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# Preface

This further information (FEI) has been prepared in support of the planning application for the proposed Magheramore Wind Farm, planning reference: LA01/2019/0922/F. The proposed wind farm is located on lands opposite the entrance to 59 Maghermore Road Dungiven BT47 4SW in the townlands of Carnanbane and Maghermore Approx 4km south of Dungiven.

The FEI has been prepared by Renewable Energy Systems Limited (RES) in collaboration with the specialists outlined below:

Technical Specialism	Author
Archaeology and Cultural Heritage	Headland Archaeology
Traffic and Transport	RES
Preliminary CEMP	RES/Blackstaff Ecology

An electronic version of this FEI, the Environmental Statement and the supporting documents submitted as part of the planning application in 2019 can be viewed free of charge at <http://www.magheramore-windfarm.co.uk>

Reference copies of the above documents may be viewed free of charge during normal opening hours at the following location:

Dungiven Library  
107 Main Street  
Dungiven  
County Londonderry  
BT47 4LE  
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Paper copies of the full FEI (2021) priced at £10 are available to purchase by contacting RES at the address below.

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# 1. Introduction

## Background

- 1.1 In August 2019, RES submitted an application (reference LA01/2019/0922/F) to the Causeway Coast & Glens BC (Planning Authority) for permission to erect a 6 turbine wind farm located on lands opposite the entrance to 59 Maghermore Road Dungiven BT47 4SW in the townlands of Carnanbane and Maghermore Approx 4km south of Dungiven.
- 1.2 The application was subject to Environmental Impact Assessment (EIA), prepared by RES, which was conducted in accordance with the Planning (Environmental Impact Assessment) Regulations, 2017. A full project description, including a range of technical and environmental studies was prepared to allow the Planning Authority to assess the environmental impacts, and these were reported in the Maghermore Wind Farm Environmental Statement (ES) which was submitted to support the application in August 2019. A Design and Access Statement and a Pre-Application Community Consultation Report were also submitted in August 2019. The planning application was validated.

## Purpose of the FEI

- 1.3 The purpose of this FEI is to update and complement, where appropriate, the environmental information previously submitted and is to be read in conjunction with the ES (2019) and its associated figures and appendices.
- 1.4 The information contained in the FEI (2021) has been produced to include a greater level of detail to provide clarity for the Planning Department, based on consultation responses received.

## Structure of the FEI

- 1.5 This FEI has been prepared in accordance with the EIA Regulations and comprises the following volumes:
  - Volume 1 - Non Technical Summary
  - Volume 2 - Main Text, Appendices and Figures
- 1.6 Volume 2 is organised as follows:
  - Section 1 - Introduction:** sets out the background to the application and the purpose and structure of the FEI, also includes consideration of the 3rd party representations received

**Section 5 - Archaeology and Cultural Heritage:** provides an additional, detailed assessment of built heritage focused on issues raised in the consultation response from the Department for Communities Historic Environment Division.

**Section 6 - Preliminary CEMP/Ecology:** provides information to address issues raised in the consultation response from NIEA (NED).

**Section 11 - Traffic and Transport:** provides information to address issues raised in the consultation response from DfI Roads.

**Conclusion:** provides a conclusion to the FEI

## Project description

- 1.7 The proposed Magheramore Wind Farm remains as described in Chapter 2 of the ES (2019). No changes to the project are proposed in this FEI.

## Northern Ireland Energy Policy

- 1.8 The aim of the Framework (DETI, 2010) is to set out the direction for energy policy for the region. It is an update to the 2004 Strategic Energy Framework which recognises that significant changes have taken place since the publication of the 2004 framework, setting out a goal for Northern Ireland to increase to 40% of electricity consumption from renewable sources by 2020.
- 1.9 The Strategic Energy Framework recognises the importance of renewable energy and onshore wind in particular in helping Northern Ireland secure its energy supply and meet European and national targets.
- 1.10 The Framework is committed to supporting and developing the industry.

## Northern Ireland Energy Strategy 2050

- 1.11 In part due to the recognition that the 40% target set in the existing Strategic Energy Target has been met, the Department for the Economy has commenced work to developing a new Energy Strategy for Northern Ireland, consultation on which took place earlier in 2021.
- 1.12 The Energy Strategy - Policy Options Consultation (2021) set out a 70% renewable electricity target by 2030. Such a provision would be in alignment with the Republic of Ireland's aim of 70% renewable electricity by 2030 as set out within the Region's Renewable Electricity Support Scheme (RESS). It is important to note that there is no cap upon the existing 40% target until it is superseded.
- 1.13 Making an energy infrastructure contribution of the scale proposed (21.6 MW) will assist in the achievement of strategic energy targets and objectives, consistent

with a wide range of International, European, UK and Regional level priorities. The rationale for the project in relation to the delivery of renewable is clear.

- 1.14 Furthermore, despite the current lack of an explicit, Northern Ireland specific, post-2020 renewables target, other relevant frameworks and reference points apply, including the Climate Change Act 2008, by which the UK committed itself to reducing greenhouse gas emissions by at least 80% of 1990 levels by 2050. Included in this target is the reduction of emissions from the devolved administrations, including Northern Ireland.

## Consideration of the 3<sup>rd</sup> party representations received

1.15 The Planning application for the proposed Magheramore wind farm was advertised on 25th September 2019 and been subjected to public consultation from this period. From this consultation, received were a total of 40 responses; of which, 12 were categorised as letters of support, and 28 were categorised as letters of objection.

1.16 Within these support letters, various beneficial attributes have been highlighted by members of the surrounding and wider community with regard to the development of Magheramore wind farm. Of such, the following points have been made:

- The development of the windfarm will be a great asset to the community, providing green and clean energy; this energy allows for the reduction in the use of fossil fuels
- The windfarm development is in line with and will help to contribute towards Northern Ireland reaching clean energy targets, such as that to achieve net zero in NI by the year 2050
- The introduction of a green energy source results in reduced levels of pollution from fossil fuel energy production, resulting in a reduced emission of CO<sub>2</sub>e into the atmosphere
- The creation of local jobs through the construction and management of the wind farm development
- The revenue generation for the local economy through a £337,000 contribution per annum towards business rates
- Promotion of renewable energy industry growth
- Potential to generate tourism; one local business owner has stated that their residential accommodation has seen an onslaught of visitors taking time to visit, and taken a great interest in the existing wind farm at Altahullion, and expects another wind farm will encourage others to visit the area
- Safeguarding of the environment for future generations by creating a more sustainable energy source

1.17 The table below outlines the issues/concerns that have also been raised and RES has provided a response to these concerns below.

Issues/concerns raised	RES Response
<p><b>Visual impact</b></p> <p>A number of concerns have been raised with regard to potential visual impacts and reporting and graphics to illustrate the same.</p>	

<p>The following themes emerge:</p> <ul style="list-style-type: none"> <li>• The scale of the machines within the proposal for the development are larger than that of other machines which are operating on wind farms across NI, therefore this is presumed to hold a much larger detrimental effect on the visual impact of the surrounding environment to that of other windfarms that are currently in operation.</li> <li>• The turbine locations will be a ‘prominent visual feature’ within the Northern Sperrin’s, which is an Area of Outstanding Natural Beauty (AONB).</li> <li>• ZVI illustrates that turbines will be visible from throughout entire Roe Valley</li> <li>• Photographs and/or photomontages provided within the proposal are not representative of locality or the actual scale of the proposed turbine installations</li> </ul>	<p>Wind turbine technology is continually improving to maximise efficiency. This is a continual process and therefore it is common for new wind farm developments to be larger than existing wind farms. It is often difficult to perceive difference in scale of wind farms unless they are in close proximity to another wind farm. Detailed descriptions and impacts on the landscape character and visual impact are detailed in ES 2019, Chapter 4.</p> <p>The landscape character of the study area is considered from paragraph 4.73 and effects on the Sperrin AONB from paragraph 4.82 of the LVIA , ES 2019,Chapter 4.</p> <p>Zone of Theoretical Visibility are used to illustrate where theoretical visibility may occur. They do not illustrate actual visibility because they do not take into account vegetation, buildings or small changes in topography. The ZTVs are analysed further and refined by field assessment. This is described from paragraph 4.119 and likely visibility from the Roe Valley is specifically referred to in paragraph 4.120 of the LVIA , ES 2019,Chapter 4..</p> <p>The photographs/photomontages have been produced to best practice standards and have not used wide angled lenses but a digital lens focal length of 50 mm to provide as accurate a representation of the human eye as possible , as stated in the ES (2019) (Technical Appendix 4.2, paragraph 4.43).</p>
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<ul style="list-style-type: none"><li>• photographs have not included a new public road which is being constructed to the western side of Dungiven, which is presumed to be a 'fatal flaw' in the ES for this proposal.</li></ul>	<p>Graphics including photomontages are produced to aid the viewer when reading the detailed written descriptions related to individual viewpoints that are contained within the LVIA (ES 2019, Chapter 4). They are not intended to illustrate exactly what would be seen by the human eye as this is not possible for the reasons provided in Technical Appendix 4.2, paragraph 4.46.</p> <p>Photographs undertaken as part of the L&amp;V assessment must be taken where it is safe to do so and this typically means at safe stopping places often beside public roads. The methodology for the selection of viewpoints is included in Technical Appendix 4.2, from paragraph 4.23.</p> <p>On review of submitted information, an error in the presentation of the photomontage of Viewpoint 3 was noticed and a revised - version of this Figure 4.15 (Rev. B) has been included. The written description in 4.130, 4.138 &amp; 4.144 (ES 2019, Chapter 4) remains unchanged as the assessment was based on the correct photomontage.</p> <p>The A6 works around Dungiven were underway during the LVIA but it remains under construction so could not have been included in the photographs. However, a selection of viewpoints were included to illustrate views from the A6 and other approaches to Dungiven (refer to Category B Viewpoints in the LVIA, paragraph 4.150. Viewpoints 7 and 8 which are located on the Teeavan Road also represent views of the wind farm from parts of the landscape which are now in close proximity to the new road</p>
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<ul style="list-style-type: none"> <li>• No cumulative impact has been undertaken of other wind farms in the Roe Valley</li> <li>• the assessment understates the potential impacts with reference to a number of viewpoints.</li> </ul>	<p>corridor.</p> <p>The construction of a large road corridor nearer to the wind farm site further illustrates that man-made infrastructure and land-use is not an uncommon feature within this Study Area.</p> <p>Cumulative impacts of other wind farms are covered within the ES (2019) Chapter 4 (para 4.188-4.206).</p> <p>The assessment is based on a detailed consideration of the landscape and visual characteristics of the Study Area and not solely on the Viewpoints. Graphic illustration of the Viewpoints is one output which should be considered in conjunction with the written analysis contained in Chapter 4 of ES (paragraph 4.126-4.206). Whilst specific viewpoints are selected to be representative of potential views, the landscape and visual assessment considers the wider impacts in the vicinity of a particular viewpoint, which is evident in the written analysis. The methodology for the selection of viewpoints is included in Technical Appendix 4.2, from paragraph 4.23.</p>
<p><b>Tourism</b></p> <p>Location of the windfarm to natural heritage sites such as Dungiven Castle, Dungiven Priory, Banagher Old Church, Carnabane Court, and the Aughlish</p>	<p>Wind farms are not an unusual feature in the wider Roe Valley area and the potential impacts of turbines on archaeology was assessed in Chapter 5 of the ES (2019) and included in FEI</p>

<p>Stone Circles. Construction and operation of the wind turbines may disrupt tourism from thriving in the area.</p> <p>It has been stated that local residents feel that tourists may avoid the area based on the obstruction caused to the natural landscape. It is envisaged that this avoidance may result in a detrimental effect to the hospitality sector locally.</p>	<p>2021.</p> <p>As stated wind farms are not an uncommon feature in the Roe Valley area and RES are unaware of any evidence that suggests the existing windfarms have negatively impacted on tourism in the area.</p>
<p><b>Environment and ecology</b></p> <p>Potential detrimental effect on the Banagher Glen Nature reserve, which is a Special Area of Conservation (SAC) site, as well as an Area of Special Scientific Interest (ASSI).</p> <p>The site for the turbine locations is also located within proximity to a Northern Ireland (NI) priority habitats woodland, and NI priority habitat peatland.</p>	<p>Potential impacts on Banagher Glen have been assessed within the ES (2019) Chapters 6,7, 8 and 9 and DAERA NED have asked that mitigation measures be captured in a Preliminary Construction Environmental Management Plan.</p>
<p><b>Policy compliance</b></p> <p>It has been noted that there is considerable concern regarding the compliance with the wind farm in question, to regional and local policy documents. The concerns are regarding the following:</p> <ul style="list-style-type: none"> <li>• Regional Development Strategy 2035</li> <li>• Planning Policy Statement 2 (PPS2)-</li> <li>• Planning Policy Statement 18 (PPS18): Renewable Energy</li> <li>• The wildlife (Northern Ireland) Order 1985</li> </ul>	<p>The site has been chosen for the reasons set out in ES (2019) Chapter 3 (Design &amp; Evolution) and as detailed in Technical Chapters of the ES (2019)</p> <p>The relevant Statutory Consultees have been consulted and Causeway Coast &amp; Glens Planning Department will determine whether this Development passes the relevant policy tests.</p>

<p><b>Archaeological impact</b></p> <p>The site is located within an area previously aforementioned as an ASSI. It has been highlighted as a matter of concern whether the existence of turbines will alter public perception of existing historical heritage sites, stating ‘demonstratable harm’ may be observed to the public’s appreciation to the monument.</p>	<p>The potential impacts of turbines on archaeology were assessed in Chapter 5 of the ES and included in FEI 2021 following a consultation response from Historic Buildings Unit and Historic Environment Division.</p> <p>The conclusions remain unchanged insofar as there will be no significant residual impacts.</p>
<p><b>Grid connection</b></p> <p>Current capacity levels within the local grid network are already operating at their maximum, therefore this windfarm’s needs could not be accommodated by the pre-existing network. It is thought that this factor results in the development being one which is determined ‘speculative’ and therefore no planning policy may permit such development.</p>	<p>Potential grid connection assessment has been undertaken as part of this application (see Appendix 2.1 of the Environmental Statement (2019)).</p> <p>RES is an experienced developer and this is not a speculative development. There is no evidence to suggest that commercial wind farm developments have been submitted on a speculative basis which is not surprising given the capital expenditure and timescales involved.</p> <p>The grid network is developed by the System Operator for Northern Ireland (SONI) and Northern Ireland Electricity (NIE) to ensure that the grid network is fit for purpose and upgrades to local and regional network form part of ongoing plans to increase renewable penetration.</p>
<p><b>Land characteristics</b></p> <p>The land in which the wind farm is proposed to be located upon will be required to be disturbed to allow for construction, it is speculated that the</p>	<p>The wind farm is predominantly sited on rough pasture which has been historically improved for agricultural purposes.</p>

<p>land drainage and ‘drying-out’ of the land associated will have a detrimental effect on the ecology of the area.</p>	<p>Detailed habitat surveys have been undertaken as part of the Chapter 6 (Ecology) of the Environmental Statement (2019).</p>
<p><b>Community benefit</b></p> <p>Will there be a financial benefit for the wider and whole community which is to be affected by the development? If so, can this be included within the proposal?</p>	<p>As stated at the public exhibition, RES is keen to hear from groups in the local area to get a better understanding of projects in the area that we could support.</p> <p>Any community funding is a voluntary benefit and is not required to make the scheme acceptable in planning terms. Any potential benefit from a community fund is not a material planning consideration and is therefore not included as part of the planning application.</p>
<p><b>Environmental Statement</b></p> <p>The ES is not an objective assessment.</p>	<p>RES is an experienced developer. The Environmental Statement contains a number of reports prepared by independent professional consultants who are experienced in assessing this type of application. All information is presented clearly and objectively with well-reasoned methodologies that are in accordance with best practice guidance relevant to each discipline.</p> <p>The ES is subject to consultation by Causeway Coast &amp; Glens Council with the relevant Departments and agencies in the course of processing of the application.</p>
<p><b>Environmental Statement</b></p> <p>Documents are difficult to view online</p>	<p>RES has stated the following in the ES (2019) and FEI (2021):</p>

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Dungiven Library

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Dungiven  
County Londonderry  
BT47 4LE  
Phone: 028 7774 1475

Paper copies of the full ES (2019) and FEI (2021) are available to purchase by contacting RES at the address below.

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# 5. Cultural Heritage & Archaeology

## Introduction

- 5.1 This chapter presents further assessment of potential effects of the proposed Magheramore Wind Farm on the historic environment following requests for Further Environmental Information (FEI) and clarification from the Department for Communities Historic Environment Division (HED), Historic Monuments Unit (HED:HM) and Historic Buildings Unit (HED:HB).
- 5.2 This chapter provides information which is supplementary to Chapter 5: Cultural Heritage & Archaeology and Appendix 5.1 (Cultural Heritage Assets not subject to operational impacts) of the EIA Report and, except where stated, all information as presented in the EIA Report remains unchanged. Additional figures have been produced to illustrate this FEI and these are identified as FEI Figures 5.21 to 5.26, continuing the numbering system used for the EIA Report. Please refer to the EIA Report for Figures 5.1 to 5.20

## Policy and Guidance

- 5.3 The FEI has been compiled in accordance with the same legislation, planning policy and guidance referred to in the EIA Report. No relevant legislation, policy or guidance relevant to the assessment has changed since the date of the EIA Report.

## Consultations

- 5.4 Table 5.1 presents a summary of the consultation responses received relating to cultural heritage following the submission of the 2019 EIA Report. The actions taken in response to the issues raised are also presented in the table. This summary of post-submission consultation should be read together with the consultations section, Table 5.1 of Chapter 5 of the EIA Report.

**Table 5.1: Consultation**

Consultee's Response	Action Taken
HED:HB's response dated 06.02.20;  "HED (Historic Buildings) requires a full assessment of the potential impacts of the wind farm on all listed assets within a	Chapter 5 Archaeology and Cultural Heritage of the Original EIAR contains a full assessment of Dungiven Castle (HB02/06/003A), the remaining 28 Listed buildings within 5km of the turbines are assessed in full in Appendix 5:1 Cultural heritage Assets Not Subject to Operational

Consultee's Response	Action Taken
<p>5km radius of the site, as all listed buildings are afforded the same level of statutory protection.”</p>	<p>Impacts.</p> <p>As the 29 Listed Buildings have been assessed in full these assessments are not repeated here. The exceptions to this are the three assets which HED: HB “considers the wind farm may have the most significant adverse impacts on”; Mount Prospect House 59 Magheramore Road Dungiven (HB02/05/001 A), Mount Prospect House (Apartments) 59 Magheramore Road Dungiven (HB02/05/001 B) and Banagher Church of Ireland Feeny Road Rallagh Dungiven (HB02/05/004). These assets are reassessed at para 5.43 (Banagher Church) and 5.47 (Mount Prospect House).</p>
<p>HED in their response of 24.02.20 requested with regard to Magheramore Court Tomb (LDY030-064) and Portal Tomb (LDY030-079) (in summary);</p> <p>1) <i>How will the proposals affect the relationships (functional and visual) between the two tombs, in particular from Magheramore Portal Tomb looking towards Magheramore Court Tomb, as illustrated below? The deliberate placement of the portal tomb downslope from the chronologically earlier court tomb, and their shared alignment, is significant and enhances the visual, functional and contextual relationship between these two sites in the prehistoric landscape. The visual impact of the proposed development upon these relationships has not been appropriately assessed. A photomontage demonstrating the impact of the proposals upon the relationships between the two tombs should be provided. It should be taken from the portal tomb and look</i></p>	<p>1) The relationship between the Magheramore Portal Tomb and Court Tomb has been assessed in paragraphs 5.19 - 5.23 and the resulting impact is included in paragraphs 5.26 - 5.28.</p> <p>A photomontage FEI Figure 5.24 has been produced to represent this view.</p> <p>2) A photomontage has not been produced from this location. Photomontage FEI Figure 5.24 from the portal tomb looking towards the court tomb is on this alignment albeit approximately 100m downslope. Photomontage Figure 5.5a is at a similar proximity to the Development albeit representing the view from the west edge of the court tomb. It is considered that these two photomontages are sufficient to understand the visual relationship and therefore a third photomontage is not needed to inform this assessment.</p> <p>3) Included in the assessment in paragraphs 5.22 and 5.24 and the resulting impact is included in paragraphs 5.26 - 5.28.</p> <p>4) Included in the assessment in paragraph 5.21 and the resulting impact is included in paragraphs 5.26 - 5.28.</p>



Consultee's Response	Action Taken
<p><i>towards the court tomb; both monuments should be visible.</i></p> <p>2) <i>The ES should assess how the proposed development will affect the critical view along the tomb alignment of court tomb Ldy030:064 looking into the tomb, as illustrated in the image below. A photomontage should be provided to illustrate the impact of the proposal upon this view. The monument should be visible.</i></p> <p>3) <i>It should be considered that the tombs were positioned off the summit of the hill, on the northern flank of the hill, to facilitate visual and functional interactions with the prehistoric communities who constructed and used the tombs and who would have lived on the lower slopes overlooked by them. This is an aspect of setting not assessed by the ES.</i></p> <p>4) <i>The ES should assess the impact of the proposal upon the ambience and distinctive character of the setting of the monuments due to the proximity, scale, noise and movement of the proposal</i></p>	
<p>HED in their response of 24.02.20 requested with regard to Banagher Old Church (LDY030:029) (in summary);</p> <p>1) <i>How will the proposal affect the main public approach via Carnanbae Road towards Banagher Old Church? A</i></p>	<p>1) Visitor approaches and experience of Banagher Old Church are included in the assessment in paragraphs 5.33 - 5.35 and the resulting impact is included the assessment paragraphs 5.39 - 5.40.</p> <p>A photomontage (FEI Figure 5.23) has been</p>

Consultee's Response	Action Taken
<p><i>photomontage demonstrating the effect of the proposal on this view should be provided and the resulting impact assessed</i></p> <p>2) <i>How will the proposal affect critical views of and the public experience of arrival at Banagher Old Church? A photomontage demonstrating the effect of the proposal upon this critical view and experience should be provided (from the area to the south of the southern entrance to the graveyard) and the resulting impact assessed.</i></p> <p>3) <i>How will the proposals affect the relationship (functional and visual) between Magheramore Cross and Banagher Old Church? A photomontage illustrating the impact of the proposal upon the visual interaction between the cross and the church should be provided.</i></p> <p>4) <i>The ES does not recognise the south window of the chancel as one of the key widely-recognised aspects of the cultural significance of Banagher Old Church. How will the proposals impact upon the view from the southern window? A photomontage may be useful here, or reference to ES Fig 5.7</i></p> <p>5) <i>HED's Guidance on Setting and the Historic Environment notes that "the experience of an asset's setting is not wholly visual, but may include a site's ambience, sense of remoteness, tranquility or removal from the modern world." (p.9). The ES should assess how the proposed development would impact upon these aspects of setting, which are particularly</i></p>	<p>provided of the view from Magheramore Cross towards the church and the Development. As this photomontage is in a very similar position to the one requested from Carnanbane Road, a further photomontage has not been produced and FEI Figure 5.23 should be referred to, to understand this impact.</p> <p>2) Visitor approaches and experience of Banagher Old Church are included in the assessment in paragraphs 5.33 - 5.35 and the resulting impact is included in paragraphs 5.39 - 5.40.</p> <p>Additional wirelines with reference photographs have been provided for two locations to illustrate the experience of a visitor arriving at the church: the lay-by where visitors are likely to park (FEI Figure 5.21) and the lane leading up to the church (FEI Figure 5.22).</p> <p>3) Magheramore Cross and its relationship with Banagher Old Church is set out in paragraph 5.32 and the resulting impact is included in paragraphs 5.39 -5.40.</p> <p>A photomontage FEI Figure 5.23 is included of the view from the cross to the church including the Development as requested by HED.</p> <p>4) It is considered that the south window is a key widely-recognised aspect of cultural significance of Banagher Old Church in that the style of stone moulding around the window is of a distinctive type which allows the window to be dated unusually precisely to 1210 - 1225 ((North Sperrins Heritage Trail, 2007, 8). There is no reference found to the importance of the view from this window nor is it considered here that the view through this window contributes to the cultural significance of this church.</p> <p>The photomontage Figure 5.7 provides the view from the graveyard immediately beyond the south window and should be referred to, to understand this impact.</p>

Consultee's Response	Action Taken
<p><i>important at a site of this nature and significance.</i></p>	<p>5) As noted in paragraph 5.38, Banagher Old Church is located to the immediate east of a modern working farm, the buildings of which partly block the wide panoramic view over the Roe Valley. The turbines at a distance of 1.5km to the south east of this church will not introduce a level of noise to this asset, they will introduce a modern visual element. The addition of the turbines will not effect the ability to appreciate the ambience of this asset, nor will it affect any “sense of remoteness, tranquillity or removal from the modern world” as this farm is situated in a ‘modern world’ immediately neighboured by a working farm with views over the modern landscape of the Roe Valley. It is considered that the proposed development will not significantly affect the “<i>site’s ambience, sense of remoteness, tranquillity or removal from the modern world</i>”</p>
<p>HED in their response of 24.02.20 requested with regard to Tamniaran Rath (LDY031:006) (in summary);</p> <p>1) <i>The visual impact of the proposed development upon these critical views (from Cashel public picnic area and the Corick Road) should be provided, to include a photomontage from the Cashel picnic area providing clear views towards the monument.</i></p>	<p>1) Tamniaran Rath is illustrated and marked on an information board in the Cashel public car park, the addition of the wind farm in the view beyond the Rath will not effect this view in that the public will still be able to view the position of the fort in relationship to the wider landscape. The turbines will simply add a further element to this wide view over Benady Glen. Similarly public views to the rath will remain along the route of the Corick Road and the presence of the proposed turbines beyond them will not affect the cultural significance of this asset.</p> <p>2) A wireline from the Cashel public car park has been produced (FEI Figure 5.25) with the location of the rath marked, no photomontage has been produced as it is considered the wireline is sufficient to demonstrate the predicted change to this view.</p>

Consultee's Response	Action Taken
<p>HED in their response of 06.02.20 with regard to Banagher Church of Ireland (HB02/05/004) requested;</p> <p>1) <i>Site location map identifying where the image in Figure 5.8 has been taken</i></p> <p>2) <i>Additional photomontages from the curtilage of the listed building showing impact of the development on the existing views from the property, would be welcome.</i></p>	<p>1) A general map location is provided on ES Figure 5.8. The viewpoint for the photomontage was adjacent to the west end of the church (i.e. with the church to the immediate left of the viewer).</p> <p>2) Banagher Church and its curtilage are heavily screened by trees to the north and west; the only locations within its curtilage from which the proposed wind farm would be visible are in the graveyard on the south-east side of the church. The existing photomontage ES Figure 5.8 provides a representative open view from this graveyard it was considered that an additional photomontage from a different location within the graveyard would add little to the understanding of the setting of this asset. No further visualisations have been provided.</p>
<p>HED in their response of 06.02.20 with regard to Mount Prospect House (HB02/05/001 A) and Mount Prospect House (Apartments) (HB02/05/001 B) requested;</p> <p>1) <i>Photomontage from within the curtilage of the listed building showing impact of the development on the existing views from the property</i></p> <p>2) <i>Site location map identifying where each image has been taken</i></p> <p>3) <i>Elevation of the newly formed entrance to the wind farm</i></p>	<p>1) A further site visit was undertaken and this confirmed that there would be no views towards the Development from the curtilage of Mount Prospect. This reflects the presence of a dense screen of trees to the south-east of the house and courtyard. Record shots have been provided to illustrate this relationship (FEI Figure 5.26) As a result, no photomontages have been produced for this Listed Building.</p> <p>2) See above.</p> <p>3) No elevation of the newly formed entrance to the wind farm has been produced. The current gate piers to this track are modern stone and concrete round pillars capped with a concrete cone at the end of stone and concrete walls that curve round the entrance. It is stated in the 2019 EIA Report that the existing gateway structure will be removed for the duration of construction works and then reinstated. Therefore, once operational, the entrance to the wind farm</p>

Consultee's Response	Action Taken
	will replicate the current gateway.

## Methodology

- 5.5 The methodology employed for compilation of the baseline and assessment of potential impacts remains unchanged from that used in the EIA Report (2019) (described in EIA Report Para 5.20 -5.49).

## Baseline Conditions

- 5.6 The baseline used for the FEI remains unchanged from that defined in the 2019 EIA Report.

## Predicted Effects of the Development

### Predicted Construction Effects

- 5.7 The construction effects identified in the 2019 EIA Report remain unchanged.

### Predicted Operational Effects

- 5.8 All designated assets within 5km of the proposed turbines were assessed in full as part of the 2019 EIA Report. The six assets, one listed building (HB02/06/003 A) and five scheduled monuments (LDY030:021, LDY030:029, LDY030:045, LDY030-064, LDY030-079), identified as being subject to operational effects were assessed within the Chapter 5: Cultural Heritage and Archaeology. The remaining 18 scheduled monuments, 28 listed buildings and two registered parks and gardens were assessed in full in Appendix 5.1 Cultural Heritage Assets Not Subject to Operational Impacts.
- 5.9 In the HED responses to the 2019 EIA Report, it identified seven assets that required further information (see FEI Table 5.2). For completeness all seven assets have been reassessed here and these assessments entirely replace the equivalent assessments in the 2019 EIA Report, regardless of whether the assessment findings for individual assets have changed or not.

**Table 5.2: Assets identified by HED for further information**

Reference Number	Title	Grid Reference
LDY030-064	Magheramore Court Tomb	268524, 405394
LDY030-079	Magheramore Portal Tomb	268496, 405478
LDY031-006	Tamniaran Rath	271178, 406708

Reference Number	Title	Grid Reference
LDY030-029	Banagher Old Church	267556, 406597
HB02/05/004	Banagher Church of Ireland	265895, 406356
HB02/05/001 A	Mount Prospect House	267773, 406881
HB02/05/001 B	Mount Prospect House (Apartments)	267765, 406910

- 5.10 **Magheramore Court Tomb (LDY030-064) and Portal Tomb (LDY030-079)** (Photomontage Figure 5.5 a & b) are jointly designated as a single scheduled monument and, as such, are both considered to be assets of high importance.
- 5.11 This monument is the remains of two prehistoric funerary monuments; they are classified from their morphology as a court tomb and a portal tomb, but they have not been excavated so there is no detailed archaeological record of their structure. Both tombs have been heavily robbed and the OS Memoirs record farmers “carried off so many cartloads of the best of the stones for door and window lintels, hearthstones, stepping stones, dykes” from the court tomb (OS Memoirs 1995, 944). It appears the portal tomb was subject to similar quarrying. They are assessed here both as individual tombs and together as a group due to their proximity, shared characteristics and joint designation.
- 5.12 The tombs are located downslope, and to the north, of the summit of Carnanbane Hill, with the portal tomb located approximately 75m downslope from the court tomb. The hill side is currently used for rough grazing. The cairns have wide panoramic views from the east through the north to the west over the rural agricultural landscape to the plains of Derry, Lough Foyle and the northern mountains of the Sperrins in the distance. The closest prominent hill in this range is Benbradagh Hill to the north-east. The view from the tombs to the south is limited by the rising ground of Carnanbane Hill.
- 5.13 Court tombs typically comprise an elongated stone cairn with a concave, semi-circular façade of large set stones (or ‘megaliths’) at one end creating a partially enclosed area or ‘court’. A gap at the mid-point of this façade on the long-axis of the cairn allows access to a line of two or more rectangular megalithic chambers. Variants include examples with entirely enclosed ‘central’ courts and ‘double’ monuments with two court tombs placed back-to-back (Waddell, 2010, 87-97). Court tombs are the earliest type of megalithic tomb recorded in Ireland dating from the Early Neolithic with radiocarbon dates suggest that the earliest date to 3700 - 3570 cal BC with some seeing reuse into the Early Bronze Age (Schulting et al, 2011, 42).
- 5.14 The Magheramore court tomb conforms to the basic model; its cairn survives 20m long and up to 8m wide, orientated north-west to south-east with the court at its north-west end. There are two circular depressions in the middle of the cairn

which are possibly the remains of two chambers however the highly disturbed nature of this cairn makes it difficult to confidently describe the tomb further.

- 5.15 Portal tombs are generally considered to be derived from court tombs. They typically comprise a megalithic chamber based on a tripod design with tall upright entrance (portal) stones and a lower backstone, supporting a massive capstone, set with its heavier end above the entrance (Ó Nualláin, 1983, 89). Historically, and colloquially, this style of monument is referred to as a dolmen. Excavated portal tombs have typically produced similar grave goods to court tombs providing them with a similar early Neolithic origin date.
- 5.16 The Magheramore portal tomb has been heavily disturbed and is therefore difficult to classify. It survives as a small collection of stones 3.7m long and 3.2m wide orientated north-west to south-east with the portal at the north-west end. The morphology of the stones with taller stones at the front and low back and side stones have been used to suggest this is the remains of a portal tomb. It is located downslope from the court tomb and shares with the court tomb both a common long-axis and a north-west orientation for the entrance.
- 5.17 The cultural significance of these tombs derives primarily from their fabric and its potential to increase our knowledge of funerary practice in the Neolithic. As both tombs possibly date from the Early Neolithic it is difficult to confidently state if one of these assets is earlier or if they were contemporary. However, previous interpretation of these assets as a court tomb and a portal tomb, if correct, would suggest that the court tomb predates the portal tomb. The relationship between these tombs adds to cultural significance as not only does their fabric contain the potential to increase knowledge of the funerary and ritual practices of the Neolithic, it also has the potential to explain why these assets are sited in proximity, if they were in use at the same time or whether they were used and built subsequently.
- 5.18 The wider landscape setting appears to have had a bearing on the siting of these tombs. The portal tomb is located approximately 75m downslope from the court tomb and the two tombs appear to have been carefully aligned on the same north-west to south-east axis with their entrances being orientated downslope to the north-west.
- 5.19 The orientation of Neolithic tombs has been widely studied and the potential for important sight-lines to and from a tomb must be examined. In the case of the Magheramore Court Tomb the orientation is north-west - south-east with the entrance to the north-west. This does not conform to the general pattern for court tombs where almost all have been built with their courts facing east of the north-south axis (Ó Nualláin, 1989,105). There is however, a very wide spread of orientations within this 180° arc, suggesting that no specific direction was important for court tombs. At this tomb, there are no obvious distant landmarks on which the entrance is orientated, it appears rather to have been positioned to capture the long-range view out over the plains of Derry and beyond. There does

not appear to be a strong preference in the orientation of portal tombs. The Magheramore portal tomb has the same alignment as the court tomb with the entrance (portal) to the north-west, but it is not clear whether this reflects an interest in the view over the plains or simply a desire to share a common alignment with a pre-existing monument.

- 5.20 Located on the side of the hill, these are not summit cairns and there is nothing to suggest that they were sited to be landmarks in distant views towards them. However, it is generally assumed that many types of burial cairns were located where they would be visible to the descendants of the dead as they carried out their daily activities. If this was the case for these tombs the land immediately surrounding and downslope of these assets may be a characteristic of their setting of relevance to their cultural significance. In their current condition, surviving as low mounds of stones, the tombs are no longer either prominent or dominant features in the landscape. These assets cannot be readily identified in the landscape until in their immediate proximity. Indeed, from one cairn it is not immediately clear that there is another tomb close by as the rough vegetation obscures their visibility.
- 5.21 Today's visitor to the site will experience these cairns in a relatively open moorland setting, both cairns are severely diminished and are not readily recognisable as prehistoric cairns until in their immediate vicinity. Once at the cairns, it is likely that the general visitor would be most struck by the expansive view to the north from which they would be able to identify many landmarks both landscape and modern. While set on the hill overlooking this landscape these cairns are not divorced from the modern world rather provide a vantage point to view it.
- 5.22 To a limited extent the views between the cairns add to their cultural significance. The cairns are intervisible and share a common alignment which can be appreciated on site. This adds a degree of value to the view from the court tomb north-west to the portal tomb and, conversely, from the portal tomb south-east to the court tomb (Photomontage FEI Figure 5.24). As discussed above, the diminutive remains of these cairns and the surrounding rough vegetation make these views difficult to appreciate but they can still be experienced due to the open moorland character of their immediate surroundings.
- 5.23 To summarise, the cultural significance of these tombs derives primarily from their fabric and its potential to increase our knowledge of funerary practice in the Neolithic and the relationship between different types of tomb. The additional contribution that setting makes to this significance relates to an appreciation of the relationship between the two monuments, their relationship with the immediate surrounding landscape on which the builders of the cairns would have been active, their common alignment and the experience of panoramic long-range views from their entrances to the north-west, suggesting a deliberate orientation of the tombs in this direction.



- 5.24 The nearest turbine of the Development is Turbine 3 which will be 201m to the south-east of the scheduled area. Turbine 4 will be 227 m to the south-west of scheduled area with the remaining four turbines partially visible over the summit of Carnanbane Hill to the south. The predicted appearance of the wind farm from the Magheramore tombs is illustrated in two photomontages: Figure 5.5 a, with a 360° view from the court tombs provided in photomontage Figure 5.5 b; and FEI Figure 5.23.
- 5.25 Turbines 3 and 4 would be dominant features in any views looking south or west from the tombs with the other turbines as prominent features slightly further away. The wind farm would not be visible in the panoramic long-range views from the east through the north to the west from the turbines.
- 5.26 The Development would be experienced in the immediate landscape setting of the Magheramore Court and Portal Tombs as a dominant feature on the southern horizon and on the hillside to the west of the asset, at least 201m from the asset. The turbines would have no effect on the viewer's ability to appreciate the long-range views from the east through north to west from these tombs and in particular none of the turbines would be in the key view from the entrances of the tombs to the north-west.
- 5.27 The proximity of the turbines would introduce a degree of visual distraction to the immediate setting of the assets, and particularly in the view from the portal tomb south-east towards the court tomb. This would diminish, but not prevent, the appreciation of the relationship between these Neolithic funerary monuments. The landscape setting of the tombs would remain essentially open and unenclosed, despite the proximity of the closest turbines.
- 5.28 To the limited extent that the view to the south-east between and across the tombs contributes to the cultural significance of this asset, this change would slightly diminish that positive contribution. It is considered that this would be an adverse impact of low magnitude, resulting in an effect of minor significance on the Magheramore portal and court tombs.
- 5.29 **Banagher Old Church (LDY030:029)** (Photomontages and Wirelines Figure 5.7, FEI Figures 5.21, 5.22 and 5.23) is a scheduled monument and also a Monument in State Care; as such it is an asset of high importance. This mid-12th century church survives extant to roof height. The church sits within a graveyard, which contains many contemporary and later gravestones and crosses as well as a thirteenth-century mortuary house shrine, O'Heany's Tomb (part of the scheduled area). Since being built on the summit of the hill, centuries of use of the graveyard have seen the ground level rise significantly. To the west of the graveyard gate is the remains of the medieval priest's strong-house or tower, outside the graveyard to the north-east is a bullaun stone. On the opposite side of Carnanbane Road to the north-west of the graveyard is Magheramore Cross, which is a detached part of the designated area.

- 5.30 The church is located on a small hillock with extensive views in a wide arc from the hills of the northern Sperrins in the north-east over the Roe Valley through the low agricultural lands to the west to the spire of Banagher Church of Ireland (HB02/06/003 A) in the south-west. These views have been partly blocked by the building of a farm to the immediate north of the church, however the wide panoramic view can still be appreciated. Views from the south-west through east to the north-east are less extensive and are restricted to the rising ground of the surrounding hills. Although located on a hilltop this church is no longer a prominent feature in the surrounding landscape and is only visible from the immediate surrounding land.
- 5.31 Magheramore Cross is a small termon cross possibly marking out the edge of the consecrated ground of the church which were exempt from secular taxation. A second termon cross survives upstanding to the east of the church and it is probable that there were originally four or five termon crosses marking this boundary. Magheramore Cross is a small upright cross which has been broken with the head of the cross now leaning against what was its base, in a field to the south of Carnanbane Road. It is immediately surrounded by an iron fence (for its protection), with gorse growing around it, much of the field in which the stone stands has been removed by quarrying.
- 5.32 Public approaches to this monument are most likely to be along Magheramore or Carnanbane Road. Due to the local landform the church and its grounds are not visible until the visitor is in relatively close proximity to the monument. When approached from the north on Magheramore Road it becomes visible at the north edge of the field that surrounds it. From the west travelling along Carnanbane Road, the church becomes visible once the summit of the hill is reached at the approximate location of the Magheramore Cross. The church is visible at a slightly greater distance when approaching the church from the south along Magheramore Road being visible from the crossroads at Murphy's Quarry due to the intervening flat ground and relative absence of trees.
- 5.33 Having approached along either Magheramore or Carnanbane Road most visitors, if travelling by car, will park in the small car park/layby on Carnanbane Road to the south of the church. From this car park the visitor can see the raised mound of the graveyard, gravestones, the church building, the priests strong-house and the graveyard wall. The visitor will then follow the road sign which directs them towards the church along a farm track which curves round from Carnanbane Road approaching the church from the north west. On arrival at the church grounds, the visitor first passes the remains of the priests strong-house before entering through the gate in the churchyard wall and climbs the stone stairway into the churchyards. A visitor is then free to walk around the remains of the church, the graveyard and visit the mortuary house. While the entrance to the north west is the main entrance to the church and grounds there is another small gate to the

north-east just beyond the priests house a path from which leads on to the farm track.

- 5.34 It is probable that the Magheramore Cross to the south west of the church on the opposite side of the road is not seen or visited by the majority of visitors to the church. It has no signage and is largely hidden by gorse.
- 5.35 The cultural significance of this asset derives largely from its intrinsic architectural and archaeological value and its potential to increase our knowledge of ecclesiastical practices in the medieval period. As a church the building also derives cultural significance from its function as a recognisable place of worship. The additional contribution that setting makes to this significance relates to an appreciation of the wide views afforded by hilltop location chosen for the church.
- 5.36 Magheramore Cross is no longer visible in views from the church grounds due to the intervening vegetation. The view from the cross to the church grounds adds to the cultural significance of this cross as this view aides our understanding of why this cross is located in this location because of its relationship with the church
- 5.37 The proposed turbines will be 1.5km to the south-east of the graveyard, visible to hub height on or over the summit of Carnanbane Hill. The appearance of the wind farm is illustrated in photomontages and wirelines (Figure 5.7, FEI Figures 5.21, 5.22 and 5.23). The Development would be experienced in the wider landscape setting of Banagher Old Church as a prominent but relatively distant feature on the south-east horizon. It would not appear in the wide panoramic view to the west. At 1.5km, the appearance of the turbines to the rear of the church in views from, and on approach to, the graveyard to the rear of the church, and in the view from Magheramore Cross towards the church will introduce a degree of visual distraction to the immediate setting of the assets. This would slightly diminish but not remove the ability to understand and enjoy the asset.
- 5.38 To the limited extent that the view to the south-east from the church contributes to the cultural significance of this asset, this change would very slightly diminish that positive contribution. It is considered that this would be an adverse impact of negligible magnitude resulting in an effect of negligible significance on the Banagher Old Church.
- 5.39 **Tamniaran Rath (LDY031:006)** is located in a field of improved pasture on a north/south ridge between the River Roe and the Black Burn. It has commanding views in an arc from the west through north to the east over and along the Roe Valley and Benady Glen. The rath also overlooks the Black Fort (LDY31:007) and the White Fort (LDY 31:008) which are located on the opposite side of Benady Glen to the east. This circular rath is 30m in diameter with a well-preserved bank, though the interior appears to have been levelled.

- 5.40 This asset primarily gains its cultural significance from its fabric and its potential to inform our understanding of domestic, defensive and agricultural activities during the medieval period. This fort is experienced and understood in a setting that makes some contribution to its overall cultural significance. The location of the fort was presumably chosen as it provided an accessible but defensible location for residents in close proximity to agricultural land, and for views along the communication corridors of the Roe Valley and Benady Glen. It is presumed that the Tamniaran Rath (LDY031:006) has also been placed to enable intervisibility with the (probably) contemporary Black Fort (LDY31:007) and White Fort (LDY 31:008). There is nothing to suggest that other, more distant views from the rath were of relevance.
- 5.41 The Development would be located to the south-west of the rath, at approximately 2.8km to the nearest turbine. The presence of turbines in views to south-west of the rath will not hinder the understanding or appreciation of the contribution made by setting to the cultural significance of the monument. Nor will it affect the interrelationship between Tamniaran Rath (LDY031:006) and Black Fort (LDY31:007) and White Fort (LDY 31:008). It is therefore considered that there will be no impact on Tamniaran Rath.
- 5.42 **Banagher Church of Ireland (HB02/05/004)** (Photomontage, Figure 5. 8) is a Grade B+ listed building and as such is an asset of high importance. This church was built in the late 18th century, bringing a church back to the parish of Banagher after the old Banagher Church (LDY030:029) was abandoned in the early 18th century in favour of the new parish church in Dungiven. This church is set back from the Altinure Road, accessed through the church carpark, then up a winding drive surrounded by mature trees to the church at the summit of a small hill. The church is not visible when approaching from Altinure Road and the carpark until one nears the top of the drive it becomes a dominating feature backdropped only by the sky. To the rear (south-east) of the church is a graveyard from which the surrounding countryside is visible.
- 5.43 Although in its immediate vicinity views to the church are not possible until immediately upon it, in views from the wider countryside the church spire is a prominent feature. The listing document notes “the spire of Banagher Church forms a salient feature of the Townlands of Derrychier, Rallagh, Knockan and Drumcovit.”. The view of the Spire from Drumcovit House (HB02/05/008) to its south-west is also of importance as, according to tradition, the Anglican Bishop of Derry enjoyed the fine views of it from the house. Fearing that the Parish Church was becoming obscured from view, he paid for the tower and octagonal spire to be built. (North Sperrins Heritage Trail, 2007, 24).
- 5.44 Characteristics of the church’s setting relevant to its cultural significance are its visibility in the wider landscape and its connection with, and importance to, the community. The secluded setting of the church - almost hidden by trees until arrival at the summit of the hill - adds to the sense of place as does the

appearance of the church against the sky, once the summit is reached. The church also gains visual and functional value from its relationship with its graveyard and the agrarian landscape beyond.

- 5.45 The proposed wind farm will not be visible in approaches to the church along the driveway and the open backdrop will be retained. The turbines will be visible at a distance of 2.68km to the south-east from the graveyard behind the church (Photomontage Figure 5.8). This may add an element of visual distraction to this viewpoint which is of limited relevance to the cultural significance of the church. While the Development will appear in combination with the spire in some views from the surrounding townlands to the north -west of the church, there will be sufficient separation that the turbines will not compete with or visually dominate the spire which will remain a prominent focal point in the local landscape. It is therefore considered that there will be an impact of negligible magnitude resulting in an effect of negligible significance on Banagher Church of Ireland.
- 5.46 Mount Prospect House (HB02/05/001 A) and Mount Prospect House (Apartments) (HB02/05/001 B) are Grade B2 listed buildings and as such are assets of high importance. These buildings are on the Magheramore Road, approximately 2.6km south of Dungiven. Built in the 18th century this farmhouse (HB02/05/001 A) and its associated outbuildings (HB02/05/001 B) have since been altered, with the outbuildings being converted into holiday accommodation in 1999. The outbuildings form a three-sided courtyard to the rear (west) of the House with a garden and mature trees to the front (east) of Mount Prospect House. The outbuildings are surrounded by numerous modern farm buildings.
- 5.47 The significance of these listed buildings relates primarily to the architectural interest of the buildings as well-preserved examples of 18th century farmhouse and outbuilding.
- 5.48 As a farmhouse and associated outbuildings, the elements of the setting that contribute most to Mount Prospects cultural significance are the functional and visual relationships between them and their associated farm buildings. Views to surrounding associated fields are also of value as they comprise the farmlands associated with these buildings. Views into these buildings from Magheramore Road are largely screened by the mature trees that surround them.
- 5.49 The ZTV indicates that up to 6 turbines might be visible from these buildings at a minimum distance of 1.6km. However, screening by an area of woodland to the south-east of the listed buildings would obstruct any views towards the Development from the immediate surroundings of the buildings (see photos in FEI Figure 5.26). It will remain possible to understand and appreciate the cultural significance of these buildings in an essentially unaltered setting.
- 5.50 The entrance to the proposed wind farm will be located to the south-east of these buildings on the opposite side of Magheramore Road. The route of the access track will follow an existing farm track. Woodland between Mount

Prospect House and Mount Prospect House (Apartments) and the proposed wind farm entrance will screen the entrance from the buildings. It is considered that the presence of the turbines and wind farm entrance would not detract from the setting of this farmhouse and outbuildings which will remain in a rural agricultural setting.

- 5.51 It is therefore considered that there will be no impact on the cultural significance of Mount Prospect House and Mount Prospect House (Apartments) from the proposed wind farm.

## Mitigation

- 5.52 Mitigation measures will remain as stated in Chapter 5 of the 2019 EIA Report.

## Residual Significant Effects

- 5.53 No significant residual effects have been identified, this remains as stated in Chapter 5 of the 2019 EIA Report.

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## 6. Preliminary CEMP/Ecology

6.1 This section of the FEI report aims to provide further information in response to the consultation response from the Department of Agriculture, Environment and Rural Affairs (DAERA), Natural Environment Division (NED) dated 6<sup>th</sup> August 2021, in which the following information was requested:

- A Preliminary Construction Environmental Management Plan shall be submitted by the applicant/approved contractor to the Planning Authority. This should identify the perceived risks to the aquatic environment, potential pollution pathways and mitigation measures to negate such risks. It should include mitigation measures already proposed in the OCEMP, with the addition of mitigation included in the geotechnical assessment and Environmental Statement, and is to include the following:
  - a) Construction Method Statement(s), including details of construction and excavation
  - b) Pollution Prevention Plan, including details of a suitable buffer of 10m between the location of refuelling, storage of oil/fuel/substrate/construction materials/machinery, concrete mixing and washing areas and any watercourses/surface drain on site
  - c) Site Drainage Plan, including details of Sustainable Drainage Systems (SuDS), surface water disposal/treatment and silt management measures
  - d) Spoil Management Plan, including location of spoil storage areas outwith the 10m buffer zone
  - e) Environmental Emergency Plan, including details of emergency spill procedures and regular inspections of machinery onsite
  - f) Water Quality Monitoring Plan

6.2 The preliminary CEMP has been updated and can be found in Appendix 1 of this FEI report.





# 11. Traffic and Transport

## Introduction

- 11.1 This section of the FEI report aims to provide further information in response to the consultation response from the Department for Infrastructure Roads Department which is dated 9th October 2019.
- 11.2 Figure 2.8 Site Entrance drawing (Ref: 03426D2402-03) contained within the Figures Section of this report, has been updated to address the following concerns:
- 11.3 A scale plan and accurate site survey at 1:500 (minimum) showing all existing conditions( e.g- fences, hedges, culverts, streams, poles, ditches, carriageway, as well as existing and proposed works, spot levels and details .
- The width and gradient of new access needs clearly indicated.
  - New width of proposed works to existing laneway and gradient need illustrated
  - sightlines of 4.5 x 120m in each direction along the full length of the visibility splays need demonstrated, the proposed works to achieve them, including side slopes, fences , hedges, streams and walls setback etc
  - Proposed alterations at access to minimize water run off onto carriageway
  - Achieving forward visibility in both directions needs demonstrated
- 11.4 A Traffic Management Plan (TMP) has also been prepared and includes the following details:
- Details of Construction traffic, numbers, frequency, size and HGV routes.
  - Abnormal load routes, approximate size, weight of loads and frequency.
  - Identify any structures on abnormal load routes.
  - Identify any alterations to roads required ie. widening, corner improvements, passing bays etc.
- 11.5 The TMP report provides a more detailed assessment of the proposed route for the delivery of turbine components illustrated within the Environmental Statement (2019) Chapter 11 (Vol. 2). The suitability of the access route is reviewed, any necessary improvement works required on the existing road network are identified, and traffic management measures required for the transport of Abnormal Indivisible Loads (AILs) and Heavy Goods Vehicles (HGV). The TMP can be found in Appendix 2.



## 12. Conclusion

- 12.1 The purpose of this FEI is to update and complement, where appropriate, the environmental information previously submitted and has been produced to include a greater level of detail to provide clarity for the Planning Authority. FEI was provided on the following topics:
- Archaeology and Cultural Heritage
  - Traffic and Transport
  - Preliminary CEMP/Ecology
- 12.2 With regards to the Traffic and Transport, the Developer will endeavour to ensure that disruption to local services will be avoided where possible. The DfI Roads Authority, relevant Councils and local communities will be notified and kept informed of all road mitigation and traffic management requirements for the proposed Development.
- 12.3 With regard to the Archaeology and Cultural heritage it is concluded that the Magheramore Wind Farm proposal is in accordance with the policies of PPS6 for all the Assets assessed. Mitigation measures will remain as stated in Chapter 5 of the 2019 EIA Report.
- 12.4 The Magheramore Wind Farm will provide several benefits. The scheme will result in a reduction in greenhouse gas emissions from the electricity generating industry by harnessing wind, as an alternative to the burning of fossil fuels, in line with Northern Ireland government energy goals and the wider UK energy targets.
- 12.5 Onshore wind is now the cheapest form of any new generation bar none and the proposed Magheramore Wind Farm, if approved, would play an important part in helping to make the important transition to a low cost, low carbon future for Northern Ireland.



# Appendix



Appendix 1 - Preliminary CEMP

Appendix 2 - TMP





# Appendix 1





# **Preliminary Construction Environmental Management Plan (CEMP)**

**Updated 2021**



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As per the Request for further environmental information (31.08.21), responses are provided in the Table below:

Request Item	RES Response	ES Section
a) Construction Method Statement(s), including details of construction and excavation	Typical construction methods are included in the oCEMP for all associated infrastructure on the Development. Detailed construction method statements will be developed and agreed prior to construction.	Please refer to preliminary CEMP (2021), Section 3
b) Pollution Prevention Plan, including details of a suitable buffer of 10m between the location of refuelling, storage of oil/fuel/substrate/construction materials/machinery, concrete mixing and washing areas and any watercourses/surface drain on site	Environmental Management and Pollution Prevention are discussed in the ES (2019) and the oCEMP	Please refer to Chapter 2 of the ES (2019), Section 2.98 - 2.100 and to preliminary CEMP (2021) Section 2.1
c) Site Drainage Plan, including details of Sustainable Drainage Systems (SuDS), surface water disposal/treatment and silt management measures	Site drainage discussed in the oCEMP and the McCloy's Water Framework Directive Assessment	Please refer to the preliminary CEMP (2021), Annex 2, Water Framework Directive Assessment
d) Spoil Management Plan, including location of spoil storage areas outwith the 10m buffer zone	Peat Spoil Management Plan issued with ES	Please refer to the ES (2019), Vol 4. Appendix 9.3, Figure 6
e) Environmental Emergency Plan, including details of emergency spill procedures and regular inspections of machinery onsite	Documents appended - see preliminary CEMP (2021) Annex 5 & 6	-
f) Water Quality Monitoring Plan	Document appended - see preliminary CEMP (2021) Annex 7	-





## 1.0 INTRODUCTION

This preliminary Construction Environmental Management Plan (oCEMP) is submitted by RES Ltd (RES). The principal objective of this document is to provide information on the methodologies to construct and decommission Magheramore Wind Farm.

As the preliminary CEMP is being prepared as part of the planning application, RES Ltd are yet to appoint a wind turbine manufacturer or contractors to undertake the electrical or civil engineering works. The contractor(s) appointed to construct the project will prepare detailed method statements to construct the works which will incorporate the details outlined in this outline CEMP.

This preliminary CEMP sets out the overarching construction management philosophy for the site and provides further details on specific activities that will be undertaken on the site.

The Annexes within the preliminary CEMP include information / reports produced for the Environmental Statement and to avoid unnecessary duplication they have not been reproduced in this document but signpost to the relevant location within the Environmental Statement.

### 1.1 Project Description

The proposed Magheramore Wind Farm includes the installation of six wind turbines with a maximum height to blade tip of 149.9m and associated infrastructure associated external electricity transformers, underground cabling, a newly created site entrance, access tracks, turning heads, crane hardstandings, control building and substation compound and energy storage containers. During construction and commissioning there would be a number of temporary works including an enabling works compound, construction compound with car parking, temporary parts of crane hardstandings and welfare facilities.

Relevant Drawings of the Site infrastructure are included as Annex 1.

Table 1.1: Outline Project Programme

TASK	CONSTRUCTION MONTH											
	1	2	3	4	5	6	7	8	9	10	11	12
Mobilisation & setup construction compound	■	■										
Site entrance and tracks		■	■	■	■	■	■	■				
Crane hardstandings				■	■	■	■	■	■			
Turbine foundations							■	■	■	■		
Control building & substation							■	■	■	■		
Cable installation									■	■	■	
Turbine deliveries										■	■	
Turbine erection										■	■	■
Operational take over											■	■

### 1.2 Conditions of Consent

Planning permission for the construction and operation of the Wind Farm is yet to be received. Upon receiving conditions, RES Ltd will provide an updated to illustrate how applicable conditions will be discharged, aligning current construction methods with relevant legislation and environmental protection practices.

### 1.3 *Community Liaison*

Throughout the construction period of the project, RES Ltd will maintain an open dialogue with local residents and all other interested parties. RES Ltd will ensure the local community is provided with regular updates on the progress of construction and upcoming activities through appropriate channels.

A member of staff will be appointed for responsibility of key contact between RES Ltd and the community. This person will be the nominated point of contact for local residents in connection any issues that may be raised during construction, operation and decommissioning of the wind farm.

Any change to the appointed person shall be communicated to the planning authority and the local community representatives as required.

## 2.0 **GENERAL CONSTRUCTION MANAGEMENT PRINCIPLES**

Magheramore Wind Farm will be constructed in accordance with the Environmental Statement (2019) prepared during the development stage of the project and in line with good practice outlined in the Scottish National Heritage guidance “Good Practice during Windfarm Construction” - 4<sup>th</sup> Edition 2019.

Throughout the development of the project, the aim has been to ensure the design:

- Minimises the extent of infrastructure;
- Avoids sensitive habitats;
- Minimises environmental impacts; and
- Maximises health and safety.

Where appropriate and practicable, local plant and materials will be used in order to maximise the benefit of the wind farm project to the local economy.

### 2.1 *Environmental Management and Pollution Prevention*

Specific procedures to ensure that the local environment is protected during construction works are managed through our Environmental Management System Procedures and Policies which is certified to ISO 14001.

#### 2.1.1 *Contractors Requirements*

Details of the environmental management and emergency procedures to be adopted by Contractors during the construction phase are contained within the RES management system procedure Safety and Environmental Requirements of Contractors - 01059R00038.

#### 2.1.2 *Surface and Ground Water Management*

In accordance with, a sustainable drainage system (SuDS) will be implemented to provide a series of surface water management techniques to mitigate any adverse impact on the hydrology of the site.

The Magheramore Wind Farm - Water Framework Directive Assessment details the design criteria and philosophy for the SuDS system. This document is included as Annex 2.

The above document also makes reference to the design of watercourse crossing, and an inventory of identified watercourse locations.

### 2.1.3 Water Quality Monitoring

Any potential pollution incident on site that may impact water quality will be dealt with in accordance with the Water Framework Directive Assessment. This document is included as Annex 2.

Water quality monitoring will be undertaken on discharge waters during the construction phase to ensure that the development does not impact on local watercourses and rivers.

A bespoke water monitoring strategy will be prepared and implemented by a specialist consultant, detailing monitoring locations, sampling frequency and the methodology for chemical and biological analyses. Site sensitivity will be considered when deciding on the level and periodicity of sampling and the proposed monitoring plan discussed and agreed with Water Management Unit prior to implementation.

The exact location of each sampling point will be determined during a walkover survey, and will reflect the point on all relevant controlled waters closest to the proposed active construction areas. Sampling points up- and down-stream of the construction activity will be selected to provide a full profile of the controlled waters.

A baseline report will be prepared following initial pre-construction water quality monitoring. This report will provide details of any contamination concentrations recorded and will be used to depict “uncontaminated background pollution levels” for the site.

In the event of a potential pollution incident, all relevant monitoring points would be visited and re-sampled to determine any changes relative to the baseline data. A report detailing the findings would be prepared for each incident and recommendations provided for further monitoring and / or requisite mitigation measures.

Following completion of the construction of the wind farm, all sample points will be revisited, re-sampled and analysed for a full suite of analytical parameters and a further report prepared discussing any impacts upon water quality arising from the construction process.

### 2.1.4 Foul Water Management

Foul drainage will be provided in agreement with the relevant authorities and most likely involve Foul effluent disposal via chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e. there shall be no emission on site).

### 2.1.5 Noise Management

The sources of construction noise are temporary and vary in location, duration and level as the different elements of the wind farm are constructed. Construction noise arises primarily through the operation of large items of plant and equipment such as excavators, diesel generators, vibration plates, concrete mixer trucks, rollers etc. Noise also arises due to the temporary increase in construction traffic near the site.

BS 5228-1:2009 ‘Noise control on construction and open sites; Part 1 - Noise’ is identified as being suitable for the purpose of giving guidance on appropriate methods for minimising noise from construction activities.

For all activities, measures shall be taken to reduce noise levels with due regard to practicality and cost as per the concept of ‘best practicable means’ as defined in Section 72 of the Control of Pollution Act 1974.

It's proposed the following noise mitigation measures will be implemented where appropriate and in line with further guidance from BS 5228-1;

- Consideration will be given to noise emissions when selecting plant and equipment to be used on site. Where appropriate, quieter items of plant and equipment will be given preference.
- All equipment should be maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;
- Stationary noise sources shall be sited as far as reasonably possible from residential properties and, where necessary and appropriate, acoustic barriers installed to further reduce the impact;
- The movement of vehicles to and from site will be controlled; and
- Employees will be instructed to ensure compliance with the noise control measures adopted.

Should it be considered necessary to further reduce noise levels, mitigation measures would be considered and appropriate measures will be undertaken.

There are many strategies that could be employed to reduce construction noise levels; BS 5228-1 also states that the 'attitude to the contractor' is important in minimising the likelihood of complaints and therefore consultation with the local community should occur. Non-acoustic factors such as mud on roads and dust generation, which can also influence the overall level of complaints, will also be controlled as detailed elsewhere in this document.

In the event that noise complaints are received, the RES onsite staff member will contact the complainant and if required, visit the property to discuss the complaint and subjectively assess the noise levels. If the noise complaint is found to be merited, additional mitigation measures will be put in place.

In the event a resolution cannot be reached between RES and the complainant, the planning authority will be informed in order that they can carry out their own subjective assessment and if required agree any additional mitigation.

All noise complaints will be recorded along with actions taken to resolve the issue. These records will be available to the Council on request.

#### 2.1.6 Dust Management

The potential issue of dust creation during the works will be weather and season dependant, therefore detailed dust management methods will be subject to the works programme and contractor working methods.

Dust management will be carried out at all times in accordance with industry best practice to ensure that any local sensitive receptors are not affected by nuisance levels of dust from the works.

The following methods of dust suppression will be considered during the construction phase of the wind farm as required:

- Site tracks to be damped down using bowser or other suitable system;
- Road sweeper to be used to remove loose material from adjacent public roads during construction;

- Cleaning of vehicles, including provision of waterless wheel washing facilities, prior to exiting site onto the public road;
- Soil erosion control measures;
- Speed limits to be put in place to ensure low vehicle speeds;
- Vehicle loads to be covered;
- Damping of dry excavations and cutting activities which generate dust; and
- Sequencing of works to minimise the time that soils are exposed.

#### **2.1.7 Spoil Management Bunds**

Excavated peat, topsoil and subsoil are expected to be reused within the works either as part of backfilling or reinstatement operations or used to form landscaping bunds. Materials will generally be stockpiled close to the location of reuse to limit vehicle movements on site. Details of peat and soil stripping at the site and the proposed use and placement of peat, topsoil and subsoil is detailed in Annex 3: Geotechnical Assessment.

#### **2.1.8 On-Site Fuel and Chemical Storage**

All fuel and chemicals will be stored within appropriately specified containers and within specifically designed stores / storage areas, and shall include appropriate measures to avoid spillages in accordance with Control of Pollution (Oil Storage) Regulations (NI) 2010.

#### **2.2 Temporary Lighting**

Temporary lighting will be required at the construction compounds for security purposes and to ensure that a safe working environment is provided to construction staff. In addition, temporary lighting may be required to ensure safe working conditions at tracks, control building and turbine locations during construction.

All temporary lighting installations will be downward facing and all lights will be switched off during daylight hours and in accordance with any mitigation proposed to avoid disturbance to badgers.

#### **2.3 Peat Slide Risk and Slope Stability**

A Quantitative Slope Stability Assessment has been undertaken as part of the Environmental Statement (see Appendix 9.3 of ES) and the design of infrastructure has taken into account the findings of the assessment. The recommendations highlighted in Annex 3 will be followed.

Prior to commencement of construction, detailed method statements will be prepared to address the working methods to be used. Additionally, a “toolbox talk” will be provided by the site management team to highlight possible events causing slope instability and provide guidance on best practice when operating in areas identified as at risk.

#### **2.4 Post Construction Restoration and Reinstatement**

During construction of the infrastructure elements (detailed in Section 3), the vegetated layer will be stripped from the area of the excavation and stored locally with the growing side up. The remaining organic topsoil and subsoils will be excavated down to formation level, or a suitable stratum, and again will be stored local to the point of excavation, but shall remain segregated to avoid mixing of materials.

Temporary storage areas shall take consideration of all identified buffer areas and be stripped of vegetation prior to stockpiling in line with best working practices. As construction is progressed the effectiveness of the buffer zones will be reviewed and if necessary adjusted. Alternatively the construction procedure may be reviewed and altered or additional control measures put in place.

Post-construction reinstatement will be undertaken as work progresses to minimise the period any organic material is stockpiled. Subsoils shall be used in landscaping and backfilling around structures while the vegetated layer and/or topsoil will be used to reinstate storage and working areas, road verges, drainage swales and embankments. In addition, following the completion of the works, a final inspection of the wind farm site will be undertaken and in circumstances where reinstatement using vegetation and/or topsoil is unsuccessful alternative methods will be considered.

Upon completion of all construction works, the temporary construction compounds will be reinstated to their approximate pre-wind farm condition. All temporary structures and construction equipment will be removed and the granular material that forms the hardstandings will be moved to areas agreed with the landowner or removed from site. Following this, the areas will be backfilled with material stripped and stored during the construction of the wind farm and reseeded as required.

In line with construction best practice and to suit the ground conditions anticipated on site, the track and hardstanding design has endeavoured to minimise spoil generated during construction.

## **2.5 Traffic Management**

Details of the proposed traffic management arrangements will be contained in a Traffic Management Plan (TMP). Any operations not covered by the TMP will be performed in accordance with local and national standards and specifications. All abnormal load movements associated with the project will be performed in accordance with the anticipated Article 78 Permit, using the delivery route shown on drawing 03426D2509-01, *Turbine Delivery Route*.

## **2.6 Health and Safety Management**

The Principal Contractor will be responsible for ensuring that a construction phase health and safety plan is prepared and implemented on site. All work will be carried out in accordance with:

- The Health and Safety at Work etc. Act 1974;
- The Construction (Design and Management) Regulations (NI) 2016; and
- All applicable third party safety guidelines.

## **2.7 Environmental**

An Ecological Clerk of Works (ECOW) will be appointed, and will be fully engaged in preparatory works that will be undertaken, with their terms of appointment extended throughout the construction period into the operational period. The agreed terms of appointment, to be agreed with Causeway Coast and Glens Borough Council, will be provided prior to construction.

The provision of an Archaeologist will be implemented during any excavation works, in agreement with Causeway Coast, and a Written Scheme of Investigation will be provided and agreed with Causeway Coast & Glens Borough Council and applied to all applicable areas of work.

## **3.0 DESIGN PHILOSOPHY AND CONSTRUCTION METHODS**

### **3.1 Site Entrance**

The traffic associated with construction of the wind farm will access the site from the Magheramore Road using the proposed site entrance. Wheel cleaning facilities will be set up at

the site entrance to remove mud from the wheels of vehicles leaving the site. Public roads will be inspected daily and a road sweeper will be employed to remove any mud or debris transferred onto the roads from site activities.

### 3.1.1 General Construction Method

The site entrance will be constructed in accordance with the design drawings as follows:

- Traffic management to be installed;
- Topsoil shall be removed and carefully stockpiled;
- New drainage shall be installed taking care to ensure that existing drainage will not be compromised;
- Road pavement works to be completed to the design requirements;
- Line marking, signage, fencing and vehicle restraint systems required as part of the design will be installed;
- Upon completion of the construction works the the site entrance will be reinstated to reduce the extent of hardstanding back to its original pre-construction state. Stone pillars and walls removed to allow access will be reinstated as will stock proof fencing. Any trees and hedgerows removed will be replanted.

## 3.2 Temporary Construction Compounds, Site Tracks and Crane Hardstandings

### 3.2.1 Temporary Construction Compounds

Temporary construction compounds are required for the provision of site offices, welfare facilities and storage arrangements for materials, plant and equipment. There is one temporary construction compound required for the construction phase of the project.

The temporary construction compound will be constructed at the location indicated on Drawing 'Infrastructure Layout' 03426D1001, in Annex 1.

Initial welfare provision will be made for use during construction of the access tracks to the temporary construction compound. This will likely be a single unit for use by a small workforce tasked with the enabling works.

The temporary construction compound will be the main compound for the site with welfare facilities at this location.

An area will be assigned for the storage of fuels and chemicals, ensuring any spillage is captured and appropriately dealt with.

### 3.2.2 Site Tracks

The running width of the tracks will be typically 5 m on straight sections, increasing at corners and passing places to accommodate the swept path of turbine delivery vehicles. The track working area will be kept to the minimum required allowing for working area, safe access, drainage and electrical works.

Site tracks will consist of compacted crushed-stone. Where tracks cross over services such as gas pipelines or electricity cables, they will be designed in consultation with the relevant authority and accordance with their specific requirements.

A number of track designs may be utilised on site which will be determined during detailed design, dependent on the ground conditions encountered on site and include:

- Typical track founded on suitable load bearing strata;



- Floating Track, laying a suitable membrane on existing ground level and constructing off that layer;

Track drainage will be incorporated within the design in accordance with sustainable drainage design principles. Where the road alignment crosses existing drainage channels, crossings appropriate to the location will be designed in accordance with the relevant guidelines.

A buffer zone in accordance with the relevant guidance from NIEA will be maintained around watercourses shown on Drawing M01616-05 WFD 01-05 Rev2 in Annex 2: WFD Assessment. The exceptions to these buffers will be where the existing tracks are located within the buffer zone and where there are watercourse crossings. Site personnel will be made aware of the buffer zones through the site induction and specific tool box talks.

#### Typical Track

Typical track construction may be used in areas identified where the thickness of soft soils is low, and the underlying layer has adequate load bearing properties. This track system will likely consist of a suitable capping layer and then a suitable running layer.

### 3.2.3 Crane Hardstandings

The main crane hardstanding area is anticipated to be 40m x 20m. There may be additional temporary hardstanding areas required for the erection of the main crane, lay down of materials and turbine components.

The main crane hardstanding area will be left uncovered for the operational lifetime of the wind farm in line with good practice outlined in the Scottish National Heritage guidance “Good Practice during Windfarm Construction” - 4<sup>th</sup> Edition 2019. Any temporary crane hardstanding elements will be reinstated post construction.

All crane hardstandings will consist of a compacted stone structure bearing directly on a suitable formation strata.

### 3.2.4 General Construction Method

Where competent soils exist close to the existing ground surface the following construction method will typically be followed:

- Track and crane hardstanding alignments will be established from the construction drawings and marked out with ranging rods, timber posts or steel pins;
- Track corridors and crane hardstanding locations shall be pegged out 500 - 1000m in advance of operations;
- Where possible, upgraded access tracks will re-use the structure of the existing track to reduce construction requirements;
- Drainage swales will be excavated adjacent to the tracks where required. Surface water runoff will not be allowed to discharge directly into existing watercourses but will be routed through a Sustainable Drainage System (SuDS);
- A surface water cut off ditch may be installed on the slope above the earthworks footprint where achievable given the topography;
- Material will be excavated and stored;
- Cut track construction will be used where soils are identified as being shallow. This cut track system will likely consist of a suitable layer of crushed aggregate, either spread by a



dozer or placed by hydraulic excavator, prior to being compacted in layers by vibratory rollers. If ground conditions dictate a geotextile membrane will be applied;

- Crane hardstanding construction will follow the same construction method as cut track;
- Floating track construction may be adopted where the ground conditions dictate. This system involves installing a geogrid membrane directly onto the organic vegetated layer and placing layers of suitable stone and additional geogrid layers (if required by the design) above;
- Where the road alignment crosses existing drainage channels, crossings appropriate to the location will be designed in accordance with the relevant guidelines;
- Depending on depth and type of material, adjacent slopes are anticipated to be between 1:1 to 1:3.
- Post-construction reinstatement shall be in line with the details of Section 2.5.

Where the load bearing properties of the underlying soils are determined to be insufficient, ground stabilisation may be carried out to provide adequate bearing capacity of the formation level. Due to the variable nature of the ground at the site, specific construction methods shall be selected at detailed design stage in consultation with specialist contractors. Such methods may consist of:

- Compaction of the existing in situ soils;
- Lime/cement stabilisation of the existing in situ soils; or
- Installation of stone or concrete columns to provide adequate support.

### 3.3 *Turbine Foundations*

Foundations will be designed as a reinforced concrete slab, in accordance with the relevant design standards, specific turbine supplier load information and ground conditions. Due account will be taken of guidance provided in appropriate codes and standards such as Eurocodes, British Standards and other specialist design documents.

Due to the anticipated load bearing capacity of the near surface soils, gravity base turbine foundations are expected to be used to support the wind turbine.

#### 3.3.1 *General Gravity Base Construction Method*

The gravity base foundation general construction method would generally be as follows:

- A surface water cut off ditch may be installed on the slope above the earthworks footprint where achievable given the topography;
- The topsoil will be excavated and stored to one side for reuse during the landscaping round the finished turbine;
- Excavation will be undertaken to competent material. Excavated subsoil material may be stockpiled temporarily adjacent to the excavation for later use as backfill or stored elsewhere on site. Temporary & permanent drainage shall be installed at the same time as the excavation works;
- In the case where competent material is lower than the required formation level the foundation will likely be over-excavated to competent material and compacted engineering fill placed to the required level;

- Where excavation is required to extend below the water table or in material which does not drain freely, temporary pumping will be employed to keep the excavation dry. Water pumped from an excavation shall be adequately treated in line with the SuDS philosophy, before being discharged directly to any watercourse;
- A layer of concrete blinding will be laid directly on top of the newly exposed formation, finished to ensure a flat and level working surface;
- Steel reinforcement, the turbine anchorage system and cable ducts will be fixed in place and formwork erected around the steel cage;
- Concrete will be placed using a pump, or other suitable device, and compacted using vibrating poker;
- Following the setting process, the foundation will be backfilled with suitable material, and landscaped using the vegetated soil layer set aside during the initial excavation; and
- A gravel path will be built leading from the access track or crane hardstanding to the turbine door or access steps and around the turbine for maintenance.

### 3.4 Turbines and Turbine Transformers

#### 3.4.1 Turbines

The turbine will typically be supplied with a light grey semi-matt finish (RAL colour 7035) and installed with a height not exceeding 149.9m measured from ground level to the blade tip in the vertical position.

The turbines shall not carry any symbols, logos or other lettering except where required under other legislation. However, RES proposes to add turbine numbers to the base of each tower to aid service engineers during the operational phase of the wind farm.

In line with Health and Safety best practice, turbine manufacturers have indicated a preference to locate a passive infra-red (PIR) detector and light above each turbine door. It should be noted that this lamp will not be permanently lit and would only be switched on by the PIR when personnel approach a particular turbine.

Specific locations for the turbines are as per 'Infrastructure Layout' 03426D1001-01 in Annex 1.

#### 3.4.2 Turbine Transformers

Depending on the model of turbine finally chosen for the site, turbine transformers will either be placed internally, or externally in close proximity to the turbine.

Oil cooled transformers will be supplied full of oil and will not require topping up on site. The transformers will be sealed and will be inspected for any damage prior to offloading. Air cooled or cast resin transformers do not require cooling oil.

Exterior transformers will be located within enclosures which shall be locked, accessible by trained and authorised personnel only, and displaying appropriate warning signs.

#### 3.4.3 General Turbine Erection Method

The following general steps will be undertaken to erect the turbines on site:

- Turbine components will be lifted by adequately sized cranes (one main crane and one smaller tail crane) and positioned on the foundations / other turbine sections until the entire turbine is erected;
- Upon completion of the erection all fasteners will be tightened and the internal fit out of the turbine undertaken;
- The turbines will then be connected to the wind farm substation; and finally

- Turbine testing and commissioning will be undertaken before the turbines will be handed over as complete.

### 3.5 *Control Building and Substation Compound*

Cables will transfer power from the wind turbines to the substation compound and control building before being transferred to the National Grid. The location of the Control Building and Substation Compound is shown on Drawing 03426D1001-01 in Annex 1.

The control building has been designed, sized and positioned to be sympathetic with the surroundings. The building typically contains the following rooms; control room, switch room, SCADA room, and equipment store and welfare facilities.

The detailed design of the foundations for the building will be based on the Site Investigation reports and building requirements, and will ensure loads associated with the building are transferred to the appropriate bearing layer in the sub-surface.

The building will likely consist of masonry/block cavity.

Foul drainage will be provided in agreement with the relevant authorities and most likely involve Foul effluent disposal via chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e. there shall be no emission on site).

Communications to the site is anticipated to be provided via direct cable connection with the service provider.

#### 3.5.1 *Sub Station Finishes*

The superstructure will consist of cavity wall construction with external cladding in some sections and a traditional pitch roof construction spanning front to back. Final building finishes will be widely in keeping with the local area where possible.

#### 3.5.2 *General Construction Method*

The control building and substation compound will generally be constructed in accordance with the following:

- A surface water cut off ditch may be installed on the slope above the earthworks footprint where achievable given the topography;
- The plan area of the substation control building and compound will be set out and the topsoil stripped and removed to a temporary stockpile;
- The building foundations will be excavated and concrete poured;
- The building structure will be constructed from the foundations, in accordance with current practice and specific design;
- The internal fit out of the building including installation of services will be completed.

### 3.6 *Cabling Works*

All electricity and other service cables between the turbines and the substation will be placed underground.

The detailed construction and trenching specifications will depend on the ground conditions encountered but typically cables will be directly buried inside a trench, except at road crossings when cables will be ducted.

Specific cable layout plans will be provided prior to construction.

#### 3.6.1 *General Construction Method*

The following construction method will typically be used:

- Trenches will be excavated and a suitable bedding material placed for which to lay the cables upon. The ground is trenched typically using a mechanical digging machine;
- The cables shall be laid directly onto the bedding material;
- The trench will then be backfilled and compacted with suitable material up to the required level and finished with a layer of topsoil to aid in the trench reinstatement;
- A suitable marking tape is installed between the cables and the surface; and
- The cables are terminated on the switchgear at each turbine and at the substation.

#### 4.0 OUTLINE DECOMMISSIONING PLAN

Prior to decommissioning, a detailed site restoration scheme will be provided to the Causeway Coast and Glens Borough Council for written approval.

Outlined in the following sections are the general procedures to be followed in the decommissioning of the wind farm based on current knowledge.

##### 4.1 *Site Track & Hardstanding Areas*

New site tracks and hardstanding areas constructed during development of the wind farm will be reinstated to the approximate pre-wind farm condition, unless otherwise agreed with the Landowner and/or Local Planning Authority. Areas to be reinstated would be treated in the following way:

- The material used to construct the tracks will be taken up and removed to areas identified in the site restoration scheme;
- The areas will be backfilled with suitable fill material, covered with topsoil and reseeded as required; and
- Backfilling of access tracks will be carefully planned in advance to avoid having to unnecessarily move plant and equipment on freshly reinstated land.
- Any tracks which were upgraded during the development of the wind farm would be left unchanged from the conditions used during the operation phase of the wind farm.

##### 4.2 *Wind Turbines*

The decommissioning of the wind turbines will be the reverse of the erection process involving similar lifting plant and equipment:

- Wind turbines will be disconnected from the cabling and internal components stripped and taken off site;
- It is anticipated that the turbine nacelle would then be taken down and loaded straight onto the back of transport vehicles and removed from site for reconditioning or scrap; and
- The turbine towers and blades would be taken down and either transported directly off site or broken down into smaller components if required.

##### 4.3 *Turbine Foundations*

It is widely accepted that there is no appreciable effect on the local environment from buried reinforced concrete structures left in-situ due to the inert state of concrete. Therefore the foundations will be reinstated as follows:

- Following the removal of the wind turbine, topsoil and subsoil will be excavated to expose the top of the foundation and set aside for reuse;

- The reinforced concrete foundation will then be broken out to an agreed depth below existing the ground level and the material will be taken up and removed as identified in the site restoration scheme; and
- The excavation will be then backfilled with suitable fill material, covered with topsoil and reseeded as required.

#### **4.4 Control Building and Substation Compound**

The control building and substation compound will be decommissioned by disconnecting and dismantling all the surface plant. Solid structures such as the building and equipment plinths will be demolished and the foundation will be removed to an agreed depth below ground level. Ducting and cabling that is within the depth to be cleared will be removed.

The fence surrounding the compound will be removed and the area landscaped so it can revert to its original state.

#### **4.5 Electrical Equipment**

The electrical equipment will be decommissioned in the reverse of the installation method involving similar plant. The equipment will be dismantled, removed from site and disposed of in an appropriate manner.

##### **4.5.1 Cabling**

Cables will be removed if it is deemed that removal would not be detrimental to the local environment. If removed, trenches will be backfilled with material removed during the cable removal process, covered with topsoil and reseeded as required.

## **5.0 RECORDS**

Records, as-built drawings, specifications, operational maintenance manuals and residual risks will be collated and filed in the Project Health & Safety file based upon the requirements of CDM Regulations (NI) 2016.



---

**ANNEX 1: DRAWINGS**

**(SEE ENVIRONMENTAL STATEMENT - VOLUME 3)**

<b>Drawing Name</b>	<b>Drawing Reference</b>
Site Location Plan	03426D2202-01
Infrastructure Layout	03426D1001-01
Turbine Elevation	03426D2902-01
Track Construction	03426D2302-01
Construction Compound	03426D2208-01
Wind Turbine Foundation	03426D2303-01
Crane Hardstanding	03426D2304-02







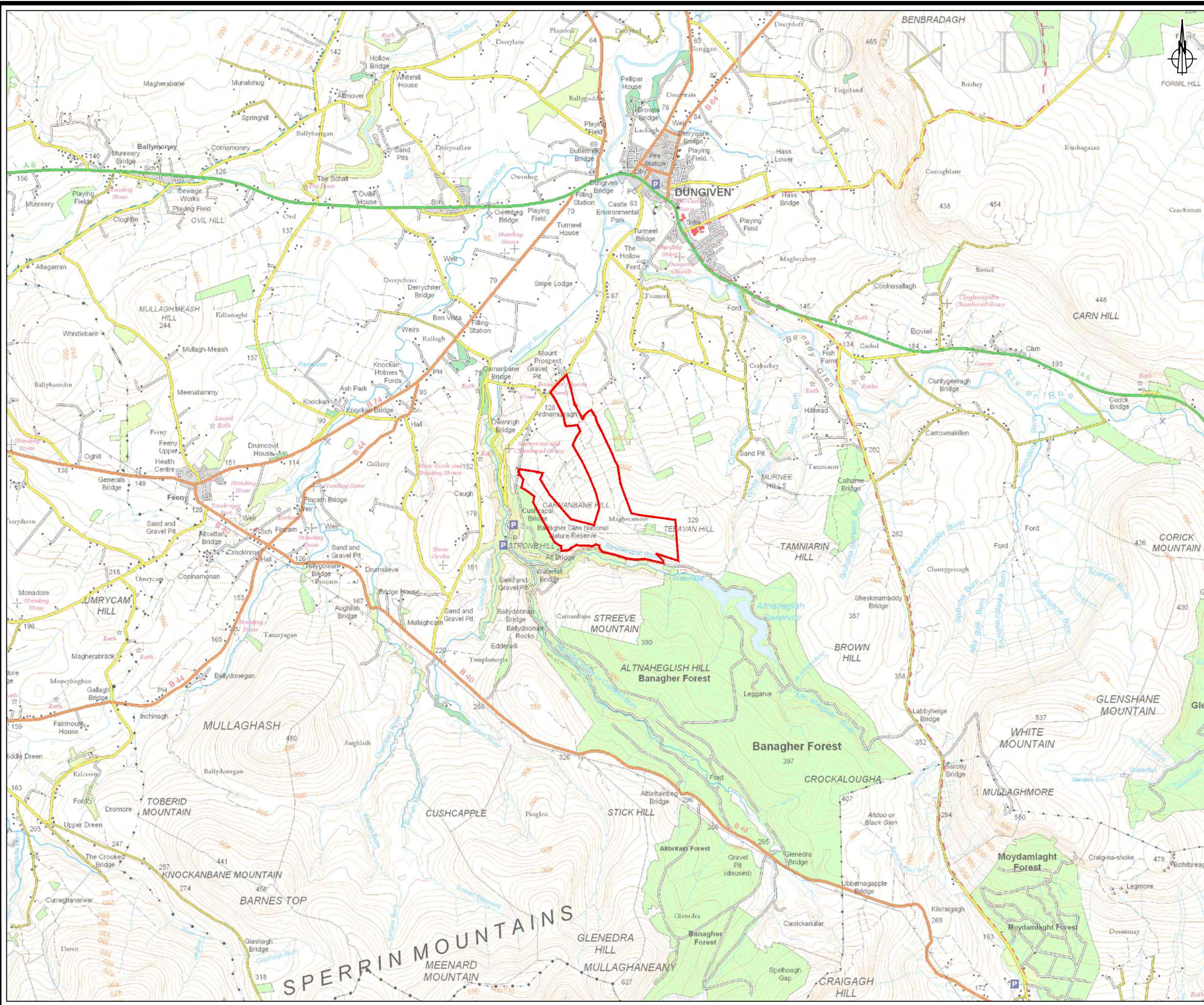
**MAGHERAMORE  
WIND FARM**

**FIGURE 1.1**

**SITE LOCATION MAP**

AUTHORITY FROM THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. © CROWN

**KEY:**



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

DRAWING NUMBER  
**03426D2202-01**

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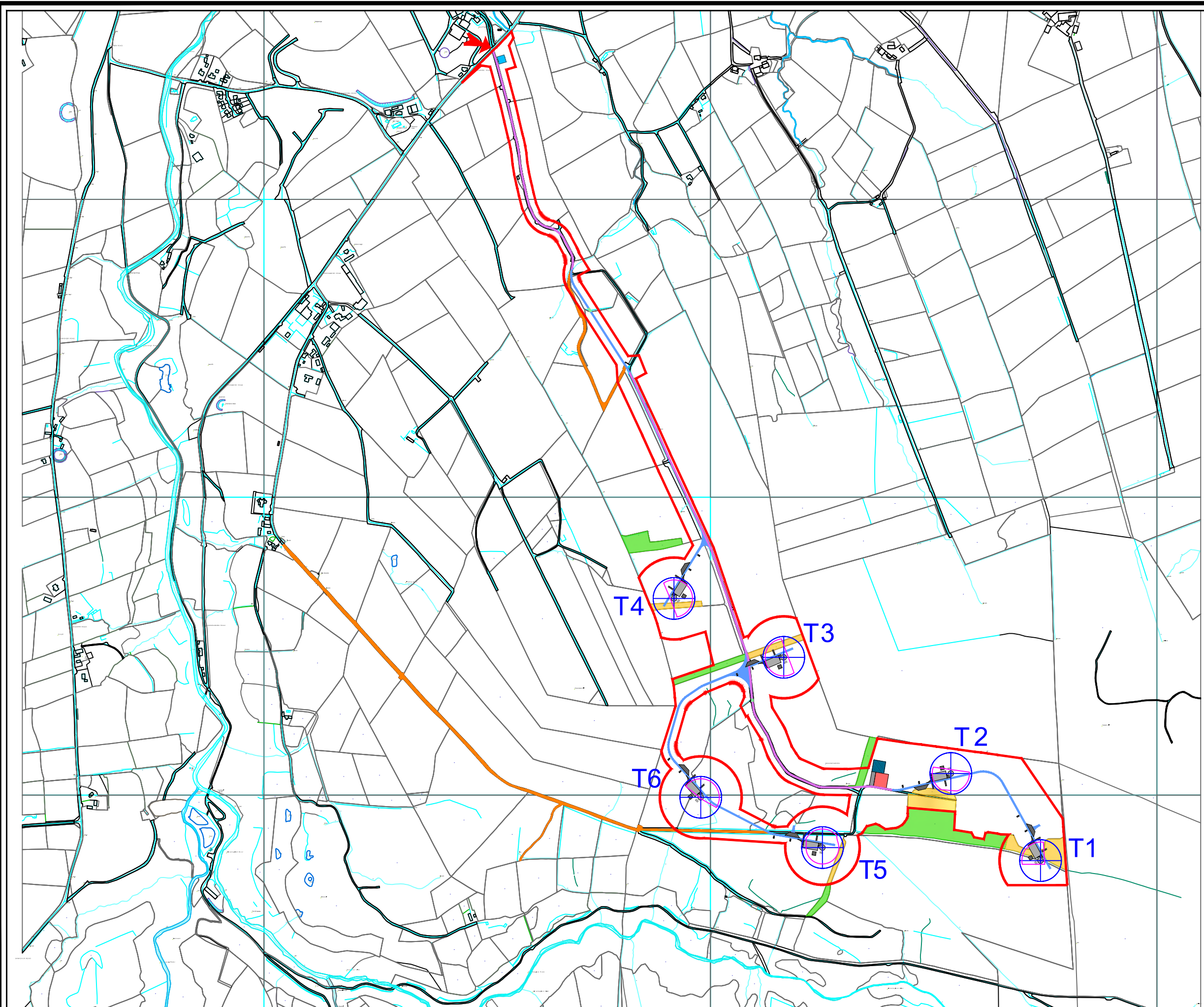


# MAGHERAMORE WIND FARM

## FIGURE 2.1

### INFRASTRUCTURE LAYOUT

AUTHORITY FROM THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. © CROWN



- Red line: [Symbol]
- Blue circle with cross: [Symbol]
- Pink circle: [Symbol]
- Blue line: [Symbol]
- Purple line: [Symbol]
- Orange line: [Symbol]
- Green line: [Symbol]
- Black line: [Symbol]
- Blue square: [Symbol]
- Dark blue square: [Symbol]
- Red square: [Symbol]
- Green square: [Symbol]
- Yellow square: [Symbol]
- Red arrow: [Symbol]



LAYOUT DWG 03426D0001-06 T-LAYOUT NO. PNIRmgh020

DRAWING NUMBER **03426D1001-01**

SCALE - 1:10,000 @ A3

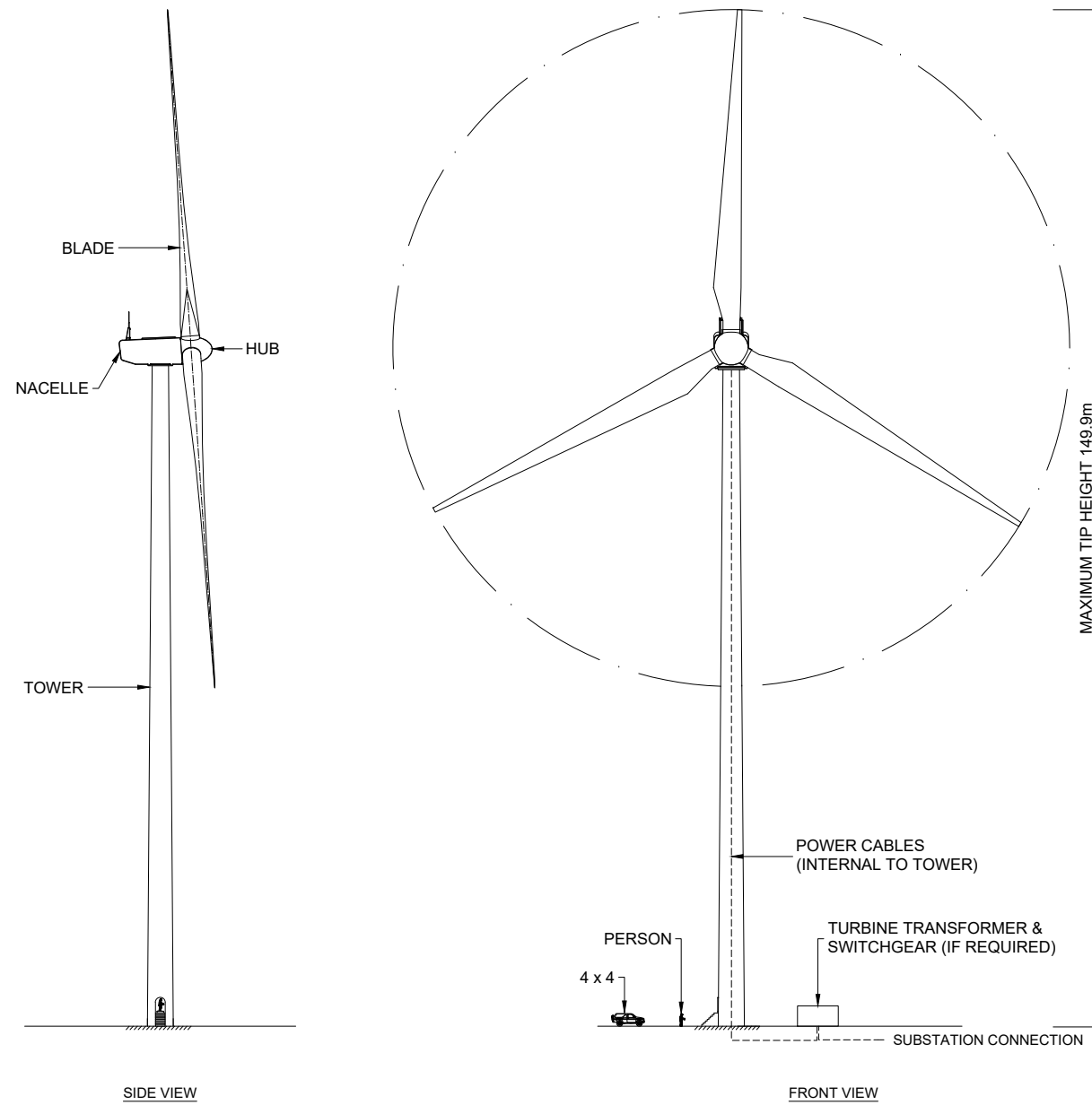
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**MAGHERAMORE  
WIND FARM**

**FIGURE 2.2  
TURBINE ELEVATION**



PHOTOGRAPH OF TYPICAL TURBINE

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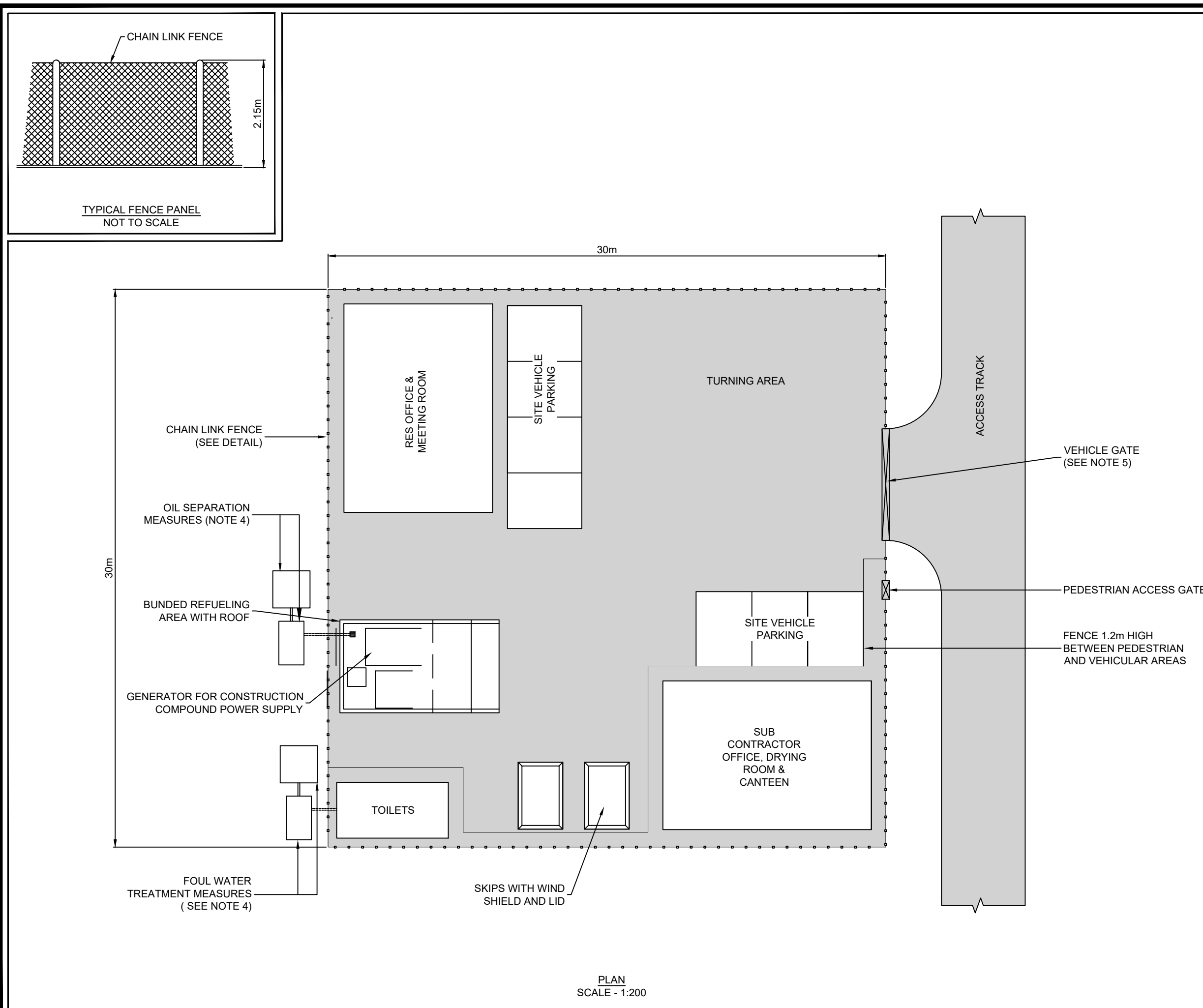
**MAGHERAMORE  
WIND FARM**

**FIGURE 2.10**

**TEMPORARY CONSTRUCTION  
COMPOUND LAYOUT PLAN**

**NOTES:**

1. SIZE, NUMBER AND LOCATION OF COMPOUND EQUIPMENT AND FACILITIES ARE INDICATIVE ONLY
2. STRUCTURE TO BE TEMPORARY AND TO BE REMOVED AFTER CONSTRUCTION.
3. COMPOUND HARDSTANDING CONSISTING OF COMPACTED STONE OVER A LAYER OF GEOTEXTILE TO PROVIDE A CLEAN, FIRM, LEVEL AND FREE DRAINING SURFACE SUITABLE FOR CABINS AND HEAVY TRAFFIC.
4. APPROPRIATE MEASURES FOR SEPARATION OF OILS AND TREATMENT OF FOUL WATER TO BE AGREED WITH THE RELEVANT AUTHORITIES.
5. VEHICULAR GATES TO BE 6m WIDE CONSISTING OF 2 x 3m LEAVES



PLAN  
SCALE - 1:200

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

DRAWING NUMBER  
**03426D2208-01**

SCALE - AS SHOWN @ A3

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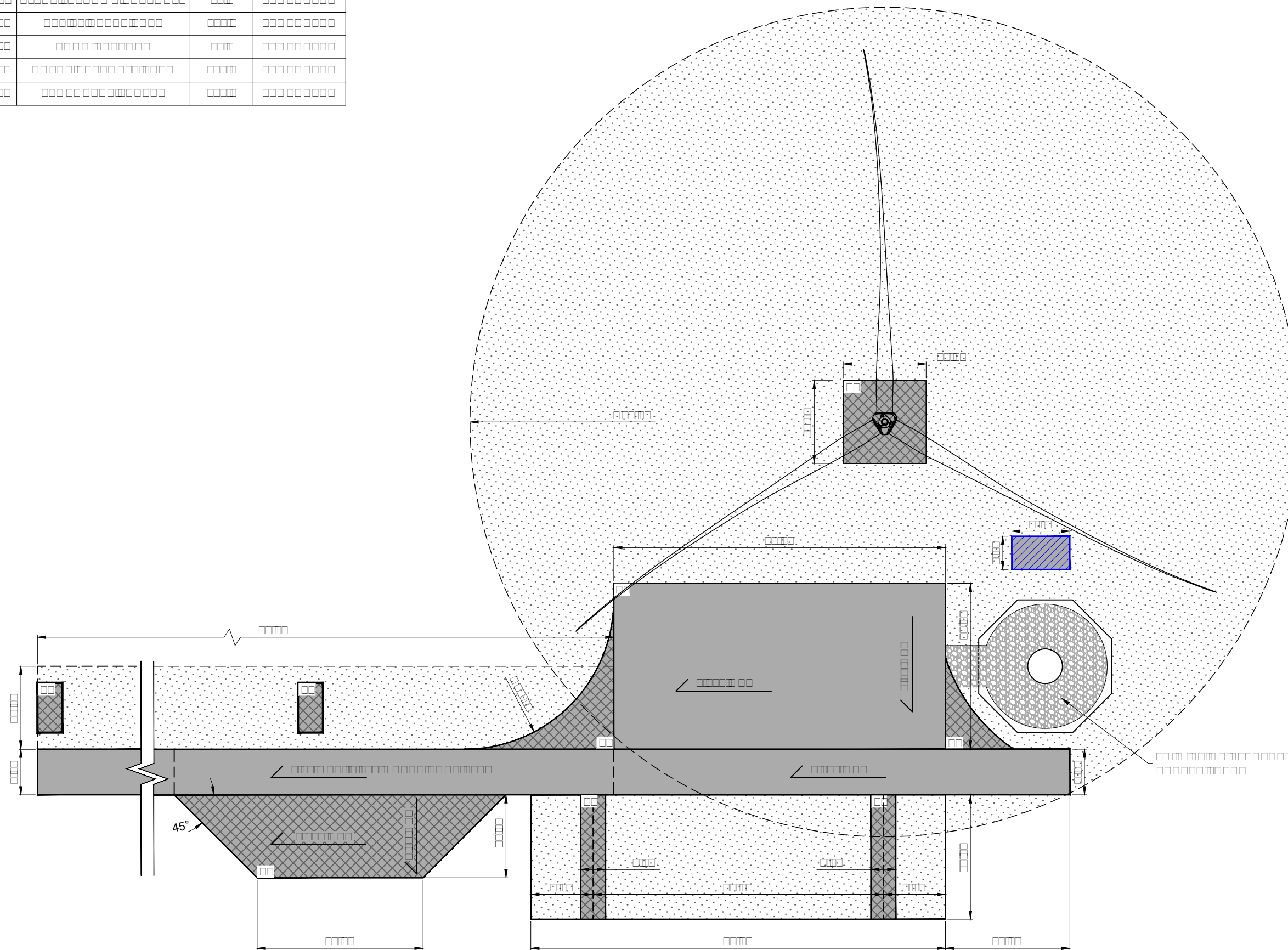


**MAGHERAMORE  
WIND FARM**

**FIGURE 2.13**

**CRANE HARDSTANDING  
GENERAL ARRANGEMENT**

AREA (m <sup>2</sup> )	AREA (m <sup>2</sup> )	AREA (m <sup>2</sup> )



**KEY:**

- Access Road
- Crane Pad
- Crane Pad
- Crane Pad
- Crane Pad

**NOTES:**

1. All dimensions are in meters unless otherwise stated.
2. The crane pad shall be constructed to the following specifications:
  - a. 150mm compacted hardcore
  - b. 150mm concrete
  - c. 150mm compacted hardcore
3. The crane pad shall be finished to a level of 100mm above the surrounding ground level.
4. The crane pad shall be constructed to the following specifications:
  - a. 150mm compacted hardcore
  - b. 150mm concrete
  - c. 150mm compacted hardcore
5. The crane pad shall be finished to a level of 100mm above the surrounding ground level.
6. The crane pad shall be constructed to the following specifications:
  - a. 150mm compacted hardcore
  - b. 150mm concrete
  - c. 150mm compacted hardcore
7. The crane pad shall be finished to a level of 100mm above the surrounding ground level.
8. The crane pad shall be constructed to the following specifications:
  - a. 150mm compacted hardcore
  - b. 150mm concrete
  - c. 150mm compacted hardcore
9. The crane pad shall be finished to a level of 100mm above the surrounding ground level.
10. The crane pad shall be constructed to the following specifications:
  - a. 150mm compacted hardcore
  - b. 150mm concrete
  - c. 150mm compacted hardcore
11. The crane pad shall be finished to a level of 100mm above the surrounding ground level.
12. The crane pad shall be constructed to the following specifications:
  - a. 150mm compacted hardcore
  - b. 150mm concrete
  - c. 150mm compacted hardcore
13. The crane pad shall be finished to a level of 100mm above the surrounding ground level.
14. The crane pad shall be constructed to the following specifications:
  - a. 150mm compacted hardcore
  - b. 150mm concrete
  - c. 150mm compacted hardcore
15. The crane pad shall be finished to a level of 100mm above the surrounding ground level.

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

DRAWING NUMBER  
**03426D2304-02**

SCALE - 1:500 @ A3

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**ANNEX 2: WATER FRAMEWORK DIRECTIVE ASSESSMENT**

**(SEE ENVIRONMENTAL STATEMENT - VOLUME 4 - APPENDIX 9.1)**





# Water Framework Directive Assessment Magheramore Wind Farm

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	1	2	3	4	5	6
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## 1 INTRODUCTION

---

### 1.1 Terms of Reference

RES Ltd (RES) has appointed McCloy Consulting Ltd to undertake a Water Framework Directive (WFD) Assessment for a planning application for the proposed Magheramore Wind Farm. The purpose of this WFD assessment is to:

- Determine if specific components or activities related to the development of the proposed Development will compromise the attainment of a WFD objective or result in the deterioration in the ecological status of any waterbodies in the vicinity of the site.
- Provide details of proposed mitigation measures specifically in relation to management of surface water from the developed site if there is initially a perceived risk of deterioration in the ecological status of any affected waterbody.

The assessment is intended to supplement the Environmental Statement (and in particular Chapter 9 Geology and Water Environment) submitted in support of the planning application for the proposal.

### 1.2 Statement of Authority

McCloy Consulting is an independent environmental consultancy specialising in the water environment, with specialist knowledge of hydrological and hydrogeological assessments, sustainable drainage systems (SuDS), drainage, river modelling, and flood risk assessment.

McCloy Consulting has ongoing involvement in numerous geology and water environment studies and SuDS projects across the UK and has developed a particular expertise in surface water management for wind farms. The company has successfully designed a number of SuDS/silt management solutions for wind farms in accordance with current best practice guidance. The primary personnel responsible for undertaking this WFD Assessment are:

- Cáitríona Downey BSc (Hons)– Graduate Environmental Consultant experienced in undertaking hydrology and hydrogeology assessments, water quality monitoring projects and flood risk and drainage assessments.
- Francis McAuley BSc (Hons) MSc FGS – Senior Project Consultant (Hydrogeologist) experienced in undertaking geo-environmental investigations, site investigations, and hydrogeological risk assessments.
- Kyle Somerville BEng (Hons) CEng MIEI – Associate and Chartered Engineer with experience in the fields of hydrology, surface water management, groundwater screening assessments and geology assessments for wind farm developments in the UK and Ireland, and has overseen outline and detailed design of surface water management for in excess of thirty onshore wind farm developments in the UK and Ireland.

### 1.3 Water Framework Directive

The EU Water Framework Directive (2000/60/EC, as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU) was established as a new integrated approach to the protection of the water environment.

The Directive is transposed in Northern Ireland through the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017.

A fundamental requirement of the Water Framework Directive (WFD) is to attain good ecological water status and that deterioration in the status of water is prevented. The Environmental Impact Assessment Directive (85/337/EEC) requires likely significant environmental impacts to be identified, assessed and mitigated. The Northern Ireland Environment Agency (NIEA) Water Management Unit (WMU) would regard an impact that would compromise the achievement of a WFD objective or result in the deterioration in the status of waters as a significant impact.

Any new development must ensure that this fundamental requirement of the directive is not compromised. A WFD Assessment of the proposed scheme should therefore be carried out and form part of the Environmental Impact Assessment (EIA).

### 1.3.1 River Basin Districts

The WFD is implemented through River Basin Management Plans (RBMP) which introduces a six-yearly cycle of planning, action and review. The plans will include identifying river basin districts, identifying water bodies and protected areas, identifying pressures and risks, monitoring and setting environmental objectives, classification systems and standards.

The WFD was initially implemented in Northern Ireland through three RBMPs that were published in December 2009; as required by WFD the plans are reviewed and updated every six years.

A second set of Plans was published in 2015.

### 1.3.2 Local Management Areas

The RBMPs have been put into practice by a Local Management Area (LMA) Action Plans during the planning cycle from 2009 to 2015.

LMAs outline some of the measures carried out locally that will contribute to protecting or improving waterbody status, while others involve long-term projects and multiple partners.

### 1.3.3 Catchment Stakeholder Group

Nine catchment stakeholder groups were set up in Northern Ireland to encourage public participation in dealing with water quality issue. Each group comprises representatives of all local and regional stakeholder sectors / groups and relevant government agencies, brought together to support and encourage a joint approach to identifying and solving catchment scale water management issues. NIEA works with the stakeholders, through Catchment Stakeholder Group meetings, to develop the focused Local Management Area Plans, used to implement the Water Framework Directive.

#### 1.3.3.1 Water Framework Directive Assessment

The aims, objectives and processes of a WFD Assessment are outlined by the Northern Ireland Environment Agency (NIEA) Water Management Unit within their report published in March 2012<sup>1</sup> which outlines how to carry out a Water Framework Directive Assessment on EIA Developments.

A WFD Assessment should be used as a decision making tool; the proposer of the scheme should use the conclusions of the assessment to decide whether to proceed with the development or to amend proposed works and / or instigate mitigating measures prior to proceeding.

Each specific component of the proposed development, that may interact with or pose a risk to a waterbody, is required to have its potential impact assessed. The cumulative effect of a number of such impacts should also be considered.

This report provides a description of the specific activities being undertaken (construction of compounds, hardstanding areas, tracks, trenches and turbine excavations, and electrical cabling etc.), identifies the potentially impacted waterbodies and provides baseline data for the waterbody.

The potential impact of the proposed works is then assessed considering the relevant WFD classification and the following WFD key environmental objectives:

- To prevent deterioration in the ecological status of the waterbody.
- To prevent the introduction of impediments to the attainment of 'Good' WFD status of the waterbody.
- To ensure that the attainment of the WFD objectives for the waterbody are not compromised.
- To ensure the achievement of the WFD objectives in the other waterbodies within the same catchment are not permanently excluded or compromised.

---

<sup>1</sup>NIEA (2012) Carrying Out A Water Framework Directive (WFD) Assessment on EIA Developments. Available: <https://www.daera-ni.gov.uk/publications/guidance-note-carrying-out-water-framework-directive-assessment-environmental-impact> [Accessed 12/10/2017]

#### 1.3.4 Approach to the Assessment

This WFD Assessment will comprise of three stages:

- Stage I: Review of WFD Waterbody catchments, classifications and LMA Plans.
- Stage II: Assessment of proposals for the Magheramore Wind Farm.
- Stage III: Proposed mitigation measures where key WFD objectives are not met.



## 2 STAGE I: WATERBODY IDENTIFICATION AND CLASSIFICATION

### 2.1 Approach

The first stage identifies those surface water and groundwater bodies with potential to be affected by the development and reviews any available WFD information to classify the waterbody including a review of the current WFD status, future status, identified environmental constraints and any existing / proposed 'mitigation approaches' for the waterbody.

Hydrological catchment boundaries established are as shown on the NIEA River Basin Plan Interactive Map<sup>2</sup> and classification information was primarily sourced from RBMP documents for the relevant LMA.

### 2.2 Surface Waterbody Identification

The site boundary considered as part of this assessment falls entirely with the Owenrigh River waterbody (UKGBN11NW020202010).

The Owenrigh River flows into the designated River Roe c. 4 km north of the site, which flows north for a further 34 km and eventually discharges to Lough Foyle. Figure 2-1 below shows the site boundary in the context of the Local Management Area group and river water body catchment. Water quality data is shown as per the NIEA River Basin Plan Interactive Map.

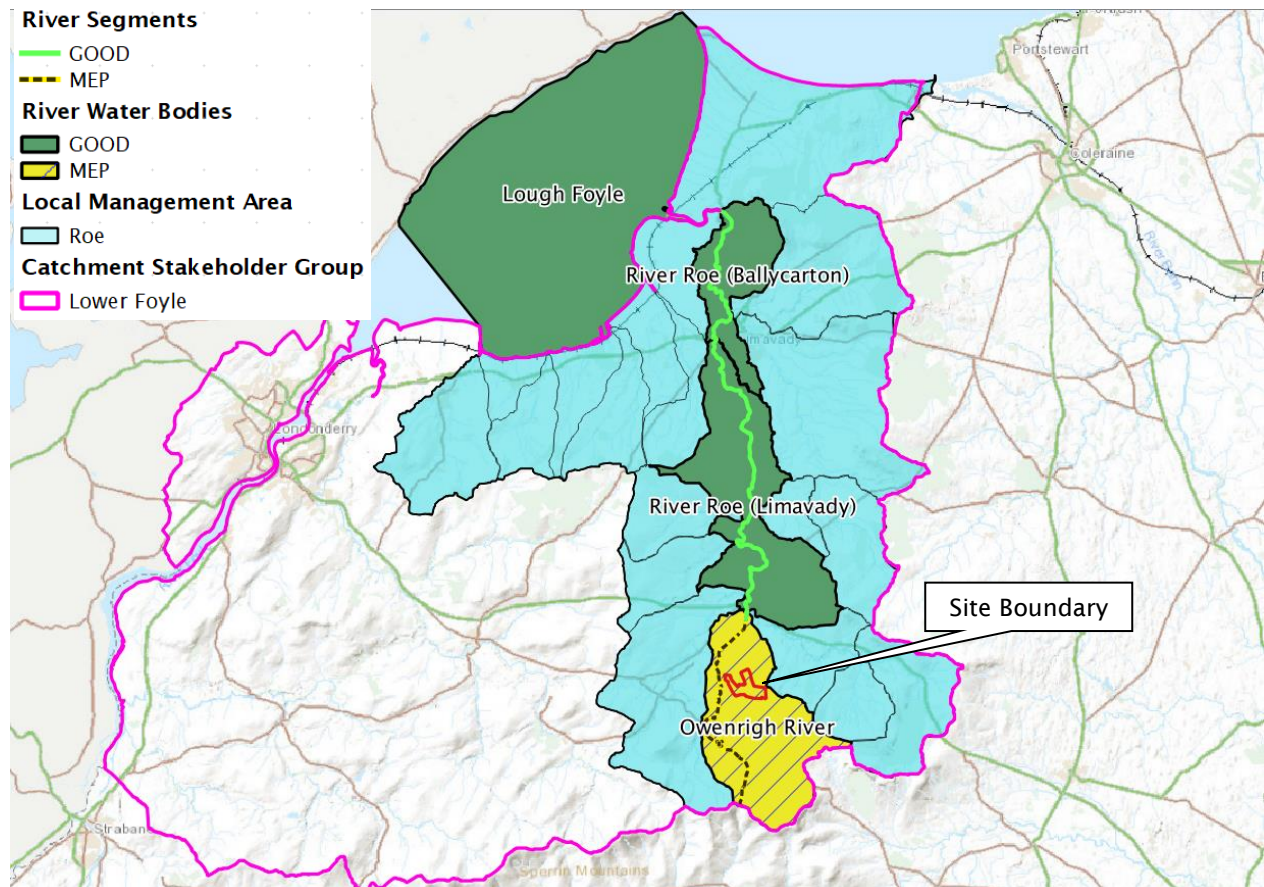


Figure 2-1: Site Hydrological Context

<sup>2</sup> NIEA River Basin Viewer. Available at <https://apps.daera-ni.gov.uk/RiverBasinViewer/>

## 2.3 Surface Waterbody Classification

The following section is intended to provide a qualitative appraisal of existing surface water quality in the waterbody whose catchment the proposed development lies within.

As identified within Section 2.2; for purposes of classification under the WFD the Owenrigh River which is located within the Roe Local Management Area<sup>3,4</sup> and the Lower Foyle Catchment Stakeholder Group. The River Roe and its tributaries are located within the North Western River Basin District<sup>5</sup>.

Following the publication of the Water Framework Directive waterbodies are given a WFD classification based on annual average / percentile results from several individual monitoring stations. WFD classification or status is a combination of chemical, biological and hydromorphological elements, whereby the overall status is the lowest of the combined constituents.

A number of biological and chemical water quality elements used in classification in the Roe Catchment can be affected by both diffuse and point source pollution. Within the LMA Plan the main impact has been assessed as affecting invertebrate communities. This element is associated with organic enrichment.

### 2.3.1 Surface Water Quality

The current Overall Current Status for the Owenrigh River (UKGBNI1NW020202010) is 'Moderate Ecological Potential' with an objective to achieve 'Good' status through to 2021 and 2027. The Owenrigh is designated under the Drainage (Northern Ireland) Order 1973 3.5 km downstream of the site.

The Owenrigh River was designated under the WFD as a Freshwater Fish Directive protected area due to the presence of economically significant species. The Directive 2006/44/EC has since been revoked, however NIEA:WMU continues to recognise the Altnaheglish, Owenrigh and Roe Rivers as protected areas containing economically significant species.

The WFD results are detailed within Table 2.1.

---

<sup>3</sup> DAERA (2012) Roe Local Management Area Action Plan 2009 to 2015 <https://www.daera-ni.gov.uk/publications/roe-local-management-area-action-plan-2009-2015>

<sup>4</sup> Roe Local Management Areas Action Plan and Update (2013) <https://www.daera-ni.gov.uk/sites/default/files/publications/doe/roe-swmi-joined.PDF>

<sup>5</sup> DAERA (2015) North Western River Basin Management Plan 2015 to 2021 <https://www.daera-ni.gov.uk/publications/north-western-river-basin-management-plan-2015-2021>

Table 2.1: Owenrigh River LMA Waterbody Classification

River Classification Element		2009 Status	2010 Status	2011 Status	2012 Status	2013 Status	2014 Status	2015 Status
Overall Status		MEP	MEP	MEP	MEP	MEP	MEP	MEP
Confidence in Overall Status		High	High	High	Medium	Medium	Medium	High
Biological	Benthic Invertebrates	Good	Good	Good	Good	Good	Good	High
	Macrophytes	High	High	High	High	High	High	High
	Phytobenthos	-	-	-	-	High	High	High
	Fish	-	-	-	-	-	-	-
Chemical / Physio-chemical	Ammonia	High	High	High	High	High	High	Good/High
	Dissolved Oxygen	High	High	High	High	High	High	High
	pH	High	High	High	High	High	High	High
	Soluble Reactive Phosphate	High	High	High	High	High	High	High
	Biological Oxygen Demand*	High	High	High	High	High	High	High
	Temperature*	High	High	High	High	High	High	High
Specific Pollutants	Dissolved Copper	Fail	Fail	-	-	Fail	Fail	-
	Total Zinc	Pass	Pass	-	-	Pass	Pass	-
Hydro-morphology	Hydrological Regime	Bad	Bad	Bad	Bad	Bad	Bad	Good
	Morphological conditions <sup>#</sup>	-	-	-	Good	Good	Good	Good

\*Element does not contribute to overall classification.

### 2.3.2 [Roe Local Management Area Action Plan and Update](#)

The LMA Action Plan and Update (2013) states that many rivers (62 %) within the River Roe Catchment have been classified as less than 'Good' status. The main reason is due to the impact on invertebrate communities. The main pressures being abstraction and flow regulation, diffuse and point source pollution, changes to morphology (physical habitat).

The update states that the aim is to achieve 'Good' quality or better in 81 % of surface waters by 2015.

Catchment wide actions to be implemented to maintain and improve the water environment are outlined within the Action Plan and the plan also outlines surface water catchment specific actions to be undertaken to maintain and improve the Catchment as follows:

#### 2.3.2.1 [Catchment Wide Actions](#)

- Carry out agricultural advisory site visits where identified as an issue through river walks and spot checks or as identified by stakeholders.

- Carry out fish habitat improvement works at identified areas within the LMA.
- Conduct a water resource assessment to inform an ongoing review of abstraction licences within Northern Ireland.
- Encourage riparian zone management with an aim to improve biodiversity and minimise sedimentation through practical management measures on farms.
- Raise awareness and promote the benefits of effective farm nutrient and waste management.
- Support local environmental initiatives such as river clean-up campaigns.
- Review of groundwater abstraction and planning applications where necessary.
- Provide advice on protected area designations to work towards improving the condition assessment of the 'River Roe & its tributaries' Special Area of Conservation (SAC).

### 2.3.2.2 *Owenrigh River Actions*

The Owenrigh River is heavily modified due to the reservoir at Altnaheglish; making the river water body susceptible to impacts from abstraction and flow regulation. The list of Actions to be taken to improve the water environment in this water body as outlined in the Roe Local Management Area Action Plan and Update are summarised below;

- Determine and address sources of organic pollution affecting aquatic invertebrates, downstream of Banagher Forest;
- Carry out agricultural advisory site visits where necessary;
- Conduct invasive species recording, raise awareness on preventing the spread of invasive species;
- Carry out pollution prevention and if necessary enforcement measures at active quarries in this water body;
- Mitigate against forestry operations at Banagher Forest;
- Carry out a full RHAT (River Hydromorphology Assessment Technique) to assess the hydromorphological classification and produce recommendations at a water body scale;
- Investigation the feasibility and practicality of implementing morphological mitigation measures as recommended;
- Obtain data on reservoir / lake levels, catchment flows and transfers of water from other water body sources to inform the review of the current abstraction / impoundment licence at Altnaheglish reservoir. Agree monitoring plans and include details on augmented flows returned to the waterway below;
- Review the current abstraction licence to finalise maximum abstraction volumes, take account of seasonal variations and ensure the ecological need for compensation flows are fully considered at Altnaheglish reservoir;
- Identification of contamination risks from 'source to tap' through the development of drinking water safety plans at Caugh Hill WTW;
- Continue to monitor mitigation measures through Drinking Water Inspectorate regulatory processes within this catchment;
- Support local measures that will improve water quality, in particular, reduction in the presence of pesticides and the levels of organic matter in raw water which cause implications for water treatment at Caugh Hill WTW.
- Investigate identified water quality impacts e.g. Dissolved Copper.

The actions within the plan applicable to the construction of the Magheramore Wind Farm are to be adhered to throughout the construction process to ensure maintenance and, where feasible, improvement of water quality classifications in the catchment.

## 2.4 Groundwater Body Identification

The proposed Development is situated within the catchment of the Claudy Groundwater Body (UKGBNI4NW003), within the North-Western River Basin District.

## 2.5 Groundwater Body Classification

The site is underlain by the Claudy groundwater body (UKGBNI4NW003), which has an area of 917 km<sup>2</sup>. The body extends southwards from Lough Foyle and eastwards from the Foyle River, the southern and south eastern boundary is defined by surface water catchments with the remaining part of the eastern boundary defined by the geological boundary with the Triassic Sherwood Sandstone or Palaeogene Basalts.

The body includes the entire catchments of the Burdennett and the Faughan and a significant portion of the River Roe. The main urban centres are Derry, Limavady and Dungiven. The primary land use is pasture / improved grassland (82.6 %).

Lowland areas occur around the coast and in the main river valleys, the land rises away from these areas with peaks close to 400 m AOD, in the south the land rises towards the Sperrin mountains.

The characteristics of the groundwater body are summarised in the following sections.

**Table 2.2: Characterisation of Claudy Groundwater Body**

Region	Geological Characteristics	Aquifer Type	
Majority of Groundwater Body	Dalradian, Carboniferous	Bl (f)	The majority of bedrock is considered to have limited potential for significant abstraction. Intergranular porosity is negligible and fracture flow dominates.
Basalt occurs as an isolated outcrop extending from the main basalt area	Palaeogene Basalts	Bm(f)	Generally considered to have moderate productivity potential. Intergranular flow is negligible and fracture flow dominates. As basalt is an outcrop considered as having limited productivity potential.

### 2.5.1 Groundwater Body WFD Classifications

Following publication of the NIEA River Basin Management Plan in 2009 only an initial characterisation had been carried out for this groundwater body. The plan classified the quantitative, chemical, and overall status of the groundwater body as 'Good'.

Second cycle results for the 2015-2021 cycle indicated water quality (quantitative, chemical, and overall) remained classified as 'Good'.

### 2.5.2 Groundwater Body WFD Objectives

The updated RBMP document "What We Plan to Achieve by 2021 and Beyond"<sup>6,7</sup> produced in December 2014 following the second cycle; highlights changes to original 2009-2015 WFD objectives. The RBMP now aims to maintain 'Good' status and ensure there is no deterioration in the water quality of these waters.

6 NIEA (2014) RBMP What we plan to achieve by 2021 and beyond <https://www.daera-ni.gov.uk/sites/default/files/publications/doe/water-plan-what-we-plan-to-achieve-by-2021-beyond-2014.pdf> [Accessed 14/06/2017]

7 NIEA (2015) Review of the Environmental Objects for the Second Cycle RBMP Available: <https://www.daera-ni.gov.uk/publications/what-we-plan-achieve-by-2021-and-beyond-2015> [Accessed 15/06/2017]

### 2.5.3 Local Management Area Action Plans

The Roe Action Plan and Update published in December 2013 highlighted any actions which had been implemented to date and stated the aim to maintain a 'Good' status in 100% of LMA's groundwaters. Catchment wide actions to be implemented to maintain and improve the groundwater environment were outlined within the Action Plan as follows:

- Review of groundwater abstraction and planning applications where necessary;
- Review authorisation of discharges to groundwater;
- Protection of drinking water sources;
- Abstraction and Impoundment control;
- Point source and diffuse source discharge control;
- Prevention or reduction of the impact of accidental pollution incidents;
- Priority substances control;
- Controls on other activities impacting on water status.

## 3 STAGE II: ASSESSMENT OF PROPOSALS

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### 3.1 Approach

The next stage undertaken will identify the nature of the development, the construction activities proposed and the potential specific detrimental effect to the water environment based on the key WFD objectives.

### 3.2 Development Description

The proposed Development comprises:

- Construction of new access tracks, upgrading of existing tracks and maintenance of existing tracks;
- Construction of a temporary construction compound, for the duration of the construction period;
- Construction of a permanent control building and substation compound with permanent hardstanding area;
- Excavation of six turbine foundations and associated dewatering and concrete pouring activities and construction of nine crane pads and lay-down areas;
- Construction of seven watercourse crossings, of which 4 are upgrades or replacements of existing culverts;
- Construction of drainage ancillary to proposed wind farm infrastructure including track drainage, minor watercourse diversions, and surface water attenuation.
- Installation of underground power and telemetry cables;
- Temporary and permanent stockpiling of soils associated with all of the above.

### 3.3 Potential Effects

The proposed Development works include works over, in and in close proximity to waterbodies. There are a number of potential adverse effects to both surface and groundwater and these will be considered in the following sections. The risks will be considered on a case by case basis in the WFD Schedules presented in this assessment.

Potential effects of wind farm construction are outlined in greater detail in **Chapter 9: Geology and Water Environment**.

#### 3.3.1 Surface Water

The primary risks of degradation of surface water bodies, including streams and drains, are summarised as follows:

- Changes in runoff and flow patterns;
- Silt / suspended solids pollution of surface waters;
- Chemical pollution of surface waters e.g. oil / fuels.

#### 3.3.2 Groundwater

Groundwater is not at risk from as many sources of pollution as surface waters. However, potential risks are considered to be as listed below:

- Chemical pollution of groundwater e.g. oil / fuels;
- Due to the nature of the works (deep excavations / importing of fill material) it is considered that there is potential for disturbance of aquifers and aquifer recharge.



### 3.4 Site Specific Proposals Assessment

The following sections (Table 3.1 - Table 3.5) detail those areas where the Development has potential to affect the water environment, detailing the nature and extent of work required and potential for adverse impacts.

The format generally mirrors that required by the guidance provided by NIEA Northern Ireland Environment Agency Water Management Unit (NIEA WMU) in 'Carrying out a Water Framework Directive Assessment on EIA Developments'.

Note that the "Current" status shown is taken from the most recent year a particular parameter was tested for and can vary between watercourses and parameters.

### 3.5 WFD Objectives

A fundamental requirement of the Water Framework Directive is to attain 'Good' ecological water quality status and that the deterioration in the status of water is prevented. The aim of carrying out a WFD Assessment is to determine if specific components or activities related to the planned development scheme will compromise the attainment of a WFD objective or result in a deterioration in the ecological status of any waterbodies.

The following tables assess the impact of the activities associated with the construction of the Development against the relevant WFD classification elements and the following WFD Objectives;

1. To prevent deterioration in the ecological status of the water body;
2. To prevent the introduction of impediments to the attainment of 'Good' WFD status for the water body;
3. To ensure that the attainment of the WFD objectives for the water body are not compromised;
4. To ensure the achievement of the WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.



3.5.1 [Potential Effect of Construction - Changes in Runoff and Flow Patterns](#)

**Table 3.1: Potential Impact of Changes in Runoff and Flow Patterns in on site watercourses affecting the Owenrigh River**

Waterbody Name	Owenrigh River	WFD Waterbody ID	(UKGBN11NW020202010)	
Local Management Area	Roe			
2015 Status	Moderate Ecological Potential	Objective 2021 - 2027	Good Ecological Potential	
<p><u>Proposed Works</u>                      Installation of new temporary or permanent impermeable surfaces.                      New temporary or permanent excavations and structures acting as barriers to runoff.                      Temporary Compaction of soils due to plant and site traffic.</p> <p><u>Potential Impacts</u>                      Increased rate and volume of surface runoff, ponding and alterations to preferential flow routes, reduced surface permeability on site.</p> <p><u>Consequences</u>                      Temporary or permanent redirection of surface water flows can result in potential adverse effects to down gradient dependant habitats either through starvation of areas where water currently flows, or flooding.                      Temporary or permanent increases in surface water runoff rates and volumes can result in increased flood risk and increased effects of erosion and scour in down gradient watercourses.                      Adopting a precautionary approach, flow changes in affected watercourses may affect benthic invertebrate communities, given that individual species are adapted to specific flow conditions.                      Changes to flow patterns causing sediment movement may impact adversely on any macrophytes via smothering or changes to water depth.                      Soluble reactive phosphate status concentrations may be expected to increase if sediment concentrations increase (as a result of changes to flow patterns and runoff characteristics).                      A reduced water depth may also be associated with increased water temperatures; and consequently dissolved oxygen decreases.                      Changes to flow patterns have the potential to affect the hydrological regime of the river.</p>	WFD CLASSIFICATION	WFD Element	Current Status	Assessed Change
		Benthic Invertebrates	High	Moderate
		Phytobenthos	High	Moderate
		Ammonia	Good /High	Good /High
		Dissolved Oxygen	High	Good / Moderate
		pH	High	High
		Soluble Reactive Phosphate	High	Good
		Biological Oxygen Demand	High	Good
		Temperature	High	Good
		Hydrological Regime	Good	Moderate
		Morphological conditions	Good	Moderate

Does the component comply with WFD Objectives 1, 2, 3 and 4?	
No	Do not proceed or complete Article 4.7 assessment.
Yes (Justification provided)	Proceed after NIEA agreement.
Yes, with mitigation	Complete Schedule B. ✓

ASSESSMENT

3.5.2 [Potential Effect of Construction - Silt / Suspended Solid Pollution of Surface Waters](#)

**Table 3.2: Potential Impact of Silt / suspended solid pollution on watercourses leading to the Owenrigh River**

Waterbody Name	Owenrigh River	WFD Waterbody ID	(UKGBN11NW0202010)
Local Management Area	Roe		
2015 Status	Moderate Ecological Potential	Objective 2021-2027	Good Ecological Potential
<p><u>Proposed Works</u> Excavations, ground disturbance, stripping of top soil and temporary soil deposition will be required during construction of the wind farm infrastructure. Importing, handling and placement of aggregate for access tracks. Plant and maintenance vehicle movement across disturbed soils and stone access tracks and washing down plant and machinery.</p> <p><u>Potential Impacts</u> The proposed works have the potential to release fine sediments, fine soil, clay and aggregate particles into surface runoff or where construction is in the vicinity off watercourses. Shallow groundwater gathering in excavations will come in contact with excavated surfaces and aggregate. Traffic movements can transport silts and fine grade aggregates.</p> <p><u>Consequences</u> Polluted groundwater within excavations will have to be pumped and (without treatment) if discharged to nearby watercourses will result in the release of a potentially heavily polluted effluent. Sediments and debris entering watercourses have the potential to adversely modify stream morphologies, smother habitats, harm aquatic flora / fauna and increase risk of blockage to culverts / drainage channels. Increased suspended sediment concentrations may affect benthic invertebrate communities given that individual species are adapted to specific water quality conditions. Changes to suspended sediment concentrations may impact adversely on macrophytes via smothering or changes to water depth and flow patterns for example.</p>	WFD CLASSIFICATION		
	WFD Element	Current Status	Assessed Change
	Benthic Invertebrates	High	Poor
	Phytobenthos	High	Good
	Ammonia	Good /High	Good /High
	Dissolved Oxygen	High	Good / Moderate
	pH	High	High
	Soluble Reactive Phosphate	High	Poor
	Biological Oxygen Demand	High	Poor
	Temperature	High	Good
Hydrological Regime	Good	Moderate	

**Table 3.2: Potential Impact of Silt / suspended solid pollution on watercourses leading to the Owenrigh River**

	<p>Soluble reactive phosphate status concentrations may be expected to increase given that phosphorus adheres strongly to some sediment particles.                      BOD concentrations may increase if it is presumed that some of the sediment fraction is organic.                      Some influence on water temperature may be exhibited due to changes to the turbidity.                      A reduced water depth (caused by sediment build up) may also be associated with increased water temperatures – in reality this is unlikely to increase the temperature to such a degree that the WFD status is affected; however a precautionary approach is adopted here.                      Some increased concentrations of metals may occur (given their association with sediments) but such increases are likely to be negligible.</p>		Morphological conditions	Good	Moderate
ASSESSMENT	Does the component comply with WFD Objectives 1, 2, 3 and 4?				
	No	Do not proceed or complete Article 4.7 assessment.			
	Yes (Justification provided)	Proceed after NIEA agreement.			
	Yes, with mitigation	Complete Schedule B.	✓		

3.5.3 [Potential Effect of Construction - Chemical Pollution of Surface Waters](#)

**Table 3.3: Potential Impact of Chemical pollution on site watercourses affecting the Owenrigh River**

Waterbody Name	Owenrigh River	WFD Waterbody ID	(UKGBN11NW020202010)	
Local Management Area	Roe			
2015 Status	Moderate Ecological Potential	Objective 2021-2027	Good Ecological Potential	
UNMITIGATED IMPACT DISCUSSION	<p><u>Proposed Works</u> The proposed works will require the temporary presence of chemicals, fuels and other oils and alum flocculants along with permanent presence of oils and lubricants associated with turbine maintenance. Excavations, deforestation / replanting, soil stripping, concrete pouring and construction of temporary welfare facilities.</p> <p><u>Potential Impacts</u> There is the potential for chemicals to enter a watercourse through accidental spillage, improper transport and refuelling or inappropriate storage and disposal procedures. Earthworks in areas previously forested may cause the release of residual fertilisers and in areas of peat excavations may cause acidification of surface waters. Unregulated use of flocculants can result in large doses entering surface waters. Cementitious materials and discharge from temporary welfare activities have the potential to enter the watercourses.</p> <p><u>Consequences</u> Oils and chemicals entering watercourses have the potential to adversely affect water quality, with associated effects to fish and aquatic ecology. Release of forestry fertilisers and acidification from peat may adversely affect nitrate and pH levels and unregulated use of flocculants has the potential to cause locally significant fluctuations in pH, with adverse effects to fish. Wastewater and associated coliforms discharged to subsoil irrigation or to the ground surface can percolate through to underlying aquifer and adversely affect water quality.</p>			
	WFD CLASSIFICATION			
	WFD Element		Current Status	Assessed Change
	Benthic Invertebrates		High	Poor
	Phytobenthos		High	Good
	Ammonia		Good /High	Moderate / Good
	Dissolved Oxygen		High	Good / Moderate
	pH		High	Good / Moderate
	Soluble Reactive Phosphate		High	Poor
	Biological Oxygen Demand		High	Poor
	Temperature		High	Good
	Hydrological Regime		Good	Moderate
	Morphological conditions		Good	Moderate

ASSESSMENT		Does the component comply with WFD Objectives 1, 2, 3 and 4?	
No		No	
Yes (Justification provided)		Yes (Justification provided)	
Yes, with mitigation	✓	Yes, with mitigation	

3.5.4 [Potential Effect of Construction - Chemical Pollution of Groundwater Bodies](#)

**Table 3.4: Potential Impact of Chemical pollution to Claudy Groundwater body**

GROUNDWATER BODY		CLAUDY		UNMITIGATED IMPACT DISCUSSION	
Groundwater Body	Clady			<u>Proposed Works</u> The proposed works will require the temporary presence of chemicals, fuels and other oils and alum flocculants along with permanent presence of oils and lubricants associated with turbine maintenance on the site. Excavations, deforestation / replanting, soil stripping, concrete pouring and construction of temporary welfare facilities.	
WFD Waterbody ID	(UKGBNI4NW003)			<u>Potential Impacts</u> There is the potential for chemicals to enter the groundwater through accidental spillage, improper transport and refuelling or inappropriate storage and disposal procedures. Earthworks in areas previously forested may cause the release of residual fertilisers into the groundwater and shallow groundwater can gather in significant excavations. Unregulated use of flocculants can result in large doses entering groundwater. Cementitious materials have the potential to enter the groundwater. Leakage from the discharge from temporary welfare activities (above ground storage and taken off-site by licensed waste disposal team) has the potential to enter shallow groundwater.	
River Basin District	North Western			<u>Consequences</u> Oils and chemicals entering groundwater have the potential to adversely affect water quality. Acidification from peat may adversely affect pH levels. Unregulated use of flocculants has the potential to cause locally significant fluctuations in pH. Wastewater and associated coliforms discharged to subsoil irrigation or to the ground surface can percolate through to underlying aquifer and adversely affect water quality.	
WFD Element	Current Status	Assessed Change			
Chemical Status	Good				
Quantitative Status	Good				
Overall Status	Good				
Does the component comply with WFD Objectives 1, 2, 3 and 4?					
No		Do not proceed or complete Article 4.7 assessment.			
Yes (Justification provided)		Proceed after NIEA agreement.			
Yes, with mitigation		✓	Complete Schedule B.		
ASSESSMENT					

### 3.5.5 [Potential Effect of Construction - Disturbance of Groundwater Bodies](#)

**Table 3.5: Potential Impact of Construction Disturbance of Aquifer / Aquifer Recharge to Claudy Groundwater Body**

WATERCOURSE		Groundwater Body	Claudy	UNMITTIGATED IMPACT DISCUSSION		Proposed Works
	WFD Waterbody ID	(UKGBN14NW003)		Installation of new temporary or permanent impermeable surfaces.		Potential Impacts
	River Basin District	North Western		Reduced surface permeability.		The detailed geology and hydrogeology assessment for the project has determined that works proposed are unlikely to encounter caustic features in limestone, and that potential for causing morphological change to fractured groundwater flow is not a significant consideration at the site.
	WFD Element	Current Status	Assessed Change			Consequences
	Chemical Status	Good	Good			Reduction of permeable areas on the site can reduce the potential for groundwater recharge.
	Quantitative Status	Good				
	Overall Status	Good				
ASSESSMENT		Does the component comply with WFD Objectives 1, 2, 3 and 4?				
	No			Do not proceed or complete Article 4.7 assessment.		
	Yes (Justification provided)			Proceed after NIEA agreement.		
	Yes, with mitigation	✓		Complete Schedule B.		



## 4 STAGE III: MITIGATING MEASURES

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### 4.1 Approach

Sections 4 to 9 of this report detail the third stage of the assessment; the approach to implementation of specific mitigation measures to be applied at the site.

In order to mitigate the potential degradation of surface and groundwater quality, changes in runoff and flow patterns, and morphology, identified in Section 3 as a result of construction activities associated with the development, mitigation measures are to be implemented during all stages of the construction process.

### 4.2 Introduction

The construction phase of all projects is a period within which there is increased potential for pollution, in particular silt pollution to local watercourses. In relation to pollution, this document is intended to provide sufficient detail to ensure that water pollution will not occur as a result of construction activities at the site and to minimise the risk of any such occurrence. Measures are also proposed to ensure no adverse effect to stream flow and morphology.

**Environmental Statement Chapter 9: Geology and Water Environment** has identified particular downstream receptors, of significance from a drainage perspective especially watercourses with fisheries potential and should be referred to for a detailed appraisal of the site hydrology and hydrogeology.

The main objectives of the following sections are to demonstrate that sufficient measures have been put in place so as to protect those identified receptors and to ensure that drainage is constructed to relevant guidance and standards, particularly as follows:

- To propose appropriate, robust and buildable SuDS techniques for the prevention of erosion and the removal of silts and pollutants from construction runoff;
- To ensure that permanent drainage at the development is designed to a sufficient hydraulic capacity to contain a pre-determined return period rainfall event;
- To give consideration of the control and monitoring proposals for the dewatering of excavations;
- To ensure that surrounding agricultural lands, heath and peat lands are not negatively affected by surface water runoff from the site;

The drainage design adopts a SuDS approach, using temporary SuDS for the drainage of the temporary works during the construction phase.

Where construction activities near water courses and water bodies are essential, steps have been undertaken to identify sufficient mitigation measures for the protection of the watercourses against pollution and have been presented on drawings accompanying this report within Annex A and Annex B. Silt management and pollution prevention during all elements of construction has been given due consideration within the design statement herein and within the scope of the full SuDS design.

This report gives both specific and general details on the drainage method for temporary works, permanent site drainage and pollution prevention measures for silt management.

### 4.3 Additional References

This document refers to and should be read in conjunction with the Magheramore Environmental Statement, in particular:

- Chapter 6: Ecology / Chapter 8: Fisheries;
- Technical Appendix 9.3: Geotechnical Assessment

Chapters are contained within Volume 2 and Technical Appendices are included within Volume 4 of the ES. In addition; the following accompanying drawings included within Annex A and Annex B of this Technical Appendix:

- Figures WFD\_01 through WFD\_05: Preliminary SuDS General Arrangements;
- Figures WFD\_07 through WFD\_: Preliminary SuDS Typical Details.

## 5 SITE DRAINAGE INFORMATION

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### 5.1 Site Area

The Development is located approximately 3 km to the south of Dungiven. The Site area considered within this assessment occupies an area of approximately 1.5 km<sup>2</sup>.

### 5.2 Topography

The Site lies on the northern and southern flank of Teeavan Hill, with wind turbines sited on the western ridge of the Hill.

Ground levels within the Site range from approximately 325 m to 110m at the northern extent. Surface slopes within the site range from approximately 1 to 47%, with an average (mean) slope of approximately 13%.

### 5.3 Site Hydrology

The following is based on a combination of desktop study and walkover survey observations. Main stream reach lengths identified are as per OSNI 1:2,500 scale mapping, validated or otherwise by means of visual survey on-site.

The Development is located entirely within the Owenrigh River Catchment.

The site is drained by several undesignated watercourses. At the site entrance a water feature draining the northern fields in the western area of the site, adjacent to the north of the farmers track, joins Altabeg Burn, a tributary which then flows 295 m to join the Owenrigh River. The east and south of the site drains towards the Altnaheglish River which flows in Banagher Glen, and joins the Owenrigh to the south west of the site. The north of the site drains towards a tributary of the Owenrigh, which connects to the river approximately 1.8 km north of the site boundary.

The Altnaheglish River flows 50 m south of the site boundary. 500 m to the south west of the site it joins the Owenrigh River which flows 280 m west of the site at the nearest point. The Owenrigh is undesignated as it flows parallel to the site. However, it is designated under the Drainage (Northern Ireland) Order 1973 3.5 km downstream of the site. The watercourse joins the designated River Roe c. 4 km north of the site. The River Roe flows for 34 km, eventually discharging to Lough Foyle.

Based on NIEA River Basin Management Plan boundaries; the site is situated within the Roe Local Management Area (LMA) which is within the Lower Foyle Catchment Stakeholder Group and falls under the control of the North Western Basin District.

## 6 SUDS DESIGN APPROACH

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### 6.1 Relevant Guidance and Legislative Requirements

It is proposed that all drainage relating to Magheramore Wind Farm will be constructed using best practice and in conformance with the requirements of the relevant regulatory authorities. The key legislation and guidance which will be adhered to are defined in the Environmental Statement Chapter 9 – Geology and Water Environment, and are not repeated here.

In order to meet the design criteria and objectives detailed previously in this report and regulatory authority requirements, the following design philosophy has been developed.

### 6.2 Controlling Runoff

- Track and hardstanding runoff will be handled by sheet flow to trackside ditches or swales.
- Tracks and hardstanding areas are to be constructed from unbound aggregate and are not surfaced, thus helping to reduce runoff volumes. This has been allowed for within the design philosophy through the utilisation of a reduced runoff coefficient of 70 %, and a heavy silt loading assumed as defined by D'Arcy et al (2000), for light industrial and engineering land uses.
- Piped under track drainage will be provided with associated sumps and check dams. The under track drainage will provide a means for flows to pass from a swale on the uphill side to the downhill side of the slope.
- In cases where the tracks must run significantly downhill, transverse drains ('grips') will be constructed where appropriate in the surface of the tracks to divert any runoff flowing down the track into the adjacent drainage ditch/across open ground.
- Rate and volume of runoff will be attenuated using check dams located in trackside swales and ponds located at significant new hardstanding areas. Attenuation features will also reduce flow velocities preventing scour, and allow settlement of silts prior to discharge.
- The use of large balancing ponds is to be avoided and there will be no merit in using other methods such as filter drains or hard permeable surfacing due to the lack of infiltration capacity in prevalent soil types.

### 6.3 Water Quality and Treatment

- Clean / dirty water separation will be maintained on site in all practicable instances. Clean water will be prevented from entering excavations and dirty water drainage swales through use of clean water diversion / cut-off ditches.
- A treatment train will be designed with a minimum of two stages of treatment for polluted runoff from the site during the construction phase.
- All treatment settlement features (check dam backwaters and ponds) are to be designed to offer sufficient retention time to settle out the silt grain sizes anticipated.
- Silt laden runoff within trackside swales will be treated through the provision of small check dams at specified centres along the swales (to be specified as part of detailed design). Note that steeper swale sections will require a greater frequency of check dams.
- Appropriate site management measures will be taken to ensure that runoff from the construction site is not contaminated by fuel or lubricant spillages. Earth spillages into any existing streams will also be avoided. There will be no discharge of trade effluent, sewage effluent or contaminated drainage into any watercourse system or ditch. Any dewatering from excavations will be via surface silt traps, check dams and settlement ponds to ensure sediment does not enter surrounding watercourses.
- Areas stripped of vegetation should be kept to a minimum. Stripped vegetation should be reinstated on slopes as early as possible.

### 6.4 Preserving Hydrology and Groundwater Recharge / Amenity & Biodiversity

- Drainage design will ensure natural streams are piped directly through appropriately sized drainage pipes on their original alignment.
- Runoff from new hardstanding areas will be collected and attenuated before discharge to receiving drainage networks.

## 6.5 Summary

The proposed SuDS design provides a surface water management train that will seek to mitigate potentially adverse impacts on the hydrology of the Development

Application of the above design philosophy in the detailed design and construction of site specific elements is considered in the following sections of this report.

## 7 DRAINAGE DESIGN PHASE - DETAILED CONSIDERATIONS

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### 7.1 Preamble

The following key considerations have been identified in the preliminary design of hydrology and drainage (including foul) for the site in order to preserve water quality, downstream hydrology and preserve stream morphology. These issues and development of suitable mitigating measures will be given further consideration during the detailed design stage of the project.

- Identification of watercourse crossings and drainage paths across the site;
- Sizing and definition of hydraulic capacity requirements for watercourse crossings;
- Detailed design of track and hardstanding drainage and silt management;
- Separation of 'clean' and 'dirty' water;
- Spoil storage;
- Management and discharge of runoff in areas of upland heath and in areas of improved grassland and peat land;
- Requirement for attenuation storage;
- Definition of "Buffer Zones".

Note that the infrastructure layout and associated SuDS design prepared for purposes of Planning is preliminary only. Post consent, track layout design and associated SuDS design will be further developed to minimise and mitigate for the effects of pollution to all local watercourses.

Preliminary drainage layout is shown on accompanying drainage management drawings within **Annex A**.

### 7.2 Watercourses and Watercourse Crossings

#### 7.2.1 Identification of Watercourse Crossings

Watercourses significant for purposes of environmental design have been identified within the Hydrology Assessment undertaken for the Environmental Statement for the project. Sensitive water features on the site comprise natural watercourses and main flowing drains.

- Two crossings of significant watercourses are required to allow development (neither of which are significant in terms of fisheries potential per **Chapter 8: Fisheries**), both of which comprise upgrades or replacement of existing culvert structures..
- Five crossings of minor watercourses are proposed to allow development, of which two are replacement crossings, and all of which affect watercourses characteristic of existing trackside drainage or peat drains.

Additional consideration will be given to design of drainage crossings at detailed (post-planning) design stage, including other drainage crossings where other drainage crossings may be ditches and drains as encountered alongside existing roads tracks and field boundaries or moorland / peatland drainage.

Works to watercourse crossings will be subject to authorisation by DfI Rivers under Schedule 6 of the Drainage (Northern Ireland) Order 1973. Works causing disturbance to the riverbed shall similarly be subject to Loughs Agency Section 46/47 permit.

#### 7.2.2 Design of Watercourse Crossings

Full design of watercourse crossings will be undertaken at detailed design stage, post planning consent. Outline designs sufficient to allow assessment of environmental effects have been prepared as part of this assessment.

The following guidance has been adhered to in the outline design and will be similarly applied in the detailed design of watercourse crossings:

- Hydrological assessments made using a number of methods including Flood Estimation Handbook to determine the design flow;
- SNIFFER WFD 111 documents;

- CIRIA Culvert design and operation guide (C689);
- Fisheries considerations shall incorporate guidance stated in Loughs Agency Guidelines for Fisheries Protection during Development Works (2011) and Scottish Executive (2002) River Crossings and Migratory Fish: Design Guidance (where appropriate).

Watercourse crossings on the site shall comprise conventional closed culverts, with the requirement for bottomless culverts driven by consideration of fish passage determined in conjunction with the site specific fisheries assessment included with the Environmental Statement, which concludes that such measures are unnecessary.

Factors considered in the design and orientation of all watercourse crossings includes:

- Crossing direction to generally be perpendicular with access track direction, therefore minimising the length of stream affected;
- Consideration of the passage of out-of-bank flood flows;
- Crossings are generally located in an area where bank slopes are the shallowest available, thus reducing the potential for runoff to carry sediment into the watercourse.
- Additional mitigation will be designed to prevent pollution of the watercourse during the construction of the watercourse crossing to reduce residual risk; comprising the temporary installation of silt fences in the stream channel downstream or similarly effective measures.
- Typical in-channel silt fence arrangements are shown on drawing **WFD\_07** included in **Annex B**.

#### 7.2.2.1 Culvert Crossings

Conventional piped or closed bottom culverts are proposed at minor water features (based on site observations and catchment size < 0.25 km<sup>2</sup>), and at water features where the requirement to maintain fish habitat in the channel has been determined to be not applicable within **Chapter 8: Fisheries**. These crossings and other culverts for surface flood conveyance or similar, shall be piped or box culverts.

Design requirements will be imposed to ensure that culverts are installed at a level lower than existing bed levels in order to create a "stilling" effect and reduce potential for increased local flow velocities in the culvert in addition to promoting the formation of a natural substrate within the culvert. Mitigation of construction of the culvert within watercourses is discussed further in Section 8.2.2.

A typical culvert representing an outline design is shown on drawing **WFD\_08** included in **Annex B**.

#### 7.2.3 Design of Watercourse Diversions

Realignment of existing track drainage or peat drainage to permit the development of access tracks is proposed at 3 locations. The proposed drainage channel will be designed to ensure a hydraulic capacity not less than the channel it is replacing.

Works to watercourses will be subject to authorisation by DfI Rivers under Schedule 6 of the Drainage (Northern Ireland) Order 1973. Works causing disturbance to the riverbed shall similarly be subject to Loughs Agency Section 46/47 permit.

Areas where minor watercourse diversions are proposed are shown on drawings **WFD01 to 06** within **Annex A**.

#### 7.2.4 Water Feature Buffer Zones

Buffer zones to water features have been established for the Site within **Chapter 9: Geology and Water Environment** for the project and are shown on accompanying drainage management drawings **WFD01 to 06** within **Annex A**. Buffers apply to "diverted" watercourse channels (where applicable), where the watercourse diversion would be installed as enabling works and in-place prior to commencement of main earthworks.

Infrastructure designed to lie outwith stated hydrological buffer zones comprises those elements of the works associated with significant earthworks, and greatest potential for spillage or leakage of chemical pollutants, i.e.:

- All turbine bases, met mast foundations, crane pads, and associated working areas including spoil storage areas.

- Areas designated for temporary or permanent spoil management or storage.
- Substation buildings and compounds, temporary construction compounds, fuel and chemical storage areas, and any other platforms.

Buffers would be imposed during the construction phase in order to limit the types of construction activities permissible in proximity to water. Where the local site environment requires additional protection (e.g. steep slopes or lack of vegetation between construction corridor and watercourse) the buffer zone will be increased or stringent mitigation measures introduced. Buffer areas will act as riparian zones allowing filtration and settlement, minimising sediment transport, attenuating flows and maximising infiltration.

All turbines and infrastructure are outside the recommended buffers (other than unavoidable watercourse crossings) as described in **Chapter 3: Design Evolution & Alternatives**.

## 7.3 Temporary Drainage

### 7.3.1 Clean / Polluted Water Separation

Drainage management will ensure that clean water is not permitted to mix with contaminated water from sources such as excavation dewatering or track runoff, where “clean water” should be interpreted as natural surface runoff unaffected by construction / earthworks runoff.

Design will ensure that upslope cut off ditches are to be installed in order to intercept and divert clean upslope surface water runoff flowing overland prior to it coming in contact with areas of excavation. Design will ensure that clean water cut off ditches are installed ahead of main earthworks wherever practical. This is intended to reduce the flow of clean water onto any exposed areas of rock and soil, thereby reducing the amount of potential silt laden runoff requiring treatment.

Installed drainage will allow provision for clean water intercepted in cut-off ditches to pass through and under track structures separate to drainage provided for track runoff.

Temporary silt / pollution prevention and scour protection measures will be provided in artificial clean water drainage installed in order to mitigate potential for scouring and transport of sediment from newly excavated channels.

Diversion drainage is to discharge either to existing watercourse channels (via silt removal features) or be dispersed over vegetated ground. Diversions are to be designed to avoid collection and interception of large catchments creating significant point flows, with associated risks due to scour and hydraulic capacity.

## 7.4 Track Drainage

### 7.4.1 Trackside Drainage

The cross fall on the track will be aligned to divert “dirty” surface water (i.e. contaminated surface water from track surface or excavations) into trackside swales by overland sheet flow or via track surface grips.

The swale and track shoulder will be vegetated as soon as possible after construction, in order to reduce potential for runoff from exposed aggregates and clays, and promote removal of suspended solids within runoff by filtration in vegetation. Any vegetation used will be appropriate to the local area. Temporary erosion protection may be required until the vegetation becomes established (coir matting or similar).

All swales will be kept as shallow as possible so that they pose no health and safety risk to plant or personnel. Maximum depth of standing water will be limited to 0.5m within the ponds and 0.3m within the swales.

Drainage swales shall be designed to satisfy the following conveyance and water quality criteria:

- Hydraulic conveyance of runoff appropriate to the protection of the surrounding land use, with additional consideration of effect of a 100-yr (flood protection) event (i.e. exceedance event);
- Store treatment volume ( $T_v$ ) (15 mm rainfall on drained area).

Under-track piped drainage crossings will be provided to allow up-slope swales to drain to the down slope side. Crossings will be provided at regular intervals (to be determined at detailed design stage) and at all localised low points. Outlets from crossing pipes shall generally coincide with swale breakouts.

Note that dirty water under track crossings and breakouts are to be maintained separate from clean water crossings (see Section 7.3.1).

Where appropriate on areas of upland heath, there will be regular outflow points (“breakouts”) from the swales throughout the SuDS system to eliminate the potential for the generation of large flows at single outflow points. This will assist the drainage network in maintaining the natural hydrological response displayed by the natural catchment. Outflows will be directed away from watercourses and across open vegetation to increase the drainage path and buffer zone between the point of discharge and the watercourse.

Typical trackside swale arrangements are shown on **WFD01 to 06** within **Annex A** and track drainage details are shown on **WFD 9 and 10** in **Annex B**.

#### 7.4.2 [Drainage Grips](#)

Drainage grips may be installed on the track surface where deemed a requirement in order to direct runoff into trackside drainage or to downslope settlement / filtration features. Positioning of grips will be determined at detailed design stage and on an observational basis during construction, however in general the need for grips will be greatest in areas on steep longitudinal track gradient.

Installation of grips will prevent extensive rutting of the track structure and aids drainage of the track surface, which in turn reduces potential for trafficking of the surface to cut the track and generate silt.

Drainage grips will generally comprise a steel channel section installed flush to the track surface, with concrete haunching as may be required in areas of heavy trafficking.

#### 7.4.3 [Runoff Attenuation](#)

Runoff from large hardstanding areas such as the site compound, turbine hardstandings, and substation will be attenuated to mimic natural runoff patterns. Flow rates from tracks will be reduced through use of attenuating check dams within swales installed adjacent to all hardstanding areas, providing immediate attenuation “at source”, with pass-forward flow rate reduced by filtration and temporary detention.

Frequent breakouts from swales to discharge accumulated runoff overland at regular frequencies will further encourage attenuation of runoff peaks by dispersing runoff over vegetation where losses would be expected by vegetative retention, transpiration, and infiltration.

Attenuation will utilise shallow ponds to aid removal of suspended solids. Calculations for the determination of storage requirements will be undertaken at detailed design stage. Preliminary calculations are included in ES Technical Appendix 9.2 – Flood Risk and Drainage Assessment, and attenuation features are shown on **WFD01 to 06** within **Annex A** and track drainage details are shown on **WFD 9 and 10** in **Annex B**. An attenuation basin detail is included on **WFD\_12** in **Annex B**.

### 7.5 Management of Suspended Solids

Runoff from the site shall be required to ensure that water quality in the receiving watercourses, including those draining to areas of fisheries interest, is not adversely affected in terms of key water quality parameters. The primary means by which the development could cause adverse effect is by release of suspended solids.

Detailed drainage design shall ensure that settlement and filtration of runoff from the site is designed such that the water quality standard is preserved.

#### 7.5.1 [Check Dams](#)

Initial treatment will be provided “at source” by check dams installed within trackside swales at regular frequencies, in order to reduce flow velocities and improve conditions for the settlement of solids in transit.

Check dams shall ideally be of stone formation however compacted clay check dams may be used should suitable stone be unavailable locally.

Where stone is used, the aggregate used to form check dams will be a small ‘clean’ graded stone. On steeper slopes the check dams will be anchored using larger stone placed on the downhill side of the check



dam to prevent washing away of the smaller graded stone. The frequency of the check dams will be determined at detailed design stage.

The check dams will serve dual functions, by both removing and settling out silts and reducing flow velocities, therefore mitigating against the effects of erosion within the swale and improving the design life of end of line infiltration features.

Where feasible and where observed site conditions allow, the frequency of installed check dams may be reduced post-construction phase, due to reduced silt loading anticipated following completion of construction activities and reduced site traffic.

Typical swale check dam arrangements are shown on track drainage drawing **WFD\_09** in **Annex B**.

### 7.5.2 [Settlement Ponds](#)

All locations where significant accumulations of dirty water discharge in the vicinity of watercourses will pass through one or a sequence of settlement lagoons in order that suspended solid concentrations released can demonstrably be shown to have no detrimental effect to downstream fish life.

Temporary and permanent settlement lagoons shall be sized to allow treatment of the levels of silt and suspended solids anticipated in construction phase and operational phase runoff respectively and shall be informed by intrusive site investigation post consent.

Where runoff contains solids unlikely to settle adequately in conventional settlement lagoons, it shall be subject to additional treatment by flocculent. In such a scenario, secondary lagoons or a containerised system would be used in which flocculent dosing and final settlement would occur. Particular requirements for flocculent dosing (in terms of type of dosing, concentration, flocculent type etc) would be determined on an observational basis to suit the nature of suspended solids within the runoff measured on site. Treated water from settlement ponds would be discharged over intact vegetation for further treatment.

Typical settlement lagoon arrangements are shown on drawing **WFD\_11** included in **Annex B**.

### 7.5.3 [Vegetative Filtration](#)

In areas not classified as improved agricultural grassland; all runoff from swales, ponds, or other pumped discharges will be dispersed over undisturbed intact vegetation, nominally over agreed riparian watercourse buffer zones, in order to allow vegetative filtration of runoff prior to water entering the receiving watercourse.

### 7.5.4 [Dewatering and Washout Pits](#)

Washout pits to be located local to significant excavations will be designed to accommodate the anticipated volume of contaminated water to be removed from the excavation, either through unavoidable surface water runoff or accumulation of shallow groundwater. Washout pits shall be sized to accommodate the volume for a period until such times as the water has been clarified, with the water subsequently pumped out and into the site drainage system.

## 7.6 **Temporary Spoil Management**

Management of spoil, including temporary and permanent spoil generated from excavations, will be considered as part of a Construction Method Statement to be approved by the planning authority prior to construction and is discussed further within **ES Technical Appendix 6.5: Outline CEMP**. Site and drainage design would ensure the following in terms of drainage for temporary spoil management areas:

- There will be no depositing of material within the watercourse buffer zones.
- Spoil shall be placed in such a manner so as to ensure no ponding of surface water on top of spoil heaps. Temporary spoil should be graded to ensure that all direct precipitation will run directly off the surface.
- Temporary spoil deposition areas will be designed to ensure that natural flow paths (drainage channels) are not be altered or blocked by deposited spoil, or will have new intercepting cut-off drainage installed upslope to divert water around the spoil.

- Spoil heaps in the vicinity of watercourses would be surrounded on the low side with silt fences in order to trap fine sediment in runoff, or shall drain to a swale and sediment trap..

## 7.7 Foul Drainage

In order to prevent the requirement for a discharge of treated effluent of poor quality to a watercourse or percolation to groundwater that may cause nutrient enrichment of habitats, foul water from temporary compounds and the permanent substation will drain to temporary or permanent chemical facilities.

There will be no treated foul water discharge from the facilities. Emptying of chemical facilities (by tanker or similar) will be undertaken by a licensed haulier and waste will be disposed of at a suitable licensed waste disposal facility.

Detailed foul design (to establish suitability of cesspool or septic tank etc.) will be determined at detailed design stage incorporating results from percolation tests.

## 8 CONSTRUCTION PHASE – DETAILED CONSIDERATIONS

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Specific requirements to be imposed on any Contractor involved in the construction of the scheme will be further detailed in a Construction Method Statement to be approved by NIEA / the relevant local planning authority prior to construction.

All site personnel will be made aware of their environmental responsibilities at the site induction prior to being allowed to work on site, and through the production of a Method Statement, outlining Environmental Requirements for Sub-Contractors, which will include environmental emergency response procedures to deal with spillages, should they occur.

This section of the report outlines the steps which will be undertaken during the construction phase of the project to ensure compliance with relevant best practice guidance stated in ES Chapter 9. Site visits by the SuDS Engineer will be agreed in advance and will be undertaken at various stages of the construction process to ensure that the proposed SuDS scheme is being constructed in line with the design.

Essential mitigation measures relevant to controlling erosion and runoff from construction of the SuDS are described in NIEA's Guidance for Pollution Prevention and Pollution Prevention Guidance notes.

### 8.1 Planning and Phasing of Drainage Works

#### 8.1.1 Site-Wide Requirements

Temporary or permanent drainage and silt management features (SuDS) will be constructed prior to earthworks (including preliminary or enabling works) proceeding to construct any linear works (tracks / hardstanding areas / cable routes), turbine bases, and other infrastructure. Drainage will be provided to temporary works and reinstated to suit the final footprint of the completed development.

Temporary measures may include:

- Temporary silt fences erected in areas where risk of pollution to watercourses has been identified e.g. watercourse crossing locations and areas where tracks or other infrastructure lie within watercourse buffer zones.
- Upslope cut-off drainage channels approximately parallel to the proposed track alignment installed in advance of any excavated cuttings for the track or turbine hardstanding areas. This will prevent washout by surface flows of exposed clays in excavations and fine sediments in track makeup, and increase efficiency of silt removal in future trackside drainage swales.
- Watercourses, drains, natural flow paths and cut-off drain outlet locations should be identified and charted, in order to ensure that piped crossings can be installed in advance of or adjacent to the track construction.
- Settlement ponds should be constructed in advance of commencing excavations for foundations and at any other locations identified as required at detailed design stage.
- Watercourse or drainage diversions should be installed as enabling works and prior to main earthworks associated with track and turbine construction.
- Trackside drainage swales should be installed in parallel with track construction. Note that this may require that drainage swales are reformed on an ongoing basis as temporary track alignments are modified to their eventual finished design level.

In addition, spoil management is to be planned in advance of earthworks and on an ongoing basis, in order to allow planning of drainage required in advance of spoil being deposited.

Suitable prevention measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.

#### 8.1.2 Timing of Works

Works on the site likely to cause a high risk to surface water will be programmed so as to avoid unfavourable prevailing ground conditions and high volumes or extended periods of seasonal rainfall. Site clearance will take place in advance of construction works.

## 8.2 Specific Construction Phase Measures

### 8.2.1 Working in the Vicinity of Water / Buffer Zones

Construction buffer zones to drainage features will be set as stated within **Chapter 9: Geology and Water Environment** and are shown on the accompanying Drainage Management Drawings within **Annex A**.

The following procedures apply to the general construction activities either within watercourses or in the vicinity of watercourses (i.e. within buffer zones):

- Due cognisance will be given to the prevailing ground conditions and season when programming the execution of the works, in order to seek to undertake the works in a period with low potential to cause introduction of silt laden runoff to on site water features.
- Works will plan so that trackside drains do not discharge directly into watercourses, but rather through a buffer area of adequate width or via a constructed settlement feature such as pond or sequence of silt fences.
- Cement and concrete will be kept outwith buffer zone to avoid contamination of watercourses.
- Runoff from excavations will not be pumped directly to watercourses. Where dewatering of excavations is required, water shall be pumped to the head of a treatment train (swale, basin, or detention pond) in order to receive full treatment prior to re-entry to the natural drainage system.
- SuDS treatment techniques will be utilised to remove silts from runoff prior to the discharge of flows over open vegetated areas.

In the event that a specific short term risk to water quality is identified on site, specific localised measures will be implemented including:

- Placing temporary filtration silt fences within drainage channels where siltation is observed.
- Installing temporary constructed settlement features such as sumps or settlement ponds / lagoons where required.

### 8.2.2 Watercourse / Drain Realignment

Residual risk to watercourses specific to the construction stage will be fully addressed in the Contractor's construction method statement. Methods to divert minor watercourses will include the following:

- Works to divert drains (at the locations shown on drainage drawings WFD01 to 06 in Annex A) shall be programmed to coincide with a period of anticipated low drain flow and shall be undertaken prior to adjacent main earthworks associated with the reason for the diversion or realignment.
- The new channel alignment will be excavated starting from its downstream extent. The channel will be lined to prevent scour of the newly excavated surface. Scour protection (liners or rip rap) will be placed at bends.
- Temporary barriers (silt fences or check dams) may be placed in the new channel and the downstream in-situ channel.
- The upstream drain will be diverted into the realigned channel and the former channel dammed and backfilled.

### 8.2.3 Watercourse Crossings

Residual risk to watercourses specific to the construction stage will be fully addressed in the Contractor's construction method statement. Methods will include measures as per the guidance stated in Loughs Agency Guidelines for Fisheries Protection during Development Works<sup>8</sup>. And in addition to "designed" measures stated in Section 7.2.2, will include the following:

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<sup>8</sup> Loughs Agency (2011) Guidelines for Fisheries Protection during Development Works. Available: <http://www.loughs-agency.org/wp-content/uploads/2015/05/loughs-agency-guidelines-for-fisheries-protection-during-development-works.pdf> [Accessed 17/06/2018]

- Works to install all crossings shall be programmed to coincide with a period of anticipated low drain flow and firm ground conditions in order to minimise potential for silt laden runoff draining toward the stream.
- The channel will be dammed upstream of the proposed culvert location using sandbags or similar in order to provide a dry working environment at the culvert location. Dammed flows will be pumped out of channel and returning directly to the drain shortly downstream of the culvert location. Erosion protection shall be placed at the point of pump return. All pumping will be controlled on a contractor permit-to-pump scheme, such that pumping operations can be carefully planned, installed and monitored.
- Geotextile silt fences shall be installed adjacent to the drain bank upstream and downstream of the culvert location in order to filter contaminated runoff that may be caused by plant movement associated with the culvert installation. A sequence (minimum 2 no.) in-channel geotextile check dams will be installed within the drain channel downstream of the culvert location and downstream of the pump-return.
- The culvert comprising pre-cast concrete or pre-formed plastic pipes shall be installed and backfilled with suitable aggregate. Headwalls and scour protection to the drain bed shall be formed at the culvert inlet and outlet using dry formed components (lean-mix concrete-filled sandbags or similar). Washed gravel or pebbles (including if feasible that material recovered from the natural substrate excavated to permit the culvert installation) shall be introduced to cover and protect the extent of the drain channel affected by excavations. No wet concrete or cementitious material shall be required to be used within the drain channel.
- Over pumping and upstream dams shall be removed and water permitted to pass through the culvert. Downstream in-channel filtration check dams shall be retained and renewed as necessary in order to trap sediment until any residual washout of sediment from the exposed excavation has stabilised to a normal (pre-construction) level.
- Geotextile or equivalent splash-guards shall be erected to the track embankment over the culvert or clear span crossing prior to trafficking.

#### 8.2.4 Turbine Bases and Crane Pads

Excavated turbine foundations are likely to result in large volumes of displaced excavated material as spoil, as well as concrete operations. Specific measures are therefore required to manage potential for silt laden runoff from spoil, silt laden runoff from pumped dewatering, and cementitious contamination in pumped dewatering from turbine bases.

Concrete will not be allowed to enter watercourses under any circumstances, and drainage from excavations in which concrete is being poured will not be discharged directly into existing watercourses without appropriate treatment. Delivery trucks, tools and equipment will be cleaned at designated washout areas located conveniently and within a controlled area of the construction compound. Runoff from wash-out areas will be appropriately stored within bunded containers and removed off-site by an appropriate waste disposal company. In addition the following drainage measures will apply;

- Installation of cut-off drains around the working areas to intercept clean surface runoff and divert it around and away from the works.
- Minimising the stockpiling of materials and locating essential stockpiles outside any watercourse buffer zone.
- Polluted (silt laden) water collected in the base of any excavation would be gathered in a sump, and pumped at a low flow rate into either the mini-settlement pond or track swale for treatment. Dewatering of excavations direct to watercourses will not be permitted.
- The foundation working areas should be re-vegetated as soon as possible after construction.

#### 8.2.5 Cable Trenches

It is noted that where feasible, the design of cable trench alignment will avoid the creation of preferential flow routes. The following shall apply to the construction of all cable trenches at the site:

- To minimise impacts from disturbance, cables will be laid in small trenches along the side of access tracks, as far as possible.
- Due cognisance will be given to the prevailing ground conditions and season when programming the execution of the works, in order to seek to undertake the works in a period with low potential to cause introduction of silt laden runoff from excavations.

- Excavation of cable trenches will be carried out over short distances, with frequent backfilling of trenches, in order to minimise opportunity for the ingress of water into open trenches.
- Temporary silt traps will be provided in longer trench runs and on steeper slopes.
- Where constructed trackside swales are disturbed by cable installation, swale slopes will be correctly reinstated post infilling of the cable trench.

#### 8.2.6 Dewatering

In order to control dewatering activities and to ensure that all dewatering allows for pollution prevention measures, a permit-to-work system will be imposed on the Contractor, particularly to ensure pumped dewatering from excavations is controlled. A permit will be required to be issued to a competent person prior to allowing any specific dewatering to commence.

#### 8.2.7 Use of Flocculant

The use of flocculant is generally discouraged where possible in favour of using conventional settlement techniques to remove suspended solids, due to the preference to avoid introducing artificial chemicals to the surface water environment.

Where flocculant is ultimately required on a temporary basis, due to the presence of extremely fine particles within clays or aggregates that cannot be effectively removed using filtration or settlement ponds or where a particular pollution risk is observed due to weather conditions, then it will be installed at settlement lagoons per the detail shown on drawing **WFD\_11** in **Annex B**.

Flocculant would generally be installed in solid form in a culvert with water allowed to flow around the flocculant block. A datasheet for the flocculant type preferred, comprising a cationic polyacrylamide, is included in Error! Reference source not found., confirming that the product is non-toxic – refer specifically to datasheet Section 12.

Use of flocculant, which will be on a temporary basis-only, will be strictly regulated with a permit scheme to be put in place and competent person installed to oversee installation, monitoring and removal of flocculant. The permit scheme will record the location, time and date of installation, date of removal, and the quantity of product used, and this schedule will be maintained for inspection by the interested regulatory body, nominally NIEA:WMU or Loughs Agency.

Flocculant would be required to be removed immediately upon reduction of the observed pollution risk that prompted its use.

#### 8.2.8 Excavated Track Drainage

Excavated type tracks are initially expected to be used in all instances at the site. Where this construction type is specified, all track runoff (polluted water) would be directed to flow to track-side drainage channels as per Section 7.4, to be installed as tracks are constructed.

Due to anticipated low rates of infiltration and high ground water tables, as is common in predominately peat conditions, it is likely across the majority of the site that flows will not percolate through the base of the swale and will therefore be discharged from the swale via frequent spillways created through the embankments on the downhill sides of the access tracks.

Drainage swales and track shoulders will be re-vegetated as soon as feasible after completion of the track and drainage across the site. Typical drainage installation for excavated tracks is shown on drawing **WFD\_09** in **Annex B**.

#### 8.2.9 Floated Track Drainage

If subject to detailed design a floating type track construction is specified, existing drainage paths are not to be unnecessarily re-routed or changed. Existing drainage paths and overland flow-routes should be maintained through the placement of drainage pipes at existing land drainage locations and/or at regular intervals.

Track runoff will be directed over the edge of the track structure to discharge across existing vegetation to allow filtration / settlement of suspended solids. Typical drainage installation for floated tracks is shown on drawing **WFD\_10** in **Annex B**.

## 9 MAINTENANCE

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### 9.1 Construction Phase

The following is intended to inform the detailed drainage / SuDS maintenance manual for the construction phase.

It is envisaged that an Engineer specialising in surface water management and SuDS would be required to undertake regular site inspections during the construction phase of the wind farm, in order to validate that any detailed SuDS design and associated requirements to ensure construction methods are adhered to on site, and in order to identify areas where additional or enhanced mitigation is required.

In addition to the regular site inspections carried out by the Engineer, the following construction inspections will be undertaken during the construction phase of the project. The list is not exhaustive and should be added to as per the requirements of the site.

#### 9.1.1 Swales / Check Dams

- All check dams and settlement basins to be checked weekly in dry weather and daily during periods of heavy rainfall via a walkover survey during the construction phase. Excess trapped silt to be removed and disposed of/ re-used as may be agreed with relevant authorities.
- Where check dams have become fully blocked with silt, they should be replaced. Procedure for replacement of the check dam as follows:
  - silt deposits to be removed from the upstream side of check dams.
  - removed silt to be buried or re-used by spreading in an area of the site where surface runoff will not convey silt deposits back to a watercourse.
  - where there are regular incidents of check dam blockage further check dams to be installed (every 15-20 m intervals) within the swales.
- Monitor side slopes of swales and basins and reinstate any areas of slope slippage by battering back or otherwise as may be appropriate;
- Should there be noticeable effects of erosion along the swales or at discharge points, suitable erosion protection measures such as placement of large stones or erosion protection textiles should be installed at the area affected;
- Any temporarily stored or stockpiled material will be placed in a manner to ensure stability and set back sufficiently far such that in the case of unforeseen collapse, spoil would not cause infilling of swales.

#### 9.1.2 Settlement / Detention Basins

- Basin inlets to be cleared of debris.
- Silt in aggregate forebays to be removed by excavator and disposed of. Any aggregate removed to be replaced with clean stone.
- Any flow control device (orifice, weir or similar) to be checked and cleared of any debris.

### 9.2 Operational Phase

A post construction phase maintenance manual will be produced upon production of as built drainage survey for the site. This maintenance manual will contain recommendations identified above, augmented with further drainage findings collected during the construction phase which are deemed to assist in provision of long term drainage management for the site.



## 10 ASSESSMENT OF MITIGATION

### 10.1 Assessment of Mitigation against WFD Objectives

**Table 10.1: Schedule B – Assessment of Specific Mitigation Against WFD Objectives**

	Objective 1	Objective 2	Objective 3	Objective 4
Scheme Component / Effect	To prevent deterioration in the ecological status of the waterbody.  Describe mitigation required to meet objective 1:	To prevent the introduction of impediments to the attainment of Good WFD status for the waterbody.  Describe mitigation required to meet objective 2:	To ensure the attainment of the WFD objectives for the waterbody are not compromised.  Describe mitigation required to meet objective 3:	To ensure the achievement of WFD objectives in other waterbodies within the same catchment are not permanently excluded or compromised.  Describe mitigation required to meet objective 4:
Changes in Runoff and Flow Patterns In relation to the surface water body.	Detailed in Sections 3.3 to 3.4, and summarised as follows: Track and hardstanding runoff will be handled by sheet flow to trackside ditches or swales; Tracks and hardstanding areas are to be constructed from unbound aggregate and are not surfaced, thus helping to reduce runoff volumes; Piped under track drainage will be provided with associated sumps and check dams. The under track drainage will provide a means for flows to pass from a swale on the uphill side of the slope to the downhill side of the slope; In cases where the tracks must run significantly downhill, transverse drains ('grips') will be constructed where appropriate in the surface of the tracks to divert any runoff flowing down the track into the adjacent drainage ditch/across open ground; Rate and volume of runoff will be attenuated using check dams. Attenuation features will reduce flow velocities preventing scour, and allow settlement of silts prior to discharge; Drainage design will ensure natural streams are piped directly through appropriately sized drainage pipes; Settlement ponds will be designed to cater for infilling and rehabilitation post construction phase of the project; Buffer zones to water features will be established.			

Table 10.1: Schedule B – Assessment of Specific Mitigation Against WFD Objectives

	Objective 1	Objective 2	Objective 3	Objective 4
Scheme Component / Effect	Objective 1 To prevent deterioration in the ecological status of the waterbody. Describe mitigation required to meet objective 1:	Objective 2 To prevent the introduction of impediments to the attainment of Good WFD status for the waterbody. Describe mitigation required to meet objective 2:	Objective 3 To ensure the attainment of the WFD objectives for the waterbody are not compromised. Describe mitigation required to meet objective 3:	Objective 4 To ensure the achievement of WFD objectives in other waterbodies within the same catchment are not permanently excluded or compromised. Describe mitigation required to meet objective 4:
Silt / Suspended Solid pollution of surface water In relation to the surface water body.	Detailed in Sections 3.3 to 3.4, and summarised as follows: <ul style="list-style-type: none"> <li>• Clean / dirty water separation will be maintained on site in all practicable instances;</li> <li>• A treatment train will be designed with a minimum of two stages of treatment for polluted runoff from the site during the construction phase;</li> <li>• All treatment settlement features (check dam backwaters and ponds) are to be designed to offer sufficient retention time to settle out the silt grain sizes anticipated;</li> <li>• Silt laden runoff within trackside swales will be treated through the provision of small check dams at specified centres along the swales;</li> <li>• Areas stripped of vegetation should be kept to a minimum and any stripped vegetation should be reinstated on slopes as early as possible.</li> <li>• Earth spillages into any existing streams will also be avoided;</li> <li>• Any dewatering from excavations will be via surface silt traps, check dams and settlement ponds to ensure sediment does not enter surrounding watercourses;</li> <li>• Runoff from new hardstanding areas will be collected and attenuated before discharge to receiving drainage networks.</li> </ul>			
Chemical Pollution of surface water and groundwater In relation to the surface water body and groundwater body.	Detailed in Sections 3.3 to 3.4, and summarised as follows: <ul style="list-style-type: none"> <li>• Appropriate site management measures will be taken to ensure that runoff from the construction site is not contaminated by fuel or lubricant spillages;</li> <li>• There will be no discharge of trade effluent, sewage effluent or contaminated drainage into any watercourse.</li> </ul>			

## 11 SUMMARY AND CONCLUSION

### 11.1 Assessment of Post-Construction WFD Status

In all instances, the mitigation described previously is sufficient to meet the WFD Objectives 1 to 4. The post-construction assessment of WFD elements for the on-site WFD waterbody is summarised in Table 11.1 below. The assessed post works status, without mitigation, is based on the worst-case scenario outlined in Tables 3.1 to 3.4.

**Table 11.1: Summary of post-construction WFD Status**

WFD Element	Current Status	Assessed Post-Works Status - No Mitigation	Assessed Post-Works Status - With Mitigation
Owenrigh River (2015)			
Benthic Invertebrates	High	Poor	High
Phytobenthos	High	Moderate	High
Ammonia	Good /High	Moderate / Good	Good /High
Dissolved Oxygen	High	Good / Moderate	High
pH	High	Good / Moderate	High
Soluble Reactive Phosphate	High	Poor	High
Biological Oxygen Demand	High	Poor	High
Temperature	High	Good	High
Hydrological Regime	Good	Moderate	Good
Morphological conditions	Good	Moderate	Good
Claudy Groundwater Body			
Chemical Status	Good	Good	Good

### 11.2 Summary

This Water Framework Directive Assessment has been undertaken to determine the effects of Magheramore Wind Farm on the ecological quality status of waterbodies potentially affected by construction activities associated with the development.

In order to consider and assess potential impacts, the elements that constitute the current and predicted status for the waterbodies affected have been considered in the context of the proposed development initially assuming no mitigation measures are implemented. This approach allows the identification of the activities with the potential to cause an adverse impact on the current and / or predicted WFD status of the waterbody.

Consideration was then given to the design and mitigation measures incorporated into the scheme. Further mitigation measures were outlined where required and general pollution prevention measures were presented.

### 11.3 Conclusion

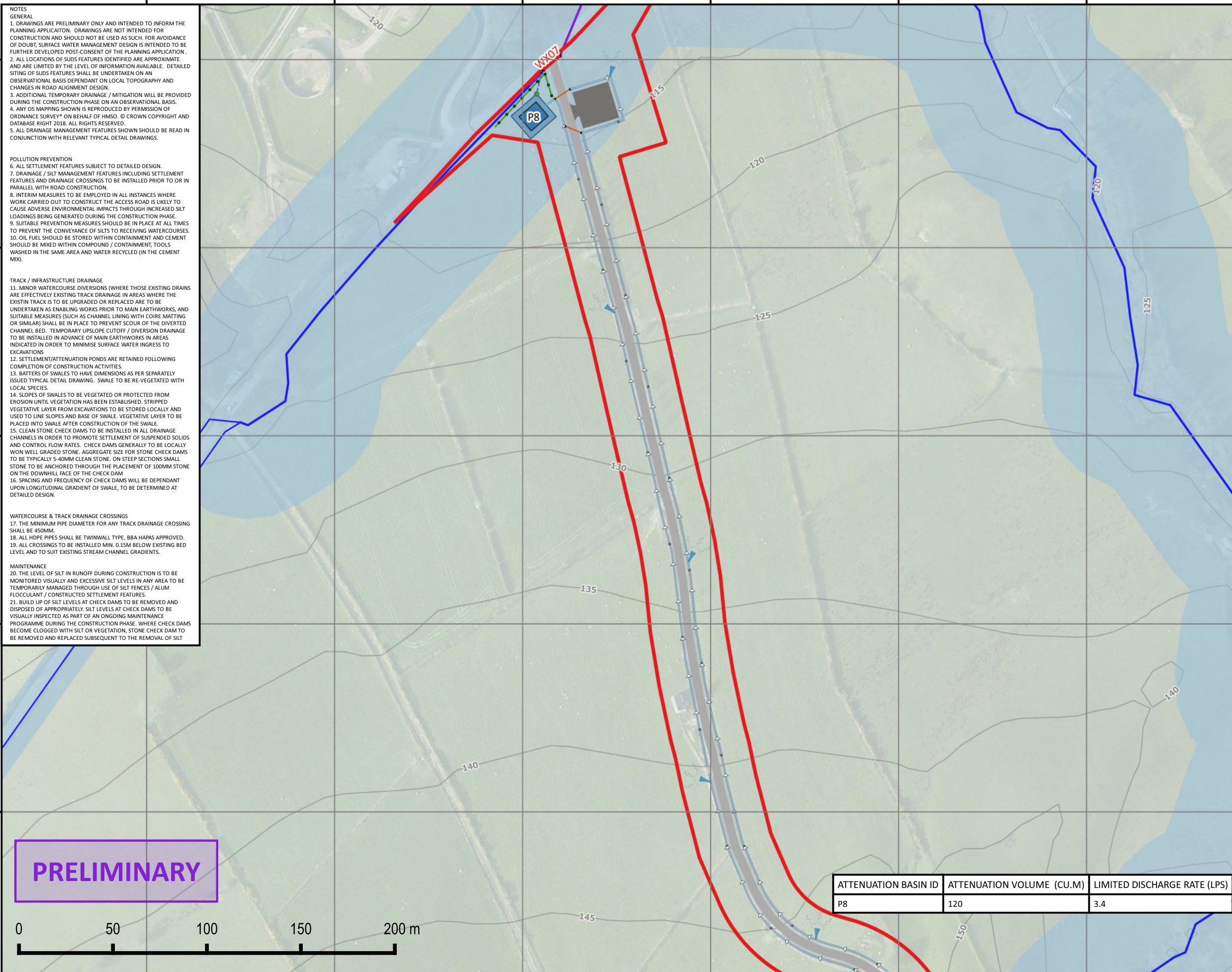
Following incorporation of site-wide general binding mitigation control measures, NIEA approved Guidance for Pollution Prevention (GPPs) and Pollution Prevention Guidelines (PPGs), and site specific mitigation, no adverse effect is anticipated to the Water Framework Directive classification of the affected waterbodies caused by the Development.

## Annex A

# Drainage Management - General Arrangements

M01616-05 _WFD_01	M01616-05 Drainage GA Sheet 1
M01616-05 _WFD_02	M01616-05 Drainage GA Sheet 2
M01616-05 _WFD_03	M01616-05 Drainage GA Sheet 3
M01616-05 _WFD_04	M01616-05 Drainage GA Sheet 4
M01616-05 _WFD_05	M01616-05 Drainage GA Sheet 5
M01616-05 _WFD_06	M01616-05 Drainage GA Sheet 6





**NOTES**

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- ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT TYPICAL DETAIL DRAWINGS.

**POLLUTION PREVENTION**

- ALL SETTLEMENT FEATURES SUBJECT TO DETAILED DESIGN.
- DRAINAGE / SILT MANAGEMENT FEATURES INCLUDING SETTLEMENT FEATURES AND DRAINAGE CROSSINGS TO BE INSTALLED PRIOR TO OR IN PARALLEL WITH ROAD CONSTRUCTION.
- INTERIM MEASURES TO BE EMPLOYED IN ALL INSTANCES WHERE WORK CARRIED OUT TO CONSTRUCT THE ACCESS ROAD IS LIKELY TO CAUSE ADVERSE ENVIRONMENTAL IMPACTS THROUGH INCREASED SILT LOADINGS BEING GENERATED DURING THE CONSTRUCTION PHASE.
- SUITABLE PREVENTION MEASURES SHOULD BE IN PLACE AT ALL TIMES TO PREVENT THE CONVEYANCE OF SILTS TO RECEIVING WATERCOURSES.
- OIL FUEL SHOULD BE STORED WITHIN CONTAINMENT AND CEMENT SHOULD BE MIXED WITHIN COMPOUND / CONTAINMENT, TOOLS WASHED IN THE SAME AREA AND WATER RECYCLED (IN THE CEMENT MIX).

**TRACK / INFRASTRUCTURE DRAINAGE**

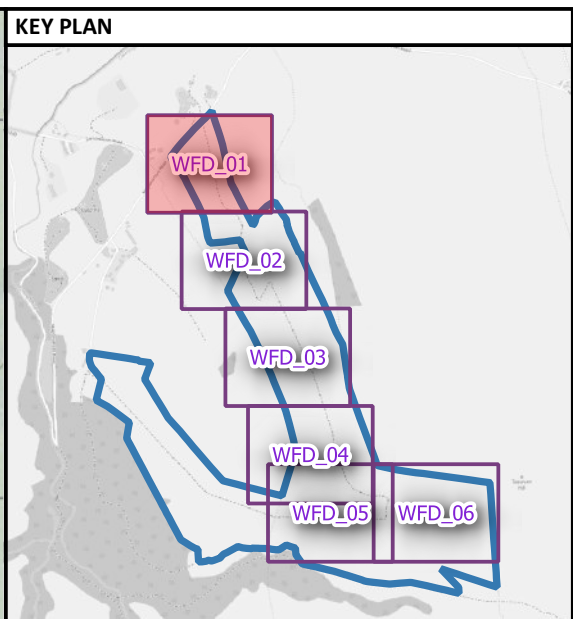
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- SETTLEMENT/ATTENUATION PONDS ARE RETAINED FOLLOWING COMPLETION OF CONSTRUCTION ACTIVITIES.
- BATTERS OF SWALES TO HAVE DIMENSIONS AS PER SEPARATELY ISSUED TYPICAL DETAIL DRAWING. SWALE TO BE RE-VEGETATED WITH LOCAL SPECIES.
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- SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDANT UPON LONGITUDINAL GRADIENT OF SWALE, TO BE DETERMINED AT DETAILED DESIGN.

**WATERCOURSE & TRACK DRAINAGE CROSSINGS**

- THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM.
- ALL HDPE PIPES SHALL BE TWINWALL TYPE, BBA HARPS APPROVED.
- ALL CROSSINGS TO BE INSTALLED MIN. 0.15M BELOW EXISTING BED LEVEL AND TO SUIT EXISTING STREAM CHANNEL GRADIENTS.

**MAINTENANCE**

- THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN ANY AREA TO BE TEMPORARILY MANAGED THROUGH USE OF SILT FENCES / ALUM FLOCCULANT / CONSTRUCTED SETTLEMENT FEATURES.
- BUILD UP OF SILT LEVELS AT CHECK DAMS TO BE REMOVED AND DISPOSED OF APPROPRIATELY. SILT LEVELS AT CHECK DAMS TO BE VISUALLY INSPECTED AS PART OF AN ONGOING MAINTENANCE PROGRAMME DURING THE CONSTRUCTION PHASE. WHERE CHECK DAMS BECOME CLOGGED WITH SILT OR VEGETATION, STONE CHECK DAM TO BE REMOVED AND REPLACED SUBSEQUENT TO THE REMOVAL OF SILT



**LEGEND**

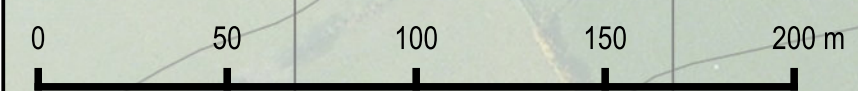
The Development		Track Drainage Features	
[Red outline]	Application Boundary	[Blue line]	Swale
[Grey fill]	Buildings	[Blue line with arrow]	Track Drainage Breakout
[Dark grey fill]	Compounds	[Green arrow]	Clean Cutoff Drain
[Light grey fill]	Tracks and Hardstanding	[Green dashed line]	Silt Fence
[Blue fill]	Hydrological Buffers for Construction Phase (50m & 10m)	[Green line with arrow]	Clean Drainage Pipe
[Blue line]	Significant Watercourse	[Orange line with arrow]	Dirty Track Drainage Pipe
[Blue dashed line]	Minor Watercourse	[Red line with arrow]	Watercourse Crossing
[Blue dashed line]	Diverted Minor Watercourse	[Blue box]	Attenuation Basin
[Blue dotted line]	Abandoned Minor Watercourse	[Blue circle]	Limited Discharge (Outfall)
[Blue dotted line]	Peat or Field Drain	[Blue dashed line]	Pumped dewatering (indicative)
[Blue dotted line]	Abandoned Field Drain	[Brown box]	Settlement Basin
[Purple line]	Ex. Culvert	[Tan box]	Spoil storage

WX ID	DESCRIPTION	COMMENT
WX07	LARGE DIA. OR BOX CULVERT	EXISTING CULVERT - NEED FOR REPLACEMENT OR UPGRADE SUBJECT TO DESIGN

**POLLUTION PREVENTION GUIDANCE NOTES:**

- Suitable SUDS prevention measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
- Temporary or permanent SuDS features should be installed BEFORE or adjacent to construction of new access road and hardstanding.
- Clean water cutoff ditch and crossing should be planned and installed BEFORE construction. Clean water management must consider spoil deposition on the site.
- Direct discharge of road drainage to watercourses shall not be permitted.
- Buffer zones are to be maintained around all relevant watercourses as indicated on this drawing. No excavated material is to be stored within the buffer zone.
- DO NOT pump water direct to watercourses.
- DO NOT strip vegetation from existing ditches unless absolutely necessary.
- If water pollution is identified the following steps should be adhered to:  
STOP - Work in the immediate area should be stopped and the source of the pollution identified  
CONTAIN - The source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.  
NOTIFY - The relevant authorities (Site Manager / NIEA) should be notified immediately to ensure that measures can be implemented downstream to protect fisheries and other sensitive areas.

**PRELIMINARY**



ATTENUATION BASIN ID	ATTENUATION VOLUME (CU.M)	LIMITED DISCHARGE RATE (LPS)
P8	120	3.4

Mossley Mill,  
Lower Ground (West),  
Carnmoney Road North,  
Newtownabbey BT36 5QA  
T: 028 9084 8694  
E: info@mccloyconsulting.com  
W: www.mccloyconsulting.com

<b>DESCRIPTION</b>				
MAGHERAMORE WIND FARM - DRAINAGE LAYOUT SHEET 1 OF 6				
<b>PROJECT / FIGURE NO.</b>				
M01616-05_WFD_01				
<b>DRAWN BY</b>	<b>SCALE</b>	<b>REVISION</b>	<b>DATE</b>	
MD	1:2000	1	28/05/2019	

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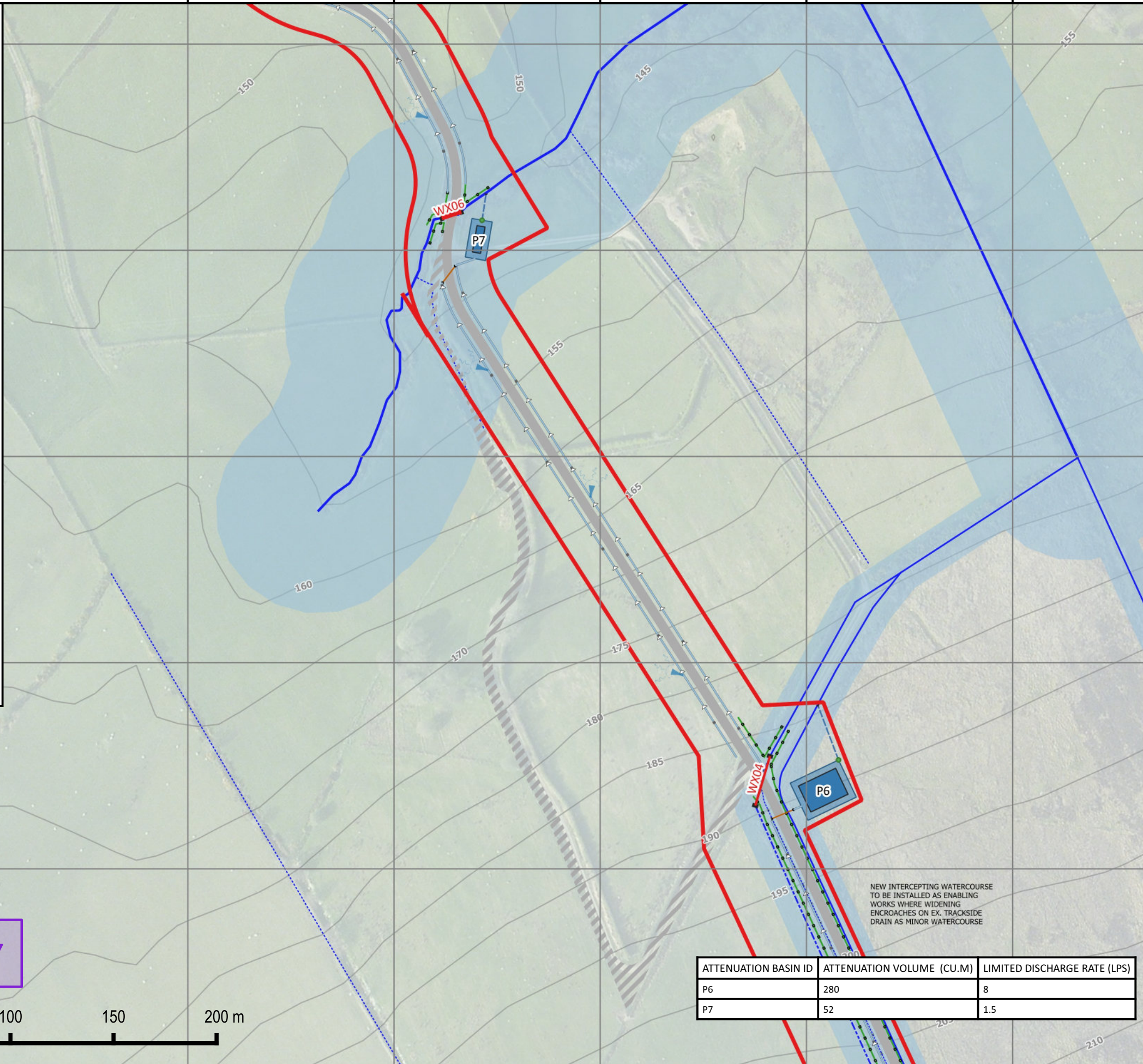
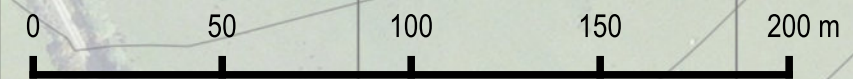
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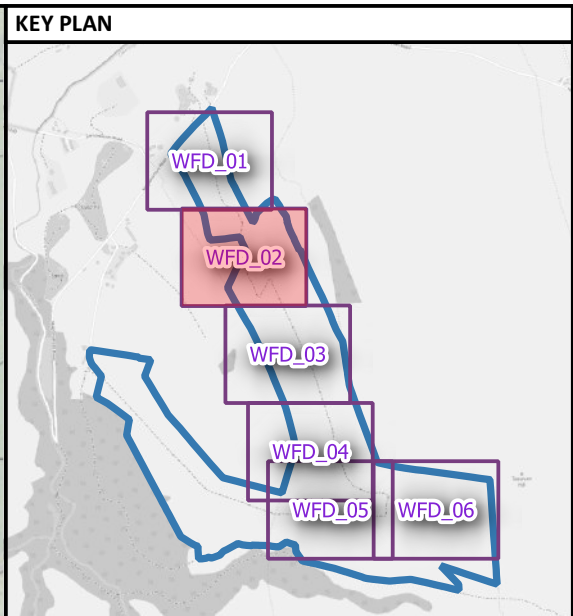
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**PRELIMINARY**



ATTENUATION BASIN ID	ATTENUATION VOLUME (CU.M)	LIMITED DISCHARGE RATE (LPS)
P6	280	8
P7	52	1.5



**LEGEND**

<b>The Development</b>	<b>Track Drainage Features</b>
Application Boundary	Swale
Buildings	Track Drainage Breakout
Compounds	Clean Cutoff Drain
Tracks and Hardstanding	Silt Fence
<b>Existing Hydrology</b>	Clean Drainage Pipe
Hydrological Buffers for Construction Phase (50m & 10m)	Dirty Track Drainage Pipe
<b>Watercourses and Ex. Drainage</b>	Watercourse Crossing
Significant Watercourse	Attenuation Basin
Minor Watercourse	Limited Discharge (Outfall)
Diverted Minor Watercourse	Pumped dewatering (indicative)
Abandoned Minor Watercourse	Settlement Basin
Peat or Field Drain	Spoil storage
Abandoned Field Drain	Ex. Culvert

WX ID	DESCRIPTION	COMMENT
WX04	MIN 600 CIRCULAR	EXISTING SMALL DIA. TRACK CULVERT TO BE REPLACED
WX06	LARGE DIA. OR BOX CULVERT	EXISTING CONCRETE DECK STRUCTURE - REPLACEMENT SUBJECT TO DESIGN

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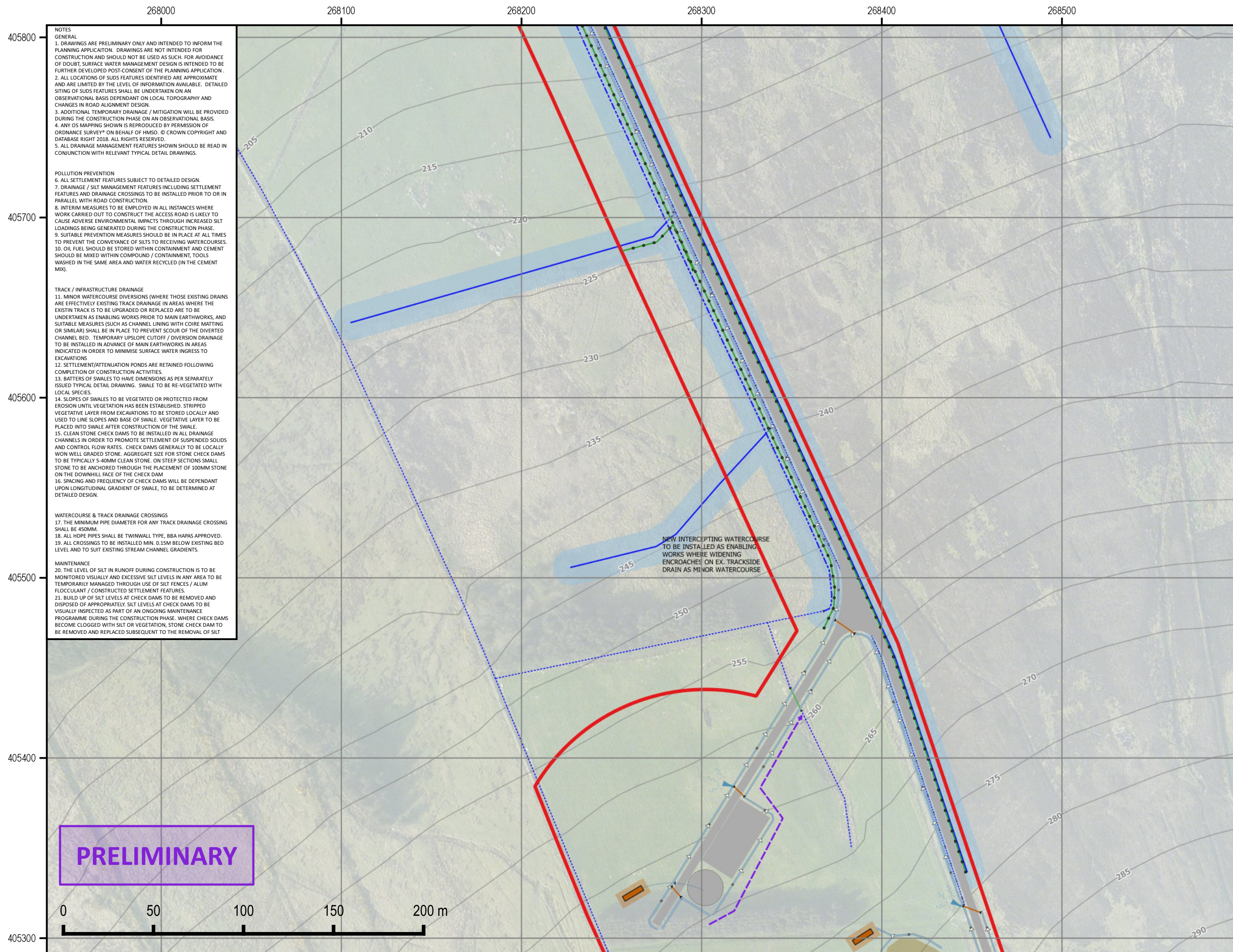
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<b>PROJECT / FIGURE NO.</b>				
M01616-05_WFD_02				
<b>DRAWN BY</b>	<b>SCALE</b>	<b>REVISION</b>	<b>DATE</b>	
MD	1:2000	1	28/05/2019	

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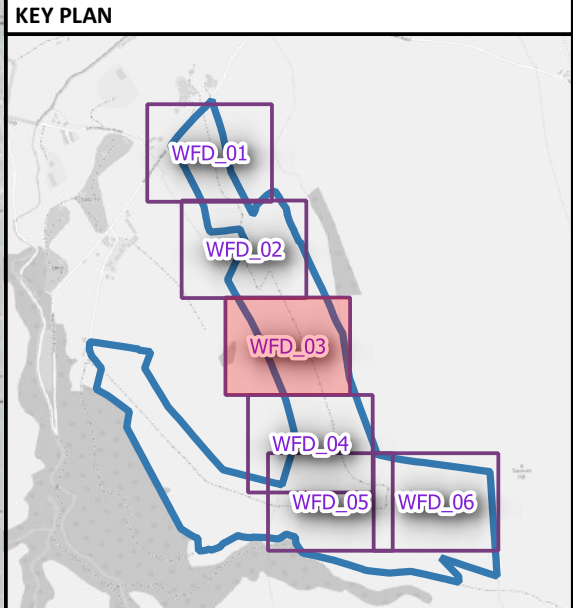
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**TRACK / INFRASTRUCTURE DRAINAGE**  
 11. MINOR WATERCOURSE DIVERSIONS (WHERE THOSE EXISTING DRAINS ARE EFFECTIVELY EXISTING TRACK DRAINAGE IN AREAS WHERE THE EXISTING TRACK IS TO BE UPGRADED OR REPLACED ARE TO BE UNDERTAKEN AS ENABLING WORKS PRIOR TO MAIN EARTHWORKS, AND SUITABLE MEASURES SUCH AS CHANNEL LINING WITH COIRE MATTING OR SIMILAR) SHALL BE IN PLACE TO PREVENT SCOUR OF THE DIVERTED CHANNEL BED. TEMPORARY UPSLOPE CUTOFF / DIVERSION DRAINAGE TO BE INSTALLED IN ADVANCE OF MAIN EARTHWORKS IN AREAS INDICATED IN ORDER TO MINIMISE SURFACE WATER INGRESS TO EXCAVATIONS.  
 12. SETTLEMENT/ATTENUATION PONDS ARE RETAINED FOLLOWING COMPLETION OF CONSTRUCTION ACTIVITIES.  
 13. BATTERS OF SWALES TO HAVE DIMENSIONS AS PER SEPARATELY ISSUED TYPICAL DETAIL DRAWING. SWALE TO BE RE-VEGETATED WITH LOCAL SPECIES.  
 14. SLOPES OF SWALES TO BE VEGETATED OR PROTECTED FROM EROSION UNTIL VEGETATION HAS BEEN ESTABLISHED. STRIPPED VEGETATIVE LAYER FROM EXCAVATIONS TO BE STORED LOCALLY AND USED TO LINE SLOPES AND BASE OF SWALE. VEGETATIVE LAYER TO BE PLACED INTO SWALE AFTER CONSTRUCTION OF THE SWALE.  
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 16. SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDANT UPON LONGITUDINAL GRADIENT OF SWALE, TO BE DETERMINED AT DETAILED DESIGN.

**WATERCOURSE & TRACK DRAINAGE CROSSINGS**  
 17. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM.  
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 21. BUILD UP OF SILT LEVELS AT CHECK DAMS TO BE REMOVED AND DISPOSED OF APPROPRIATELY. SILT LEVELS AT CHECK DAMS TO BE VISUALLY INSPECTED AS PART OF AN ONGOING MAINTENANCE PROGRAMME DURING THE CONSTRUCTION PHASE. WHERE CHECK DAMS BECOME CLOGGED WITH SILT OR VEGETATION, STONE CHECK DAM TO BE REMOVED AND REPLACED SUBSEQUENT TO THE REMOVAL OF SILT.



**LEGEND**

<b>The Development</b>	<b>Track Drainage Features</b>
Application Boundary	Swale
Buildings	Track Drainage Breakout
Compounds	Clean Cutoff Drain
Tracks and Hardstanding	Silt Fence
<b>Existing Hydrology</b>	Clean Drainage Pipe
Hydrological Buffers for Construction Phase (50m & 10m)	Dirty Track Drainage Pipe
<b>Watercourses and Ex. Drainage</b>	Watercourse Crossing
Significant Watercourse	Attenuation Basin
Minor Watercourse	Limited Discharge (Outfall)
Diverted Minor Watercourse	Pumped dewatering (indicative)
Abandoned Minor Watercourse	Settlement Basin
Peat or Field Drain	Spoil storage
Abandoned Field Drain	Ex. Culvert

**POLLUTION PREVENTION GUIDANCE NOTES:**

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- DO NOT pump water direct to watercourses.
- DO NOT strip vegetation from existing ditches unless absolutely necessary.
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 NOTIFY - The relevant authorities (Site Manager / NIEA) should be notified immediately to ensure that measures can be implemented downstream to protect fisheries and other sensitive areas.

Mossley Mill,  
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 W: www.mccloyconsulting.com

<b>DESCRIPTION</b>			
MAGHERAMORE WIND FARM - DRAINAGE LAYOUT SHEET 3 OF 6			
<b>PROJECT / FIGURE NO.</b>			
M01616-05_WFD_03			
<b>DRAWN BY</b>	<b>SCALE</b>	<b>REVISION</b>	<b>DATE</b>
MD	1:2000	1	28/05/2019

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**POLLUTION PREVENTION**

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9. SUITABLE PREVENTION MEASURES SHOULD BE IN PLACE AT ALL TIMES TO PREVENT THE CONVEYANCE OF SILTS TO RECEIVING WATERCOURSES.
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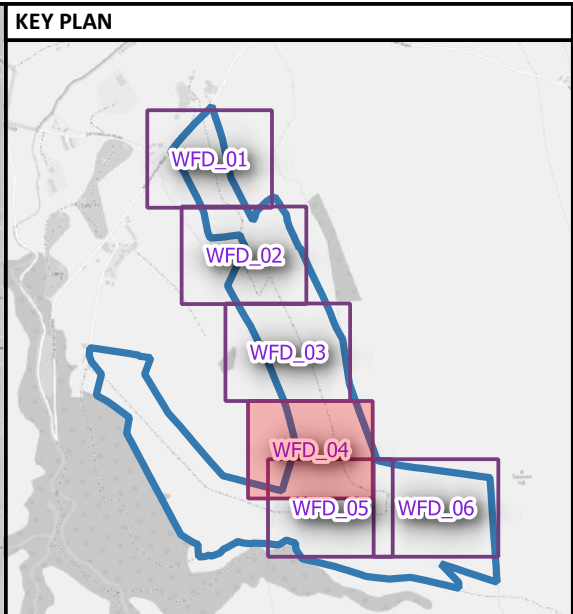
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**LEGEND**

The Development		Track Drainage Features	
[Red outline]	Application Boudary	[Blue line]	Swale
[Grey fill]	Buildings	[Blue line with triangle]	Track Drainage Breakout
[Dark grey fill]	Compounds	[Green arrow]	Clean Cutoff Drain
[Light grey fill]	Tracks and Hardstanding	[Green dashed line]	Silt Fence
[Blue fill]	Hydrological Buffers for Construction Phase (50m & 10m)	[Green line with arrow]	Clean Drainage Pipe
[Thick blue line]	Significant Watercourse	[Orange line with arrow]	Dirty Track Drainage Pipe
[Thin blue line]	Minor Watercourse	[Red line with arrow]	Watercourse Crossing
[Dashed blue line]	Diverted Minor Watercourse	[Blue box]	Attenuation Basin
[Dotted blue line]	Abandoned Minor Watercourse	[Green circle]	Limited Discharge (Outfall)
[Dashed blue line]	Peat or Field Drain	[Blue dashed line]	Pumped dewatering (indicative)
[Dotted blue line]	Abandoned Field Drain	[Brown box]	Settlement Basin
[Purple line]	Ex. Culvert	[Tan box]	Spoil storage

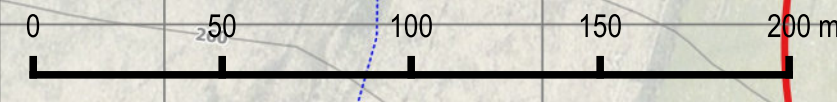
WX ID	DESCRIPTION	COMMENT
WX03	MIN 600 CIRCULAR	EXISTING SMALL DIA. SHORE / CULVERT TO BE REPLACED
WX05	MIN 600 CIRCULAR	NEW CULVERT

**POLLUTION PREVENTION GUIDANCE NOTES:**

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ATTENUATION BASIN ID	ATTENUATION VOLUME (CU.M)	LIMITED DISCHARGE RATE (LPS)
P3	60	1.7

**PRELIMINARY**



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Newtownabbey BT36 5QA  
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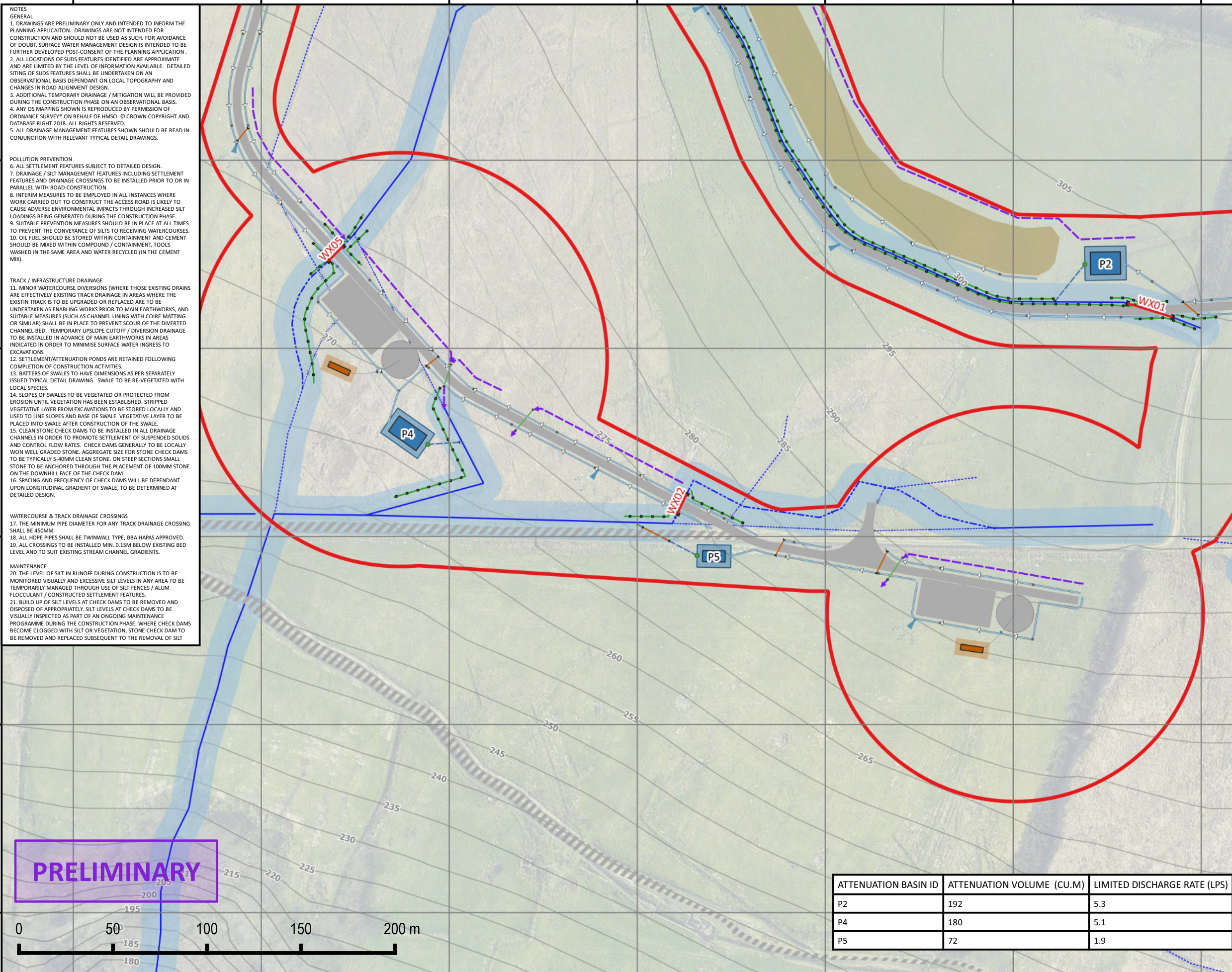
<b>DESCRIPTION</b>				
MAGHERAMORE WIND FARM - DRAINAGE LAYOUT SHEET 4 OF 6				
<b>PROJECT / FIGURE NO.</b>				
M01616-05_WFD_04				
<b>DRAWN BY</b>	<b>SCALE</b>	<b>REVISION</b>	<b>DATE</b>	
MD	1:2000	1	28/05/2019	

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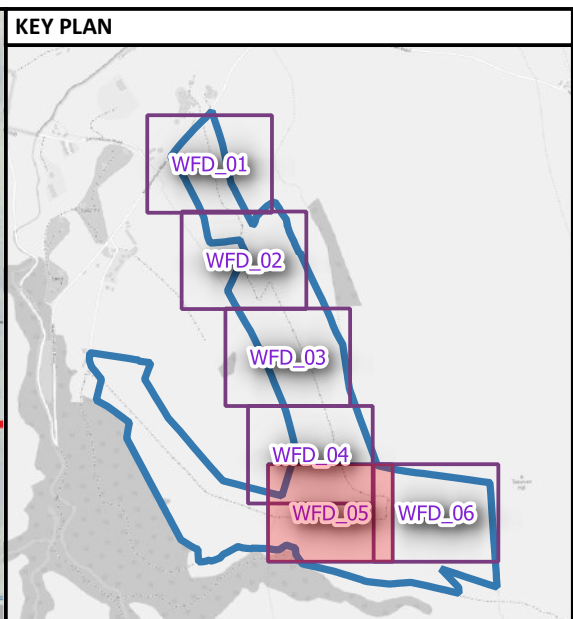
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**LEGEND**

<b>The Development</b>	<b>Track Drainage Features</b>
Application Boundary	Swale
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Abandoned Minor Watercourse	Settlement Basin
Peat or Field Drain	Spoil storage
Abandoned Field Drain	Ex. Culvert

WX ID	DESCRIPTION	COMMENT
WX01	MIN 600 CIRCULAR	NEW CULVERT - EX TRACKSIDE DRAIN AS MINOR WATERCOURSE
WX02	MIN 600 CIRCULAR	NEW CULVERT
WX05	MIN 600 CIRCULAR	NEW CULVERT

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**PRELIMINARY**



ATTENUATION BASIN ID	ATTENUATION VOLUME (CU.M)	LIMITED DISCHARGE RATE (LPS)
P2	192	5.3
P4	180	5.1
P5	72	1.9

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Newtownabbey BT36 5QA  
T: 028 9084 8694  
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<b>DESCRIPTION</b>				
MAGHERAMORE WIND FARM - DRAINAGE LAYOUT SHEET 5 OF 6				
<b>PROJECT / FIGURE NO.</b>				
M01616-05_WFD_05				
<b>DRAWN BY</b>	<b>SCALE</b>	<b>REVISION</b>	<b>DATE</b>	
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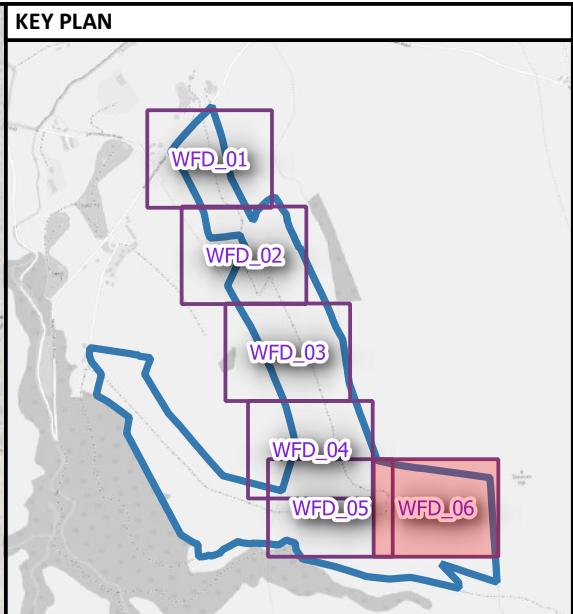
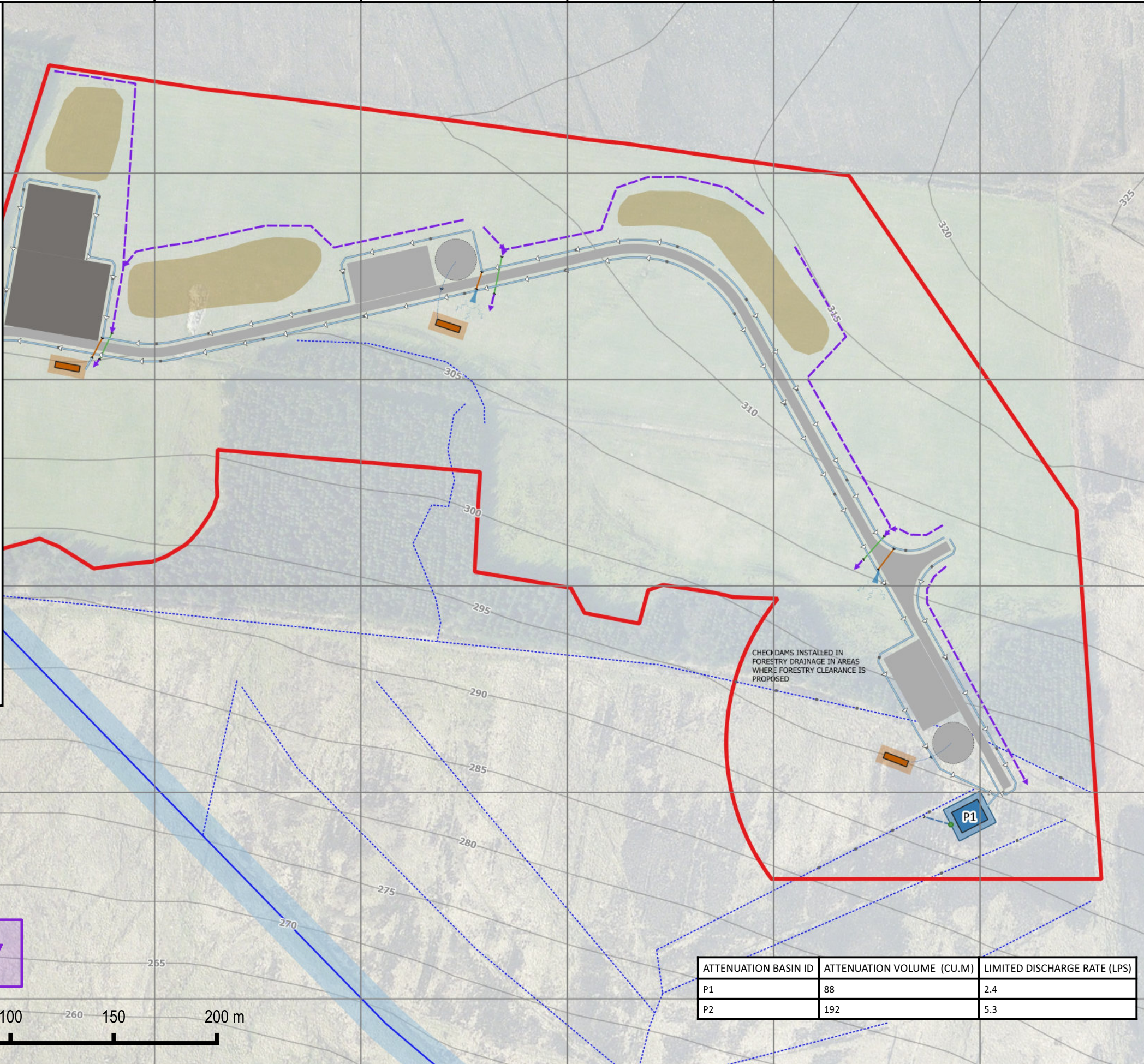
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- SETTLEMENT/ATTENUATION PONDS ARE RETAINED FOLLOWING COMPLETION OF CONSTRUCTION ACTIVITIES.
- BATTERS OF SWALES TO HAVE DIMENSIONS AS PER SEPARATELY ISSUED TYPICAL DETAIL DRAWING. SWALE TO BE RE-VEGETATED WITH LOCAL SPECIES.
- SLOPES OF SWALES TO BE VEGETATED OR PROTECTED FROM EROSION UNTIL VEGETATION HAS BEEN ESTABLISHED. STRIPPED VEGETATIVE LAYER FROM EXCAVATIONS TO BE STORED LOCALLY AND USED TO LINE SLOPES AND BASE OF SWALE. VEGETATIVE LAYER TO BE PLACED INTO SWALE AFTER CONSTRUCTION OF THE SWALE.
- CLEAN STONE CHECK DAMS TO BE INSTALLED IN ALL DRAINAGE CHANNELS IN ORDER TO PROMOTE SETTLEMENT OF SUSPENDED SOLIDS AND CONTROL FLOW RATES. CHECK DAMS GENERALLY TO BE LOCALLY WON WELL GRADED STONE. AGGREGATE SIZE FOR STONE CHECK DAMS TO BE TYPICALLY 5-40MM CLEAN STONE. ON STEEP SECTIONS SMALL STONE TO BE ANCHORED THROUGH THE PLACEMENT OF 100MM STONE ON THE DOWNHILL FACE OF THE CHECK DAM.
- SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDANT UPON LONGITUDINAL GRADIENT OF SWALE, TO BE DETERMINED AT DETAILED DESIGN.

**WATERCOURSE & TRACK DRAINAGE CROSSINGS**

- THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM.
- ALL HDPE PIPES SHALL BE TWINWALL TYPE, BBA HARAS APPROVED.
- ALL CROSSINGS TO BE INSTALLED MIN. 0.15M BELOW EXISTING BED LEVEL AND TO SUIT EXISTING STREAM CHANNEL GRADIENTS.

**MAINTENANCE**

- THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN ANY AREA TO BE TEMPORARILY MANAGED THROUGH USE OF SILT FENCES / ALUM FLOCCULANT / CONSTRUCTED SETTLEMENT FEATURES.
- BUILD UP OF SILT LEVELS AT CHECK DAMS TO BE REMOVED AND DISPOSED OF APPROPRIATELY. SILT LEVELS AT CHECK DAMS TO BE VISUALLY INSPECTED AS PART OF AN ONGOING MAINTENANCE PROGRAMME DURING THE CONSTRUCTION PHASE. WHERE CHECK DAMS BECOME CLOGGED WITH SILT OR VEGETATION, STONE CHECK DAM TO BE REMOVED AND REPLACED SUBSEQUENT TO THE REMOVAL OF SILT.



**LEGEND**

The Development		Track Drainage Features	
[Red Outline]	Application Boudary	[Blue Line]	Swale
[Grey Box]	Buildings	[Blue Arrow]	Track Drainage Breakout
[Dark Grey Box]	Compounds	[Purple Arrow]	Clean Cutoff Drain
[Light Grey Box]	Tracks and Hardstanding	[Green Line]	Silt Fence
[Blue Box]	Hydrological Buffers for Construction Phase (50m & 10m)	[Green Arrow]	Clean Drainage Pipe
[Blue Line]	Significant Watercourse	[Orange Arrow]	Dirty Track Drainage Pipe
[Blue Line]	Minor Watercourse	[Red Arrow]	Watercourse Crossing
[Blue Line]	Diverted Minor Watercourse	[Blue Box]	Attenuation Basin
[Dotted Blue Line]	Abandoned Minor Watercourse	[Green Circle]	Limited Discharge (Outfall)
[Dotted Blue Line]	Peat or Field Drain	[Blue Arrow]	Pumped dewatering (indicative)
[Dotted Blue Line]	Abandoned Field Drain	[Brown Box]	Settlement Basin
[Purple Line]	Ex. Culvert	[Tan Box]	Spoil storage

WX ID	DESCRIPTION	COMMENT
WX01	MIN 600 CIRCULAR	NEW CULVERT - EX TRACKSIDE DRAIN AS MINOR WATERCOURSE

**POLLUTION PREVENTION GUIDANCE NOTES:**

- Suitable SUDS prevention measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
- Temporary or permanent SUDS features should be installed BEFORE or adjacent to construction of new access road and hardstanding.
- Clean water cutoff ditch and crossing should be planned and installed BEFORE construction. Clean water management must consider spoil deposition on the site.
- Direct discharge of road drainage to watercourses shall not be permitted.
- Buffer zones are to be maintained around all relevant watercourses as indicated on this drawing. No excavated material is to be stored within the buffer zone.
- DO NOT pump water direct to watercourses.
- DO NOT strip vegetation from existing ditches unless absolutely necessary.
- If water pollution is identified the following steps should be adhered to:  
STOP - Work in the immediate area should be stopped and the source of the pollution identified  
CONTAIN - The source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.  
NOTIFY - The relevant authorities (Site Manager / NIEA) should be notified immediately to ensure that measures can be implemented downstream to protect fisheries and other sensitive areas.

ATTENUATION BASIN ID	ATTENUATION VOLUME (CU.M)	LIMITED DISCHARGE RATE (LPS)
P1	88	2.4
P2	192	5.3

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<b>DESCRIPTION</b> MAGHERAMORE WIND FARM - DRAINAGE LAYOUT SHEET 5 OF 6				
<b>PROJECT / FIGURE NO.</b> M01616-05_WFD_06				
<b>DRAWN BY</b> MD	<b>SCALE</b> 1:2000	<b>REVISION</b> 1	<b>DATE</b> 28/05/2019	

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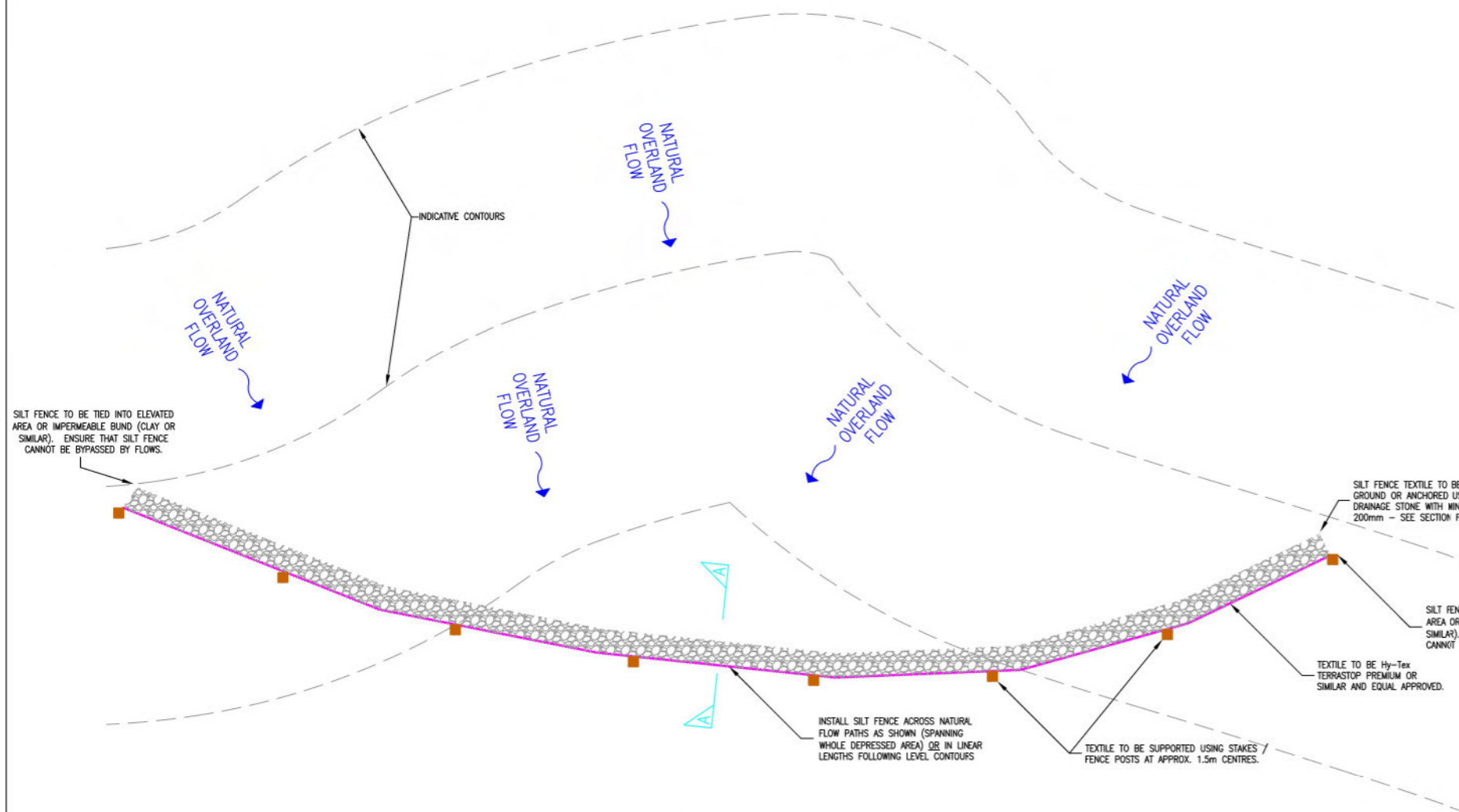


## Annex B

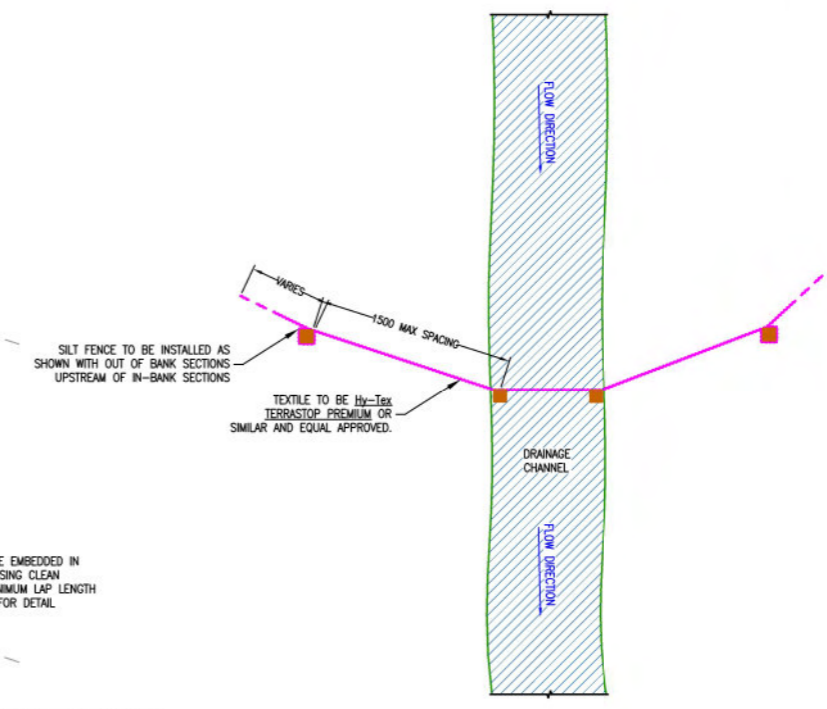
# Drainage Management – Typical Details

M01616-05 _WFD_07	Typical Detail - Silt Fence
M01616-05 _WFD_08	Typical Detail - Piped Culverts
M01616-05 _WFD_09	Typical Detail - Drainage at Excavated (Cut) Track
M01616-05 _WFD_10	Typical Detail - Drainage at Floated Track
M01616-05 _WFD_11	Typical Detail - Settlement Lagoon Arrangement
M01616-05 _WFD_12	Typical Detail - Detention Basin/Attenuation Pond

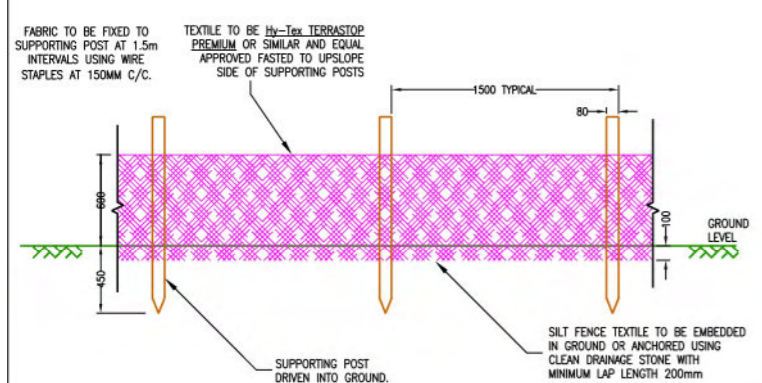




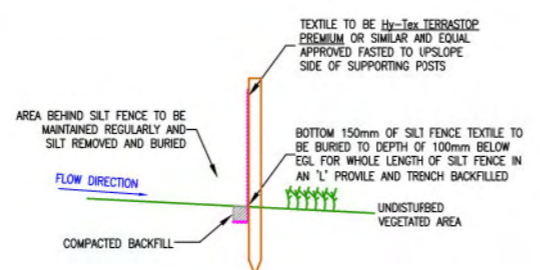
TYPICAL OVERLAND SILT FENCE PLAN  
SCALE 1:25



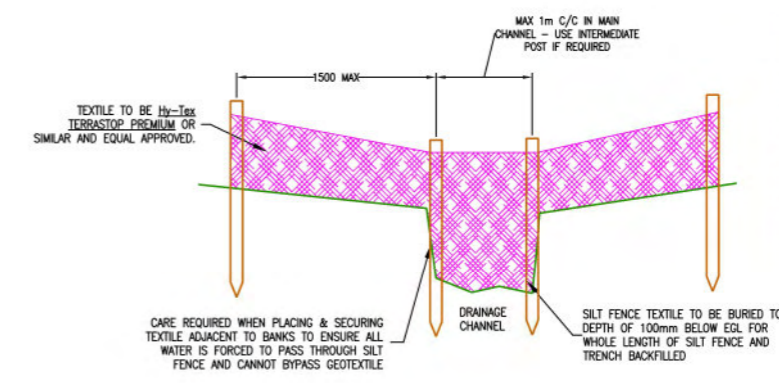
TYPICAL CHANNEL SILT FENCE PLAN  
SCALE 1:25



ELEVATION  
SCALE 1:25



SECTION A-A  
BURIED TYPE OPTION  
SCALE 1:25



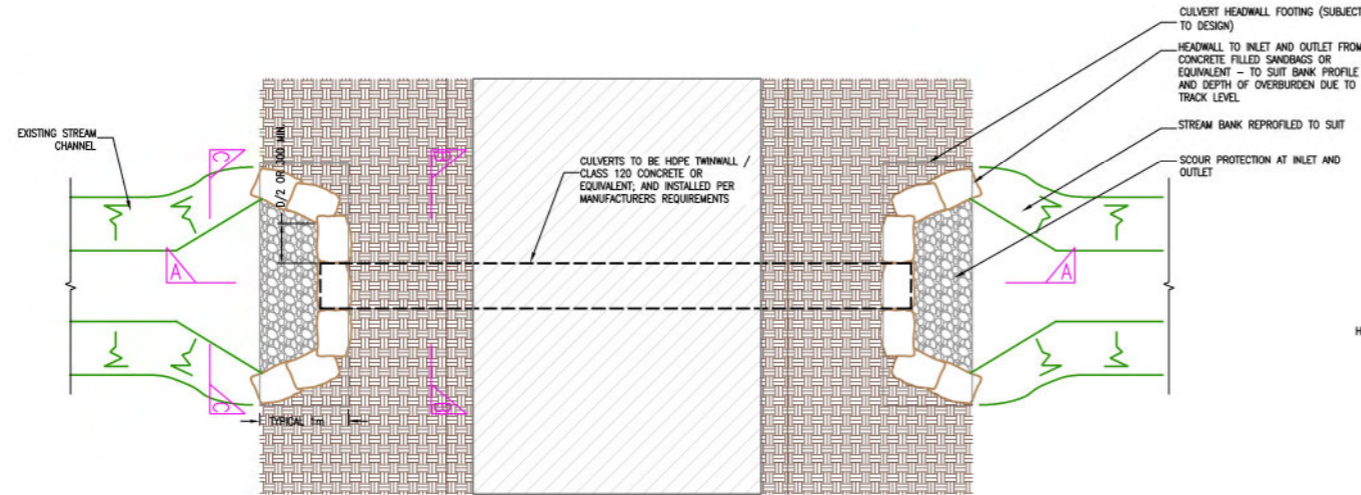
TYPICAL CHANNEL SILT FENCE ELEVATION  
SCALE 1:25

EXAMPLE OF CHANNEL SILT FENCE INSTALLATION  
NTS

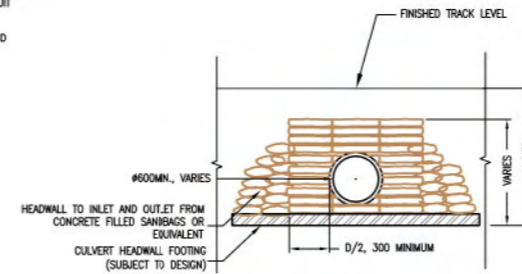
**INDICATIVE DESIGN**

NOTE: THIS DRAWING IS BASED ON 3RD PARTY INFRASTRUCTURE / PROPOSAL DRAWING.

N/A				
1	MD	JD	27/05/2019	ORIGINAL
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STATUS				
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<b>McCloy Consulting</b>				
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<b>MAGHERAMORE WINDFARM</b>				
<b>RES</b>				
DRAWING TITLE				
<b>DRAINAGE MANAGEMENT (SuDS) INDICATIVE TYPICAL DETAILS SILT FENCE</b>				
SCALE		ORIGINAL SIZE		
AS SHOWN		A1		
DRAWN	CHECKED	DATE		
MD	JD	27/05/2019		
PROJECT No.	DRAWING No.	ISSUE No.		
M01639-05	WFD_07	1		

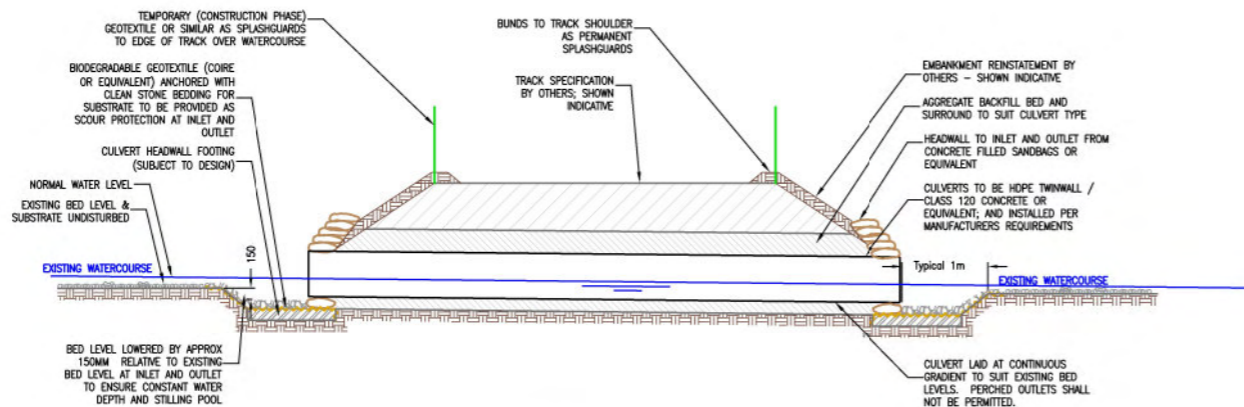


PLAN  
SCALE 1:50

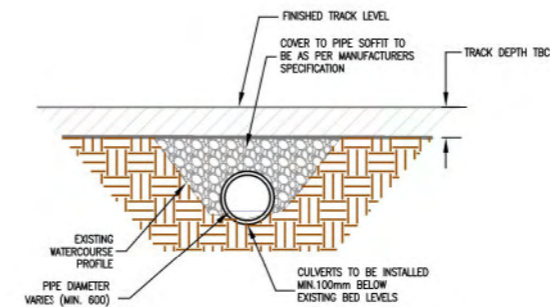


ELEVATION C-C (WITH HEADWALL)  
1:50

- NOTES FOR CONSTRUCTION METHODS & ENVIRONMENTAL PROTECTION**
- WORKS TO BE PROGRAMMED TO SUIT PERIODS OF LOW RIVER FLOW AND RAINFALL. DUE COGNISANCE GIVEN TO THE PREVAILING GROUND CONDITIONS AND SEASONAL WEATHER CONDITIONS.
  - CULVERT LOCATION TO BE DAMMED UPSTREAM BY USE OF SANDBAGS OR EQUIVALENT AND OVERPUMPED IN ORDER TO PROVIDE A DRY WORKING ENVIRONMENT.
  - IN CHANNEL SILT FENCING TO BE INSTALLED DOWNSTREAM OF THE WORKS AND DOWNSTREAM OF OVERPUMPING FOR THE DURATION OF THE CULVERT INSTALLATION WORKS.



SECTION A-A  
SCALE 1:50



SECTION B-B  
SCALE 1:50

NOTE: THIS DRAWING IS BASED ON 3RD PARTY INFRASTRUCTURE / PROPOSAL DRAWING.  
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PROJECT: **MAGHERAMORE WINDFARM**

CLIENT: **RES**

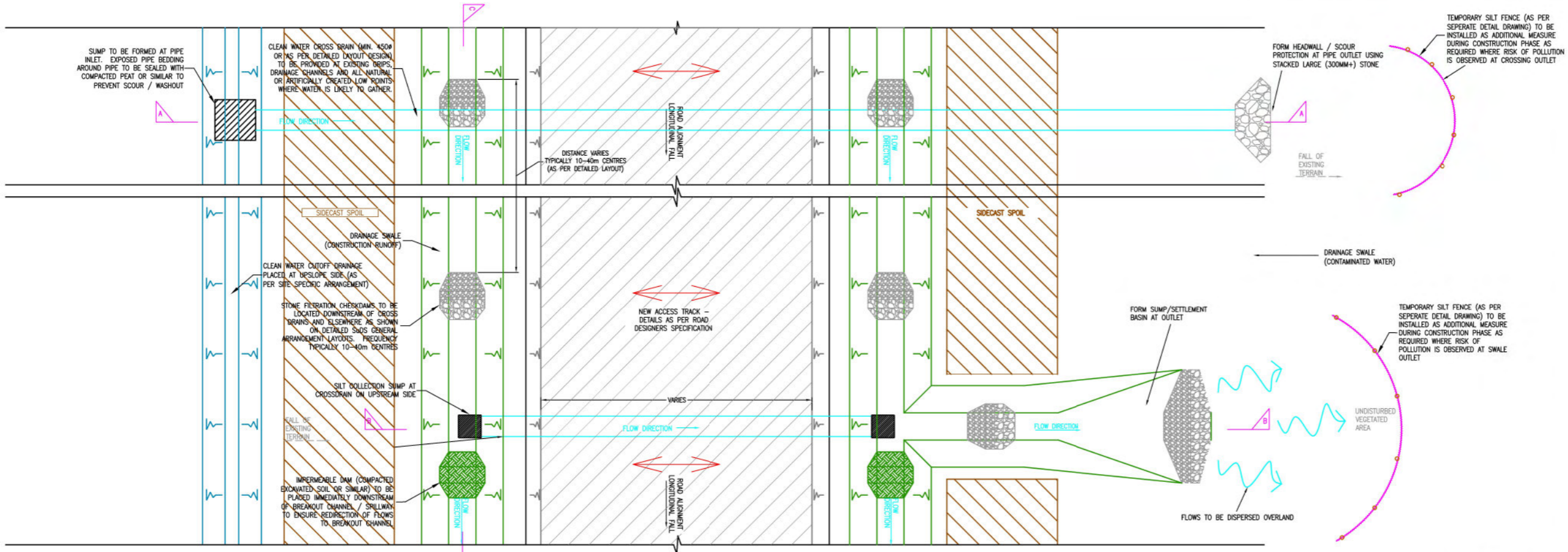
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SCALE: AS SHOWN	ORIGINAL SIZE: A1
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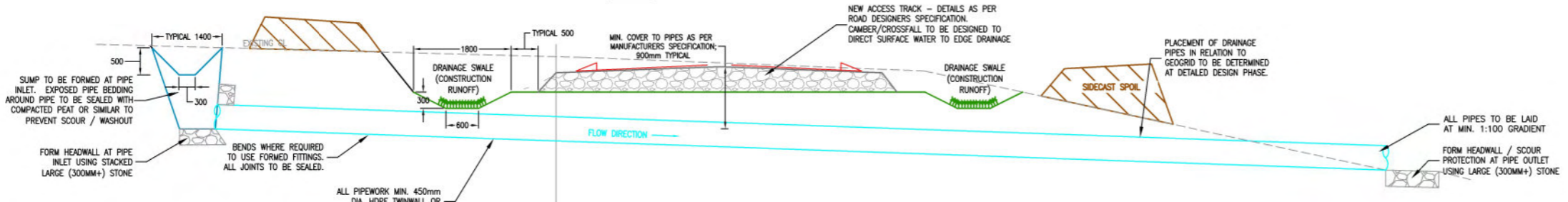
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PROJECT No: M01639-05	DRAWING No: WFD_08	ISSUE No: 1

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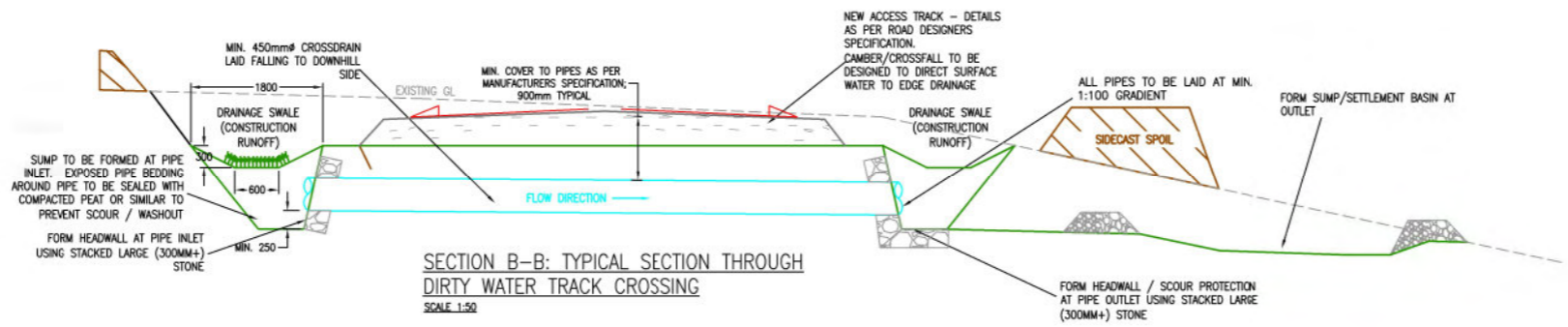




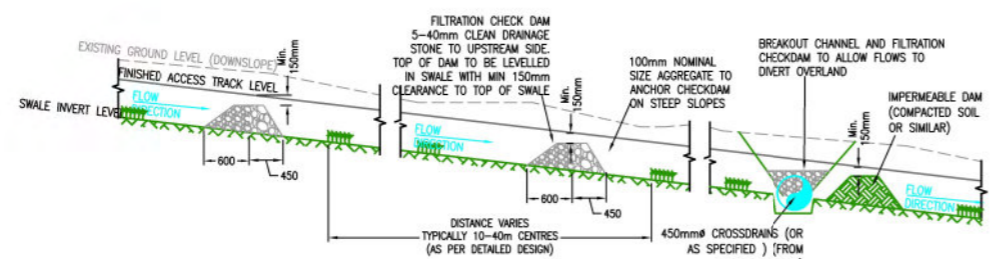
PLAN OF TRACKSIDE DRAINAGE - ROAD SECTIONS IN CUT  
SCALE 1:50



SECTION A-A: TYPICAL SECTION THROUGH CLEAN WATER TRACK CROSSING  
SCALE 1:50



SECTION B-B: TYPICAL SECTION THROUGH DIRTY WATER TRACK CROSSING  
SCALE 1:50



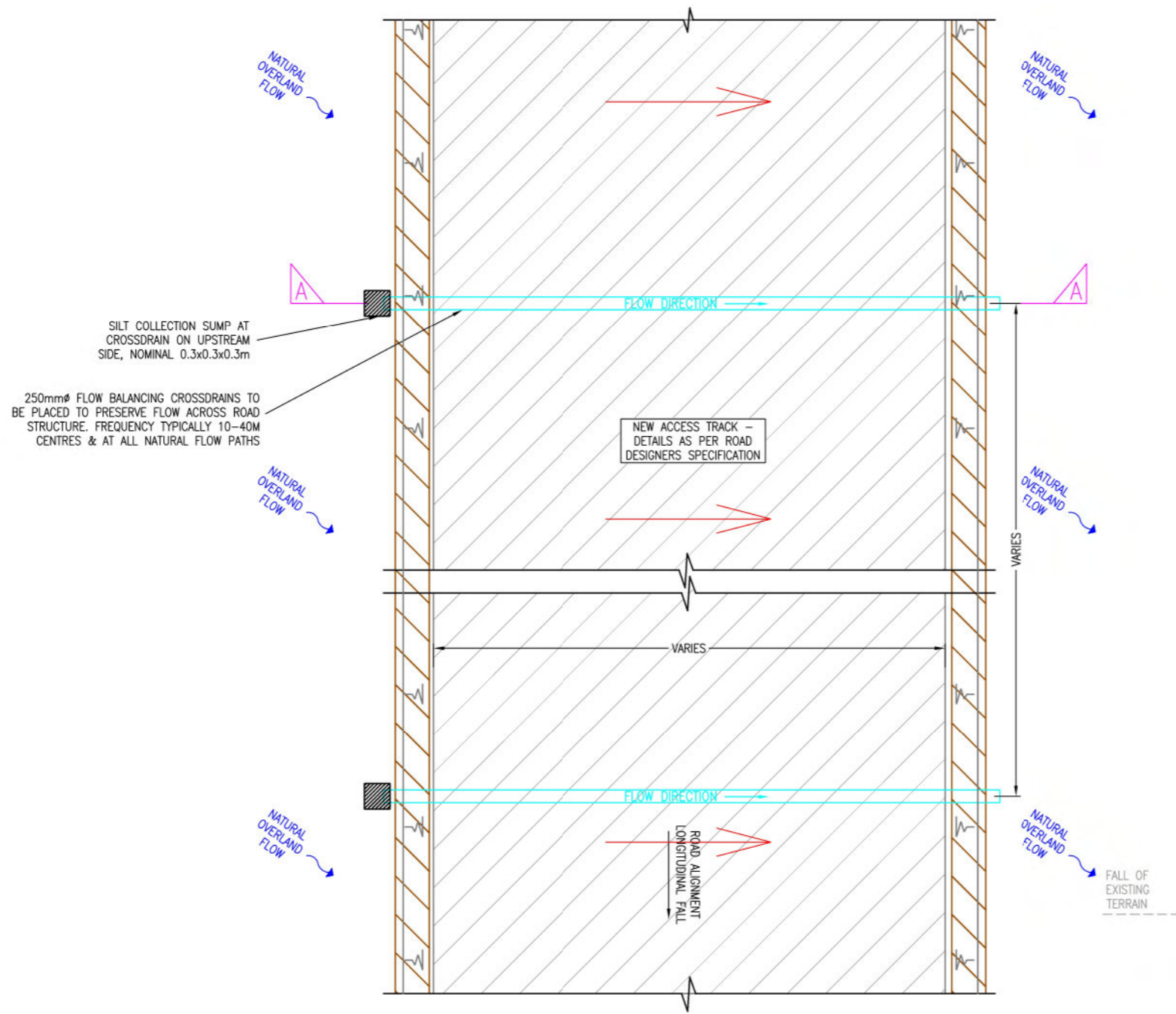
SECTION C-C: ROADSIDE SWALE & CHECK DAMS  
SCALE 1:50

- NOTES:
- ROAD CONSTRUCTION TO BE AS PER HIGHWAY ENGINEERS DESIGN & SPECIFICATION
  - REFER TO DETAILED PLAN SUDS DRAWINGS FOR DETAILS OF CHECK DAM / CROSS DRAIN / CUTOFF DRAIN / OUTFALL LOCATIONS ETC.
  - FEATURES SHOWN ARE PERMANENT SITE DRAINAGE. TEMPORARY SITE DRAINAGE OVER AND ABOVE THAT SHOWN ON DRAWINGS MAY BE REQUIRED TO SUIT TEMPORARY ROAD ALIGNMENTS AND LEVELS.

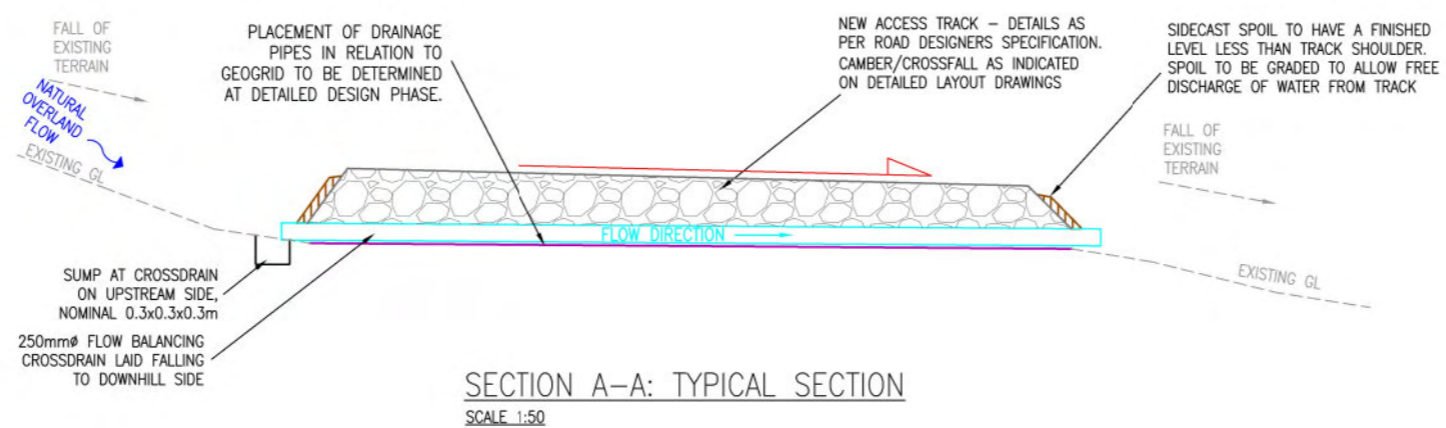
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NOTE: THIS DRAWING IS BASED ON 3RD PARTY INFRASTRUCTURE / PROPOSAL DRAWING				
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PROJECT				
MAGHERAMORE WINDFARM				
CLIENT				
DRAWING TITLE				
DRAINAGE MANAGEMENT (SUDS) INDICATIVE TYPICAL DETAILS DRAINAGE AT EXCAVATED (CUT) TRACK				
SCALE				
AS SHOWN			ORIGINAL SIZE	
A1			A1	
DRAWN	CHECKED	DATE		
MD	JD	27/05/2019		
PROJECT No.	DRAWING No.	ISSUE No.		
M01639-05	WFD_09	1		





PLAN OF ROADSIDE DRAINAGE –  
FLOATED ROAD SECTIONS  
SCALE 1:50



SECTION A-A: TYPICAL SECTION  
SCALE 1:50

**INDICATIVE DESIGN**

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N/A

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PROJECT  
**MAGHERAMORE WINDFARM**

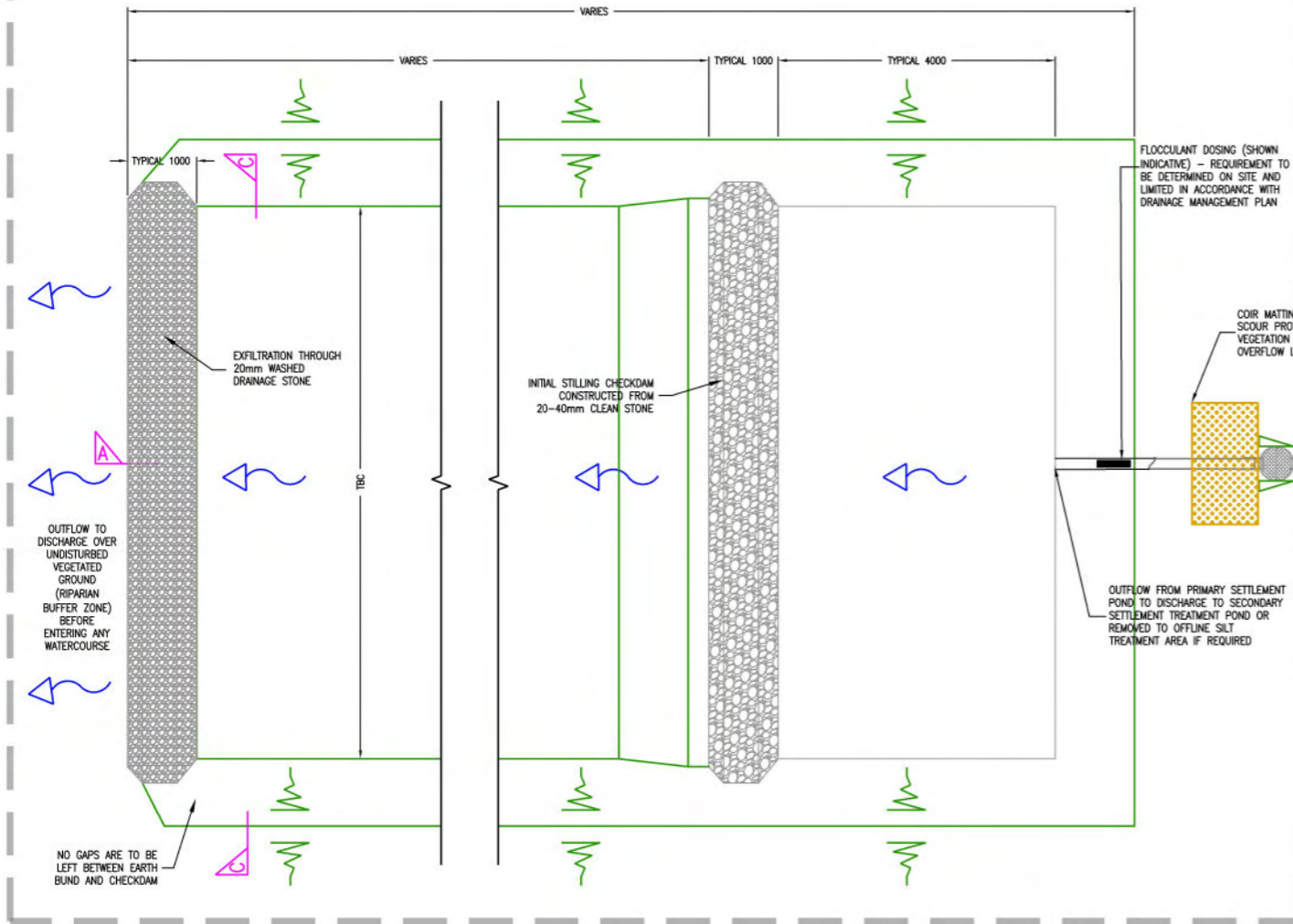
CLIENT  
**RES**

DRAWING TITLE  
**DRAINAGE MANAGEMENT (SuDS)  
INDICATIVE TYPICAL DETAILS  
DRAINAGE AT FLOATED TRACK**

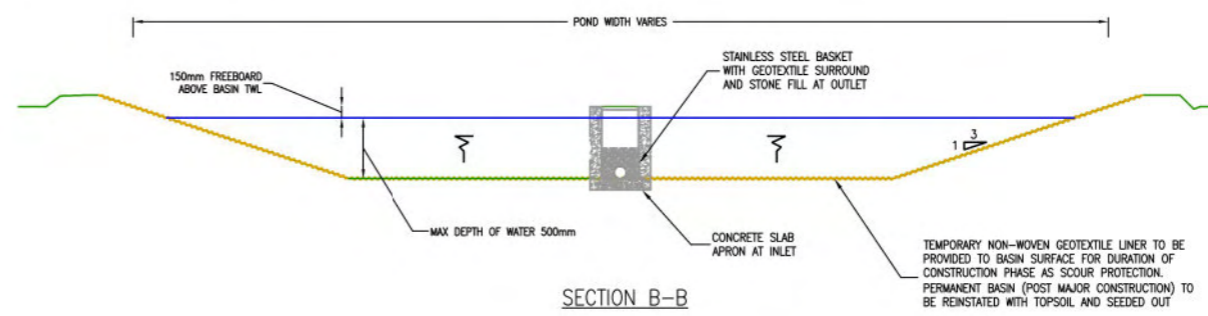
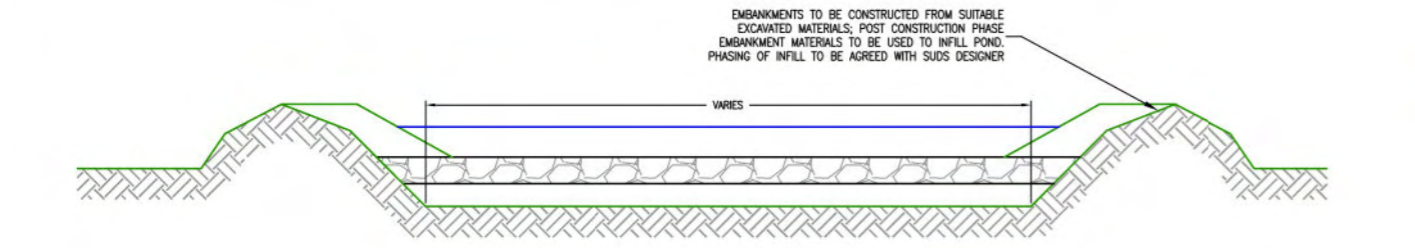
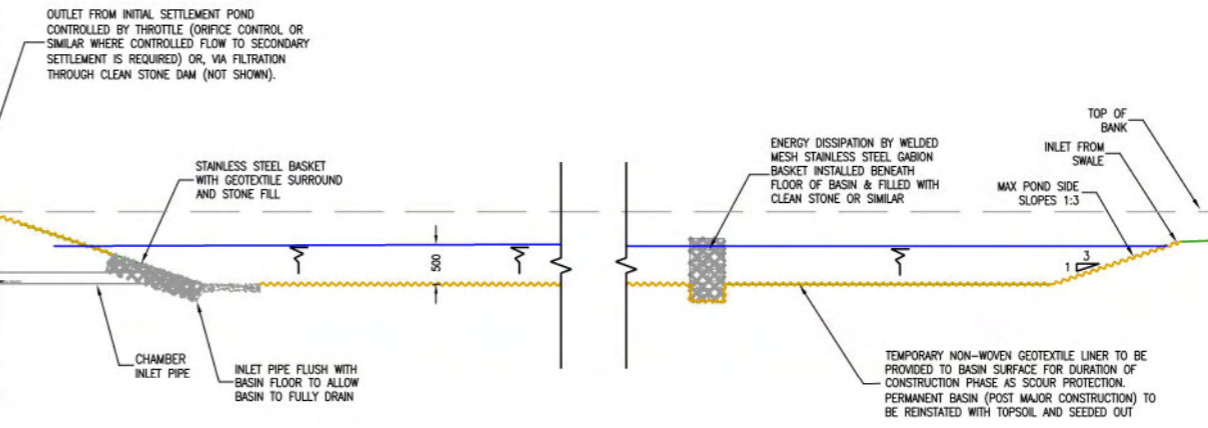
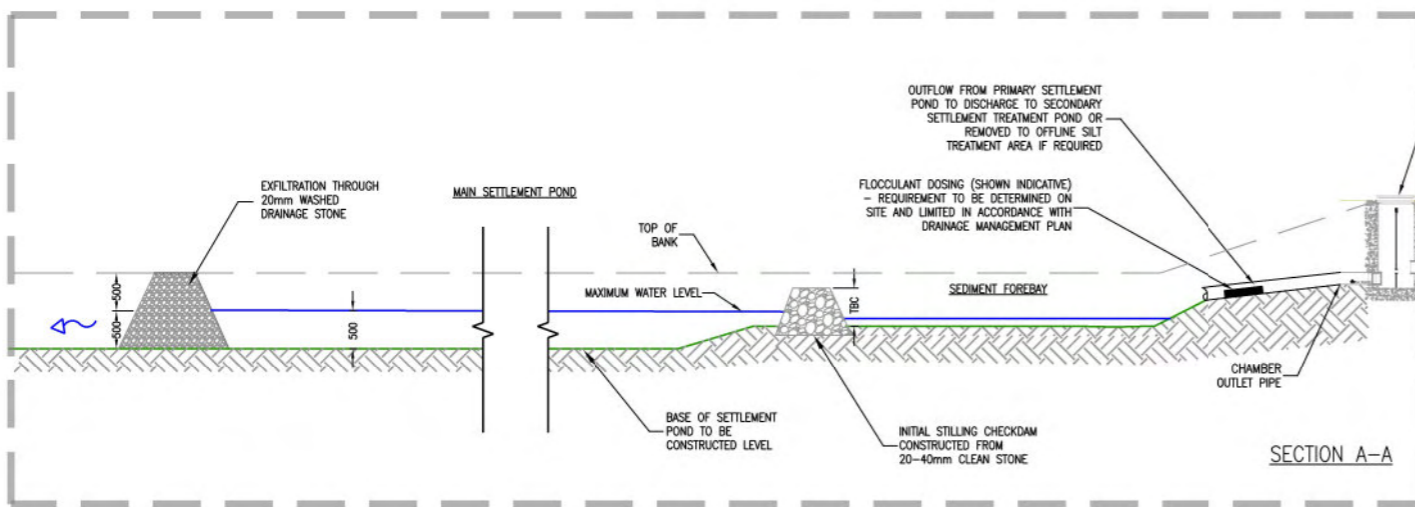
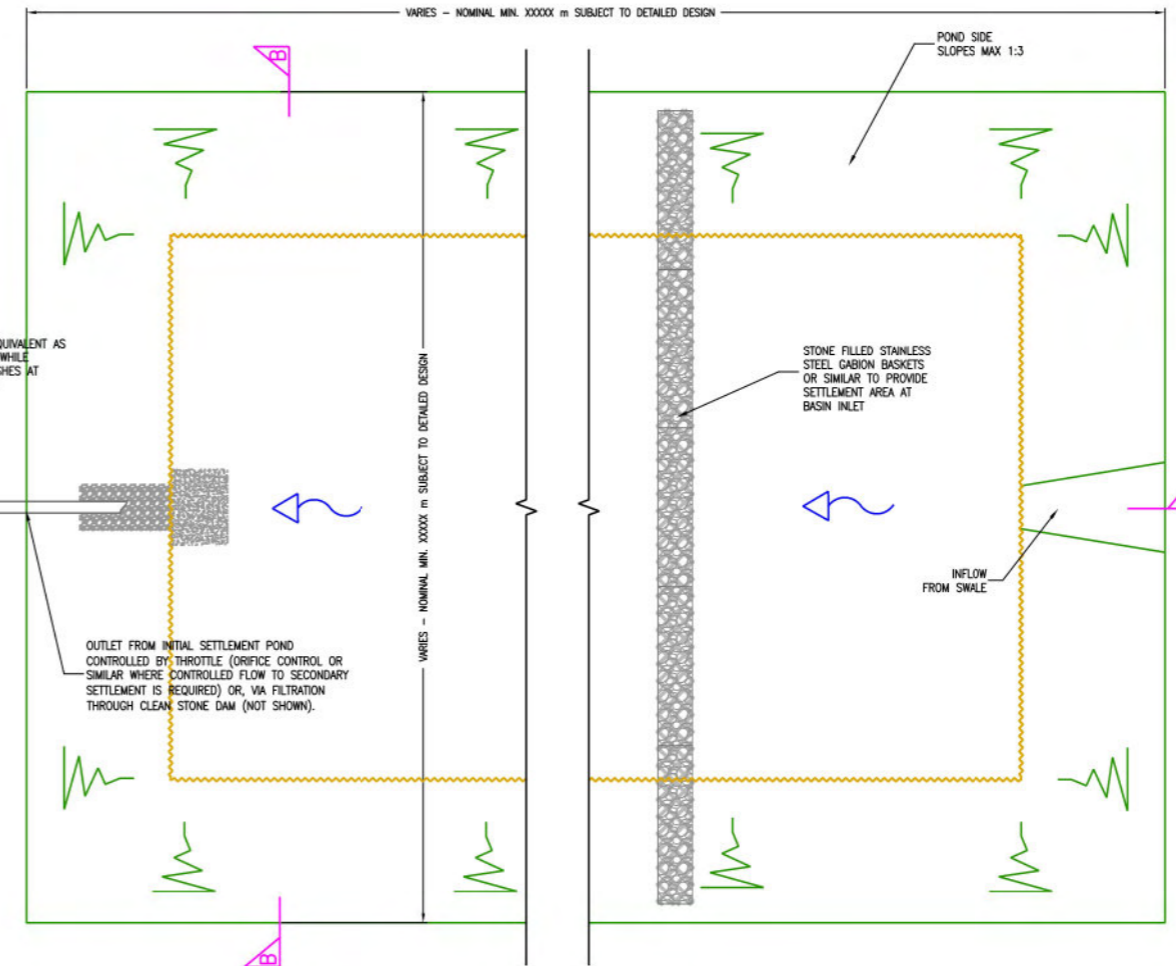
SCALE	AS SHOWN	ORIGINAL SIZE	A1
DRAWN	MD	CHECKED	JD
DATE	27/05/2019		
PROJECT No.	M01639-05	DRAWING No.	WFD_10
ISSUE No.	1		



SECONDARY SETTLEMENT (IF REQUIRED BY DETAILED DESIGN)



PRIMARY SETTLEMENT



**INDICATIVE DESIGN**

NOTE: THIS DRAWING IS BASED ON 3RD PARTY INFRASTRUCTURE / PROPOSAL DRAWING

N/A				
1	MD	DKS	29/05/2019	ORIGINAL - FOR INFORMATION
STATUS				
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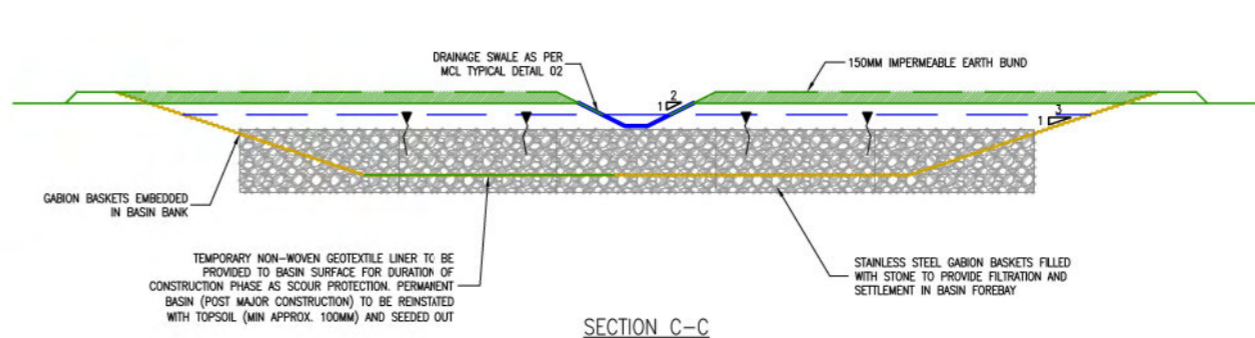
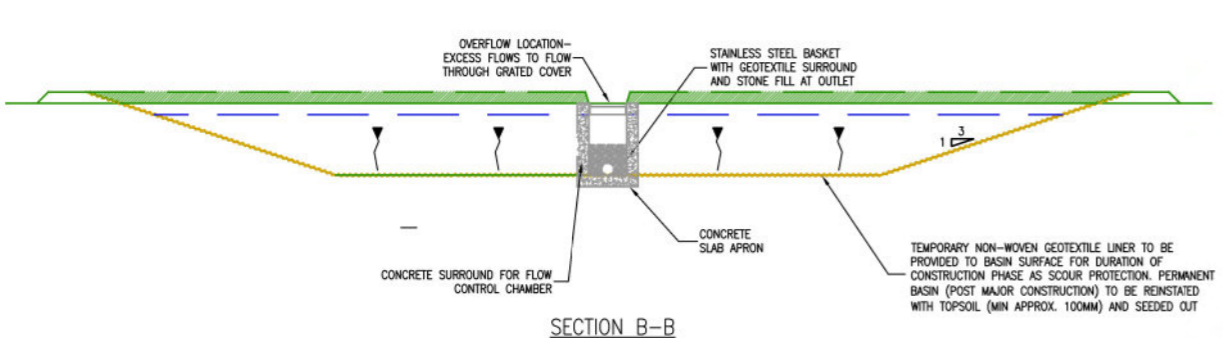
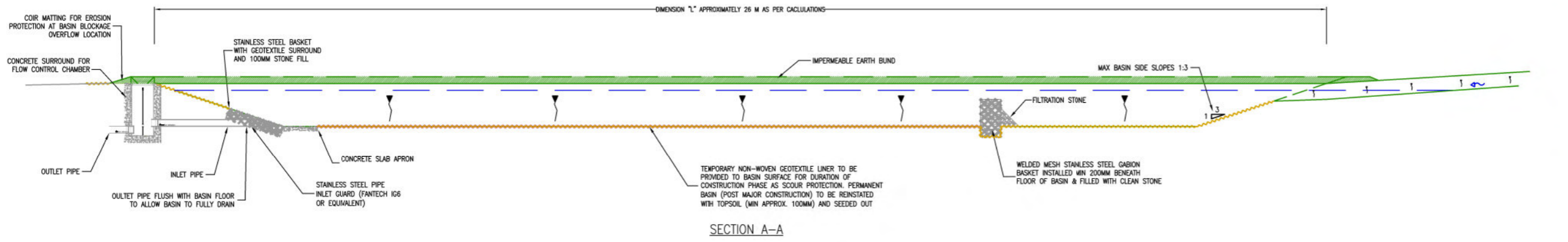
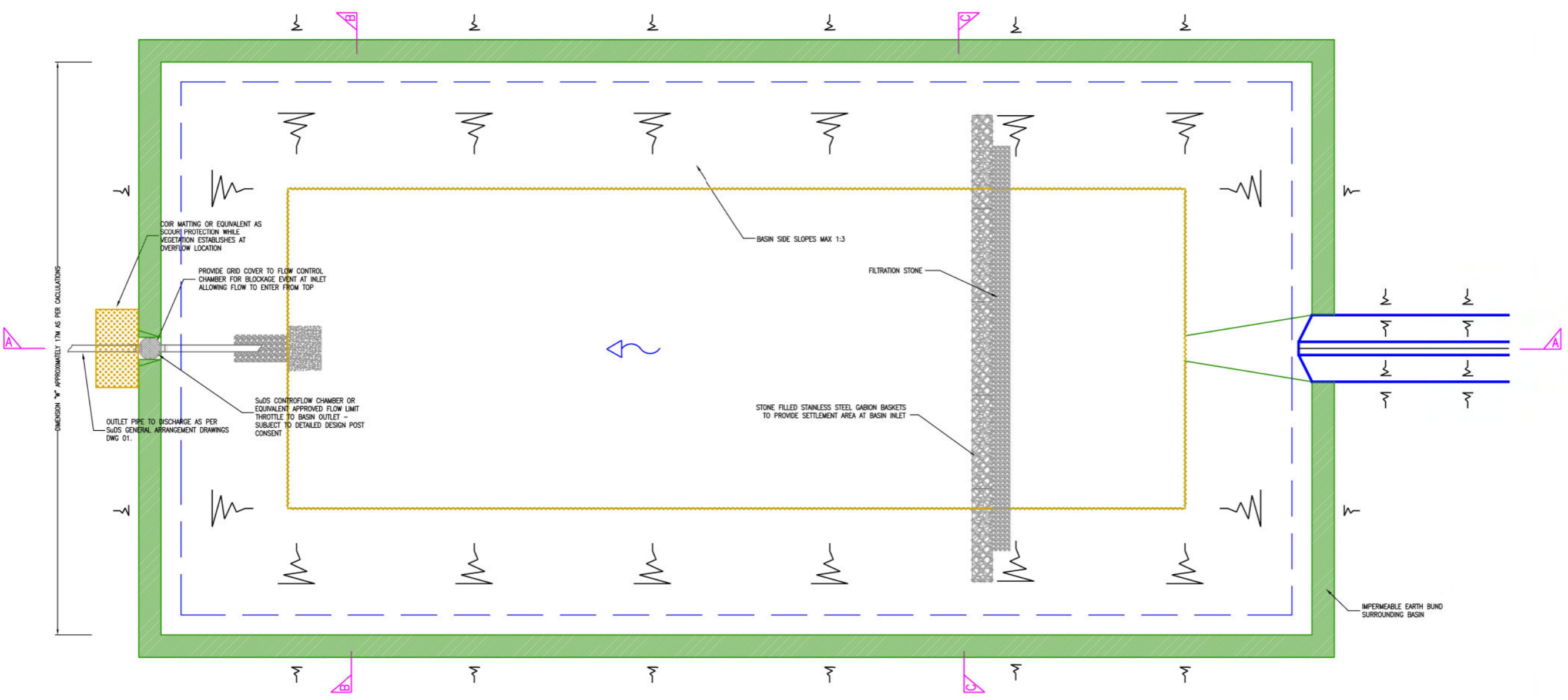
**MAGHERAMORE WINDFARM**

**RES**

DRAWING TITLE: DRAINAGE MANAGEMENT (SuDS) INDICATIVE TYPICAL DETAILS SETTLEMENT LAGOON ARRANGEMENT

SCALE	AS SHOWN	ORIGINAL SIZE	A1
DRAWN	MD	CHECKED	DKS
DATE	29/05/2019		
PROJECT No.	M01616-05	DRAWING No.	WFD_11
ISSUE No.	1		





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PROJECT			
MAGRERAMORE WINDFARM			
CLIENT			
DRAWING TITLE			
DRAINAGE MANAGEMENT (SuDS) OUTLINE TYPICAL DETAILS DETENTION BASIN/ ATTENUATION POND			
SCALE		ORIGINAL SIZE	
AS SHOWN		A1	
DRAWN	CHECKED	DATE	
MD	JD	27/05/2019	
PROJECT No.	DRAWING No.	ISSUE No.	
M01639-05	WFD_12	1	

## Annex C

# Typical Flocculent Datasheet



# Floc blocks (all AN grades)

## Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Date of issue: 8/4/2016 Version: 1.1

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

#### 1.1. Product identifier

Product form : Mixtures  
Product name : Floc blocks (all AN grades)  
Type of product : Construction materials, Construction materials additives

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

##### 1.2.1. Relevant identified uses

Industrial/Professional use spec : Industrial use  
Professional use

Use of the substance/mixture : Flocculant

##### 1.2.2. Uses advised against

No additional information available

#### 1.3. Details of the supplier of the safety data sheet

Mudtech Ltd  
Wyburn House  
ST16 1SB Stafford - United Kingdom  
T +44 (0)845 299 0790 - F +44 (0)1929 554361  
[sales@mudtech.co.uk](mailto:sales@mudtech.co.uk)

#### 1.4. Emergency telephone number

Emergency number : CHEMTEL International: +1 813-248-0585; USA/Canada And Territories 800-255-3924,  
Chemtel - will accept call charge.

### SECTION 2: Hazards identification

#### 2.1. Classification of the substance or mixture

##### Classification according to Regulation (EC) No. 1272/2008 [CLP]

Not classified

##### Adverse physicochemical, human health and environmental effects

To our knowledge, this product does not present any particular risk, provided it is handled in accordance with good occupational hygiene and safety practice.

#### 2.2. Label elements

##### Labelling according to Regulation (EC) No. 1272/2008 [CLP]

EUH-statements : EUH210 - Safety data sheet available on request

#### 2.3. Other hazards

Other hazards not contributing to the classification : Very slippery when wet.

### SECTION 3: Composition/information on ingredients

#### 3.1. Substances

Not applicable

#### 3.2. Mixtures

Comments : An anionic polyacrylamide blend

This mixture does not contain any substances to be mentioned according to the criteria of section 3.2 of REACH annex II

### SECTION 4: First aid measures

#### 4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : Not expected to present a significant inhalation hazard under anticipated conditions of normal use.

# Floc blocks (all AN grades)

## Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

First-aid measures after skin contact	: Take off contaminated clothing and wash it before reuse. Wash with plenty of soap and water. Get medical advice if skin irritation persists.
First-aid measures after eye contact	: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
First-aid measures after ingestion	: Rinse mouth. Give water to drink. Do NOT induce vomiting. Get immediate medical advice/attention.

### 4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation	: Not expected to present a significant inhalation hazard under anticipated conditions of normal use.
Symptoms/injuries after skin contact	: May cause slight irritation.
Symptoms/injuries after eye contact	: May cause slight irritation.
Symptoms/injuries after ingestion	: May cause irritation to the respiratory tract.

### 4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

Suitable extinguishing media	: Carbon dioxide. Dry powder. Foam. Use extinguishing media appropriate for surrounding fire.
Unsuitable extinguishing media	: Do not use a heavy water stream.

### 5.2. Special hazards arising from the substance or mixture

Fire hazard	: The product is not flammable.
Explosion hazard	: Product is not explosive.
Reactivity in case of fire	: Not known.
Hazardous decomposition products in case of fire	: Toxic fumes may be released.

### 5.3. Advice for firefighters

Precautionary measures fire	: No special measures required. Stop leak if safe to do so.
Firefighting instructions	: Use extinguishing media appropriate for surrounding fire. Exercise caution when fighting any chemical fire. Prevent fire fighting water from entering the environment.
Protection during firefighting	: Do not enter fire area without proper protective equipment, including respiratory protection. Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.
Other information	: Very slippery when wet.

## SECTION 6: Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

#### 6.1.1. For non-emergency personnel

Protective equipment	: Wear suitable gloves and eye/face protection.
Emergency procedures	: Ventilate spillage area. Avoid contact with skin and eyes.

#### 6.1.2. For emergency responders

Protective equipment	: Wear suitable protective clothing, gloves and eye or face protection. For further information refer to section 8: "Exposure controls/personal protection". Avoid contact with skin and eyes.
Emergency procedures	: Ventilate area.

### 6.2. Environmental precautions

Avoid release to the environment. Prevent entry to sewers and public waters.

### 6.3. Methods and material for containment and cleaning up

For containment	: No special measures required.
Methods for cleaning up	: Sweep up the product. Shovel into suitable and closed container for disposal. This material and its container must be disposed of in a safe way, and as per local legislation. Do not use water for cleaning.
Other information	: Dispose of in accordance with relevant local regulations.

### 6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For disposal of solid materials or residues refer to section 13: "Disposal considerations".

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

Additional hazards when processed	: Very slippery when wet.
-----------------------------------	---------------------------

# Floc blocks (all AN grades)

## Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Precautions for safe handling	: Wear personal protective equipment. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Avoid contact with skin and eyes.
Hygiene measures	: Always wash hands after handling the product. Do not eat, drink or smoke when using this product.

### 7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	: Store in a well-ventilated place. Keep container closed when not in use. Keep away from water or moist air. Keep dry.
Incompatible products	: Strong bases. Strong acids.
Incompatible materials	: Direct sunlight.
Storage area	: Store in a well-ventilated place.
Packaging materials	: Keep only in original container.

### 7.3. Specific end use(s)

No special requirements.

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

No additional information available

### 8.2. Exposure controls

#### Appropriate engineering controls:

Ensure good ventilation of the work station.

#### Personal protective equipment:

Protective goggles. Gloves. Protective clothing.

#### Materials for protective clothing:

Wear suitable protective clothing

#### Hand protection:

protective gloves

#### Eye protection:

tightly fitting safety goggles

#### Skin and body protection:

Wear suitable protective clothing

#### Respiratory protection:

Not required for normal conditions of use



#### Environmental exposure controls:

Avoid release to the environment.

#### Other information:

Do not eat, drink or smoke when using this product. Provide readily accessible eye wash stations and safety showers.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

Physical state	: Solid
Appearance	: Emulsion.
Colour	: white.
Odour	: odourless.
Odour threshold	: No data available
pH	: 6.5 Approx
Relative evaporation rate (butylacetate=1)	: No data available



# Floc blocks (all AN grades)

## Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Melting point	: Not applicable
Freezing point	: No data available
Boiling point	: No data available
Flash point	: ≈ °C
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: Non flammable
Vapour pressure	: No data available
Relative vapour density at 20 °C	: No data available
Relative density	: g/cm <sup>3</sup>
Solubility	: Soluble.
Log Pow	: No data available
Viscosity, kinematic	: > mm <sup>2</sup> /s
Viscosity, dynamic	: No data available
Explosive properties	: Product is not explosive.
Oxidising properties	: Oxidising solids Not applicable.
Explosive limits	: No data available

### 9.2. Other information

No additional information available

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

The product is non-reactive under normal conditions of use, storage and transport.

### 10.2. Chemical stability

Stable under normal conditions.

### 10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

### 10.4. Conditions to avoid

Moisture. Extremely high or low temperatures.

### 10.5. Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

### 10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide.

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

Acute toxicity : Not classified (Based on available data, the classification criteria are not met)

Floc blocks (all AN grades)	
LD50 oral rat	> 2000 mg/kg

Skin corrosion/irritation : Not classified (Based on available data, the classification criteria are not met)

pH: 6.5 Approx

Serious eye damage/irritation : Not classified (Based on available data, the classification criteria are not met)

pH: 6.5 Approx

Respiratory or skin sensitisation : Not classified (Based on available data, the classification criteria are not met)

Germ cell mutagenicity : Not classified (Based on available data, the classification criteria are not met)

Carcinogenicity : Not classified (Based on available data, the classification criteria are not met)

Reproductive toxicity : Not classified (Based on available data, the classification criteria are not met)

STOT-single exposure : Not classified

STOT-repeated exposure : Not classified

Aspiration hazard : Not classified (Based on available data, the classification criteria are not met)

Potential adverse human health effects and symptoms : Based on available data, the classification criteria are not met.

# Floc blocks (all AN grades)

## Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

### SECTION 12: Ecological information

#### 12.1. Toxicity

- Ecology - general : The product is not considered harmful to aquatic organisms nor to cause long-term adverse effects in the environment.
- Ecology - water : The product does not have any known adverse effect on the tested aquatic organisms.

Floc blocks (all AN grades)	
LC50 fish 1	> 100 mg/l
LC50 fish 2	≈ mg/l
LC50 other aquatic organisms 1	> mg/l
EC50 Daphnia 1	> 100 mg/l

#### 12.2. Persistence and degradability

Floc blocks (all AN grades)	
Persistence and degradability	No data available.

#### 12.3. Bioaccumulative potential

Floc blocks (all AN grades)	
Bioaccumulative potential	No data available.

#### 12.4. Mobility in soil

Floc blocks (all AN grades)	
Ecology - soil	Soluble in water.

#### 12.5. Results of PBT and vPvB assessment

No additional information available

#### 12.6. Other adverse effects

- Other adverse effects : None known.
- Additional information : The product does not have any known adverse effect on the tested aquatic organisms

### SECTION 13: Disposal considerations

#### 13.1. Waste treatment methods

- Regional legislation (waste) : Disposal must be done according to official regulations.
- Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions.
- Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.

### SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

#### 14.1. UN number

- UN-No. (ADR) : Not applicable
- UN-No. (IMDG) : Not applicable
- UN-No. (IATA) : Not applicable
- UN-No. (ADN) : Not applicable
- UN-No. (RID) : Not applicable

#### 14.2. UN proper shipping name

- Proper Shipping Name (ADR) : Not applicable
- Proper Shipping Name (IMDG) : Not applicable
- Proper Shipping Name (IATA) : Not applicable
- Proper Shipping Name (ADN) : Not applicable
- Proper Shipping Name (RID) : Not applicable

#### 14.3. Transport hazard class(es)

##### ADR

- Transport hazard class(es) (ADR) : Not applicable

##### IMDG

- Transport hazard class(es) (IMDG) : Not applicable

##### IATA

- Transport hazard class(es) (IATA) : Not applicable



# Floc blocks (all AN grades)

## Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

### ADN

Transport hazard class(es) (ADN) : Not applicable

### RID

Transport hazard class(es) (RID) : Not applicable

### 14.4. Packing group

Packing group (ADR) : Not applicable

Packing group (IMDG) : Not applicable

Packing group (IATA) : Not applicable

Packing group (ADN) : Not applicable

Packing group (RID) : Not applicable

### 14.5. Environmental hazards

Dangerous for the environment : No

Marine pollutant : No

Other information : No supplementary information available

### 14.6. Special precautions for user

#### - Overland transport

Not applicable

#### - Transport by sea

Not applicable

#### - Air transport

Not applicable

#### - Inland waterway transport

Not applicable

#### - Rail transport

Not applicable

### 14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

## SECTION 15: Regulatory information

### 15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

#### 15.1.1. EU-Regulations

Contains no REACH substances with Annex XVII restrictions

Contains no substance on the REACH candidate list

Contains no REACH Annex XIV substances

#### 15.1.2. National regulations

Classified in line with 29 CFR

### 15.2. Chemical safety assessment

No chemical safety assessment has been carried out

## SECTION 16: Other information

Other information : None.

Full text of H- and EUH-statements:

EUH210	Safety data sheet available on request
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SDS EU (REACH Annex II)

*This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product*





# Magheramore Windfarm

## Phase I Geotechnical Study



5th April 2019

1196155

Commercial Confidential

**RES Garth McGimpsey**

## Document history

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Issue	Date	Revision Details
A	25/04/2019	Draft First Issue
B	01/05/2019	Second Issue Following Client Review
C	10/05/2019	Third Issue Following Client Review

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# 1. Brief

Natural Power was appointed by RES in April 2019 to undertake detailed peat probing and Geotechnical and Environmental Desk Study Report for the proposed Magheramore Wind Farm, near Dungiven, Co Londonderry. Emphasis for this study was placed on identification of any ground stability hazards including the potential for peat slide.

This survey report is based on the boundary presented in RES Drawing Reference: '03426D1001-01'.

Peat probes were carried out at 186 locations alongside and within the infrastructure footprint; peat cores and shear vane testing was carried out at two discrete locations where the peat was of sufficient depth.

## 1.1. Sources of Information

The main sources of information used in the preparation of this report are:

- Historical Ordinance Survey Map review
- British Geological Survey (BGS) geology map data and historical borehole records.
- Geological Survey Northern Ireland (GSNI)
- Aerial photographic records, assessed on Google Earth Professional.
- Northern Ireland Rivers Agency Flood Map.

## 1.2. Summary of Development

The onshore wind farm project is located on reclaimed peatland, currently used for livestock grazing. The development is located along the broad hilltop of Carnanbane hill and Teeaven Hill, south of Dungiven. Access is via an existing farm track from the Magheramore road, (IG 267814,406804)

Vegetation is predominantly grass for grazing with occasional forestry plantation; long grasses and reeds are present in a few discrete locations indicating sporadic areas saturated ground and poor drainage. A geomorphology map can be found in figure 4 of the appendices.

## 1.3. Geotechnical Classification of Structures

In line with BS EN 1997:1 – 2004 (Eurocode 7 Geotechnical Design), the structures on the development have been classified as detailed in Table 1.3.

Table 1.3: Geotechnical Structure Category

Construction Element	Geotechnical Category
Wind Turbine Generator and Foundation	3
Control Building/ substation	2
Access Tracks / Hardstands / Compound	2

**Geotechnical Category 2** structures: include conventional types of structure and foundations with no exceptional risk or difficult ground or loading conditions. Designs for structures in this category should normally include quantitative geotechnical data and analysis to ensure that the fundamental requirements are satisfied.

Routine procedures for field and laboratory testing and for design and execution may be used for Geotechnical Category 2 designs.

**Geotechnical Category 3** structures: are those which fall outside the limits of geotechnical categories 1 and 2. This category has been set for wind turbines due to their large size and exceptional loading conditions which incorporates, dynamic loading and high overturning forces.

## 1.4. Objectives of Report

The central objectives of this report are to:

- Review the available information on the likely ground conditions;
- Summarise and present results from the Peat Probing Survey;
- Develop a conceptual geotechnical ground model for the development;
- Identify geo-hazards and conduct a preliminary peat slide risk assessment;
- Identify geotechnical parameters where possible;
- Identify any potential geotechnical or environmental constraints associated with development of the development.

## 2. Environmental Setting

### 2.1. Development Location & Access

The Development is located within the county of Londonderry approximately 5km south-east of the town of Dungiven. The development is accessed from Magheramore road, following a farm track to the top of Carnanbane hill and Teeaven Hill.

### 2.2. Topography

The development extends over the southern and western sides of a broad hilltop. The main site is at an elevation of approximately 300mAOD descending to 100mAOD where the access track meets the public road.

Terrain relief is shallow across the site, with occasional open field ditches.

### 2.3. Hydrology & Drainage

Information on the Northern Irish Rivers Agency interactive viewer doesn't indicate any flooding potential or surface water within the main site. There is one small stream crossing the access track at IG 268025, 406200. During the peat survey various ditches were observed to contain small quantities of surface water.

### 2.4. Historical Development of the Development

#### 2.4.1. Ordnance Survey Maps

The historical development was established from examination of the historical Ordnance Survey maps provided on [www.nidirect.gov.uk](http://www.nidirect.gov.uk). 'PRONI' Historical Map Viewer web development and the historical aerial photography available from Google Earth Professional.

The findings of the historical map review are summarised in Table 2.4.1 below.

Table 2.4.1: Summary Review of Historical Maps

Map Reference	Scale	Date	Summary Description
OSNI Historical Edition 1	1:10,560	<b>1832 - 1846</b>	Site is mapped as open peatland, access road from main road exists but doesn't extend to the top of the hill.
OSNI Historical Edition 3	1:10,560	<b>1900 - 1907</b>	Site is still mapped as open peatland. Access track extends to the top of the hill following an alternate route.
Google Earth Aerial Imagery	Variable	<b>2010</b>	Field boundaries and track position are similar to the present day.
Google Earth Aerial Imagery	Variable	<b>Present</b>	No significant change.

Source: Ordnance Survey Mapping



## 3. Geology

### 3.1. Superficial Deposits

The site exhibits deposits typical of a previously glacially dominated environment, with glaciofluvial material, tills with later peat deposits formed from the surface. A superficial geology map can be found in figure 1 in the appendices below.

The glaciofluvial deposits are located at the base of the hill where the main access track joins the public road. They are described on the BGS online geology viewer as 'Sand and Gravel', deposited by seasonal and post glacial meltwaters. The BGS engineering geology viewer defines these deposits as 'Coarse Soil' which covers all size variations and mixes of sand and gravel. Conditions for foundations are considered good, with frost susceptibility of near-surface silts and sands. Excavation is easy, but occasionally hard, Immediate support will be required, ground water controls may be required. Depending on composition soil can be used or separated into desired grades, otherwise it is suitable for granular fill. Any future site investigation should seek to understand the presence of any heterogeneity within the soil, as this could lead to differential settlement or difficult ground water conditions.

Till deposits are located at higher elevations of the site along the access track and before the main site. The BGS online viewer classifies these as 'diamicton'. The BGS engineering viewer defines these as firm to very stiff gravelly sandy CLAY with many cobbles and boulders. This is often fissured within the top few meters. Foundation conditions are variable and dependent on shear strength, heterogeneity of clast size and groundwater conditions can lead to differential settlement. Excavation is easy, but large boulders may require hard digging to blasting. Excavations should remain stable for short periods of time. If of suitable grading, plasticity and water content, the sediment may be suitable for general cohesive fill. Boulders may need to be removed to allow grading. In general, it should be placed as soon as possible and subject to minimal construction traffic. Any future site investigation should obtain information on deposit thickness and lithological differences; presence of silts and clays as well as water-bearing sands and gravels should be obtained.

#### 3.1.1. Peat Deposits

The BGS online geology viewer maps the entire top of the hill as covered by peat. Natural Power has conducted a detailed site walk-over and peat probing survey along the infrastructure layout proposed in 'MM Infrastructure Layout 03426D1001-01.'

Peat depth was relatively shallow over the whole infrastructure footprint, no peat was found for the first 900m of access track and reached a maximum of 1.3m. Two pockets were found at T1 and for 300m of track around T6, where the depth was consistently above 0.5m reaching a maximum of 1.3m. A map of the peat survey results can be found in Figure 5, within the report appendices.

Peat core descriptions and hand shear vane testing was carried out when possible and at the foundation centre of T1 and T6. The results are presented in Table 3.1.1 below:

**Table 3.1.1: Summary of Surveyed Peat Data**

Turbine	Cu Undrained Shear Strength (kPa)			Core	
	Depth	Peak	Remould	Depth	Description
T1	0.5	32	17	0.0 – 0.75	Very soft black amorphous plastic PEAT (H6/B1)
	1.0	42	22	0.75 – 1.0	Firm black amorphous slightly sandy PEAT (H5/B1)
T6	0.5	43	22	0.0 – 0.6	Firm black pseudofibrous slightly spongy PEAT (H5/B3)

Source: Natural Power

The peat composition changes across the site, with a pocket of dry slightly more decomposed peat at T1, and wetter pseudofibrous peat at T6. From index cores taken during the peat probing survey it was found that the grassy fields are underlain by a thin layer of peat under the plough base. They exhibited 100 to 200mm of treated peaty soil with a thin 50 to 100mm layer of unaltered peat.

## 3.2. Solid Geology

The site is primarily underlain by metamorphic psammities, semipelites and pelites from the Argyll Group, some unnamed igneous intrusions strike northeast southwest across the main part of the site. The first part of the access track is underlain by The Roe Valley Group sedimentary rocks. During the peat survey no bedrock outcrops were observed, this could be due to the superficial deposits being of a substantial thickness. A solid geology map can be found as Figure 2 within the appendices.

The Argyll Group is made up of the Dart Psammite formation originally deposited in the Neoproterozoic between 542 to 1000 million years ago, some beds are described as pebbly. This group contains psammite semipelite and pelite, the BGS online engineering viewer classifies this as Slate, Schist and Granofels.

The BGS Engineering Geology Map resource has been reviewed: Slate is generally strong to very strong with a large range of bed sizes, joint spacing is medium to wide with well-marked cleavage planes. Rock weathers to clayey gravel, ground water flow is low, with flow restricted to discontinuities. Slate is generally good for foundations depending on the nature of the weathered zone. Excavation is generally hard, with fresh rock requiring blasting. Slate is suitable for granular fill if its tabular nature can be dealt with. It is important that any future site investigation determines the discontinuity spacing and orientation, as well as the nature of the weathered zone.

Schist exhibits a wide range of strengths, often exhibiting pronounced mineral layering. Schist will weather to gravelly sand or sandy clay. Groundwater flow is restricted to discontinuities. Schist is considered good for foundations but has an inherent variability of weathering depth and nature. Ripping and blasting will be required to excavate. Schist is generally suitable as fill, but care must be taken when selecting to account for variable strengths and durability. As with slate it is important that any future site investigation determines information about the orientation, spacing and nature of the discontinuities, as well as the nature of the weathered zone.

Granofels is strong to extremely strong with no foliation. Granofels will weather to different proportions of sand and gravel. Groundwater flow is restricted to discontinuities. With favourable degrees of metamorphism and variability of interbedded metamorphic layers granofels is considered good for foundations. Highly weathered material may be excavatable by ripping, but fresh material will require blasting. Granofels is suitable for selected

granular fill. As with slate and schist the SI should obtain information on the spacing, orientation and nature of discontinuities, as well as the nature of the weathered zone.

The Argyll Group is intruded with several Meta-Gabbroic sills intruded in the late Neoproterozoic.

The sills are not likely to be large features, and will likely provide heterogeneity within the bedrock, but are given the following properties by the BGS: Considered to be strong to extremely strong, with medium spaced joints. Gabbroic rocks weather to clayey gravelly sand or sandy gravel. Ground water flow is restricted to discontinuities. Conditions are very good for foundations. Heavily weathered zones may be ripable, but fresh material will require blasting. Fresh rock is suitable for selected granular fill. SI should determine discontinuities and nature of weathered zone, as well as extent of sill presence.

The Roe Valley Group underlies the first few hundred meters of access track, this is made up of the Barony Glen Formation and the Spincha Burn Conglomerate formation laid down in the Carboniferous 352 to 359 million years ago.

The Barony Glen formation is described by the BGS as a medium strong to extremely strong sandstone, it may contain slate or mudstone and siltstone beds. Weathers to loose to very dense sand, gravel or silty/clayey sand. Groundwater flow can be through matrix and discontinuities. foundation conditions are usually very good, depending on the nature of the weathered zone. Highly weathered rock may be excavatable by hard digging, but fresher material may require blasting. When excavated as a slope fresh or slightly weathered material may maintain long term stability. Strong sandstone is suitable as selected granular fill if care is taken during abstraction. SI should determine intact rock strength as well as nature of discontinuities and weathered zone.

The Spincha Burn Conglomerate formation is described by the BGS as very weak to very strong coarse-grained Conglomerate. May weather to silty, sandy gravels, cobbles or boulders depending on inherent clast size. Groundwater flow is extremely variable through either matrix or discontinuities. Conglomerate is generally good for foundations, depending on the bed thickness and nature of weathered zone. Excavation depends on degree of weathering and matrix strength, some material can be extracted by hard digging and require immediate support, with fresher or stronger material needing ripping or blasting. Can be suitable for selected granular fill if separated from matrix or compositions suitable, generally suitable for general fill. During the SI it is important to determine the intact rock strength and well as discontinuities and nature of weathering zone.

### 3.3. Historical Borehole Records

The GSNI GeoIndex records 4No. boreholes 2km west of the site at a water treatment plant on a nearby hill and 6No. boreholes approximately 0.5km south east of the site at Altnaenglish Dam. A summary of the published information can be found below in Table 3.1:

Table 3.1: Summary of Historical Borehole Data

BH_ID	Location	Coordinate (Irish Grid)	Elevation (mAOD)	Total Depth	Rockhead Depth	Comments
63NW2	Waterworks	266451, 404626	210.6	4m	3m	Boreholes conducted in glacial till, above Argyll Group geology. Location is 2km west of the main site, 90m lower and on the
63NW1	Waterworks	266448, 404589	210.7	5m	5m	
63NW3	Waterworks	266484, 404600	207.6	4m	3m	

BH_ID	Location	Coordinate (Irish Grid)	Elevation (mAOD)	Total Depth	Rockhead Depth	Comments
63NW4	Waterworks	266504, 404599	204.5	3m	2m	opposite side of a river cut valley.
63NE1	Altnaheglish Dam	269654, 404165	250.3	17m	7m	Boreholes conducted in glacial till, above Argyll Group geology. Location is ~500m south east of the main site ~50 to 70m lower than the main site across the base of a river cut valley.
63NE2	Altnaheglish Dam	269652, 404141	240.2	13m	3m	
63NE3	Altnaheglish Dam	269643, 404119	220.6	47m	16m	
63NE4	Altnaheglish Dam	269635, 404104	220.4	57m	27m	
63NE5	Altnaheglish Dam	269626, 404092	215.5	52m	20m	
63NE6	Altnaheglish Dam	269606, 404069	242.1	15m	5m	

Source: GSNi

### 3.4. Mineral Extraction

Murnies Sandpit, Crebarkey is located 1.6km north east of the main site. It is hosted in Glaciolacustrine deltaic sands and gravels, deposited in the Quaternary.

Banagher sand and gravel pit located 1.6km south west of the main site. This is also hosted in glaciolacustrine deltaic sands and gravel, deposited in the Quaternary. It doesn't appear to be in use in the present day.

D Murphy Quarry is located just across from the site access track. This is also hosted in glaciolacustrine deltaic sands and gravel, deposited in the Quaternary.

### 3.5. Hydrogeology

There are no significant aquifers underlying the site. The Roe Valley Group, Argyll Group and the unnamed igneous intrusions are all classified as low productivity by the BGS.

### 3.6. Radon Gas

The entire site is in an area with the highest radon potential, between 10% and 30%. Radon protective measures may be necessary at discrete infrastructure locations as described in publication BR211 by the Building Research Establishment.

### 3.7. Natural Ground Hazards

The BGS Onshore Geindex does not show any mass movement deposits or landslides within 1 km of the development boundary. As this is an upland development the risk of landslides cannot be negated and must therefore be considered by any future phase of intrusive geotechnical site investigation.

There are landslide deposits hosted in similar superficial deposits, but these are generally associated with high relief features such as glacially cut U-shaped valley and fluvial erosion.

## 4. Environmental Information

### 4.1. Landfill and Other Waste Developments

There are no records of any landfill developments on development or within 250m of the development.

### 4.2. Industrial Land Uses

There are no records of industrial land uses on development or within 200m of the development.

### 4.3. Records of Petrol and Fuel Developments or Pipelines

There are no records of fuel developments or pipeline on the development, although no accurate information is available at this stage.

### 4.4. Water Abstraction Licenses

There are not water abstraction licenses documented within the site boundary or surrounding area.

### 4.5. Source Protection Zones

There are no groundwater Source Protection Zones (SPZ) within 500m of the development.

### 4.6. Designated Environmentally Sensitive Developments

The entire development is within the Sperrins Area of Outstanding Natural Beauty. Banagher Glen is located at to the south west of the main site, at the bottom of the valley, it is designated as a nature reserve as well as being a Special Area of Conservation and Area of Special Scientific Interest with all the other rivers in the area.



## 5. Peat Slide Risk Assessment

Between Tuesday 16<sup>th</sup> to Thursday 28<sup>th</sup> of April, a detailed peat survey was carried out over the proposed infrastructure foot print of the wind farm.

The majority of the site exhibited a peat depth of under 0.5m, which is generally considered to have a negligible peat slide potential. Peat in many of these areas appears to have been historically treated resulting in an increased shear strength further reducing the risk. Typically, this may have comprised artificial drainage and mixing ploughing with topsoil materials and is likely to have taken place historically as part of the local farming practice.

Two principal contributors to peat slide are peat depth and slope angle. The locations of T6 and T1 are recorded with peat depths and slopes that may elevate risk of peat slides. There is a low to medium risk with peat depth of just over 1m and a slope angle of 6 degrees at T6 and 8 degrees at T1. The slope angle increases downslope from T1 to between 10 and 15 degrees, this is the slope angle at the highest risk from peat slide, although no peat depth data is taken from this area. A slope angle map can be found in figure 3 in the appendices below.

It is advised that care is taken when working peat in these areas, not to load the peat deposits on the downslope side or increase peat depth by stock piling in these areas due to the slope angles.

During the survey no previous instability was observed, nor are there any peatland features such as peat hags or peat pipes that could increase the risk of instability.

The Altnaheglish River is the only potential receptor at risk from peat slide from the proposed development. It is situated 500m downslope from the development and is designated as a SAC and ASSI, as well as being a national park downstream. There is no planned infrastructure at risk from peat slide, but an existing track runs along the northern bank of the Altnaheglish River.

### 5.1. Infinite Slope analysis

The purpose of this analysis is to identify the baseline FOS and the minimum un-drained shear strength ( $C_{u_{min}}$ ) required for stability of peat deposits. When the (in-situ) measured peat strength values ( $C_u$ ) exceed the minimum value ( $C_{u_{min}}$ ) there is limited potential for peat failure to occur. The analysis uses a Factor of Safety (FoS) of 1.3; based on BS6031:2009: Code of practice for Earthworks (BSI, 2009).

The infinite slope analysis, as recommended in Peat Landslide Hazards and Risk Assessments: Best practice guide for Proposed Electricity Generation Developments (PLHRAG, 2017) is based on a translational slide, which is understood to represent the prevalent mechanism for peat failures. This analysis adopts total stress (un-drained) conditions in the peat. This state applies to short-term conditions that occur theoretically during construction and for a time following construction until construction induced pore water pressures dissipate (ground water pressures requires time to dissipate as the hydraulic conductivity can be very low in peat deposits).

The following assumptions were used in the analysis of peat deposits across the Development:

- The groundwater is resting at ground level;
- Minimum acceptable factor of safety required is 1.3 (BS6031:2009);
- Failure plane assumed at the basal contact of the peat layer;

- Slope angle on base of sliding assumed to be parallel to ground surface and that the depth of the failure plane is small with respect to the length of the slope;
- Thus, the slope is considered as being of infinite length with any end effect ignored;
- The peat is homogeneous at each location;
- In the surcharged case a 20 kPa stress is modelled, this is approximately equivalent to a 2m high peat stockpile or 1.5m high subsoil stockpile.

The analysis method for a planar translational peat slide along an infinite slope was for calculated using the following equation in total stress terms highlighted by MacCulloch, (2005) and originally reported by Barnes, (2000):

$$F = C_u / (\gamma z \sin\beta \cos\beta)$$

Where:

**F** = Factor of Safety (FOS)

**C<sub>u</sub>** = Undrained shear strength of the peat (kPa)

**γ** = Bulk unit weight of saturated peat (kN/m<sup>3</sup>)

**z** = Peat depth in the direction of normal stress

**β** = Slope angle to the horizontal and hence assumed angle of sliding plane (degrees)

Un-drained shear strength values (C<sub>u</sub>) are used throughout this assessment. Effective strength values are not applicable for the case of rapid loading of the peat during construction hence the Barnes, (2000) formula cited above, has been adopted throughout.

Factors of Safety for three different loading scenarios are calculated one with no load on undisturbed peat, a 20kPa surcharge load on undisturbed peat and a 20kPa surcharge on disturbed peat. These were calculated for peat deposits are T1 and T6. Both locations achieved FOS values above 4.9 in all three of these scenarios. This is well in excess of 1.3 and therefore indicates a negligible risk from peat slide based on this numerical analysis.

It should be noted that these values are created using current slope and peat deposit conditions, changes to these conditions would require separate testing and analysis to be carried out. Such analysis would typically be revised following detailed intrusive ground investigation.

## 6. Conclusions

### 6.1. Development Setting

Natural Power has carried out a Phase I Geotechnical desk Study on behalf of RES as part of pre-planning of Magheramore Wind Farm near Dungiven in Northern Ireland. The development occupies a broad ridge between Carnanbane Hill and Teeavan Hill, just north of the Altnaheglish River.

Historically the land was an undeveloped peatland, which has since been reclaimed to grazing grassland.

### 6.2. Conceptual Geotechnical Ground Model

Based on the available desk study data and surveyed peat data, the following generalised conceptual geotechnical ground model has been developed for the development:

- A relatively shallow 0.5m deposit of peaty soil covers most of the main site, with an increased depth of peat at T1 and T6 where this increases to a maximum of 1.1m at T1 and 1.3m at T6.
- A deposit of Diamicton Till underlies the peat and peaty soil. Using nearby boreholes this is likely to be between 3 and 5 meters thick; but could be up to 10 meters depending on the depositional environment.
- The main site is underlain by the Argyll Group meta-sediments, this is intruded with unnamed meta-gabbroic intrusions. The rock mass is therefore predicted to offer favourable foundation conditions where rock mass is unaffected by weathering and located at shallower depths below ground level.

### 6.3. Summary of Potential Geotechnical Constraints

The geotechnical model for the development is based on interpretation of online information and observations made while carrying out the peat surveying.

The majority of the development is covered by peaty topsoil and represents reclaimed land now existing in agricultural use. There are however thicker deposits of peaty soil with unmodified peat beneath across turbine locations T1 and T6. Figure 5, Appendix A depicts the peat depths across the development.

The risk of peat instability can be elevated in scenarios where there is confluence of increased peat depth across moderately sloping terrain. Other factors such as peat material strength, rainfall/hydrology, hydrogeology, and anthropogenic influences can also remedy an area at peat slide risk where these influences cannot be suitably mitigated or managed effectively.

Peat deposits and slopes at T1 and T6 (un-mitigated) are at an elevated risk of peat slide during wind farm construction. This is due to the recorded peat depth of approximately 1m and the terrain slope angles encountered across these turbine and hardstand areas at T1 & T6. Any resultant peat slide into minor watercourses surrounding these positions could result in pollution being carried offsite in the form of suspended particulates and into sensitive environmental receptors such as the Altnaheglish River system.

This risk can be mitigated through the routine application of best practice design and construction methodology. Peat at these locations is still relatively shallow that infrastructure micro-siting would not need to be considered. Preservation and protection of the natural hydrological regime and any proposed drainage diversion at T6 will be a key factor to incorporate into civil infrastructure design and the construction environmental management plan (CEMP). Through this approach it would be expected that any low risk of peat slide at T1 & T6 would be further reduced and is not significant. Table 6.1 forms an initial geotechnical risk register which is aimed at relaying the risk of peat instability and highlights suitability mitigation measures.

Considering the geotechnical performance of the surface soils: further investigation into the peaty subsoil should be undertaken if tracks are designed to run over the top of these layers. That is where floating access track construction is proposed there will likely be required to be an assessment of required soil reinforcing geogrid to mitigate settlement of the track construction.

Superficial glacial till deposits are of unknown depth with estimates taken from historical boreholes located some distance from the site.

## 6.4. Geotechnical Risk Register

The following geotechnical risk register (Table 6.1) has been established for the development. Risk assessment is semi-quantitative and based on geotechnical site assessment.

Probability (P)		
Very Likely	1 in 10	5
Likely	1 in 100	4
Probable	1 in 1000	3
Unlikely	1 in 10,000	2
Negligible	1 in 100,000	1

Impact (I)	Time	Cost
Very High	5	>10 weeks on completion
High	4	> 1 week on completion
Medium	3	>4 weeks: <1 week on completion
Low	2	1 – 4 weeks: none on completion
Very Low	1	<1 week to activity: none on completion

Risk Rating (R) = Probability P x Impact I

		I	I	I	I	I
		5	4	3	2	1
P	5	25	20	15	10	5
P	4	20	16	12	8	4
P	3	15	12	9	6	3
P	2	10	8	6	4	2
P	1	5	4	3	2	1

Risk ratings	
1 to 4	Trivial, no action required
5 to 8	Tolerable, but must consider solutions or improvements
9 to 12	Substantial and construction must not start until risk has been reduced
13+	Intolerable and construction must not start until risk has been reduced

Table 6.1: Magheramore Geotechnical Risk Register

Hazard / Risk	Cause	P	I	Risk Rating	Consequences	Mitigation	P	I	Risk Rating
Peat Landslide	High rainfall, increased surface water infiltration (T1 & T6)	2	3	6	Instability of superficial deposits around earthworks  Harm to personnel and equipment  Destruction of built infrastructure	Due consideration given to the prevailing ground and weather conditions when scheduling construction works  Monitoring of rainfall and weather forecasts  Contingency plans for wet weather working  Robust drainage design  Preservation of natural hydrological regime  Monitoring (visual) regular site inspection to detect early indications of ground movement (tension cracks, groundwater issues etc.)	2	2	4
Peat Landslide	Weather conditions, flooding, loss of support from forestry plantation (Area around T1)	3	2	6	Localised instability and damage to temporary and permanent earthworks.	Due consideration given to the prevailing ground and weather conditions when scheduling construction works  Use of appropriate drainage medium in ditches  Monitoring of rainfall and weather forecasts  Contingency plans for wet weather working	1	1	1

Hazard / Risk		Cause	P	I	Risk Rating	Consequences		Mitigation	P	I	Risk Rating
Peat Landslide	Concentrated loads placed at top of slope system or on marginally stable peat deposits (T1 & T6)	2	5	10	Rapid ground movement Harm to personnel and equipment Destruction of temporary or permanent works	Where areas of deep peat (>1m) are included in the infrastructure design a robust construction method statement must be in place for construction of floating access track sections Utilise detailed peat depth contour plan in construction planning No peat storage at the top of a slope system of over marginally stable peat deposits at T1 & T6 A programme of inspections should be implemented during excavation and access track construction works Monitoring of excavated materials	1	2	2		
Peat Landslide	Uncontrolled water flows	2	3	6	Rapid ground erosion around and within temporary and permanent earthworks	Detailed drainage design undertaken Geotechnical supervision of any de-watering operations Due consideration given to the prevailing ground and weather conditions when scheduling site works	1	2	2		
Peat Landslide	Unstable excavations	4	2	8	Localised instability associated with temporary and permanent earthworks	Earthworks plan should incorporate geotechnical data and design specification	2	1	3		



Hazard / Risk		Cause	P	I	Risk Rating	Consequences	Mitigation	P	I	Risk Rating
Peat Landslide	Removal of toe support to slope system	3	3		9	Harm to personnel and equipment	A programme of inspections should be implemented during excavation and access track construction works. Contingency plan for slope stabilisation and rapid reaction strategy developed in the event of instability	2	2	4
Peat Landslide	Surface water erosion	3	1		3	Localised instability associated with temporary and permanent earthworks Harm to personnel and equipment	Long term established vegetation cover on slopes Suitable temporary surface water management Addressed in drainage design plans	2	1	2
Peat Landslide	Subsurface groundwater flow and 'piping'	2	2		4	Localised instability associated with temporary and permanent earthworks Harm to personnel and equipment	Blockage prevention using free draining fill A programme of geotechnical inspections will be implemented during excavation works	2	1	2
Bearing Capacity Failure (Peat Surface)	Areas of soft wet peat land (T1 & T6)	5	2		10	Localised instability associated with temporary and permanent earthworks Harm to personnel and equipment	Due consideration given to the prevailing ground and weather conditions when scheduling site works	3	1	3

Hazard / Risk		Cause	P	I	Risk Rating	Consequences	Mitigation	P	I	Risk Rating
Peat Failure	Mass movement of temporary storage mounds and bunds.	4	4	16	Localised instability and settlement associated with temporary and permanent earthworks Harm to personnel and equipment	Storage site selection by geotechnical engineer Routine maintenance and inspection of peat storage mounds	2	2	4	
Ultimate limit state failure (bearing capacity)	Construction loading and poor ground conditions	3	2	6	Bearing capacity failure, localised instability, damage to temporary and permanent structure and earthworks	Appropriate geotechnical design applied Excavation of shallow peat along tracks Expose competent formation at turbine sites Adopt floating road construction over deep peat, if appropriate	1	1	1	

Hazard / Risk	Cause		Risk Rating	Consequences	Mitigation		Risk Rating
	P	I			P	I	
Serviceability limit state failure (settlement)	Construction loading and poor ground conditions	<b>5 2</b>	<b>10</b>	Excessive settlement Damage to temporary and permanent structures and earthworks Construction delayed Additional fill required	Ground improved with structural fill addressed as part of detailed geotechnical design Adopt geotechnical monitoring of tracks Contingency to re-level tracks on completion	<b>3 1</b>	<b>3</b>
Creep, long term settlement of tracks (floating sections over peat)	Poor and variable foundation soils	<b>5 1</b>	<b>5</b>	Ongoing settlement, damage to access track running surface	Contingency for routine maintenance	<b>3 1</b>	<b>3</b>

Source: Natural Power

## 6.5. Summary of Potential Environmental Constraints

From information compiled within this desk study there are no major environmental constraints within the development. External to the site, it is worth noting that environmental protections are in place for the Altnaheglish River located to the south and downslope from the development.

Thus, protection of onsite watercourses which flow south into the Altnaheglish River system will further be an essential facet of the construction environmental management planning.

The site is also located in an Area of Outstanding Natural Beauty.

Although not indicated there is the potential for services on the development, a utilities search must be conducted before any intrusive works begin on development.

## 6.6. Site Investigation

Based on the findings of this report, it is recommended a phased site investigation be carried out for this project, to confirm the deeper geological conditions across the development. This further site investigation would typically be carried out as part of pre-construction phase of works and be suitable for informing the detailed design.

The key objective of the site investigations will be to provide sufficient information to allow the detailed design of all components of the wind farm to be completed.

The general approach and standards of work should adhere to British Eurocode Standards, where appropriate. outline proposals for the development investigation works are given below:

### 6.6.1. Pre-Intrusive Works

As the site is relatively small with easy access an aerial topographic survey would provide high resolution topographical data to feed into the civil infrastructure design. As well as high resolution aerial imagery. UAV/Drone supported surveys would suit the site conditions and provide an efficient means of survey.

### 6.6.2. Intrusive Ground Investigation

It is advised that low ground pressure plant be used for the investigation to reduce damage to the peat deposits and increase stability and prevent lasting damage to fields.

- Dynamic Cone Penetrometer (DCP) testing would provide efficient and adequate sub-grade information for shallow infrastructure such as tracks and crane pads;
- Trial pits and disturbed sampling should be used in conjunction with in-situ DCP testing to obtain soil profile descriptions and lab samples to further refine design;
- Depending on ground conditions plate load tests should be carried out at each crane pad location to give accurate bearing capacity estimates.
- It is recommended that a carefully planned drilling investigation be carried out at each turbine foundation. Due to the variable nature of the ground conditions, different techniques may be required at different locations. Peat deposits would be sampled using driven soil samplers, followed by sampling and Standard Penetration Testing (SPT) of superficial and weathered material, followed by rotary core drilling. Class A samples should be obtained in soils and rock for lab tests to further refine foundation design. For areas over thick deposits of glacial till, GeoBore drilling may be required to allow high quality samples to be obtained for lab testing, this will feed into any piling design should it be needed.
- Boreholes should be drilled to sufficient depth for anticipated foundation design for the proposed wind turbines. Eurocode 7 indicates this is typically 1.5times the base depth, initially assuming approximately 18m diameter

bases, drilling depths of approximately 27m depth are anticipated. This could be reduced if good quality bedrock can be proven and backed up with other site investigation data.

- Appropriately targeted geotechnical laboratory testing, which is likely to comprise material classification/ index testing, point load, unconfined shear strength, compaction testing, shear strength testing, CBR, and chemical testing, where necessary and/ or appropriate.

### 6.6.3. Resistivity Testing

It is recommended electrical resistivity testing is carried out at each turbine and the control building/substation to enable electrical earthing design.

### 6.6.4. Reporting

It is recommended the investigation findings should be compiled into an interpretative Ground Investigation Report (GIR) as part of a pre-construction phase of works and to inform the detailed design. The report should include derivation of the geology and groundwater regime, identification of engineering properties of the materials, identification of geohazards, and recommendations for geotechnical design and construction at all key infrastructure locations, including the turbine foundations and access tracks.

# 1. References

- BS EN 1997-1:2004, EC7: Geotechnical Design, Part 1: General Rules.
- BS EN 1997-2:2007, EC7: Geotechnical Design, Part 2: Ground Investigation and Testing.
- British Geological Survey, Northern Ireland 1:50,000 Digital Data
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- Northern Ireland Rivers Agency, Flood Map, Risk of Flooding from Rivers and Sea.
- Health Protection Agency, Radon Maps, Indicative Atlas of Radon
- BRE 211, RADON, Guidance on protective measures for new buildings, BRE Press, 2007.
- Gas Networks.ie, Gas Networks Pipeline Map

## **Appendix A – Maps & Plans**

Figure 1. Superficial Geology

Figure 2. Solid Geology

Figure 3. Slope Angle

Figure 4. Geomorphological Features

Figure 5. Peat Depth

Figure 6. Peat Spoil Management Plan





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Project:  
**Magheramore Wind Farm,  
Co. Londonderry**

Title:  
**Figure 1: Superficial Geology**

**Key**

- Development boundary
- Proposed turbine
- Existing track
- New track
- Turning head
- Upgraded track
- Cranepad
- Control building
- Construction compound
- 10 m contour

**Superficial geology\***

- Alluvium
- Till
- Peat
- Glacial sand and gravel

\* Data reproduced from GSNI 250k superficial geology dataset

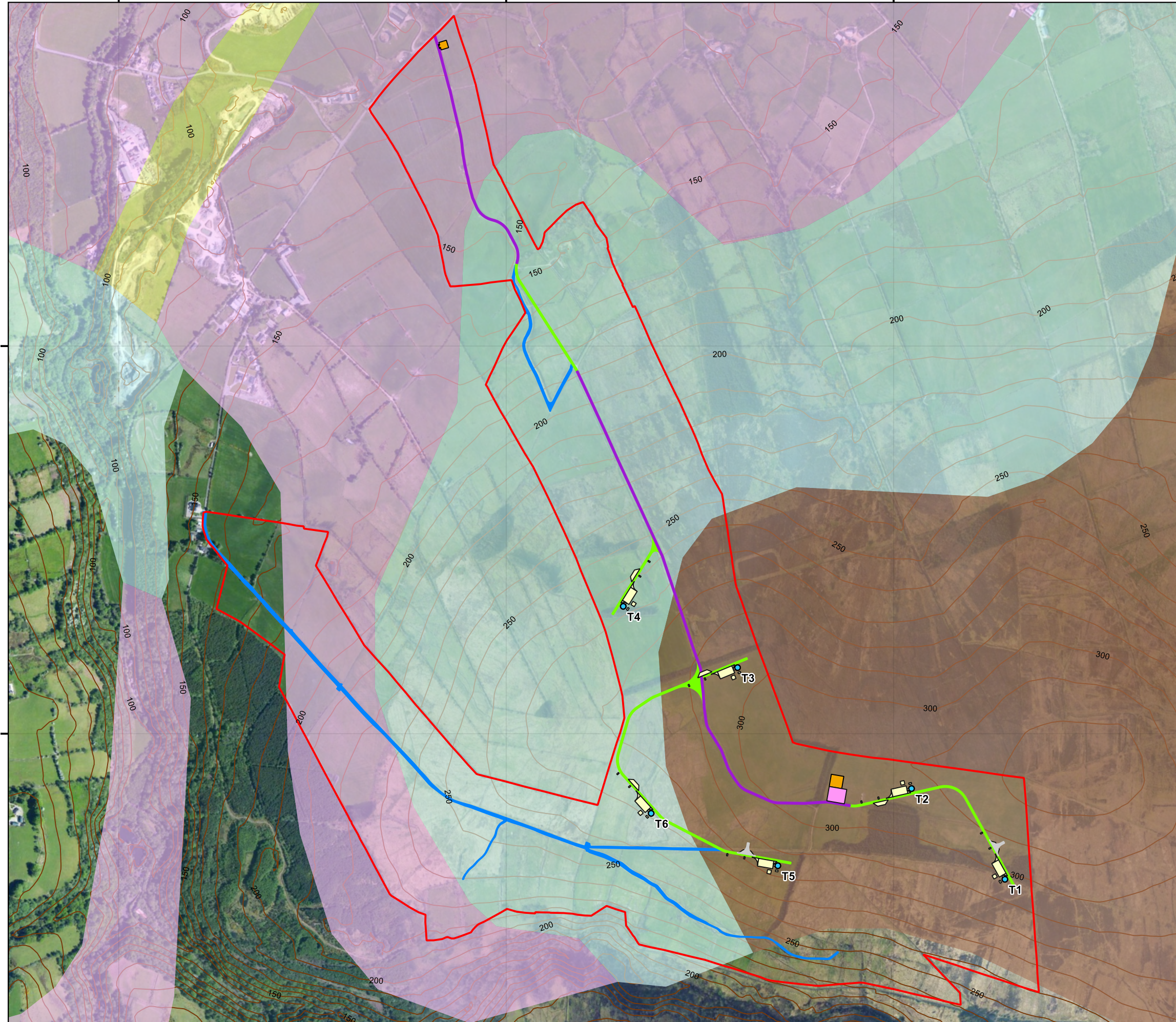
Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community  
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Coordinate System: OSNI 1952 Irish National Grid

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Ref: GB202040\_M\_001\_B    Layout: 220419\_6t\_A

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Project:  
**Magheramore Wind Farm,  
 Co. Londonderry**

Title:  
**Figure 2: Bedrock Geology**

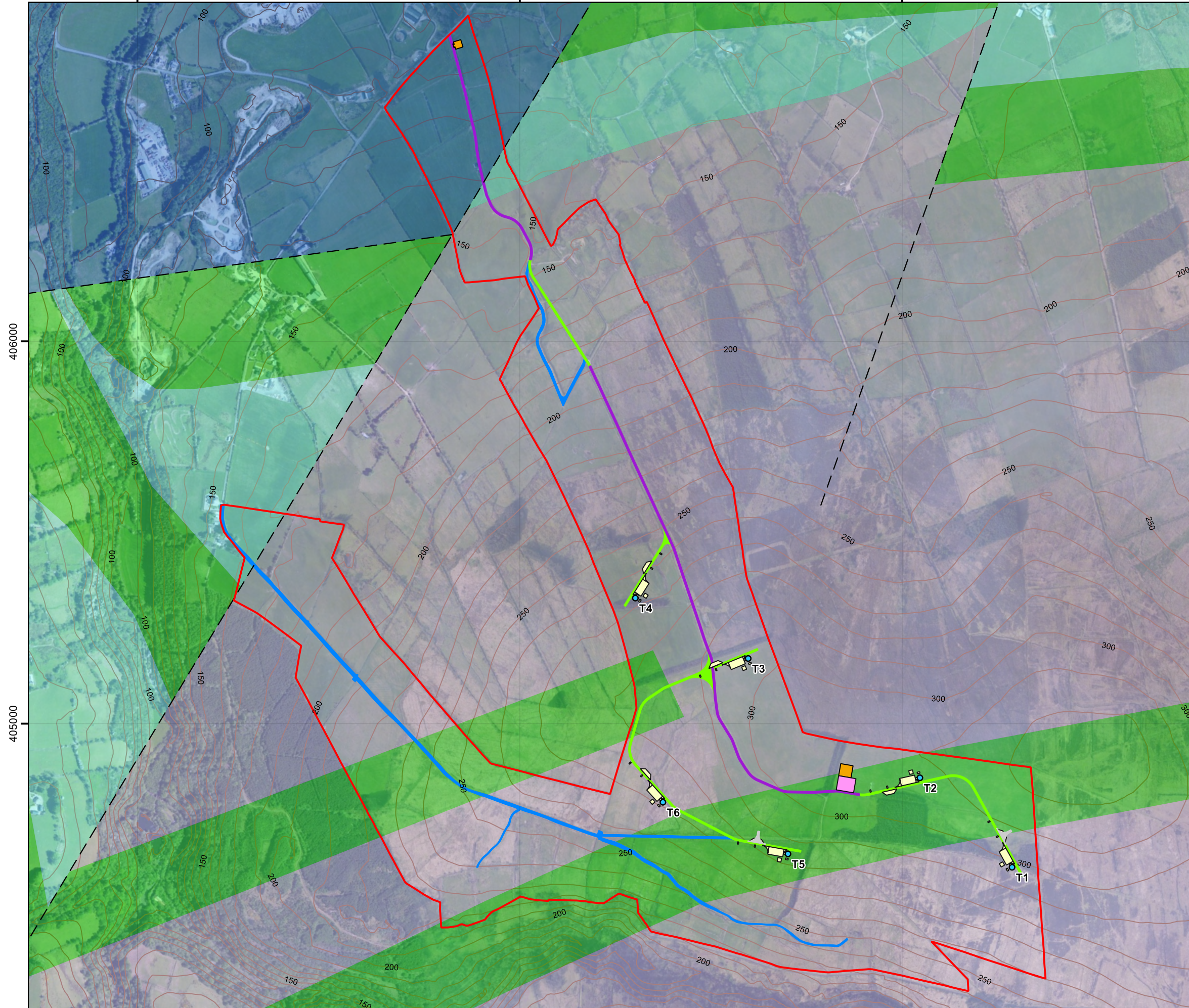
**Key**

- Development boundary
- Proposed turbine
- Existing track
- New track
- Turning head
- Upgraded track
- Cranepad
- Control building
- Construction compound
- 10 m contour

**Bedrock geology\***

- Dart formation
- Unnamed igneous intrusion, Pre-Caledonian
- Dungiven formation
- Barony Glen formation
- Fault

\* Data reproduced from GSNI 250k bedrock geology dataset



Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community  
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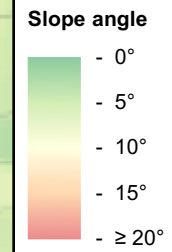
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Project:  
**Magheramore Wind Farm,  
Co. Londonderry**

Title:  
**Figure 3: Slope angle**

- Key**
- Development boundary
  - Turbine
  - Infrastructure footprint
  - ▭ Water crossing



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0 125 250 375 500 m



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Project:  
**Magheramore Wind Farm,  
Co. Londonderry**

Title:  
**Figure 4: Geomorphological  
Features**

- Key**
- Development boundary
  - Turbine
  - Existing track
  - New track
  - Turning head
  - Upgraded track
  - Cranepad
  - Control building
  - Compound
  - 10 m contour
- Forestry status**
- Retained
  - Removed
- Geomorphological feature**
- Natural peat
  - Peaty soil
  - Soft ground
  - Watercourse
  - Roadside Ditch
  - Field Ditch

Scale @ A3: 1:10,000

Coordinate System: OSNI 1952 Irish National Grid

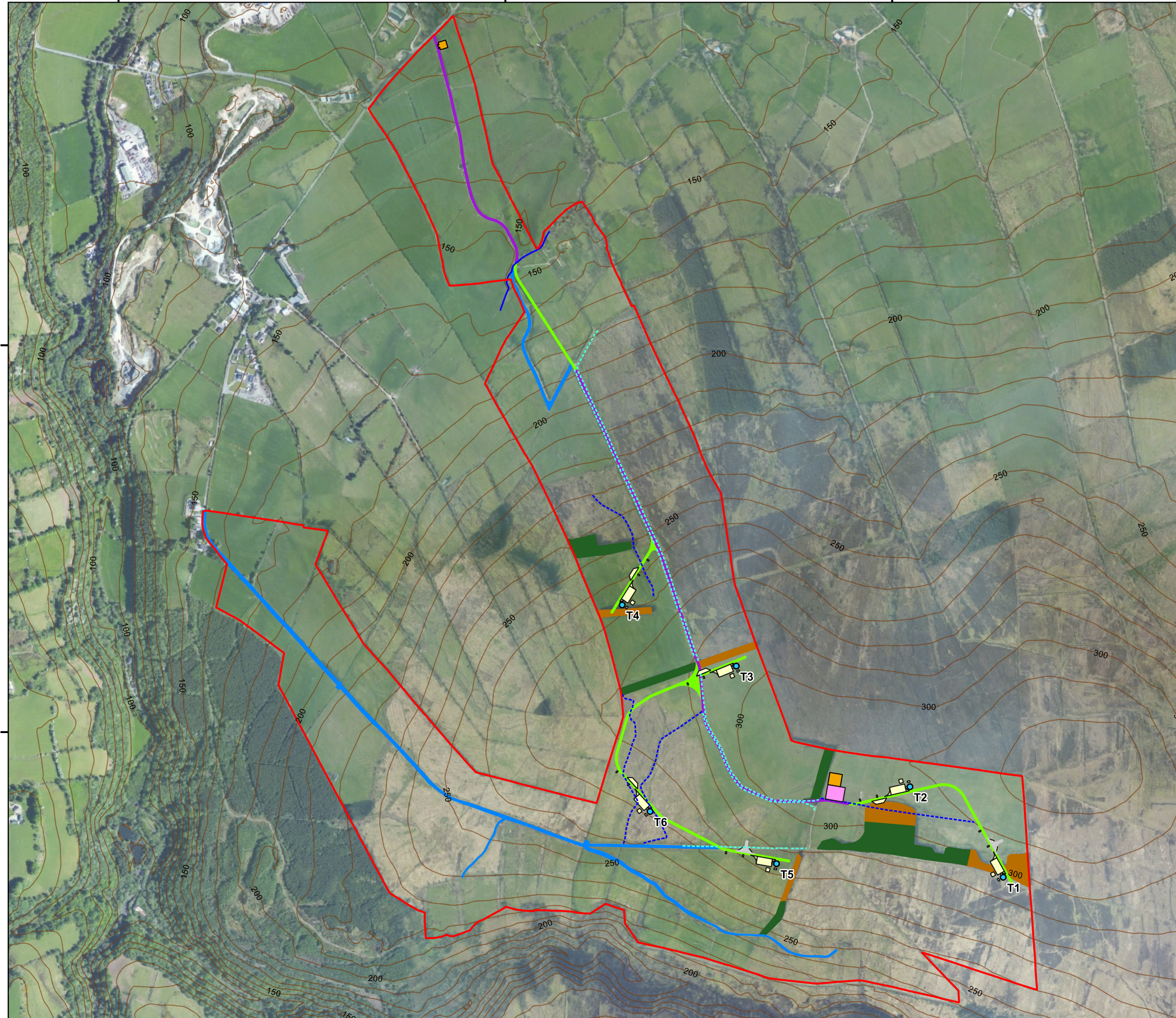
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Project:  
**Magheramore Wind Farm,  
Co. Londonderry**

Title:  
**Figure 5: Peat Depth**

**Key**

- Development boundary
- Turbine
- Infrastructure footprint
- ∩ Water crossing
- 10 m contour
- + Peat probe

**Peat depth (m BGL)\***

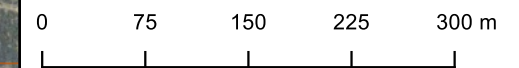
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\* Peat probe data interpolated using IDW. Distance coefficient = 10.

Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community  
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Scale @ A3: 1:5,500

Coordinate System: OSNI 1952 Irish National Grid



Date: 15-05-19    Prepared by: AB    Checked by: CM

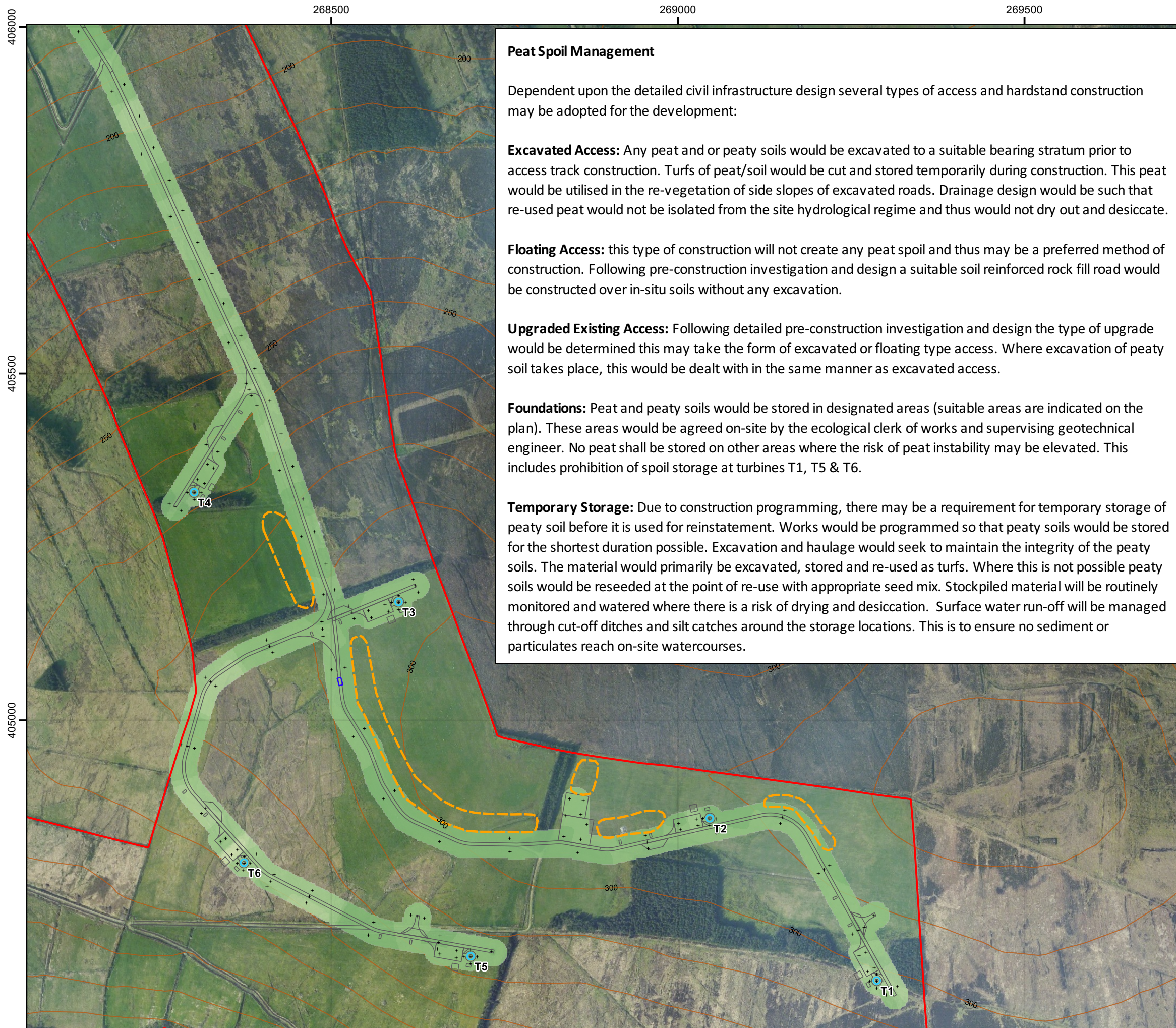
Ref: GB202040\_M\_005\_B    Layout: 220419\_6t\_A

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### Peat Spoil Management

Dependent upon the detailed civil infrastructure design several types of access and hardstand construction may be adopted for the development:

**Excavated Access:** Any peat and or peaty soils would be excavated to a suitable bearing stratum prior to access track construction. Turfs of peat/soil would be cut and stored temporarily during construction. This peat would be utilised in the re-vegetation of side slopes of excavated roads. Drainage design would be such that re-used peat would not be isolated from the site hydrological regime and thus would not dry out and desiccate.

**Floating Access:** this type of construction will not create any peat spoil and thus may be a preferred method of construction. Following pre-construction investigation and design a suitable soil reinforced rock fill road would be constructed over in-situ soils without any excavation.

**Upgraded Existing Access:** Following detailed pre-construction investigation and design the type of upgrade would be determined this may take the form of excavated or floating type access. Where excavation of peaty soil takes place, this would be dealt with in the same manner as excavated access.

**Foundations:** Peat and peaty soils would be stored in designated areas (suitable areas are indicated on the plan). These areas would be agreed on-site by the ecological clerk of works and supervising geotechnical engineer. No peat shall be stored on other areas where the risk of peat instability may be elevated. This includes prohibition of spoil storage at turbines T1, T5 & T6.

**Temporary Storage:** Due to construction programming, there may be a requirement for temporary storage of peaty soil before it is used for reinstatement. Works would be programmed so that peaty soils would be stored for the shortest duration possible. Excavation and haulage would seek to maintain the integrity of the peaty soils. The material would primarily be excavated, stored and re-used as turfs. Where this is not possible peaty soils would be reseeded at the point of re-use with appropriate seed mix. Stockpiled material will be routinely monitored and watered where there is a risk of drying and desiccation. Surface water run-off will be managed through cut-off ditches and silt catches around the storage locations. This is to ensure no sediment or particulates reach on-site watercourses.

Project:  
**Magheramore Wind Farm,  
Co. Londonderry**

Title:  
**Figure 6: Peat Spoil  
Management Plan**

#### Key

- Development boundary
- Turbine
- Infrastructure footprint
- Indicative temporary spoil storage area
- Water crossing
- 10 m contour
- + Peat probe

#### Peat depth (m BGL)\*

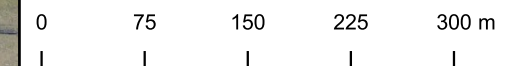
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ANNEX 4: ES MITIGATION TABLE



## Summary of Mitigation

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
LVIA	Landscape & Visual impact	The exterior surfaces of the turbines will be painted in a recessive, non-reflective light grey colour to minimise their visual prominence against the sky in most weather conditions.	By condition.
		The control room and substation compound will be designed in a manner that is sensitive to the immediate landscape character with regards to colour and choice of materials.	Through Construction & Decommissioning Method Statement (CDMS) to be agreed with CC & G BC prior to construction and implemented during construction.
		The site entrance is located at an existing access to farm lands on the south side of the Magheramore Road where two stone pillars and walls mark a well-defined farm entrance. Following construction, the site entrance will be reinstated to reduce the extent of hardstanding back to its original pre-construction state. Stone pillars and walls removed to allow access will be reinstated as will stock proof fencing. Any trees and hedgerows removed will be replanted.	By Condition. Decommissioning Method Statement to be agreed with CC & G BC prior to decommissioning and implemented during decommissioning.
Archaeology and Cultural Heritage	Potential direct effects on currently undiscovered archaeological remains and heritage assets on site	<p>Programme of mitigation in advance of works to be agreed with HED:HM</p> <p>This programme will allow for features to be recorded appropriately and is likely to comprise;</p> <ul style="list-style-type: none"> <li>Evaluation, by trial trenching, test-pitting and/or geophysical survey, as appropriate, of areas where extensive disturbance will occur (such as compounds and turbine bases), particularly at lower altitudes (below 300m OD); and</li> <li>Archaeological monitoring of groundworks where appropriate.</li> </ul>	<p>By Condition.</p> <p>Programme of Works to be agreed with CC &amp; G BC prior to construction and implemented during construction</p>
Ecology	General	Measures required to address ecological concerns described in this ES during the construction phase will	By Condition. CDMS will be agreed with the CC & G BC prior to

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		be incorporated within a Construction and Decommissioning Method Statement (CDMS), which will be submitted to and agreed with the CC & G BC at the pre-construction stage.	construction and implemented during construction.
	Designated Watercourses	Avoidance during infrastructure design and SuDS drainage management (Appendix 9.1). No in-stream works will be required. Application of the SuDS drainage management and CMS as detailed in Appendix 9.1	By Condition  HMP to be agreed with NIEA / CC & G BC prior to construction and implemented during construction and operation.
	Loss of Wet Heath / degraded Blanket Bog	Heathland restoration and enhancement according to the Outline HMP.	By Condition  CDMS will be agreed with the CC & G BC prior to construction and implemented during construction
	Temporary disturbance to bats	Soft-felling and preconstruction inspection surveys have been recommended. Two Schwegler 1FF bat boxes will also be erected.	
	Potential collision risk of bats with turbine blades	The proposed turbine layout was amended to ensure a minimum stand-off distance of 50 m (Natural England TIN051) to all habitat edges (shelterbelts and natural watercourses) which will be maintained through the lifetime of the Development. A Bat Monitoring & Mitigation Plan (BMMP) will be implemented under the Precautionary Principle.	
	Bats (under precautionary principle).	The Bat Monitoring Plan (BMP) will be agreed with NIEA/The Council and monitoring will be undertaken in years 1, 2, 3 & 5 and will be reviewed after each survey period to determine whether remedial action is required to mitigate the effects of the Development on bats. At the end of year 5, the data will be reviewed to determine whether monitoring should continue.	By Condition  BMP to be agreed with NIEA / CC & G BC prior to construction and implemented during construction and operation.



ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
	Impact on Common Lizard	<p>Depending on the commencement of construction on site, the works corridor will be mowed.</p> <p>If possible, this work will be undertaken before the end February (to avoid a conflict with the bird breeding season). If this is not possible, then mowing will take place between August and September, when common lizards are likely to be fully active.</p> <p>Should the latter be required, the corridor will be subjected to an active nest survey by a suitably qualified ornithologist immediately prior to the commencement of mowing operations.</p> <p>Clearance of stones, tree stumps, logs, brash, rocks or piles of similar debris will be undertaken carefully and by hand. Although this is only required in a few areas where the proposed site tracks traverse low stone walls. This work will not take place during the hibernation period for common lizard (i.e. mid-October to mid-March).</p> <p>Clearance of tall vegetation will be undertaken using a strimmer or brush cutter with all cuttings raked and removed the same day. Cutting will only be undertaken in a phased way which will either include:</p> <p>Cutting vegetation to a height of no less than 30mm, clearing no more than one third of the site in anyone day or;</p> <p>Cutting vegetation over three consecutive days to a height of no less than 150mm at the first cut, 75mm at the second cut and 30mm at the third cut;</p> <p>Following removal of tall vegetation using the methods outlined above, the remaining vegetation will be maintained at a height of 30mm through regular mowing or strimming to discourage common lizards from returning. Ground clearance of any</p>	<p>By Condition</p> <p>CDMS and HMP, which will be agreed with NIEA / CC &amp; G BC prior to construction and implemented during construction.</p>

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<p>remaining low vegetation (if required) and any ground works will only be undertaken following the works described above.</p> <p>As an additional precaution the ECoW will be present from the commencement of clearance/construction with a watching brief to ensure that no common lizards remain within the construction corridor and remain in situ until the area is cleared to ensure no species or habitat conflicts emerge affecting damage to the local lizard population.</p> <p>If any common lizards are found during excavation works, all works within the affected area will cease until the ECoW has safely removed them (under licence) from the construction corridor.</p>	
	<p>Badgers - Potential for disturbance</p>	<p>None required, no badger setts found within 25m of the construction area. However, given the foraging records for this species, a pre-construction badger survey will be completed.</p> <p>A detailed Protected Species Management Plan (PSMP) will be developed and agreed with NIEA prior to construction commencing. This will include details of the protection of badgers. The following will be included within the PSMP (as a minimum):</p> <p>All excavations will be fenced off and/or ramps provided to prevent entrapment in the event that a badger was to fall into an excavation.</p> <p>No fencing that restricts access for badgers will to their foraging grounds will be permitted.</p> <p>An emergency procedure will be implemented by site workers if signs of badger (e.g. setts, latrines or animals) are encountered. All work</p>	<p>By Condition</p> <p>CDMS which will be agreed with NIEA / CC &amp; G BC prior to construction and implemented during construction.</p>

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		within 25m to cease, and the Ecological Clerk of Works to inspect site and define mitigation (if required).	
Ornithology	Impacts during bird breeding season	To allow construction work to take place during the bird breeding season (1st March - 31st August) whilst avoiding any significant adverse effects on breeding birds	By Condition  CDMS which will be agreed with NIEA / CC & G BC prior to construction and implemented during construction.  During Construction
Fisheries	Sediment run-off	50m minimum width for significant watercourses (catchment area within site >0.25 km <sup>2</sup> with the exception of essential watercourse crossings.	CDMS, to be agreed with CC & G BC prior to construction and implemented during construction.
	Construction Methods & Timing	All works at stream crossings will adhere to the measures outlined in the Good Practice Guidance notes PPG5: Works In, Near or Liable to Affect Watercourses (Environment Agency, 2014). It is also recommended that to minimise the risk of suspended sediment entrainment in surface water run-off, the site drainage system should only be constructed during periods of low rainfall and therefore low run-off rates.	
	Surface Water Management	The surface water management plan outlined in Chapter 9 will include a series of measures minimise modification and disruption of the existing hydrology. This approach will include a system for the drainage of the temporary works during the construction phase, with use of swales, check dams and settlement ponds to provide a surface water management system that will prevent any adverse effects on the ecology of the principal receiving watercourses during the construction phase of the project.  Additional measures to prevent the release of suspended solids will include:	

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<ul style="list-style-type: none"> <li>• Preservation of natural run-off patterns;</li> <li>• Reduction of flow rates from access tracks through use of attenuating check-dams;</li> <li>• Use of shallow ponds to aid settlement;</li> <li>• Linear track drainage swales with regular outflow points throughout the SuDS system to limit the potential for large flows at single outflow points;</li> <li>• Avoidance of peat storage within denoted watercourse buffer zones or in areas of overland water flow.</li> </ul>	
	Release of pollutants	<p>All precautions will be taken to avoid spillages of diesel, oil or other polluting substances during the construction phase. This will be achieved through good site practices as described in the Good Practice Guidance notes proposed by EA/SEPA/NIEA (Environment Agency, 2014)</p> <p>A contingency plan will be prepared setting out the procedure to be followed in the event of a significant spillage occurring. Specific measures will be included in the Construction and Decommissioning Method Statement (CDMS), which will be agreed with DOE Planning prior to construction.</p>	
	Sediment run-off, release of pollutants during decommissioning	Mitigation measures during decommissioning will be the same as during the construction phase with regard to addressing the potential for run-off of suspended solids and other polluting substances. The level of mitigation will be determined by the level of reinstatement required. It is proposed that the surface water quality monitoring be extended into the decommissioning phase.	Through Decommissioning Method Statement, to be agreed with CC & G BC prior to decommissioning and implemented during decommissioning.
Geology and Water Environment	Changes in run-off and flow pattern, silt/suspended solid/chemical pollution of watercourses	The Site will adopt a surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of on-site retention of flows and use of buffers and other silt removal techniques. All drainage-	CDMS and CEMP, which will be agreed with CC & G BC prior to construction and implemented during construction.



ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<p>related mitigation measures proposed will be encompassed by a robust and proven Sustainable Drainage System (SuDS) design which will be used to control drainage and silt management on the Site.</p>	<p>Outline SUDS is provided in Revised Technical Appendix 9.1 - Water Framework Directive Assessment in Annex 2 of outline CEMP</p>
		<p>Hydraulic design of crossings will be undertaken as per the guidance and requirements provided in CIRIA C689 “Culvert Design and Operation Guide” (or other standard as may be required by Rivers Agency in post-consent consultation), with primary parameters likely to include:</p> <ul style="list-style-type: none"> <li>▪ Width of the culvert will be greater than the width of the active drainage channel;</li> <li>▪ Alignment of the culvert will suit the alignment of the drainage channel, i.e. preserve the existing direction of flow;</li> <li>▪ The slope of the culvert will not exceed the slope of the bed of the existing drainage channel.</li> <li>▪ Detailed design of crossings will assume a hydraulic capacity requirement of 1% Annual Equivalent Probability flow as a conservative measure. Detailed hydraulic design of culverts and similar structures post permission is normal and accepted practice for wind farms in Northern Ireland.</li> <li>▪</li> </ul>	<p>Statutory Approval, prior to construction</p>
		<p>Fisheries shall be protected by adopting the guidance stated in Guidelines for Fisheries Protection during Development Works as published by Loughs Agency.</p>	<p>Through CDMS which will be agreed with CC &amp; G BC prior to construction and implemented during construction.</p>
		<p>Consultation and approval will be sought from all relevant parties as required by the Department of the Environment Surface Waters Alteration Handbook (December 2013), including Rivers Agency in particular, at the pre-construction detailed design stage for all works in and affecting watercourses and</p>	<p>Statutory Approval, prior to construction</p>

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<p>drains, as per the requirements of Schedule 6 of the Drainage (Northern Ireland) Order 1973 and subsequent amendments.</p> <p>A water quality monitoring program will be implemented to monitor effects on the hydrological and groundwater regime and water quality during the infrastructure construction, operation and decommissioning phases of the wind farm.in order to:</p> <ul style="list-style-type: none"> <li>▪ Demonstrate that the mitigation measures and surface water management is performing as designed;</li> <li>▪ Provide validation that the in-place mitigation measures are not having an adverse effect upon the environment;</li> <li>▪ Indicate the need for additional mitigation measures to prevent, reduce or remove any effects on the water environment, such as additional temporary settlement or filtration structures or short term flocculant dosing to suit observed Site conditions.</li> </ul>	<p>Through CDMS, which will be agreed with CC &amp; G BC prior to construction and implemented during construction.</p> <p>Operational phase.</p> <p>Decommissioning Method Statement</p>
		<p>A detailed Pollution Prevention Plan (PPP) will be implemented and monitored by the site manager as part of a full Construction &amp; Decommissioning Method Statement (CDMS) for the project</p> <ul style="list-style-type: none"> <li>▪ Storage - all equipment, materials and chemicals on the Site will be stored away from any watercourse (i.e. outwith previously stated buffer zones). Chemical, fuel and oil stores will be sited on impervious bases in accordance with PPG2 and within a secured bund of 110% of the storage capacity, within the lay down area.</li> <li>▪ Vehicles and refuelling - standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Refuelling of vehicles and machinery will be carried out on an</li> </ul>	<p>Through CDMS, which will be agreed with CC &amp; G BC prior to construction and implemented during construction</p>

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<p>impermeable surface in designated areas, well away from any watercourse or drainage ditches (i.e. outwith previously stated buffer zones) and will adhere to best practice as detailed in PPG7.</p> <ul style="list-style-type: none"> <li>▪ Maintenance - on site maintenance to construction plant will be avoided in all practicable instances, unless vehicles have broken down necessitating maintenance at the point of breakdown. Suitable measures in accordance with a pollution prevention plan will be put in place prior to commencement of maintenance in this instance.</li> <li>▪ Cement and concrete batching - Preference shall be given to construction techniques that do not require use of cementitious materials where suitable practicable alternatives exist. When concrete / cement are used, concrete batching will not be permitted on Site. Wet concrete operations will not be carried out within watercourses or adjacent to watercourses. Measures to prevent discharge of alkaline wastewaters or contaminated storm water to watercourses will be outlined in a detailed Pollution Prevention Plan for the Site to be approved by NIEA before commencement of works. Wastewater spillage will be minimised by using settling tanks and recycling water.</li> <li>▪ Mess and welfare facilities will be required during construction and decommissioning and will be located at the construction compound. Foul effluent disposal shall be via chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e.</li> </ul>	

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<p>there shall be no emission on Site).</p>	
		<p>Methods to divert minor watercourses will include the following:</p> <ul style="list-style-type: none"> <li>▪ Works to divert drains (at the locations shown on drainage drawings WFD01 to 06 in Annex A) shall be programmed to coincide with a period of anticipated low drain flow and shall be undertaken prior to adjacent main earthworks associated with the reason for the diversion or realignment.</li> <li>▪ The new channel alignment will be excavated starting from its downstream extent. The channel will be lined to prevent scour of the newly excavated surface. Scour protection (liners or rip rap) will be placed at bends.</li> <li>▪ Temporary barriers (silt fences or check dams) may be placed in the new channel and the downstream in-situ channel.</li> </ul> <p>The upstream drain will be diverted into the realigned channel and the former channel dammed and backfilled.</p>	
		<p>The following procedures apply to the general construction activities either within the watercourses or in defined watercourse buffer zones:</p> <ul style="list-style-type: none"> <li>▪ Due consideration will be given to the prevailing ground and weather conditions when programming the execution of the works in order to ensure that in-channel works are undertaken during periods of predicted low flow and low rainfall in order to minimise contact with water.</li> </ul> <p>Ensure that roadside drains do not discharge directly into watercourses, but rather through a riparian buffer area of intact vegetation as denoted on design drawings.</p>	<p>Through CDMS, which will be agreed with CC &amp; G BC prior to construction and implemented during construction</p>
		<p>Construction of watercourse crossings will be programmed to coincide with periods of predicted low flow in the</p>	<p>Through CDMS, which will be agreed with CC &amp; G BC prior to construction and</p>

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<p>affected channel (determined by rainfall and would generally coincide with summer months) and adhere to working period restrictions imposed. Construction will be strictly as per the design for each identified watercourse crossing and will fully implement all SuDS and additional mitigating measures proposed at the detailed design stage. For purposes of outline design, the proposed mitigation will include:</p> <ul style="list-style-type: none"> <li>▪ Installation of silt fences parallel to the watercourse channel in the vicinity of the proposed crossing;</li> <li>▪ Installation of small cut-off drains to prevent natural surface runoff entering area of construction activity;</li> <li>▪ Installation of filtration or other silt entraining features within the watercourse channel immediately downstream of the works location;</li> <li>▪ Use of over pumping where deemed appropriate.</li> <li>▪ Due consideration will be given to the prevailing ground conditions and season when programming the execution of cable trench excavations in order to ensure works are undertaken during periods with low rainfall and elevated shallow groundwater levels in order to reduce the likelihood of runoff entering the excavations.</li> <li>▪ Excavation of cable trenches will be carried out over short distances, with frequent backfilling of trenches to minimise opportunity for the ingress of water into open trenches, temporary silt traps will be provided in longer trench runs and on steeper slopes and spoil will be stored in line with a spoil management plan, which will be produced as part of the CDMS at the pre-construction stage.</li> </ul>	<p>implemented during construction</p> <p>Through CDMS, which will be agreed with CC &amp; G BC prior to construction and implemented during construction</p>



ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<ul style="list-style-type: none"> <li>▪</li> </ul> <p>Soil and subsoil excavation and movement will be undertaken in accordance with best practice guidelines such as Good Practice Guide for Handling Soils (MAFF, 2000) in order to minimise potential for silt laden runoff from spoil and excavations. Areas of stockpiled spoil including stored peat:</p> <ul style="list-style-type: none"> <li>▪ will not be permitted within previously identified watercourse buffer zones; and</li> <li>▪ will not be permitted to obstruct the flow of overland surface water with specific drainage to spoil mounds to be provided.</li> </ul> <p>Spoil drainage will be designed on a bespoke basis for spoil storage areas and ditch blocking areas contained in the HMP to allow controlled dewatering and prevent washout of suspended solids to the receiving water environment.</p>	<p>CDMS, which will be agreed with CC&amp; G BC prior to construction and implemented during construction.</p> <p>Outline SUDS is provided in Revised Technical Appendix 9.1 - Water Framework Directive Assessment in Annex 2 of outline CEMP</p>
		<p>In dry weather dust suppression methods such as by dust suppression bowser will be employed.</p>	<p>CDMS, which will be agreed with DOE Planning prior to construction and implemented during construction.</p>
		<p>All swales, crossings and other hydraulic features will be engineered to ensure that dimensions etc. are suitable to convey predicted flows and so prevent build-up of surface water and / or flooding. Shallow groundwater (e.g. in areas of glaciofluvial sand/gravel deposits) or rainfall runoff collected in excavations will be discharged via settlement ponds or filter strips prior to entry to the receiving water environment. Any settlement lagoons or filter strips associated with dewatering will be regularly inspected, particularly after periods of heavy rainfall and prior to periods of forecast heavy rainfall. Maintenance (to clear blockages or remove silt) will be carried out in periods of dry weather where practicable.</p>	<p>CDMS, which will be agreed with CC &amp; G BC prior to construction and implemented during construction.</p>

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<p>Mitigation of the effects of the wind farm development will comprise the following:</p> <ul style="list-style-type: none"> <li>▪ Ensure best practice is adhered to on the Site and avoid pollution release to watercourses by incorporating NIEA Pollution Prevention Guidance notes into management policy.</li> <li>▪ In the event that permanent welfare facilities are installed as part of control building / substation facilities, foul effluent will be disposed of through the use of sealed cesspools or chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e. there shall be no emission on the Site).</li> <li>▪ Cyclical maintenance of permanent SuDS drainage features installed during the construction phase, including unblocking of drains, maintenance of access road and other hard standing surfaces, and removal of silt build-up from settlement features. An outline maintenance programme is included in Technical Appendix 9.1: Water Framework Directive Assessment.</li> </ul>	Operational management
Peat Slide Risk Assessment	General Risk Management Recommendations	It is recommended a phased site investigation be carried out pre-construction to confirm the deeper geological conditions across the development to provide sufficient information to allow the detailed design of all components of the wind farm.	CDMS, which will be agreed with CC & G BC prior to construction and implemented during construction.

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
Noise	Potential for operational noise to exceed daytime noise limit	Reduction of noise levels for certain wind speeds and directions during the day  Noise management by operating certain turbines in noise reduced mode	By condition
	Potential construction noise at nearby properties Potential short-term construction noise at nearby residential properties	The following noise mitigation options will be implemented where appropriate: <ul style="list-style-type: none"> <li>▪ Consideration will be given to noise emissions when selecting plant and equipment to be used on site;</li> <li>▪ All equipment should be maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;</li> </ul> Stationary noise sources will be sited as far away as reasonably possible from residential properties and where necessary and appropriate, acoustic barriers will be used to screen them.	Through CDMS, which will be agreed with CC & G BC prior to construction and implemented during construction
		The movement of vehicles to and from the site will be controlled and employees will be instructed to ensure compliance with the noise control measures adopted.	TMP within CDMS, to be agreed with DfI Roads and CC & G BC prior to construction and implemented during construction.
		Site operations will be limited to 0700-1900 Monday to Saturday except during turbine erection and commissioning or during periods of emergency work.	By Condition
		Action may be required to reduce construction noise levels at nearby properties for work scheduled to take place on Saturdays 1300-1900. The following may be considered: <ul style="list-style-type: none"> <li>▪ Reduce number of construction activities occurring simultaneously</li> </ul>	TMP within CDMS, to be agreed with DfI Roads and CC & G BC prior to construction and implemented during construction.

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<ul style="list-style-type: none"> <li>▪ Restrict distance of construction activities from identified properties or</li> <li>▪ Reduce construction traffic as required.</li> <li>▪</li> </ul>	
Traffic and Transport	Impact on other road users	<p>A Traffic Management Plan (TMP) will be prepared by the Applicant in accordance with the requirements of Department of Infrastructure - Roads, CC &amp; G BC, the local PSNI, and if required, any other relevant stakeholders. Features of the TMP will include:</p> <ul style="list-style-type: none"> <li>▪ Details of the access route, conformation of any points along the access route that require engineering works, details of traffic numbers, delivery timings, and signage and escort requirements;</li> <li>▪ A delivery schedule for normal and abnormal loads so as to minimise disruption as far as reasonably practicable;</li> <li>▪ Details of how any movements will comply with legislation regarding the movement of abnormal loads e.g. notice procedures and notice periods;</li> <li>▪ Details on the use of escorts where required. Where long vehicles and abnormal loads would have to use the wrong side of the carriageway or need to swing into the path of oncoming vehicles a lead warning vehicle would be used. One escort vehicle would drive ahead and pull oncoming traffic into identified passing places. An escort vehicle would travel directly in front of the convoy and pull over any oncoming traffic that comes onto the road after the first escort vehicle has passed. A further convoy escort vehicle would follow the convoy; and</li> <li>▪ Information about marking of vehicles as long/abnormal loads.</li> </ul>	TMP within CDMS, to be agreed with DfI Roads and CC & G BC prior to construction and implemented during construction.

ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		<ul style="list-style-type: none"> <li>▪ Information on how warning signs will be used</li> <li>▪ The TMP will include plans for notifying relevant stakeholders in advance of delivery periods, including the emergency services, Transport NI, local residents, local business, local services and schools.</li> </ul>	
		<p>A video survey of the pre-construction condition of all public roads will be recorded around the site entrances and access routes (but including the site entrance and immediate access roads), to provide a baseline record of the state of the roads prior to construction work commencing. This will enable any repairs and maintenance work required to the relevant road due to any damage caused by the passing of heavy vehicles associated with the wind farm construction to be identified following the construction phase. The roads will be returned, at minimum, to the baseline condition at the end of the construction phase. Any damage caused by wind farm traffic during the construction period, which would be hazardous to public traffic, will be repaired immediately. These works will be carried out under permits with DfI Roads, as appropriate.</p>	<p>CDMS, to be agreed with CC &amp; G BC prior to construction and implemented during construction.</p>
		<p>The local community will be informed prior to the commencement of construction and prior to the commencement of turbine deliveries by letter and through local press. The contact details of the Construction Site Manager will be made available as a contact point for enquiries. Local schools on the delivery routes will be contacted to identify school and nursery drop-off and pick up locations and times. Construction deliveries will be scheduled to avoid these busy periods as far as reasonably possible.</p>	<p>TMP within CDMS, to be agreed with CC &amp; G BC prior to construction and implemented during construction.</p>
	<p>Impact on breeding birds</p>	<p>If cutting or removal of hedges and trees is required then this should be done outside the bird breeding season (1st March to 31st August). If work is to be done during the breeding season</p>	<p>CDMS, to be agreed with CC &amp; G BC prior to construction and implemented during construction.</p>



ES Section	Potential Effect	Mitigation Proposed	Means of Implementation and timing
		then there should be a survey to establish whether nesting birds are present.	
Shadow Flicker	Material reduction to residential amenity	Mitigation measures can be incorporated into the operation of the wind farm to reduce the instance of shadow flicker. Mitigation measures range from planting tree belts between the affected dwelling and the responsible turbine(s) or installing blinds at the affected dwellings. When there is extreme nuisance, mitigation could be to the extreme of shutting down individual turbines during periods when shadow flicker could theoretically occur.	By Condition









**Safety and Environmental Requirements for Contractors on all  
activities (RSWP 005)**



### Revision History

Issue	Date	Nature and Location of Change
1-13		Previous revision histories to this document can be found in revision 13
14	12/09/15	Document completely redrafted as part of lean review/ FFF process, to incorporate previous departmental 'Safety Requirements' versions and Environmental Requirements of Contractors document. Reviewed extensively by all the UK Geographic Business Units during this process and this document now replaces; RSWP 011 Safety Responsibilities of Contractors Construction (Eire) 01059R00039 RSWP 022 Responsibilities of Contractors Working on RES Offices 01059-000095 RSWP 027 Safety Requirements of Contractors Generation 01059-00065 RSWP 031 Safety Requirements of Contractors Development 01059-001264 Environmental Requirements of Contractors 01226R00016
15	19/08/16	Document title changed by removing RWSP 005 from start and putting at end; Safety & Environmental Requirements for Contractors on all activities (RSWP 005)

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## 1 PURPOSE

The purpose of this document is to promote; Health, Safety, Environment, Safety Leadership and Sustainability of our Contractors, Consultants, RES employees and the general public by setting out the minimum expectations when working on RES managed contracts.

This document shall be supplied to all Contractors and Consultants tendering for any contracts relating to works or services on any RES site or office, it shall be read carefully and its receipt acknowledged in writing in connection with a specific Contract. No variation shall be permitted without the express permission of the appropriate RES Manager responsible for the works / services; eg. Project Manager, Construction Site Manager, Asset / Site Manager or Office / Facilities Manager, etc.

This document shall be read in conjunction with the relevant Health and Safety (& Environmental - where applicable) Plan for the location of the works.

## 2 SCOPE

It should be noted that this document and the References quoted below **do not** cover all possible site activities and it therefore remains the Contractor's / Consultant's responsibility to ensure that their works are carried out in a safe and environmentally responsible manner which complies with **ALL relevant legislation current at that time**. All work activities with significant risks are to be covered by an appropriate written risk assessment and work instruction / method statement that has been reviewed by the appropriate RES Manager prior to works commencing.

## 3 RESPONSIBILITIES & REQUIREMENTS

Contractors & Consultants shall comply with all relevant requirements appertaining to their contracted works. Throughout this document any references to Contractor(s) shall also apply equally to Consultant(s) and whilst RES are not typically identified, this does not absolve RES employees from following the same site rules and requirements as our Contractors or Consultants. Where specific training requirements or qualifications are required, Contractors may provide evidence of alternative training subject to it being equivalent to / better than, the RES defined minimum requirements.

## 4 RES RESPONSIBILITIES

### 4.1 Controlling Documentation

RES shall provide the Health, Safety & Environmental Plan (Pre-tender and construction phase), Project Quality Plan and Site Waste Management Plan. RES shall review all Safe Systems of Work for **all significant risk** activities; including Risk Assessments, Method Statements and Permits to Work - **work will not be permitted without these being in place**. HV Electrical cable and system isolations and documentation shall be controlled through RES Senior Authorised Person (SAP) or RES nominated SAP.

RES shall audit all aspects of the management of health, safety, quality and environment on site and may carry out appropriate surveys, inspections, tours and sampling at any time. RES may carry out their own accident investigation if deemed necessary to ensure that correct preventative measures are put in place.

## 4.2 On Site Responsibilities

Safety requirements & rules shall be displayed on site and readily available for all employees to see. RES shall provide the RES site induction or RES on-line induction (to be advised by RES) prior to visiting, starting works & at refresher intervals and provide support to those who have difficulty with the English language to ensure that all site attendees can demonstrate that they understand the site rules & instructions.

RES shall provide prompt information that could affect health & safety of workers, and/or other 3rd parties, members of the public, ensuring adequate steps to prevent harm to livestock on site, maintenance of site fencing, boundaries & keeping gates closed.

RES shall facilitate agreements on interface responsibilities between other parties - within procedures and appropriate documentation controls, including regular meetings / liaison with RES staff, employees and other contractors to identify and discuss hazards with work activities and how they could affect others.

Unaccompanied site visits will be at the discretion of the RES Site Manager. First Aid facilities and provision of first aid is the responsibility of the contractor unless agreed otherwise, RES facilities will be available for use in case of emergency.

## 4.3 Wildlife

RES Site Manager shall inform Contractors of any constraints or work time restrictions due to the protection of wild life, i.e. nesting sites, habitat issues. If unexpected wildlife is encountered during work activities, i.e. bird nest / badger sett etc, work is to be temporarily suspended and the Site Manager informed. No work shall take place until clearance has been given by RES to resume.

# 5 CONTRACTOR / CONSULTANT RESPONSIBILITIES & REQUIREMENTS

## 5.1 Controlling Documentation

Contractors shall provide the Health & Safety management & site controls applicable to employees, visitors, third parties, Quality management & associated documentation for services, equipment, materials, products, Environmental management & associated documentation for services, equipment, materials, products. Contractors shall conform to the Project; Health, Safety (& Environmental) Plan, Quality Plan and Site Waste Management Plan. Contractors shall provide the Inspection & Test Plan appropriate for their works and any associated documentation required to support conformance to contract specification.

Safe Systems of Work for all **significant risk** activities shall be provided, including; Risk Assessments, Method Statements and Permits to Work - **work will not be permitted without these being in place.**

## 5.2 On Site Responsibilities

Safety requirements & rules shall be displayed on site and be readily available for all employees to see, with delivery of toolbox talk records provided to RES. Contractors shall ensure that all site attendees complete a RES site induction or have undertaken a RES on-line induction (to be advised by RES) prior to visiting, starting works & at refresher intervals - including provision of support to those who have difficulty with the English language; everyone attending site must demonstrate that they understand the site rules & instructions. Contractors shall provide safety training & skills competency records (nationally recognised training bodies) - including matrix of training requirements and supporting certificates, CITB cards etc for all employees.

Contractors shall provide communication devices for contact and emergencies; to suit site requirements (mobile phone signals may not work), provision of prompt information that could affect health & safety of workers, and/or other 3rd parties, members of the public.

Implementing adequate steps to prevent harm to livestock on site, maintenance of site fencing, boundaries & keeping gates closed. A fencing & gates / gated scheme **shall** be developed and agreed with the landowner, including location, temporary or permanent. Agreeing interface responsibilities between other parties, defining within procedures and appropriate documentation controls.

Undertake regular meetings / liaison with RES staff, employees and other contractors to identify and discuss hazards with work activities and how they could affect others. Agreement to start works on site is through the consent of the RES Site Manager. When required, work instructions and risk assessments are to be provided to all employees undertaking the work who fully understand and agree with the requirements. Keep adequate records for site works including nature of work, duration, etc and making available to RES as required.

Visitors to be accompanied on site **at all times** by a fully inducted employee, (visitors shall receive a full induction if visiting site more than once and unaccompanied site visits shall be at the discretion of the Site Manager).

Contractors shall appoint a Competent Safety Representative (responsible for all safety issues for their company inc. electrical safety rules if applicable) and Site Supervisor(s) normally (black coloured hard hat required on construction sites) trained to nationally recognised standards, E.g. SSSTS, IOSH Managing Safely, Black / Gold CITB Card.

## 5.3 Site Accommodation

Temporary electrical systems are to be designed, inspected & tested by the Contractor, who shall provide the forms of Completion, Inspection & Testing required by the Wiring Regulations BS7671. Housekeeping relating to accommodation, storage and vehicles is to be of a high standard including regular cleaning. Areas for storage of plant, equipment, materials along with rules for use and access are to be in agreement with / designated on site by the RES Site Manager - Contractor shall provide all details of site requirements and what is being used on site (including any reinstatement of area after use).



All access tracks and entry routes are to be kept free of obstacles and well maintained - this includes controlling dust. Petrol or diesel engine plant is not to be used within buildings unless exhaust gases are piped to open air or an alternative approved. LPG is only to be used in accordance with legislation.

#### 5.4 Site Security

Contractors **shall** use designated means of access and egress on the site, daily site records of employees **shall** be collected to aid security in the event of a fire or other emergency. Where security is used on site it **shall** be the duty of the gate / guard person to ensure vehicles and people are logged and have undergone induction.

#### 5.5 Safety Audit(s)

Contractors shall make available all information and records as required by an auditor in the undertaking of their activities. The Contractor **shall** co-operate at all times in the undertaking of such health, safety, quality or environmental related audits and follow up actions. The Contractor **shall** undertake their own audits and inspections as agreed by both parties. Any actions identified from the audits shall be planned, communicated and agreed to rectify the issue(s).

#### 5.6 Alcohol, Drugs & Smoking

The supply and consumption of alcohol & drugs is **prohibited** on site. Any misbehaviour at work such as; being under the influence of alcohol or drugs, shall be classed as gross industrial misconduct. Accident investigation on site may require the need for alcohol or drug tests to be undertaken by the employer.

Any person prescribed medication by their GP must be fit for work. The Site Manager needs to be informed of such instances and arrangements made for storage of their medication on site. A record of their capability for work may also be required.

#### 5.7 First Aid

First aid facilities and provision of first aid is the responsibility of the contractor unless agreed otherwise. All First Aid treatments must be reported and logged, no matter how small. Notification of first aid arrangements **shall** be displayed and employees and other 3<sup>rd</sup> parties **shall** be informed of the arrangements.

#### 5.8 Accident Reporting & Investigation

All accidents **shall** be reported and recorded in their company and the RES site accident book / recording system. The RES Site Manager **shall** be informed of all accidents, incident and near misses. The RES accident procedure shall be followed. Any notifiable accidents, specified injuries or conditions, or dangerous occurrences which are reported by the contractor under RIDDOR regulations, **shall** be reported without delay to the RES Site Manager.

The Contractor **must** encourage near miss incident and hazard reporting, active recognition and reporting is a key function in Safety Leadership and a mandatory responsibility of everyone on site. The Contractor's Health and Safety Advisor is to carry out a full investigation of all accidents and issue a report to RES.

## 5.9 Lone Working

A risk assessment **shall** be produced to determine the risks of lone working and to mitigate any risks - lone working should be avoided where possible. Where persons are required to work alone, i.e. surveys, a lone working procedure shall be in place and communicated to all parties. The procedure shall be agreed with the Site / Project Manager.

## 5.10 Excavations, Barriers & Existing Underground Services

No mechanical excavation work shall take place within one metre of live High Voltage Cables, nor within 500mm of any known live utility services. Contractors shall provide early notice of their intended work near live services, confirming location of underground services and preparing safety document controls, barriers around all opening, trenches, excavations to prevent access into the areas.

Permission to remove / open mesh, coverings, gratings shall be obtained and removed items are to be replaced as soon as possible. Report any broken or damaged gratings etc and put in place controls to prevent any risk of injury etc. Provide all shoring and support to excavations to prevent collapse as per HSG 150.

Excavated materials not suitable for backfill are to be disposed of in accordance with the Site Spoil Management Plan. Drilling, spikes or posts are to not to be driven into the ground without a permit to break ground as issued by the Site Manager.

There must be no alterations to any RES supplied barriers, screens or notices. Warning lights and reflective surfaces **shall** be placed on barriers around excavation works. Inspection reports are to **be** undertaken **prior** to entry of excavations, upon completion of shuttering and after additional works, alterations or dismantling as per HSE CIS 47. Weekly inspections are required and **evidence** submitted to RES. Excavation tags to be positioned at all **access/egress** points to all excavations and be updated at each inspection.

Segregation of plant and pedestrians shall be maintained; barriers are to be installed at access points and within excavation, along with appropriate signage. Stop blocks to be used with reversing of vehicles up to an excavation.

Pumps to be used to remove water from excavations shall be regularly inspected for stability; pumped water, whether ground or rain is not to be pumped into a watercourse or drain, water is to be managed in accordance with the site drainage plan (typically settlement lagoons).

## 5.11 Lifting Operations - Mobile cranes or similar type of equipment & lifting accessories

All lifting operations shall be managed in accordance with BS 7121; which shall include preparation of: risk assessment, method statement and lifting plan; and shall be agreed by all parties prior to works taking place. The lifting plan shall cover crane mobilisation, assembly and travel on site as well as any unloading and lifting activities. All crane movements on site are subject to 'Permit for Movement of Heavy Plant'.

All lifting equipment shall be fully certified and in date; copies of all certification and inspection reports shall be provided to RES prior to the works taking place. Safe Working Load (SWL) shall be clearly marked on all lifting equipment and ancillaries, along with test date. Structural steelwork shall not be used for lifting point or anchorage without

agreement of RES (only permitted in exceptional circumstance and has been subject to structural review - Structural Engineer report required).

All temporary points for attachment to be load tested prior to use and record of test provided to RES, method of testing to be agreed. All testing shall be undertaken by an approved Test Engineer to British standards; approved on Lifting Equipment Engineers Association (LEEA) or similar organisation. Persons are not allowed to ride on a hoist unless it has been designed to carry passengers and fitted with interlock gates / safety devices. All persons operating hoists are to be fully trained and have recorded evidence of training to a national recognised standard.

RES lifting operations checklist shall be used unless contractor has their own approved requirements. All crane lifts shall be planned by a competent Appointed Person (AP), an approved Crane Supervisor **MUST** be on site if the AP is not able to monitor the lifting. Lifting plans including method statement / risk assessment shall be reviewed by RES.

### 5.12 Scaffolding / Ladders

Only competent and fully trained persons **shall** be used to erect, dismantle and modify/alter and inspect scaffolding (CISRS - tube & clip, PASMA - system). All scaffolding **must** display an in date SCAFFTAG or similar signage tag at point of access detailing scaffold status. All scaffolding **shall** be designed, erected, maintained, examined and recorded for the type of scaffold used - where necessary scaffold should be earthed.

All trained scaffold erectors **shall** wear securely attached safety harnesses connected to suitably tested fixed points as appropriate to risk assessment requirements. Scaffold boards **shall** be clamped into place wherever possible; any gaps in scaffold boards **shall** be covered with an appropriate secured material strong enough for the application and activity. Scaffolding **shall** be redesigned for all work activities, adjusted and inspected prior to use for each phase of work, scaffolding is not to be used until it has been cleared for the work activity.

Permission to use a scaffold erected by others must be obtained from the Site Manager and only after an inspection has been carried out. Incomplete and unsafe scaffolding **must** not be used and appropriate measures shall be put in place to prevent usage and when site is unattended access routes to scaffold to be removed to stop persons climbing scaffold.

All ladders used on site **shall** be in good condition and have a system of regular inspection; register to be kept on site. Metal ladders **shall** not be used in the vicinity of electrical equipment or scaffold.

Scaffold inspections **shall** be carried out by a competent person before use and then weekly (7 Days). Inspections will also need to be carried out following any modification or alteration to scaffolding; reports to be provided to RES weekly.

### 5.13 Work at Height

Any work at height or below ground level activity, **shall** require a method statement & risk assessment and be reviewed by RES prior to starting the work. A safe access & safe work place **shall** be provided via use of crawling boards, ladders, barriers, handrails, toe boards, edge protection as applicable. All materials **shall** be prevented from falling.

Warning notices shall be displayed, along with exclusion zones at all levels, access routes etc.

The Work at Height hierarchy; Avoid, Prevent, Minimise should be implemented; 'collective' protection methods shall take priority to individual personal protection, with fall arrest equipment only being used if all other forms of protection cannot be achieved.

If Fall Arrest is to be used, persons must be fully trained in its use; it shall be inspected before / during use and have appropriate tested attachments; relevant records of equipment tests / dates to be provided. 100% attachment of the equipment is required during working at height, including double lanyards or other fall arrest equipment if collective measures are not implemented, method statement shall include Emergency Plans to rescue a suspended casualty. The Contractor shall inspect all equipment to ensure compatibility between each item being used.

MEWPS, mobile scaffold, podium steps **shall** be used where possible, ladders shall only be used for short duration low risk work, for no more than 30 minutes and only where stability can be achieved.

#### 5.14 Risk & Environmental Controls

Contractors shall identify all potential environmental risks and report to the Site Manager, inform all employees of the site environmental rules and inform RES of environmental incident or potential incident as soon as practicable. Provision of information to RES for carbon counting / sustainability targets and records, typically: vehicles on site, mileage covered, fuel used (site equipment), materials used, visitors and travel details, etc.

#### 5.15 Environmental Plan

Contractors will be required to provide relevant documentation for inclusion into the RES Environmental Plan when applicable, all contractors are to comply with the RES Environmental Plan at all times.

#### 5.16 Existing Features (Sites)

Any disturbance, remediation or disposal of contaminated land shall only be carried out under the direction of RES and in accordance with the Health, Safety (and Environmental) Plan, areas of contaminated land **shall** be fenced off and all persons made aware of its location and hazardous nature. Where any unexpected or potential hazardous obstacles are encountered, work **shall** cease until specialist advice has been obtained.

Underground services **shall** be identified in the site Health, Safety (and Environmental) Plan and controls put in place for the works to be undertaken, i.e. permit to work, risk assessment, etc. If poor conditions of underground services are found after exposure, this is to be reported to RES and the relevant authority.

Any old containers found on site should be checked and emptied by a licensed waste carrier before removal. Pollution is often caused through vandalism, theft or fly tipping - the site or working area **shall** be protected by fencing and locked access to discourage unauthorised access. Any instances of tipping on site **shall** be reported to the Site Manager.

### 5.17 Discharges to Water

All employees **shall** be made aware of the following:

- Rules about discharges to drains from spillage
- Refuelling / storage controls to be in place & location to be away from surface drains (minimum 10m distance)
- Use of bunded areas / bunds, double skinned bowsers for storing of fuels, liquids etc - to be checked weekly
- Management of any / all spills, spill kits, informing Site Manager etc (included in risk assessment)
- Discharge of any fuel, chemicals, silt, etc to a drain or water course is forbidden. Ensure that a suitable method for containing any surface water is provided when working near to a watercourse
- Surface water drains should only carry uncontaminated rain water and shall be protected from any other contaminants  
Methods for prevention of pollution to water courses shall be regularly checked and maintained - failing of systems should be reported immediately to RES.

### 5.18 Hazardous Substances (COSHH)

Contractor shall provide a list of substances, liquids, gases, etc to be used on site or with their work activities, along with quantities to be stored in secure storage containers, clearly labelled with legible warning signs and content details. MSDS & COSHH Risk Assessment & register and controls in place, including emergency plans.

As defined by COSHH Risk Assessment, spill kits are to be located near any hazardous liquids or substances either at point of use or storage area. Emergency procedures and associated equipment shall be provided - 'Kelp' bio-remediation solution shall be provided for early treatment of any spills after initial clean up.

Generators **shall** be provided with an internal bund and external fuel tank with fuel cut off float switch, the refuelling area shall be kept empty of water (covered area or inceptor/full retention separator).

Bowsers are to be stored to minimise risk of collision, run-away and vandalism, with a flexible pipe, tap or valve provided with an appropriate lock for security when not in use. Flexibly delivery pipes for use with refuelling must be fitted with manually operated pumps or a valve that closes automatically when not in use (delivery end).

Fuel type and capacity shall be displayed, along with no smoking signs and close valve when not in use signs, etc. A responsible person **shall** supervise deliveries, check tank quantities and emptying of tank and residues for safe disposal elsewhere.

Switch gear containing SF<sub>6</sub> (Sulphur Hexafluoride) **shall** be labelled on the equipment and substation door, along with contractor details and any leak **shall** be reported to the Site Manager and acted upon following the emergency contamination spill procedure.

### 5.19 Waste Management

Waste management **shall** follow the waste hierarchy of: Prevent, Reduce, Re-use, Re-cycle, Other recovery before disposal, all wastes shall be stored and segregated at designated disposal points away from watercourses and potential risk areas (cleared from work area as it is accumulated).



All personnel are to prevent litter from being blown around the site by disposing of rubbish responsibly. Skips must be covered to prevent refuse blowing away and rainwater accumulation. Skips to be replaced when full and disposal shall be in accordance with statutory requirements and RES Site Waste Management Plan, Contractors shall provide appropriate waste documentation.

### 5.20 Earthworks

Contractors shall work to the site drainage / SuDS design statement for the site. Appropriate drainage / SuDS management methods shall be agreed with the Site Manager where no Construction Method Statement is present.

Contractors shall make best endeavours to prevent water becoming contaminated at the place of work, activity area and to prevent build up of silt; shall use methods of work that eliminate or reduce workings in channels and do not contaminate surface water. Water containing silt **shall** not be discharged directly into rivers, streams or surface water drains. If silty water does occur and present a hazard, suitable treatment will be required - details of controls to be presented to the Site Manager.

Contractor shall prevent water from entering excavations, any cut-off ditches, well point de-watering or pumping shall be in accordance with the site drainage plan. Disturbance to flora and fauna whilst carrying out works **shall** be kept to the minimum and agreed with the Site Manager.

Topsoil and vegetation (not part of subsoil) **shall** be retained and stored in accordance with the Site Spoil Management Plan and reinstated on all areas of stripped ground as soon as possible to prevent erosion and leaching.

Where wet and marshy ground occurs, excavated materials may need to be stored on a geotextile. Turf shall be reinstated wherever possible to maintain the original species mix. Exposed ground and stockpiles / storage shall be kept to the minimum to prevent silt and dust build up, whilst long term storage shall be controlled and stockpiles seeded with recovered seed, covered and silt fences constructed from geotextile where required. In dry weather dust suppression controls will be required to eliminate at source, e.g. watering.

Environmental Agency guidance shall be used as guidance in control measure for works and maintenance in or near water.

### 5.21 Road Cleanliness

Site roads to be brushed or scraped as required to minimise mud and dust deposits, especially at site entrances and watercourse crossings; mechanical suction brush may be necessary. Wheel wash stations may be required to mitigate debris going onto public highways, private roads or accesses. Used water shall be collected and passed through a silt trap before disposal.

### 5.22 Drip Trays

Where practicable, drip trays shall be used to contain absorbent granules, sheets or fibres and disposed of to site rules. Once used, drip trays shall be cleaned using

appropriate materials and disposed of in accordance with COSHH regulations. Regular checks and cleaning of drip trays to be carried out.

### 5.23 Concrete

All concrete disposal shall be as set out in the Site Waste Management Plan (SWMP) when in place or responsibly and in accordance with legislation when no SWMP in place. Cement and wash out water is not to enter any watercourse or aquifer; wash out of cement vehicles **shall** only be permitted in a designated and suitable prepared wash out area(s), clearly signed and to the satisfaction of the RES Site Manager.

Tools, equipment or materials shall not be washed in watercourses, mortar mixing and storage shall be clear of any watercourses. Any concrete works near to a watercourse shall be approved by the appropriate agency and the RES Site Manager.

### 5.24 Wildlife

Wildlife **shall** be protected from entering and becoming trapped in any part of the works on site. For excavations this may mean provision of fences, crossing or escape routes. Due consideration shall be given to hazards presented to personnel from wildlife; adders, wild boar, buzzards, wasps etc.

### 5.25 Emergencies

Environmental emergencies such as spills **shall** be dealt with in accordance with the Environmental Emergency Response Plan - familiarisation with this plan is required before commencement of any works. Any spill kit provided **shall** be made accessible at all times to all site staff.

### 5.26 Environmental Assessment

Contractor shall provide an assessment of the likely environmental impacts of their activities (if applicable), along with controls to minimise impact and any corrective measures and actions.

## 6 APPENDICES

Appendix 1 - References

Appendix 2 - Issue / Receipt for Safety and Environmental Requirements for Contractors on all activities

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## Appendix 1 - RES References

The following documents may contain useful references.

### *App 1.1 RES Documents*

- i) RES Health, Safety, Quality & Environmental Management Systems, and associated documentation including all IMS, Safety Procedures, RAWP and documents and templates

### *App 1.2 Project Specific Documents*

- i) The Health, Safety & Environment Plan (Pre-tender and construction phase)
- ii) Health & Safety Plan
- iii) Quality Plan
- iv) Environmental Plan
- v) Inspection and Test Plan
- vi) Site Waste Management Plan



Appendix 2 - Issue / Receipt for Issue / Receipt for Safety and Environmental Requirements for Contractors on all activities

SAFETY & ENVIRONMENTAL REQUIREMENTS FOR ALL CONTRACTORS

ISSUE DOCUMENT

Issued to .....

Contract Number and Description  
.....

.....  
...

.....  
...

Location  
.....

The person named below is the Company Project Manager responsible for overall management of the contract.

Project Manager ..... Telephone  
.....

The person named below is the Company Site / Facilities Manager responsible for local management of the contract, who shall be permanently on Location.

Site Manager ..... Mobile  
.....

Other Site Telephones  
.....

The Site Manager shall always be the first point of contact, if for any reason, he is not available you shall contact the Company Project Manager.

The Company Integrated Management System and Site Rules are available / displayed at:  
.....  
.



**SAFETY & ENVIRONMENTAL REQUIREMENTS FOR ALL CONTRACTORS**

**RECEIPT DOCUMENT**

**RENEWABLE ENERGY SYSTEMS COPY**

(To be detached and retained by the Site Manager when this document is issued to a Contractor on site)

I acknowledge receipt of the safe works procedure - Safety & Environmental Requirements for All Contractors.

Contract Number and Description

.....

.....

...

.....

..

Location

.....

Signed .....

Contracting Company

.....

Date .....

Contracting Company Head Office Telephone

.....

Local/site Telephone Number .....









## **Emergency Procedure in the Event of a Contaminant Spillage**

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## 1.0 OBJECTIVES

This procedure details the emergency procedure to be followed and actions to be taken in the event of a hazardous waste spillage such as oil, fuel and chemicals, occurring on a RES managed premises or site / project in order that the environmental impacts that may be associated with a hazardous waste spillage may be mitigated.

## 2.0 SCOPE

This procedure covers all UK geographic locations; sites, project or offices for which RES are responsible for or manage.

## 3.0 PROCEDURE

### 3.1 *Project, Site or Office Locations*

		<b>Responsibility</b>
i)	<p>The Contractor shall provide MSDS and COSHH assessments for all substances controlled under COSHH that are to be used or stored on the site.</p> <p>Records of the supplied MSDS &amp; CoSHH Assessments shall be maintained.</p> <p>Note: Substances with hazardous properties such as cement, concrete and curing agents are all controlled by the COSHH.</p>	<b>C</b>
ii)	<p>Appropriately sized spill kits shall be provided for the controlled substances that will be used or stored on the site; the contractor shall train personnel in the use of these spill kits and maintain training records.</p>	<b>C</b> <b>RRM</b>
iii)	<p>The Contractor shall provide oil spill training and awareness to their staff</p> <p>RES have subscribed to an emergency environmental call-off support service from Veolia to be used the event of a major spill, details included in Project Directory or can be provided by the HSQEM.</p>	<b>C,</b> <b>HSQEM</b>
iv)	<p>In the event of a liquid spill occurring the Contractor shall cease work in the vicinity immediately.</p> <p>If spillage is flammable, extinguish all ignition sources.</p> <p>Identify source of pollution and rectify the problem.</p> <p>The Contractor's trained personnel shall immediately deploy the spill kit in accordance with the manufacturer's instructions.</p> <p>Contractor's personnel shall don appropriate PPE and clean up the spill.</p> <p>All used spill kit materials should be disposed of in the proper manner.</p>	<b>C</b>



v)	<p>In the event of a concrete spillage into water channel or surface water, as the waste is highly alkaline it is regarded as Hazardous Waste. Every effort should be made to contain the movement of the liquid cement in the watercourse or drainage channel.</p> <p>Similarly in the event of a Peat / Spoil Movement / Slip into a water course; remove any peat or clay material which has entered the watercourse and transport to a location where it will no longer be a source of pollution.</p> <p>Notify the following agencies; Environmental Agency (region specific; EA, SEPA or NIEA etc), local Fisheries.</p>	<b>RRM, C</b>
vi)	<p>Place geotextile silt fences/stone barrages at downstream points in the river as required.</p> <p>Constant monitoring should be maintained not only of the water quality (clarity) downstream of the check dams, but also of the excavated peat or clay material.</p> <p>Consideration should also be given to the subsequent movement of the spoil / peat and any preventative / containment measures required.</p>	<b>RRM</b>
vii)	The Contractor shall inform the RRM of the incident as soon as possible and certainly no more than 1 hour after the spill.	<b>C</b>
viii)	The Contractor is responsible for replacing the used spill kits as soon as possible and no later than 24 hours after use.	<b>C</b>
ix)	The Contractor is responsible for ensuring that used spill kits and any other oil / fuel soaked / contaminated material e.g. rags, used during the incident are disposed of in accordance with the Environmental Waste Management Regulations in operation. These materials shall be bagged up, and disposed of at a licensed hazardous waste disposal site e.g. taken away by a licensed oil / fuel disposal / broker company.	<b>C</b>
x)	The Contractor shall submit copies of the receipt or waste oil certificate to the RRM within 48 hours.	<b>C</b>

#### 4.0 REFERENCE DOCUMENTS

- i) IMS 20 – Emergency Incident Preparedness and Response [HSQE00-001043](#)

#### 5.0 DEFINITIONS

<b>Abbreviation or term</b>	<b>Explanation of abbreviation or term</b>
i) C	Contractor: Any company or person employed by RES to carry out any work on a site / project or office location
ii) COSHH	Control of Substance Hazardous to Health Regulations 2011
iii) H&S Plan	Health and Safety File maintained by the Site Manager
iv) HSQE	Health, Safety, Quality & Environment
v) HSQEM	HSQE Manager (Head of HSQE)
vi) MSDS	Material Safety Data Sheet supplied by manufacturer
viii) RRM	Responsible RES Manager (Construction Site – Construction Site Manager, Generation Site – Site / Asset Manager, Office Locations – Office Manager)



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ANNEX 7: WATER QUALITY MONITORING PLAN.....20







## Water Quality Monitoring Procedure

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## 1 INTRODUCTION

Res Construction Ltd. Will appoint a suitably qualified consultant to provide water quality monitoring services for the wind farm. The following contains information regarding the proposed procedure, testing regime and legislation to be employed.

## 2 PROCEDURAL APPROACH

### *Legislation*

The key primary legislation currently enforced by the different Environmental body to protect the quality of water is:

Northern Ireland Environment Agency (NIEA)

- The Industrial Pollution Control (NI) Order 1997;
- The Waste and Contaminated Land (NI) Order 1997 (partially enacted); and
- The Waste Order (NI) 1999

A series of Regulations (secondary legislation) are also relevant including (among others) 'The Surface Waters (Dangerous Substances) Regulations (NI) 1998' and the 'Groundwater Regulations (NI) 1998'.

Any surface water or groundwater (where feasible whose catchment lies wholly or partially within the Wind Farm boundary will therefore be considered to be a 'controlled water' with respect to this water quality monitoring programme.

Controlled water covers all tidal rivers, all freshwater rivers, all lakes and ponds and any water contaminated in underground strata.

### *Strategy*

During construction works carried out at the wind farm site, there is potential for contamination, emanating from construction plant or materials to enter the controlled surface and groundwaters either by direct runoff, leaching or infiltration. Consequently, it will be necessary to monitor the concentrations of certain key contaminants (refer to section - "Sample Testing" for full list) at key locations throughout the wind farm site with due regard to the relevant 'Pollution Prevention Guidelines' prepared by NIEA; specifically PPG5 ('Works liable to affect watercourses') and PPG6 ('Working at Construction and Demolition sites'). These sampling points will represent a selection of relevant watercourses and available wells.

The exact location of each sampling point will be determined during a walkover survey to be conducted as part of a hydrological desk study. The location of the sample points will reflect the point on all relevant controlled waters closest to the proposed active construction areas. Sampling points up-stream and down-stream of the construction activity area should also be selected to provide a full profile of the controlled waters.

Early consultation with the Environmental Water Quality Officer is recommended to discuss what the most sensitive features are and understand exactly what they would expect from the monitoring. This also provides an opportunity for the developers to demonstrate diligence and build a relationship in the case of future problems,

### ***Sampling Strategy***

Site sensitivity must be taken into account when deciding on the level and periodicity of sampling that is to be undertaken, sensitive sites/ areas are normally defined by the NIEA, therefore, close co-operation with the NIEA is advisable to ensure that any planned monitoring/ sampling will fulfil or obligations and meet their requirements. As considerable costs may be incurred with a prolonged testing regime the site sensitivity is crucial in identifying which sites may need the additional monitoring. A sensitive site may well require a monitoring programme to be initiated to establish the baseline conditions whereas a non-sensitive site may well find that an initial sampling visit, carried out prior to commencement of site construction mobilization and activity, is suffice to establish a baseline water quality data set.

### ***Non- Sensitive Testing;***

An initial sampling visit, carried out prior to commencement of site construction mobilization and activity, is normally sufficient to establish the baseline water quality data set. Ongoing monitoring will be carried out during the construction phases then a post-construction sampling visit will be carried out following the cessation of all construction work and demobilization. Post-construction testing must reflect the needs of the site and replicate what testing was undertaken prior to construction.

The following table summarises the proposed frequency of the ongoing water quality monitoring requirement for non-sensitive sites:

<b>Construction Phase</b>	<b>Frequency</b>
Civil Works	Monthly
Turbine Erection	Bi-Monthly

### ***Sensitive Site Testing***

Sensitive sites may require a monitoring programme to be carried out as 4 or 5 visits over an 8 to 10 week period, ideally covering at least one high rainfall event. As water quality conditions can change quickly in response to natural conditions, this programme of monitoring will provide additional information during high flows, e.g. when there may be more suspended sediment, and may provide extra data to project developers liability. Ongoing monitoring will be carried out during construction phases and the a post-construction sampling visit will be carried out following cessation of all construction work and demobilization. Again this post-construction testing must reflect the needs of the site and replicate what testing was undertaken prior to construction.

Data from the ongoing and post-construction surveys will be compared to the baseline data to check for any anomalies or changes to the water quality.

In the event that an incident (such as fuel spillage or spoil slip) occurs, that potentially effects site groundwater or surface watercourses, or there is justifiable cause for concern, a targeted programme of sampling will be implemented to assess the impact and determine ongoing water quality.

It is essential that an ongoing dialogue is maintained with NIEA to ensure that the monitoring regime is suffice to ensure that any planning conditions are not compromised.

### ***Sampling Procedure***

The protocol followed at each sample point will comprise:

- i. All samples will be collected by a suitably experienced consultant.
- ii. All sample containers used will be fully compatible with the intended analysis as agreed with the accredited laboratory.
- iii. All containers will be provided by the laboratory and comprise 1 x 2000ml plastic bottle and 1 x 500ml amber jar.
- iv. All containers will be sterilised and sealed by the laboratory prior to delivery.
- v. All containers will be clearly labelled on site with water resistant labels.
- vi. Rain water samples will be collected at a distance as far from the bank as practicable. If it is necessary for the sampler to stand in the river the container will be filled upstream of the sampler.
- vii. The sample will be taken by immersing an open mouthed vessel to a depth just below the surface to avoid surface film being sampled.
- viii. Care will be taken to avoid the disturbance of the bottom sediment close to the sampling point.
- ix. Temperature and total dissolved solids are to be measured in the field.
- x. In accordance with codes of practice:
  - a. BS5930 - Site Investigation and BS EN ISO 10175:2001 - Investigation of Potentially Contaminated Sites, groundwater from wells should be purged until consecutive readings of pH, temperature and conductivity have stabilized within 10% of each other or three times the volume of standing water within the well has been purged, to ensure a representative groundwater sample is taken.
- xi. Samples will be stored in sealed chilled cooler boxes until delivery to the laboratory
- xii. The sample name, date, weather, flow and visual description will be recorded at each point.
- xiii. A series of on-site hydro chemical analyses will be completed using portable calibrated field instruments. These will be completed with due regard to the manufacturers specification. Parameters to be analysed will include temperature, pH, Electrical conductivity (EC), Dissolved Oxygen (DO) and Oxidation/ Reduction Potential (ORP).
- xiv. The samples will be dispatched to the accredited laboratory to arrive no later than 48hrs after sampling.
- xv. Samples were accompanied with laboratory specific Chain of Custody documentation.



### ***Sample Testing***

It is proposed that the following analyses will be carried out on the water samples collected:

- Heavy metals (10 elements);
- Fuels and Oils;
- Polyaromatic Hydrocarbons (PAHs);
- Biological Oxygen Demand (BOD);
- Chemical Oxygen Demand (COD);
- pH;
- Total Suspended Solids;
- Total Dissolved Solids;
- Field Readings (observation of visible oils, electrical conductivity, dissolved oxygen, temperature, pH, and oxidation and reduction potential)

Note: Depending on the site, undertaking hydrocarbon and metal analysis may not be required for each monitoring visit. For example, if there are no known sources of metals or if construction works with the potential for hydrocarbon leaks are distant from water bodies. Additionally, turbidity analysis may be required as a precaution if construction works are undertaken that may alter the natural flow of a watercourse, e.g. pillars supporting a watercourse crossing.

### ***Reporting***

A baseline report will be prepared 2 weeks following initiation of the baseline water quality monitoring programme. This report will provide details of any contamination concentrations recorded and will be used to depict 'uncontaminated background pollution levels' for the site.

The analytical results will be compared to the most relevant Environmental Quality Standards appropriate.

Following each of the ongoing monitoring visits a brief report including a discussion of the analytical results with respect to the most relevant Environmental Quality Standards will be prepared within 2 weeks of submission to the laboratory. A series of rolling graphs if water quality results would be included in the reporting. Any environmental deterioration illustrated by the results would be highlighted.

In the event of a potential pollution incident, all relevant monitoring points will be visited and re-sampled to determine any changes relative to baseline data. A report detailing the findings will be prepared for each incident and recommendations provided for any further monitoring and/ or requisite mitigation measures.

Following completion of the construction of the wind farm, all sample points will be visited, re-sampled and analysed for the full suite of analytical parameters and a further report prepared, assessing and discussing any impacts upon water quality throughout the construction process.

All information, recovered during the monitoring process, will be collated and an assessment made regarding the impact on the surface and groundwater of the construction activities.

---

### 3 PERSONNEL & EQUIPMENT

#### *Personnel*

All personnel taking samples, analysing and reporting will be suitably qualified.

#### *Equipment*

Sample containers and cool box  
Disposable gloves  
Submersible pump or wattera pipe  
Water dip meter  
Waterproof pH and Temperature meter  
Waterproof Electrical Conductivity meter  
Waterproof ORP and Temperature meter  
Waterproof Dissolved Oxygen meter

### 4 CONSULTANT EXPERIENCE

The contractor will be appointed based upon evidence of previous relevant experience within the UK, Ireland and EC, their ability to commit appropriate resources to the project and the qualifications and competency of the personnel charged with completing the work.



# Appendix 2







## **Magheramore Traffic Management Plan**

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### Revision History

<b>Issue</b>	<b>Date</b>	<b>Author</b>	<b>Nature And Location Of Change</b>
01	13 <sup>th</sup> May 2021	Stephen McCarron	First Created

Template: Wind Farm Traffic Management Plan 01714R001660, Issue 05	Procedure: Management of Project Engineering Design <a href="#">MS01-006641</a>
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## 1 INTRODUCTION & SCOPE

### 1.1 Introduction

The principal objective of this document is to provide details of the proposed traffic management arrangements during the construction of the proposed Magheramore Wind Farm (Planning ref: LA01/2019/0922/F).

This report provides a more detailed assessment of the proposed route for the delivery of turbine components illustrated within the Environmental Statement Chapter 11 (Vol. 2). The suitability of the access route is reviewed, any necessary improvement works required on the existing road network are identified, and traffic management measures required for the transport of Abnormal Indivisible Loads (AILs) and Heavy Goods Vehicles (HGV).

### 1.2 Description of the Site

The proposed Magheramore Wind Farm is located opposite '59 Magheramore Road, Dungiven, BT47 4SW', in the townlands of Carnanbane and Magheramore.

Delivery of turbine components, known as Abnormal Indivisible Loads (AIL's), is anticipated to follow the route shown on drawing 03426D2509-01, *Turbine Delivery Route* (Environmental Statement Figure 11.1), within Appendix A.

The proposed access route for AILs from Lisahally Port has been used previously for the construction of various wind farms that have subsequently utilised the A6. From Lisahally, the route will travel onto Maydown Road and turn west onto the Clooney Road and travel west for approximately 2.5km to Crescent Link and continuing west to the Altnagelvin Roundabout before progressing east along Glenshane Road (A6) for approximately 26km, turning south on to the Feeney Road for 2.5km, progressing east on the Bangaher Road, turning left onto the Carnanbane Road and continuing south until the junction with the Magheramore Road. AIL vehicles would turn right and travel southwest until the delivery vehicle had cleared the junction before reversing northeast along the Magheramore Road for approximately 320 metres before turning left into an existing farm entrance on the Magheramore Road that will be modified to create a suitable Site Entrance.

## 2 CONSTRUCTION ACTIVITY

### 2.1 Public Highway Interface

#### 2.1.1 Highway Upgrading Works

Widening works would be required at three locations along the abnormal load delivery route, as illustrated on drawing 03426D2506-01, in Appendix A. Widening locations are the:

- To south of Banagher Road - Detail 2;
- To south of Carnanbane Road -Area 1; and
- Junction of Carnanbane Road and Magheramore Road -Detail 6;

All widening works will occur in third party land take and accordingly these works are included in the Planning Application Boundary.

Widening areas will be reinstated once turbine delivery has been undertaken. If road widenings require the removal of boundary features such as fences, trees or hedgerows, these will be reinstated at suitable locations. Reinstatement will also be applied to any street furniture which may be removed on a temporary basis. In the unlikely event that a replacement blade is required during the operational phase of the wind farm, the widenings will need to be reopened temporarily, after which they will be reinstated.

### **2.1.2 Site Entrances**

The site entrance is located on the Magheramore Road where an existing farm access is located but would be modified accordingly to accommodate AIL deliveries.

The proposed site entrance design is shown in Figure 2.8 (03426D2402-02) and has been designed in accordance with the requirements of Development Control Advice Note (DCAN) 15, 2nd Edition.

## **2.2 Wind Farm Construction**

A detailed breakdown of components and materials that will be delivered to the Wind Farm Site has been provided in Chapter 11 of the Environmental Statement.

### **2.2.1 Road and Hardstanding Construction**

On-site tracks and hard standings will be constructed of imported, crushed stone. The majority of deliveries at this stage would use tipper lorries and flatbed trucks. Plant required for the works will be delivered on low loaders.

### **2.2.2 Reinforced Concrete Foundation Construction**

Deliveries for reinforced steel are anticipated to be 1 flatbed lorry per turbine, and therefore negligible.

Ready mix concrete is anticipated to be delivered from a local batching plant on 6 or 8 wheeled 'ready-mix' concrete trucks, carrying 6 or 8 cubic meters respectively. Due to technical reasons, each part of the turbine foundation must be cast in one day in order to prevent unwanted 'cold joints' in the concrete. Consequently, there will be 10 days when the number of deliveries to the site may be significantly higher than usual.

### **2.2.3 Wind Turbine Erection**

The wind turbines are expected to be broken down into the following components: upper, middle and lower tower sections, blades, drive train and nacelle. These abnormal loads are transported by specialist hauliers with custom built trailers, either individually or in short convoys of typically two to three abnormal loads, accompanied by escort vehicles. Escort vehicles come before and after the transporter and where necessary, police may be used for additional safety for road users and to control traffic at holding points.

Associated goods such as smaller components, tools and other equipment will be delivered on flatbed trucks and low loaders.

A high capacity truck mounted crane will be required to erect the turbines.

### **2.2.4 Staff and Miscellaneous Equipment**

Electrical and communications cables will be delivered to site on reels mounted on flatbed trucks or low loaders and laid in trenches.

The daily commute of workers in cars, vans and small trucks will form a large proportion of the site traffic.

Occasional deliveries of small packages will also take place with vans and other light goods vehicles.

Site offices, welfare facilities and equipment storage containers will be delivered on flatbeds and low loaders, and will be maintained on an ad-hoc basis.



Regular deliveries of fuel for the site plant will be made using a mini tanker.

### 2.3 Estimated Delivery Traffic Volumes

Table 2.1 summarises the likely traffic mix to be generated by the wind farm project during the construction phase. For each given type of vehicle, an estimate is given of the total number of trips to be made throughout the construction phase, and the number of trips that might conceivably be made in any one day by that type of vehicle. The figures are based on the current best available source and may be therefore subject to some changes due to later modifications to design and / or construction methodology, or in order to comply with Health & Safety requirements.

Phase	Purpose	Vehicle	Approximate No of Journeys for project duration	Max journeys possible in 1 day (not all journeys will occur in one day)	Approximate Period of Delivery - (Assumes 15 month programme)
Site Set-Up	Portacabin delivery	Low loader	5	5	1
	Skip delivery	Low loader	5	5	1
	Generator delivery	Low loader	2	2	1
	Water and fuel tank delivery	Low loader	1	1	1
	Excavator delivery	Low loader	1	1	1
	Roller-compact	Low loader	1	1	1
Road & hard standings	Stone for site tracks	Tipper trucks	1556	40	1 - 7
	Stone for control building and substation compounds	Tipper trucks	73	40	1 - 6
	Stone for construction compound and gatehouse	Tipper trucks	133	40	1 - 2
	Stone for turning heads	Tipper trucks	69	40	1 - 6
	Stone for pathways	Tipper trucks	11	11	1 - 9
	Stone for crane hardstanding	Tipper trucks	1823	40	1 - 7
Foundation construction	Excavator delivery	Low loader	2	2	1
	Misc works	Backhoe loader	2	2	1
	Concrete for turbine foundations, piles & transformer plinths	Mixer trucks	600	50	3 - 9
	Steel delivery	Flat bed	20	20	2 - 6
	Foundation bolts or steel insert delivery	Flat bed	10	10	2
	Place foundation bolt cage or steel insert	30t to 50t crane	1	1	3 - 7

Turbine erection	Tool container delivery	Low Loader	15	15	9
	Tower section delivery	Extendible trailer	30	6	9 - 12
	Blade delivery	Extendible trailer	30	6	9 - 12
	Nacelle	Low loader	10	2	9 - 12
	Hub and rotor	Low loader	10	2	9 - 12
	Turbine erection	1000t to 1200t crane	1	1	9 - 12
	Turbine erection	150t to 200t crane	1	1	9 - 12
Cable Installation	Cable delivery	Flat bed or Hiab	3	2	7
	Excavator delivery	Low loader	2	1	7
	Cable laying	Telescopic handler	2	1	7 - 11
Sub Station & Control Building	Concrete delivery	Mixer trucks	30	50	2
	Brick delivery	Flat bed	3	3	2 - 3
	Roofing & Cladding	Flat bed	3	3	3 - 4
	Switchgear	Flat bed	2	2	6
	Misc electrical equipment	Flat bed	3	3	6 - 9
Reinstatement	Removal of temporary compound & gate house stone	Tipper trucks	133	40	8 - 9
	Removal of temporary hardstanding stone	Tipper trucks	650	40	8 - 9
Misc		Vans, cars	4680	5	1 - 15
		Telescopic handler	2	2	1 - 15
		Skip lorry	104	2	1 - 15
		Small tanker	104	2	1 - 15
		Light goods van	260	4	1 - 15
Site De-mobilisation	Portacabin removal	Low loader	5	5	15
	Skip removal	Low loader	5	5	15
	Generator removal	Low loader	2	2	15
	Water and fuel tank removal	Low loader	1	1	15
	Roller-compactor	Low loader	1	1	14
	Excavator removal	Low loader	5	5	15
	Misc works	Backhoe loader	2	2	15
<b>Total *</b>			<b>10415</b>		

**Table 2.1: Traffic Generation Breakdown**

The number of daily deliveries will vary throughout the construction of the wind farm depending on the character of works that will be taking place on site.

These numbers have been derived from RES experience in previous wind farm construction. In reality, the daily journeys tend to be lower, but these numbers have been included as a likely worst-case scenario.

## **3 TRAFFIC MANAGEMENT**

### **3.1 General Deliveries**

#### **3.1.1 Delivery Times**

Movement of heavy goods vehicles onto and off of the site itself shall be restricted to between 07:00 - 19:00, Monday to Saturday in accordance with planning condition 28.

#### **3.1.2 Pollution Control**

The following measures will be implemented to minimise pollution due to construction traffic:

- all vehicles transporting soil and other dusty materials will be fully sheeted;
- adequate sheeting of vehicles carrying waste materials;
- an effective wheel washing facility will be provided at the exit from the site;

#### **3.1.3 HGV Deliveries**

Normal HGV load delivery routes (including stone and concrete) will utilise the Banagher and Carnanbane Roads from the Feeny Road and / or the Magheramore Road, with sources of material to be confirmed prior to construction. No passing bays will be required as the roads are largely two way with adequate passing bays located where the road is narrower to accommodate traffic to and from the existing quarry on the Magheramore Road.

Where agreed by DfI Roads, circular HGV haul routes may be implemented for the construction phase of the project.

Post consent, a further detailed review of all bridges/structures along the preferred route will be undertaken and, if required, structural surveys will be carried out. The requirement (if any) of any subsequent improvement works will be undertaken following consultation with DfI Roads.

### **3.2 ALL Deliveries**

#### **3.2.1 Pollution Control**

Turbines shall be delivered to site in sufficient time to meet the agreed erection programme, and in accordance with the requirements of the relevant Authorities. A detailed delivery plan will be prepared prior to the actual delivery and sufficient notice will be given to all relevant parties.

Turbines will be sourced from outside the UK; they shall be delivered to the UK by ship, and stored at the Belfast Port. It will be the turbine supplier's responsibility to identify a suitable storage location and obtain any necessary permits.

As part of the detailed delivery plan the appointed haulier will submit a Risk Assessment for review and approval. This will include a contingency plan for potential road closures or restrictions as a result of vehicle breakdowns or accidents on the route.

#### **3.2.2 Abnormal Loads Convoy Size & Timing**

Deliveries shall only take place during the hours agreed with the relevant authorities, and in accordance with any time restrictions specified in planning conditions. Deliveries will be timed to avoid predictable peak traffic periods wherever possible. Convoys would typically comprise no more than 3 abnormal vehicles.

#### **3.2.3 Escorts for Abnormal Loads**

Abnormal loads shall be escorted in accordance with 'Self-Escorting of Abnormal Loads and Abnormal Vehicles' Code of Practice. The escorting may be undertaken by the haulage contractor, or Police Service of Northern Ireland (PSNI), if required.

#### **3.2.4 Road Clearance Scheme**

Clear roadways might be required to allow the transporters passage along narrow streets (At times of road parking may be restricted to allow for this). RES will liaise with the local community, businesses and key delivery services to ensure they are fully informed in advance should a road clearance scheme be required.

### **3.3 Notification to Stakeholders**

The Highways Authority, relevant Councils and local communities will be given written notice of the turbine deliveries, and regular updates will be available as the delivery timetable is finalised with the supplier during the delivery period.

#### **3.3.1 Emergency Services**

The Police, Fire and Ambulance service will be given written notice of the turbine deliveries and kept fully informed throughout the delivery period.

#### **3.3.2 Local Residents**

RES will endeavour to engage with the local community councils and residents prior to construction starting. RES will make every effort to ensure that local residents and community representatives are kept fully informed of all the road mitigation and traffic management requirements for the development.

#### **3.3.3 Local Services**

RES will make every effort to ensure disruption caused by deliveries is avoided. Services of particular relevance include, but are not limited to;

- Local schools and nurseries.
- Local buses, including school buses.
- Local doctors, surgeries or health providers.

Information will be provided to make service providers aware of the programme of planned works.

#### **3.3.4 Planned Engineering Works**

RES will work with the Department for Infrastructure (DfI) to identify any planned engineering works that conflict with the delivery route times. Discussions will be had to identify a means to minimise disruption to the local community and the planned engineering works.

#### **3.3.5 School Run and Community Events**

RES will identify any conflicts with school and nursery drop off and pick up locations and times. Construction deliveries will, where possible, be scheduled to avoid these busy periods as well as scheduled local authority bin collections or where possible be rerouted to avoid potential pinch points.

Planned and notified community events will also be considered by RES when scheduling/routing deliveries.

### **3.4 Road Condition Survey**

Any damage arising that is directly attributable to these works will be reviewed with the relevant authorities and appropriate remediation agreed.

### **3.5 Temporary Road Signage**

Temporary road signage informing drivers about the ongoing construction on site, as well as routing works traffic to and from the development will be installed in the vicinity of the site, as agreed with the DfI prior to any construction.

## **4 ABNORMAL INDIVISIBLE LOADS (AIL) DELIVERY ROUTES**

---

This section identifies the proposed delivery route for abnormal deliveries.  
The proposed route is indicated on drawing 03426D2509-01, in Appendix 1.

#### **4.1** *AIL Delivery Route*

The AIL components will be delivered by sea to the port of entry, loaded onto specialised trailers and transported to site via the identified route, referenced above.

#### **4.2** *AIL Return Journeys*

Unladen AIL transport vehicles will have their trailers shortened prior to their departure from the site and will thus not be considered abnormal.

---

## APPENDIX A - DRAWINGS

<b>Drawing Number</b>	<b>Drawing Title</b>
03426D2509-01	Turbine Delivery Route
03426D2506-01	Planning Application Boundary
03426D2402-02	Site Entrance









# MAGHERAMORE WIND FARM

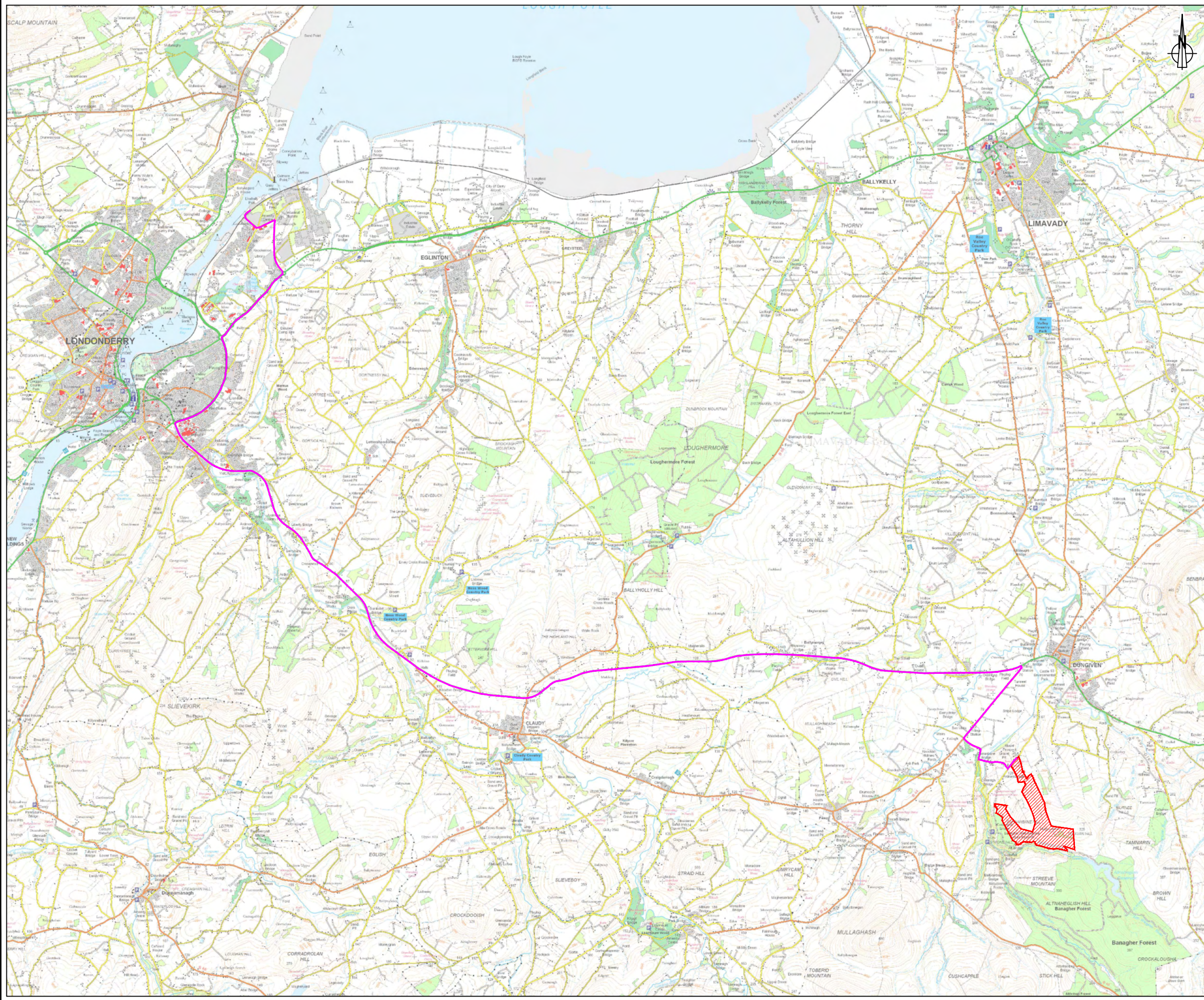
## FIGURE 11.1

### TURBINE DELIVERY ROUTE

AUTHORITY FROM THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. © CROWN

#### KEY:

- 
- 



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

DRAWING NUMBER **03426D2509-01**

SCALE - 1:100,000 @ A3

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# MAGHERAMORE WIND FARM



## FIGURE 1.2

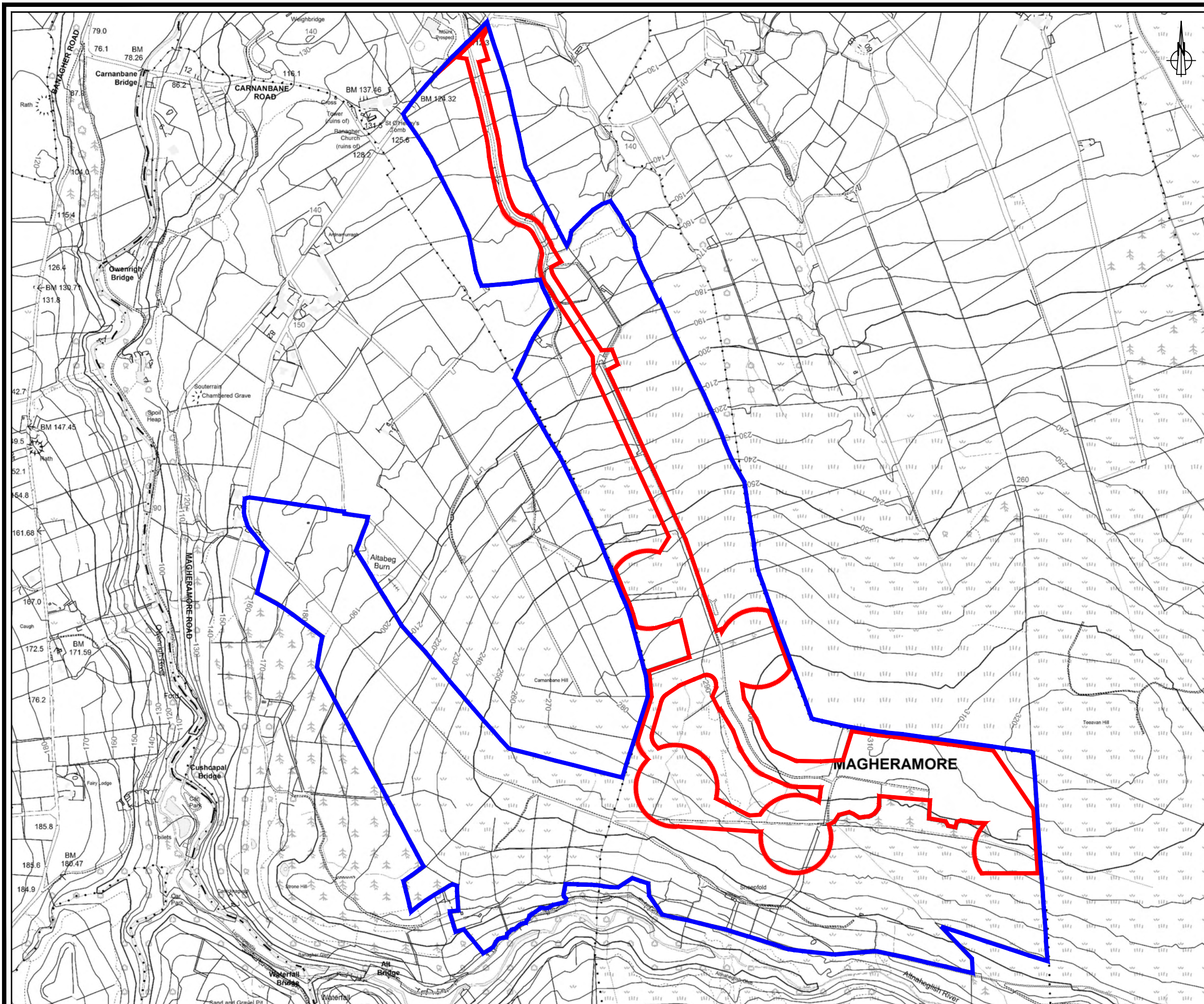
### PLANNING APPLICATION BOUNDARY

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MAIN SITE  
SHEET 2 OF 4

#### KEY

-  PLANNING APPLICATION BOUNDARY (OUTSIDE OF LINE DENOTES BOUNDARY)
-  LAND UNDER APPLICANT CONTROL (INSIDE OF LINE DENOTES BOUNDARY)



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

DRAWING NUMBER  
**03426D2506-02**

SCALE - 1:10,000 @ A3

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# MAGHERAMORE WIND FARM

## FIGURE 2.8

### SITE ENTRANCE

SURVEY DATA SUPPLIED BY  
360 SURVEYS - 02/2019

**KEY:**

- EXISTING ROAD
  - SITE TRACK WIDENING
  - SITE ENTRANCE COMPOUND
  - VISIBILITY SPLAY
  - PROPOSED ABNORMAL LOADS:  
AREA WILL BE REINSTATED ON COMPLETION OF WIND FARM CONSTRUCTION
  - RETENTION POND
  - EXISTING HEDGE
  - EXISTING FENCE
  - EXISTING GATE
  - VERGE
  - PLANNING APPLICATION BOUNDARY
- MINIMUM 150mm TYPE 1 SUB-BASE SOFT AREAS AND UNSUITABLE MATERIAL (PEAT, TOPSOIL, SILT) TO BE REMOVED

**NOTES:**

1. DO NOT SCALE FROM DRAWING.
2. DATA DERIVED FROM TOPOGRAPHIC SURVEY.
3. DETAILS AND DIMENSIONS ARE INDICATIVE ONLY AND SUBJECT TO CHANGES AT DETAILED DESIGN STAGE.
4. APPROPRIATE SUDS DESIGN MEASURES WILL BE EMPLOYED AT DETAIL DESIGN STAGE.
5. RUNOFF FROM THE SITE ENTRANCE WILL BE INTERCEPTED AND DIVERTED TO EXISTING DRAINAGE, PREVENTING ANY RUNOFF TO THE PUBLIC ROAD. SURFACE RUNOFF FROM THE MAIN SITE WILL BE DIRECTED TO VARIOUS SUDS FEATURES, AS DESCRIBED WITHIN THE ENVIRONMENTAL STATEMENT
6. ALL VISIBILITY SPLAYS SHOWN ARE WITHIN LANDS UNDER APPLICANTS CONTROL. ANY PHYSICAL HINDRANCES WITHIN THE EXTENTS OF THE VISIBILITY SPLAYS WILL BE REMOVED. VEGETATION WILL BE TRIMMED TO A MAXIMUM OF 250MM ABOVE EGL.

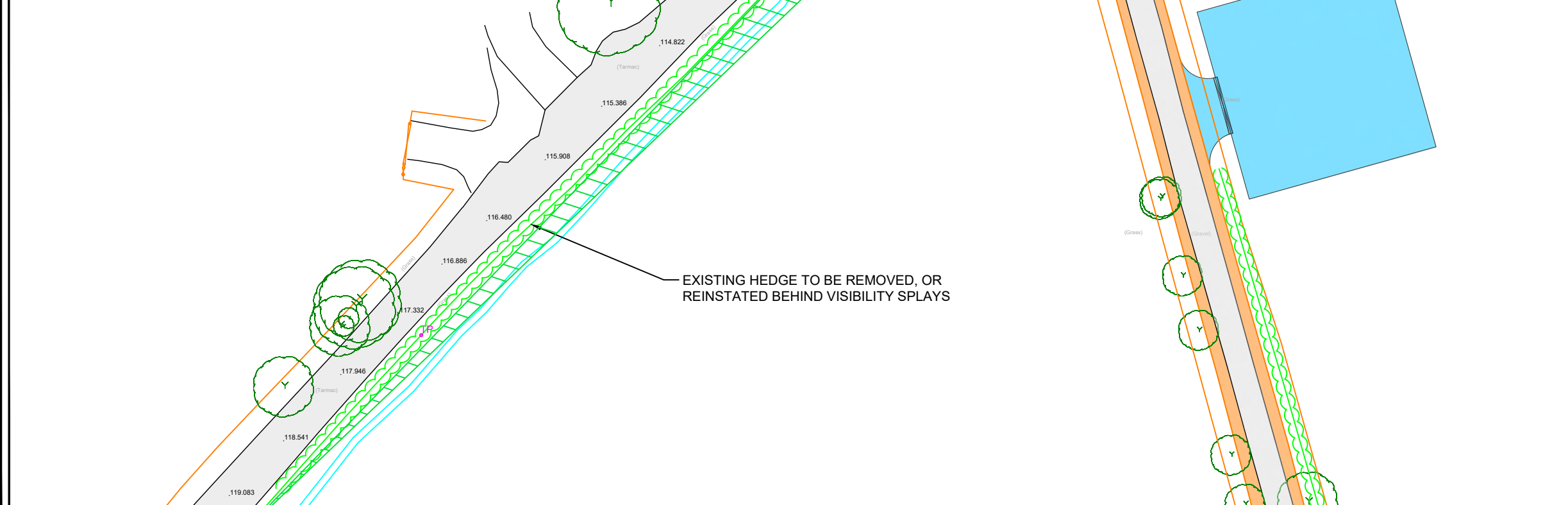
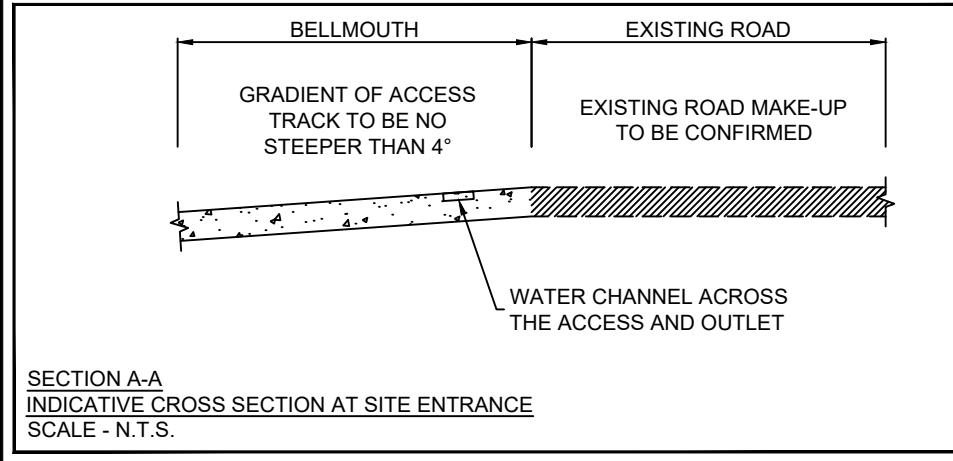
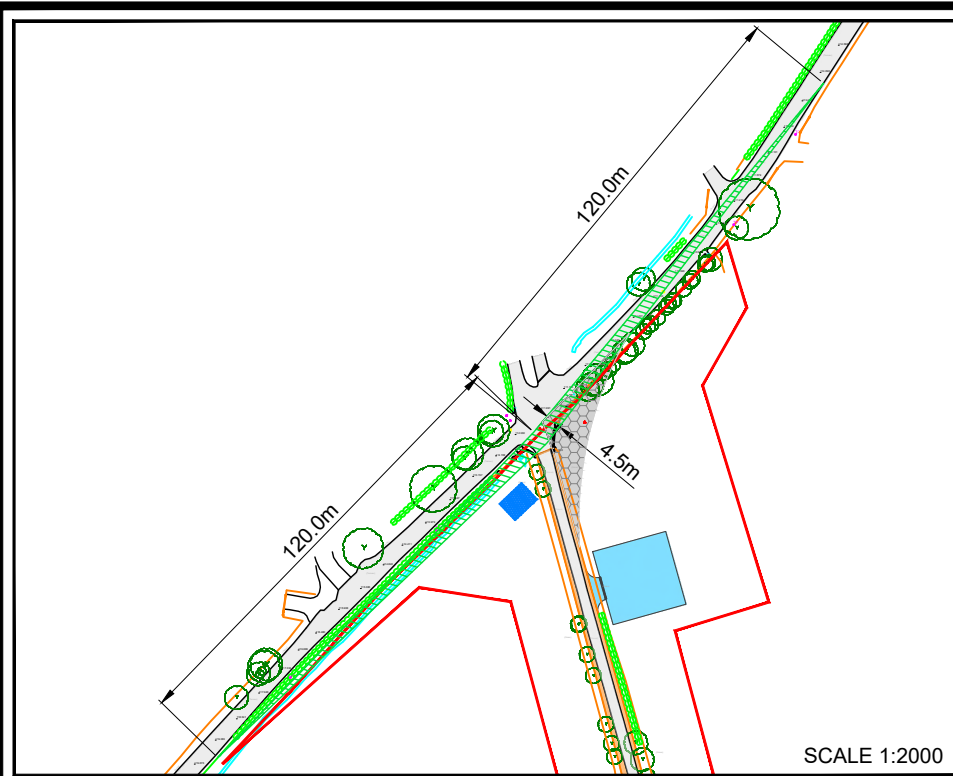
LAYOUT DWG N/A T-LAYOUT NO. N/A

DRAWING NUMBER  
**03426D2402-03**

SCALE - 1:500 @ A3

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# Figures





## Figures

Section 1 - revised photomontage Figure 4.15 (Viewpoint 3)

Section 5 - Archaeology and Cultural Heritage (FEI Figures 5.21 to 5.26)

Section 11 (Site Entrance)



# Figures

## Section 1



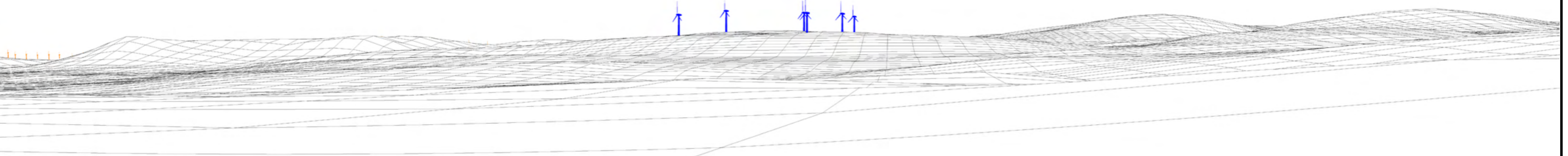


← Visible to left-hand side:  
 Rigged Hill; Dunmore II; Dunbeg South  
 Visible in the wider view / in other directions:  
 Loughermore Cluster; Altahullion & Glenconway  
 Ballyhanedin

MAGHERAMORE  
 4 3 2 6 5 1

Craigigore

Evishagaran



Where present in view: Magheramore Wind Farm turbines shown in blue; Existing wind farms in red; Consented wind farms in orange; Proposed wind farms in green; Single turbines in pink

Turbine dimensions shown for the Development: max. tip height above ground level 149.9 m; hub height 94 m; rotor diameter 112 m

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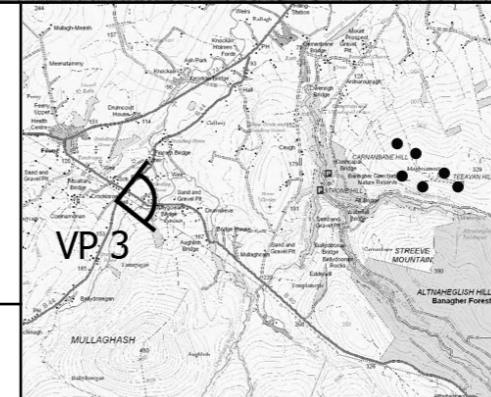
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**MAGHERAMORE WIND FARM**

**FIGURE 4.15 (page 1/2)**

**VIEWPOINT 3, WIRELINE & PHOTOMONTAGE  
 FINCARN CROSSROADS AT B40 - B44 JUNCTION**

Easting: 263667  
 Northing: 404445  
 Elevation A.O.D: 135 m  
 Bearing: 84.36 °  
 Approx. Included Angle: 70 °  
 Approx. distance to nearest turbine: 4.71 km to T4



LANDSCAPE AND VISUAL IMPACT ASSESSMENT			
DRAWN / APPROVED: SMc / GM	DATE: October 2021	PRINT SIZE: A3	REVISION: B

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No visible changes to forestry from this location



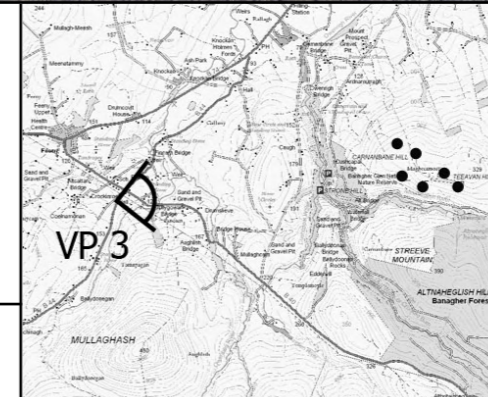
**Shanti McAllister**  
 landscape planning and design  
 info@shantimcallister.co.uk www.shantimcallister.co.uk

**MAGHERAMORE WIND FARM**

**FIGURE 4.15 (page 2/2)**

**VIEWPOINT 3, BASELINE PHOTOGRAPH  
 FINCARN CROSSROADS AT B40 - B44 JUNCTION**

Easting: 263667  
 Northing: 404445  
 Elevation A.O.D: 135 m  
 Bearing: 84.36 °  
 Approx. Included Angle: 70 °  
 Approx. distance to nearest turbine: 4.71 km to T4



LANDSCAPE AND VISUAL IMPACT ASSESSMENT			
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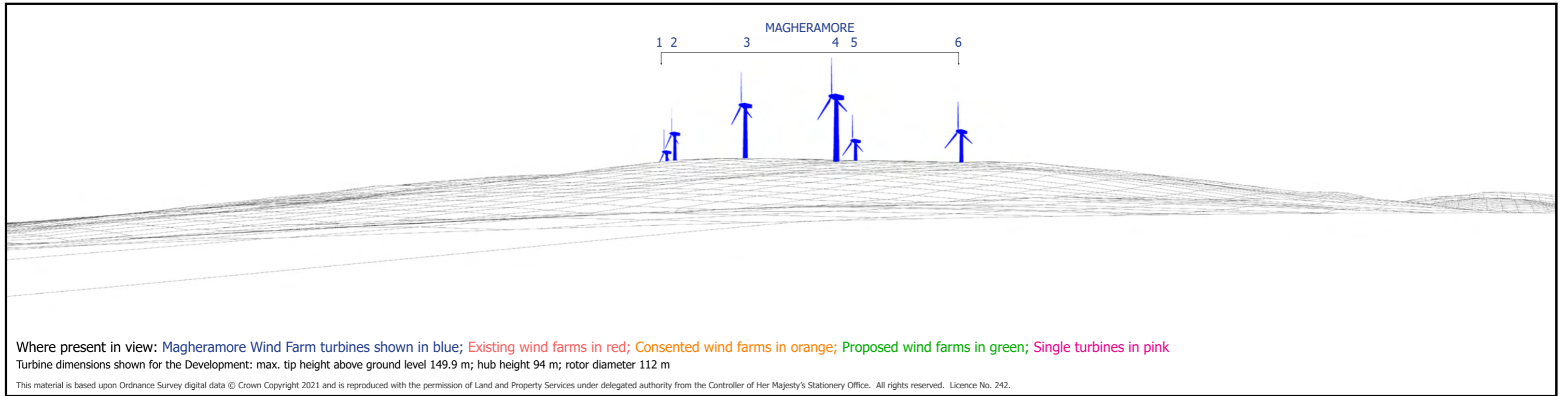


# Figures

## Section 5







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IMPACT ASSESSMENT**

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SMc / SC	March 2021	A3	A

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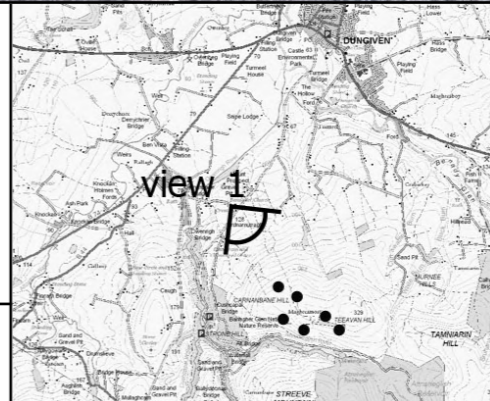
**MAGHERAMORE WIND FARM FEI**

**FIGURE 5.21**

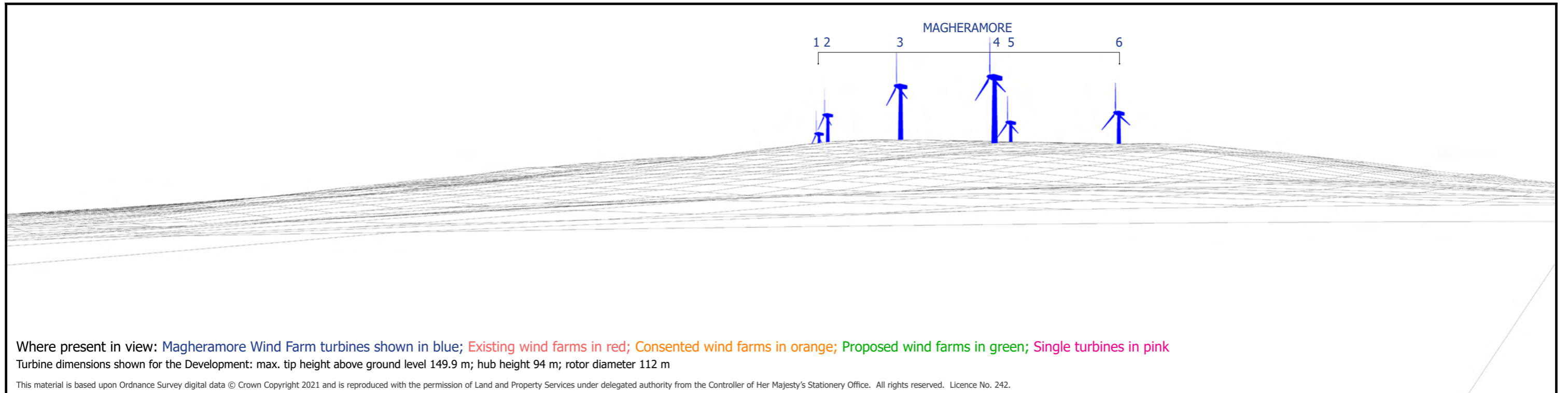
**WIRELINE & REFERENCE PHOTOGRAPH  
LDY 030:031  
BANAGHER OLD CHURCH AT PARKING LAY-BY**

**NOTE:** This Figure must be viewed in conjunction with the analysis of archaeology and cultural heritage effects and the detailed methodology for the preparation of visualisations contained in LVIA Technical Appendix 4.2 of the Environmental Statement, in particular the paragraphs referencing Scottish Natural Heritage Guidance regarding the limitations of visualisations.

Easting:	267422
Northing:	406639
Elevation A.O.D	139 m
Bearing:	143.26 °
Approx. Included Angle:	80 °
Approx. distance to nearest turbine:	1.57 km to T4







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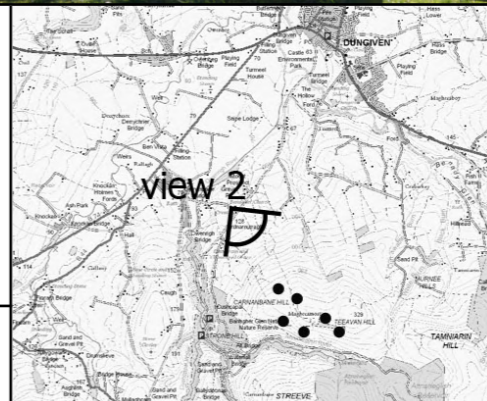
**MAGHERAMORE WIND FARM FEI**

**FIGURE 5.22**

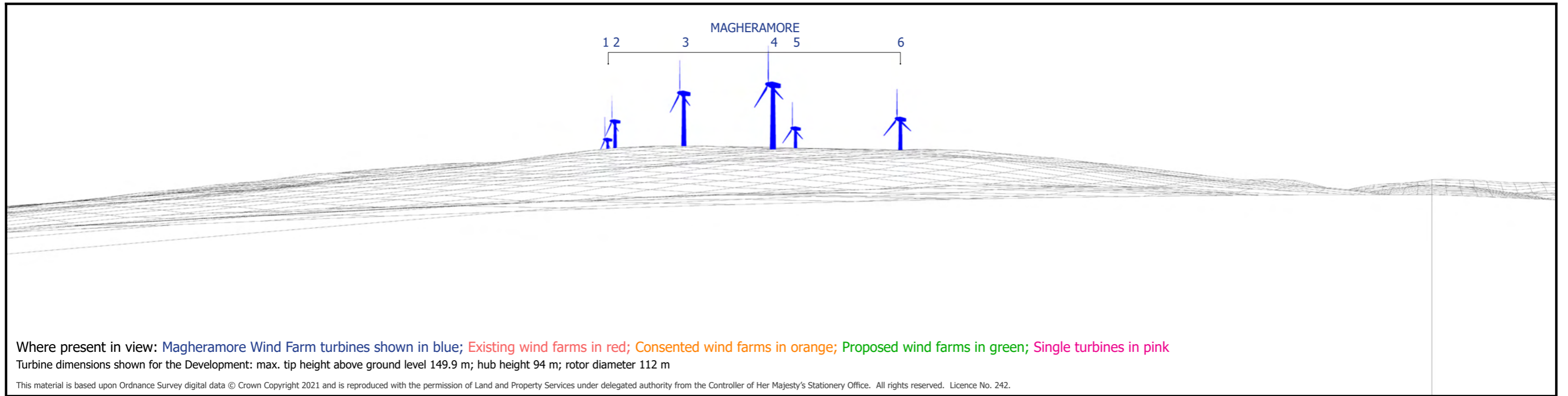
**WIRELINE & REFERENCE PHOTOGRAPH  
LDY 030:032  
BANAGHER OLD CHURCH APPROACH LANE**

**NOTE:** This Figure must be viewed in conjunction with the analysis of archaeology and cultural heritage effects and the detailed methodology for the preparation of visualisations contained in LVIA Technical Appendix 4.2 of the Environmental Statement, in particular the paragraphs referencing Scottish Natural Heritage Guidance regarding the limitations of visualisations.

Easting:	267449
Northing:	406624
Elevation A.O.D	138 m
Bearing:	143.60 °
Approx. Included Angle:	80 °
Approx. distance to nearest turbine:	1.55 km to T4







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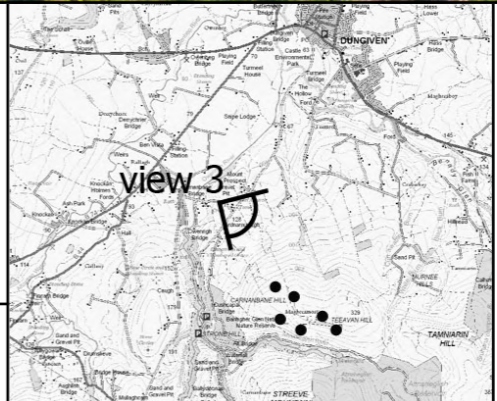
**MAGHERAMORE WIND FARM FEI**

**FIGURE 5.23**

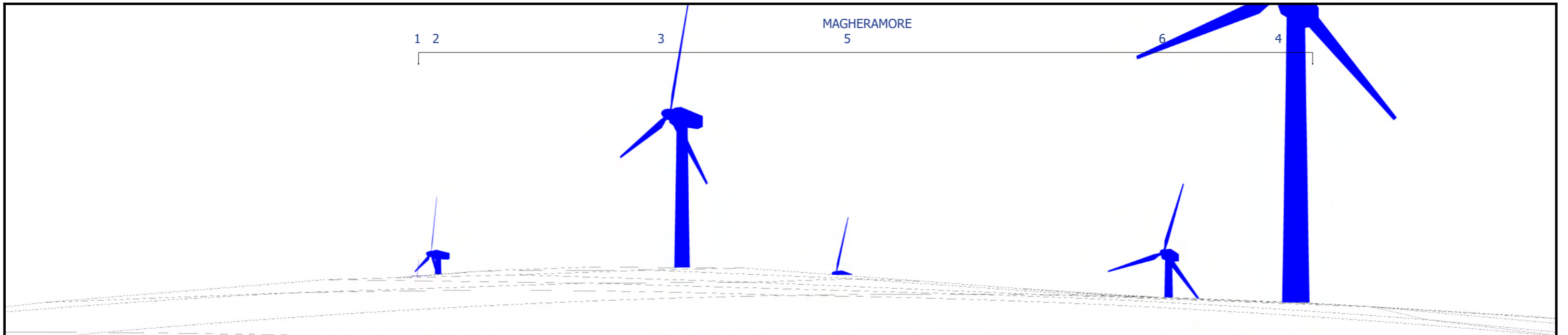
**WIRELINE & PHOTOMONTAGE  
LDY 030:029 MAGHERAMORE CROSS  
LOOKING TOWARDS BANAGHER OLD CHURCH**

**NOTE:** This Figure must be viewed in conjunction with the analysis of archaeology and cultural heritage effects and the detailed methodology for the preparation of visualisations contained in LVIA Technical Appendix 4.2 of the Environmental Statement, in particular the paragraphs referencing Scottish Natural Heritage Guidance regarding the limitations of visualisations.

Easting:	267400
Northing:	406645
Elevation A.O.D	137 m
Bearing:	142.56 °
Approx. Included Angle:	80 °
Approx. distance to nearest turbine:	1.57 km to T4







Where present in view: Magheramore Wind Farm turbines shown in blue; Existing wind farms in red; Consented wind farms in orange; Proposed wind farms in green; Single turbines in pink

Turbine dimensions shown for the Development: max. tip height above ground level 149.9 m; hub height 94 m; rotor diameter 112 m

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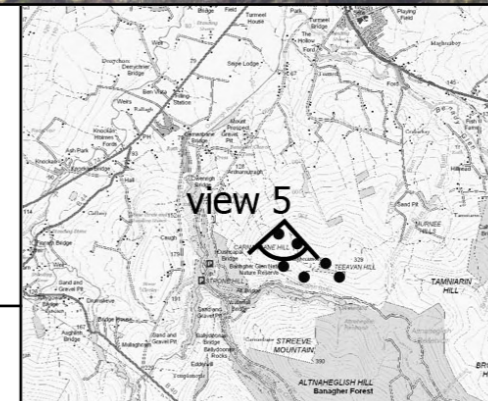
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**MAGHERAMORE WIND FARM FEI**

**FIGURE 5.24**

**WIRELINE & PHOTOMONTAGE  
LDY 030:064 & 079 MAGHERAMORE PORTAL  
TOMB LOKING S.E. TOWARDS COURT TOMB**

Easting: 268321  
 Northing: 405667  
 Elevation A.O.D: 233 m  
 Bearing: 152.59 °  
 Approx. Included Angle: 80 °  
 Approx. distance to nearest turbine: 0.33 km to T4

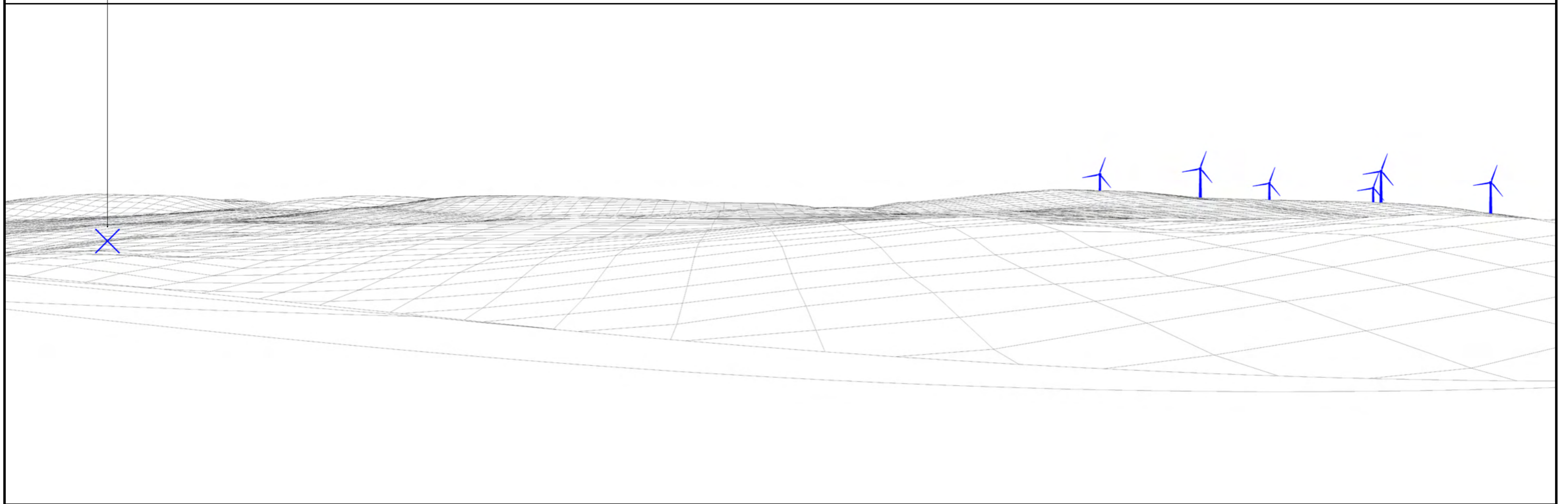
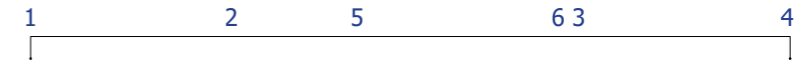


**NOTE: This Figure must be viewed in conjunction with the analysis of archaeology and cultural heritage effects and the detailed methodology for the preparation of visualisations contained in LVIA Technical Appendix 4.2 of the Environmental Statement, in particular the paragraphs referencing Scottish Natural Heritage Guidance regarding the limitations of visualisations.**



Location of LDY 031:006  
Tamniarin Rath

MAGHERAMORE



Where present in view: Magheramore Wind Farm turbines shown in blue; Existing wind farms in red; Consented wind farms in orange; Proposed wind farms in green; Single turbines in pink

Turbine dimensions shown for the Development: max. tip height above ground level 149.9 m; hub height 94 m; rotor diameter 112 m

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IMPACT ASSESSMENT

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SMc / SC	March 2021	A3	A

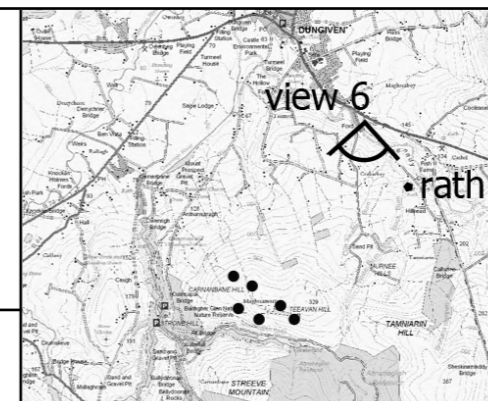
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**MAGHERAMORE WIND FARM FEI**

**FIGURE 5.25**

**WIRELINE  
CASHEL PICNIC AREA LOOKING TOWARDS  
TAMNIARIN RATH, LDY 031: 006**

Easting: 270429  
Northing: 407872  
Elevation A.O.D: 200 m approx.  
Bearing: 210 °  
Approx. Included Angle: 80 °  
Approx. distance to nearest turbine: 3.26 km to T3



**NOTE: This Figure must be viewed in conjunction with the analysis of archaeology and cultural heritage effects and the detailed methodology for the preparation of visualisations contained in LVIA Technical Appendix 4.2 of the Environmental Statement, in particular the paragraphs referencing Scottish Natural Heritage Guidance regarding the limitations of visualisations.**





Figures

Section 11





# MAGHERAMORE WIND FARM

## FIGURE 2.8

### SITE ENTRANCE

SURVEY DATA SUPPLIED BY  
360 SURVEYS - 02/2019

**KEY:**

- EXISTING ROAD
  - SITE TRACK WIDENING
  - SITE ENTRANCE COMPOUND
  - VISIBILITY SPLAY
  - PROPOSED ABNORMAL LOADS:  
AREA WILL BE REINSTATED ON COMPLETION OF WIND FARM CONSTRUCTION
  - RETENTION POND
  - EXISTING HEDGE
  - EXISTING FENCE
  - EXISTING GATE
  - VERGE
  - PLANNING APPLICATION BOUNDARY
- MINIMUM 150mm TYPE 1 SUB-BASE SOFT AREAS AND UNSUITABLE MATERIAL (PEAT, TOPSOIL, SILT) TO BE REMOVED

**NOTES:**

1. DO NOT SCALE FROM DRAWING.
2. DATA DERIVED FROM TOPOGRAPHIC SURVEY.
3. DETAILS AND DIMENSIONS ARE INDICATIVE ONLY AND SUBJECT TO CHANGES AT DETAILED DESIGN STAGE.
4. APPROPRIATE SUDS DESIGN MEASURES WILL BE EMPLOYED AT DETAIL DESIGN STAGE.
5. RUNOFF FROM THE SITE ENTRANCE WILL BE INTERCEPTED AND DIVERTED TO EXISTING DRAINAGE, PREVENTING ANY RUNOFF TO THE PUBLIC ROAD. SURFACE RUNOFF FROM THE MAIN SITE WILL BE DIRECTED TO VARIOUS SUDS FEATURES, AS DESCRIBED WITHIN THE ENVIRONMENTAL STATEMENT
6. ALL VISIBILITY SPLAYS SHOWN ARE WITHIN LANDS UNDER APPLICANTS CONTROL. ANY PHYSICAL HINDRANCES WITHIN THE EXTENTS OF THE VISIBILITY SPLAYS WILL BE REMOVED. VEGETATION WILL BE TRIMMED TO A MAXIMUM OF 250MM ABOVE EGL.

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

DRAWING NUMBER  
**03426D2402-03**

SCALE - 1:500 @ A3

**ENVIRONMENTAL STATEMENT**

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