

APPENDIX 2.3 - LLANBRYNMAIR GRID CONNECTION ROUTE - ENVIRONMENTAL ASSESSMENT

1 APPENDIX 2.3: GRID CONNECTION ASSESSMENT - ENVIRONMENTAL REVIEW

1.1 Introduction

- 1.1.1 In August 2013 RES submitted Consolidated Supplementary Information (CSEI) for Llanbrynmair Wind Farm. A proposed grid connection for Llanbrynmair Wind Farm does not form part of the Section 36 application and the assessment of any potential grid connection is limited to a high-level Grid Connection Assessment¹ and Ecology Assessment² contained within Appendix 4.4 of CSEI 2013 Volume II A - Supporting Appendices.
- 1.1.2 SPEN and National Grid, the electricity network operator, are currently developing proposals for the connection of proposed onshore wind farm developments located within the Technical Advice Note 8: Renewable Energy (TAN8) Strategic Search Areas (SSAs) of Mid-Wales (Powys) to the local electricity system and the wider National Electricity Transmission System.
- 1.1.3 Since the submission of the August 2013 CSEI additional information has been published by Scottish Power Energy Networks (SPEN) in relation to the Mid Wales Connections Project, connecting wind farms in Mid Wales to a National Grid hub substation and by National Grid in relation to the Mid Wales Connection Project, comprising a new 400kV grid connection through Mid Wales and Shropshire to a new 400kV hub substation. The identification of the final grid connection route between the onsite Llanbrynmair Wind Farm and the Cefn Coch National Grid substation will be undertaken by the distribution network operator SPEN, and the routeing and siting of the new 400kV grid connection and 400kV hub substation will be undertaken by National Grid. As at December 2013, it is expected that the Llanbrynmair Wind Farm will be connected via a 132kV overhead line. A brief overview of the SPEN and National Grid projects is provided below.

Background

- 1.1.4 A new network of 132kV and 400kV overhead lines, and 132kV and 400kV substations and collector hubs will be required to connect proposed wind farms located within the TAN8 Strategic Search Areas (SSAs) of the Mid Wales region to the wider National Electricity Transmission System. National Grid identified two National Grid substation search areas located at Aberbechan (Hub E) and Cefn Coch (Hub F), within which the required 400kV substation hub would potentially be located and SPEN have undertaken routeing work to identify technically and environmentally feasible route corridors for grid connections between proposed onshore wind farms contracted to the Mid Wales Connections Project to these two substation search areas. The original National Grid Substation Search Areas, Hub E - Aberbechan and Hub F Cefn Coch are shown on Figure 1.
- 1.1.5 In July 2012, National Grid identified Cefn Coch to Lower Frankton as the preferred corridor option to connect wind farms in Mid Wales to the national electricity network. The choice of the Cefn Coch substation location was based on consultation feedback, further assessment work by National Grid to consider the potential effects of the proposed connection on the environment, landscape, heritage and communities, and potential costs of the connection, as outlined in the Selection of Preferred Connection report³.
- 1.1.6 Following the identification of the preferred substation location near Cefn Coch, SPEN published preferred grid connection corridors between the proposed wind farms with which they have connection contracts and the preferred substation location near Cefn Coch. The SPEN preferred grid connection corridors between Llanbrynmair Wind Farm and the adjacent Carnedd Wen Wind Farm are shown on Figures 2 and 3. The BNC 3 - BNC 4 - BNC 5 preferred

¹ Land Use Consultants (LUC), 2010. *Llanbrynmair Wind Farm Grid Connection Assessment*. LUC, Glasgow.

² Land Use Consultants (LUC), 2011. *Llanbrynmair Wind Farm Grid Connection: Ecology Assessment*. LUC, London.

³ National Grid, (July 2012). *Mid Wales Connection Project, Connecting Wind Farms through Mid Wales and Shropshire: Selection of Preferred Connection (Draft)*

route corridor was proposed by SPEN for the connection of the proposed Llanbrynmair and Carnedd Wen Wind Farms located within SSA-B and the Cefn Coch National Grid substation.

- 1.1.7 In summer 2013, additional information was published by National Grid, indicating the draft route for the proposed new 400kV grid connection through Powys and Shropshire to a preferred site for the 400kV substation west of Cefn Coch. Following the publication of this information, SPEN published suggested line routes in September 2013 between the contracted wind farms of the Mid Wales Connections Project and the Cefn Coch 400kV substation location within the selected preferred route corridors. The preferred National Grid corridor option and the Cefn Coch National Grid substation site location are shown on Figure 1.

Previous Assessment

Grid Connection Assessment

- 1.1.8 In 2010 LUC (Land Use Consultants) was commissioned by RES UK and Ireland Ltd. (RES) to undertake a high-level grid connection assessment of potential 132kV overhead line grid connection routes between the proposed Llanbrynmair Wind Farm onsite substations and the potential National Grid substation search areas (E - Aberbechan and F - Cefn Coch). At the time of the assessment the connection for the Llanbrynmair Wind Farm was planned to extend from one of three proposed onsite substations.
- 1.1.9 The purpose of the assessment was to identify a number of environmentally and technically feasible broad route corridors which could be taken by overhead line grid infrastructure in order to link the proposed wind farm to a 400kV National Grid hub at Cefn Coch, based on the identification of environmental and technical constraints, and consideration of landscape and visual routeing principles, including the Holford Rules⁴, where relevant reference was made to the *Mid Wales Connections Project: Routeing Methodology*, latest revision/work in progress (LUC in association with Gillespies, 2010), particularly in terms of informing the technical constraints which apply to routeing.
- 1.1.10 The *Llanbrynmair Wind Farm Grid Connection Assessment*⁵ was included within Appendix 4.4 of CSEI 2013 Volume II A - Supporting Appendices. Provisional field work was undertaken to inform the findings of this study.

Ecology Assessment

- 1.1.11 In August 2011 LUC was commissioned by RES to undertake a desk based analysis of the ecological characteristics of the preferred route corridors identified within the 2010 assessment to identify potential ecological constraints which may deem the preferred route corridors unfeasible from an ecological perspective. The *Llanbrynmair Wind Farm Grid Connection: Ecology Assessment*⁶ was included within Appendix 4.4 of CSEI 2013 Volume II A - Supporting Appendices, and the assessed corridors are shown on Figure 4 and Figure 5 which accompany this review. No field based assessment or analysis was undertaken to inform this study.

Updated Information

- 1.1.12 Since the preparation of the grid connection assessment and ecological assessment by LUC in 2010 and 2011 respectively, the preferred National Grid substation location west of Cefn Coch has been identified and published within the National Grid Mid Wales Connection Project Substation Site Report⁷ (herein referred to in relation to Study Area B) and the

⁴ NGC, (updated 1993, 2003) *The Holford Rules, and SHETL clarification notes*

⁵ Land Use Consultants (LUC), 2010. *Llanbrynmair Wind Farm Grid Connection Assessment*. LUC, Glasgow.

⁶ Land Use Consultants (LUC), 2011. *Llanbrynmair Wind Farm Grid Connection: Ecology Assessment*. LUC, London.

⁷ National Grid, (September 2013). *Mid Wales Connection Project, Connecting Wind Farms through Mid Wales and Shropshire: Substation Site Report* (Draft for Consultation)

location of a single onsite substation for the Llanbrynmair Wind Farm (herein referred to in relation to Study Area A) has been amended.

Cefn Coch National Grid Substation

- 1.1.13 The selected Cefn Coch National Grid substation (NW) was one of eight substation site options identified by National Grid as shown on Page 25, Figure 8.1 of the Substation Site Report, is located ‘*approximately 500m to the north-west of the Cefn Coch Substation Siting Area and outside the Preferred Route Corridor*’ (Page 37, Para. 10.2.1) and within the boundary of the consented Tirgwynt Wind Farm, west of and outside the original National Grid Cefn Coch substation search area, as shown on Figure 1. The substation location lies adjacent to the broad route corridors, F3 and F4, identified within the 2010 grid connection assessment. The draft route alignment of the National Grid 400kV grid connection is also shown on Figure 1, including where it connects to the proposed Cefn Coch substation.
- 1.1.14 The selected substation (NW) is described within the Substation Site Report at paragraphs 10.2.1-10.2.5 where the site is described as occupying ‘*a remote rural situation, on the edge of TAN 8 SSAB and adjacent to the proposed Tirgwynt wind farm. Whilst currently a substation in this location would represent a detracting urban element, which would be inconsistent with the local landscape character, this situation is likely to change with the construction of the Tirgwynt wind farm and Mynydd Waen Fawr wind farm⁸ (if constructed) as the proposed substation would potentially be seen alongside above ground equipment such as overhead electricity lines, pylons and the turbines of the Tirgwynt Wind farm and other planned wind farms.*’
- 1.1.15 A site appraisal for the selected substation site is found in the substation site report at paragraphs 10.2.6-10.2.32 outlining the potential environmental constraints and opportunities for the site. The substation site report states that: ‘*There are fewer potential negative effects associated with this site than any of the others being assessed. There is a concern that the movements and noises associated with the construction of the substation may have a detrimental effect upon the curlews and other breeding bird that nest nearby. However the EIA for the consented Tirgwynt windfarm did not identify this as a significant impact.*’ and in conclusion: ‘*Overall, and taking into account the above assessments, Site NW is identified as the preferred location for the substation.*’
- 1.1.16 It is understood that through winter 2013 National Grid will be undertaking further detailed environmental assessments and investigations at the preferred substation location. Following the consultation period with stakeholders, interested parties and members of the public, the intended detailed design of the substation will be subject to further environmental assessment and public consultation prior to the submission of a consent application for the proposed development.
- 1.1.17 No assessment of the selected National Grid Cefn Coch substation site has been undertaken by LUC as part of this review or the August 2013 CSEI.

Llanbrynmair Onsite Substation

- 1.1.18 The original infrastructure design for Llanbrynmair Wind Farm identified three substations serving the northern, central and southern groups of turbines. Natural Resources Wales (NRW) expressed concerns during the third round of SEI about the potential significant effects of the substations from a visual perspective. In particular, this related to effects on Glyndŵr’s Way National Trail and other recreational routes. The central substation was redesigned to act as the primary substation, carrying out all of the electrical functions of the wind farm. Having undertaken an environmental review to determine the most appropriate location, in consultation with NRW, the central substation was relocated to SH 947 053.

⁸ The planning application for Mynydd Waun Fawr Wind Farm was withdrawn by Vattenfall in 2013.

- 1.1.19 In winter 2012/2013 the onsite substation was relocated adjacent to the proposed Carnedd Wen substation and next to an area of coniferous woodland. The location of the revised onsite Llanbrynmair Wind Farm substation is shown on Figure 1 which accompanies this review and Figure 3.6 of the CSEI 2013.
- 1.1.20 The design of the substation is discussed in more detail within chapter 4 of the August 2013 CSEI and is fully assessed with respect to potential environmental effects within the CSEI. It is understood that the turbines of the proposed Llanbrynmair Wind Farm will be connected to the onsite substation via underground cables, as outlined within Chapter 3 of the CSEI.

Broad Route Corridors

- 1.1.21 The preferred Cefn Coch National Grid substation and the revised onsite Llanbrynmair Wind Farm onsite substation fall outside the preferred broad route corridors, F3 and F4, identified in the original grid connection assessment, shown on Figure 2 and Figure 3. As a consequence the broad route corridors require extension and amendment to ensure a viable connection between the Llanbrynmair Wind Farm onsite substation and the Cefn Coch National Grid Substation search area is possible.

1.2 Updated Environmental Advice

- 1.2.1 A high level review to identify potential environmental constraints has been undertaken to accompany the original assessments included within the August 2013 CSEI, considering the potential changes in the environmental advice previously provided in relation to the broad route corridors F3 and F4.
- 1.2.2 A broad review of landscape and visual sensitivities and constraints, along with desk based ecological analysis and assessment of the preferred broad route corridors to identify potential ecological constraints located out with the proposed substation areas and the broad route corridors, where a grid connection corridor may extend. Study areas extending to 200m radius from the selected substation locations were identified as outlined below:
- Study Area A - 200m radius from Llanbrynmair onsite substation site (see para. 1.2.5 below)
 - Study Area B - 200m radius Cefn Coch National Grid substation site

Grid Connection Assessment in Relation to the Updated Substation Locations

Updated Grid Connection Assessment Advice

- 1.2.3 The review in relation to general grid routing principles, landscape and visual issues is outlined in Table 1.1, and should be read in conjunction with the original grid connection assessment contained within Appendix 4.4 of the CSEI 2013 Volume II A - Supporting Appendices.
- 1.2.4 When considering Table 1.1, it should be noted that the landscape and visual constraints and effects associated with the Llanbrynmair Wind Farm onsite substation have been fully assessed within the August 2013 CSEI.

Table 1.1: Landscape and Visual Considerations

| Criterion | Study Area A - 200m radius from Llanbrynmair Wind Farm Onsite Substation | Study Area B - 200m radius from National Grid Cefn Coch Substation |
|--|--|--|
| International, National or Local landscape designations | Not covered by any international, national or local landscape designations. | Not covered by any international, national or local landscape designations. |
| Areas of highest environmental value⁹ | Study Area A not likely to affect areas of highest environmental value. | Study Area B not likely to affect areas of highest environmental value. |
| LANDMAP considerations | Study Area A lies outside a LANDMAP area of High or Outstanding value for <i>Landscape Habitats</i> and <i>Visual and Sensory</i> and within a LANDMAP area of High value for <i>Historic</i> , <i>Geological</i> and <i>Cultural Landscapes</i> . | Study Area B lies outside a LANDMAP area of High value for <i>Landscape Habitats</i> and partially out with an area of High value for <i>Historic Landscapes</i> . The area lies within an area of High value for <i>Visual and Sensory</i> , <i>Geological</i> and <i>Cultural Landscapes</i> . |
| Topographic/ Technical Constraints | Topography of Study Area A is not likely to result in increased sky lining of infrastructure or grid connections leading from it and offers opportunities to screen the substation through the introduction of subtle earth bunding to the north-east. | Topography of Study Area A is not likely to result in increased sky lining of infrastructure or grid connections leading to it and is not likely to require substantial earthworks to accommodate the infrastructure. The network of existing and proposed wind farm developments was deemed to create a physical constraint for the routeing of OHLs in the original assessment, |
| Other landscape considerations | Study Area A lies within an area of semi-improved grassland/grazed moorland, flanked by commercial coniferous forestry plantation and is of low landscape value. If consented and built, the introduction of Llanbrynmair Wind Farm will contribute to significant landscape change. The grid connection will appear in context with the turbines and substation. It will make an additional, albeit minor, contribution to landscape change alongside the wind farm. | Study Area B lies predominantly within the boundary of the consented Tirgwynt Wind Farm. Once Tirgwynt is constructed the grid connection from Llanbrynmair will appear in the context of Tirgwynt Wind Farm alongside the turbines, and other above ground equipment such as OHLs, pylons and onsite substations. The study area consists of semi-improved grassland and enclosed grazing of typical low-medium landscape value. |

⁹ Areas of Highest Environmental Value are defined within the methodology contained within the original *Llanbrynmair Wind Farm Grid Connection Assessment*. (2010), LUC

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| <p>Visual considerations</p> | <p>The revised onsite substation was designed to minimise visibility from the Glyndŵr's Way National Trail, and included mitigation earth bunding and tree planting as outlined in the August 2013 CSEI.</p> <p>The visual effects of the onsite substation are fully assessed in the CSEI 2013.</p> <p>An OHL grid connection between the onsite substation and the broad route corridors previously identified is likely to be backclothed against the surrounding higher ground of the wind farm site and adjacent coniferous forestry.</p> | <p>The proposed substation location is within the boundary of the consented Tirgwynt Wind Farm where significant visual change is predicted as a result of the construction and operation of the wind farm. The introduction of the grid connection will be in the context of the neighboring Tirgwynt Wind Farm and will not extend the visual influence of energy related infrastructure over a larger area than the broad route corridors identified in the previous grid connection assessment.</p> |
|-------------------------------------|--|---|

Findings and Discussion

Designated Landscapes

- 1.2.5 Changes to the broad route corridors, as a result of the substation changes outlined will not result in any changes to the advice outlined in the original grid connection assessment in relation to internationally, nationally or locally designated landscapes.

Landscape

- 1.2.6 The Llanbrynmair Wind Farm and Tirgwynt Wind Farm are located within TAN 8 SSA-B where there is an expectation to accept significant landscape change as a result of onshore wind energy development. The extension of the broad route corridors within study areas A and B will not substantially add to the level of landscape change experienced across each wind farm development site, due to the presence of the adjacent wind farms and substation infrastructure.

Visual

- 1.2.7 The amendments to the broad route corridors (F3 and F4) will not substantially alter the potential visual change highlighted within the original grid connection assessment. Once constructed the consented (Tirgwynt) and/or proposed (Llanbrynmair) wind farm developments will result in significant visual effects across the development sites and the local surrounding areas (as assessed in the CSEI 2013 and the Tirgwynt Wind Farm Environmental Statement). The location of the substations within these areas will not substantially add to the level of visual change experienced across each wind farm development site and the local surrounding areas.
- 1.2.8 The revised substations are located within close proximity to the broad route corridors identified within the original grid connection assessment; it is judged that the original broad route corridors require only minor amendment and therefore the original environmental advice in relation to the identified preferred broad route corridors and potential landscape effects is still current.

Ecology Assessment in Relation to the Updated Substation Locations

Updated Ecology Assessment Advice

- 1.2.9 An updated ecological assessment was required to determine if the conclusions of the previous reports remain appropriate when including Study Area A and Study Area B in relation to the amended substation locations and the consequential changes required to the broad route corridors. Table 1.2 below outlines the ecological constraints associated with the new locations of the substations plus a 200m radius study area, as shown on Figure 6 and Figure 7.
- 1.2.10 When considering Table 1.2, it should be noted that the ecological constraints and effects associated with the Llanbrynmair Wind Farm onsite substation have been fully assessed within the August 2013 CSEI.

Table 1.2: Ecological Considerations

| Criterion | Study Area A - 200m radius from Llanbrynmair Wind Farm Onsite Substation (see Figure 7) | Study Area B - 200m radius from National Grid Cefn Coch Substation (see Figure 6) |
|---|---|--|
| International biodiversity designations | Does not contain any internationally designated biodiversity sites. | Does not contain any internationally designated biodiversity sites. |
| National biodiversity designations | Does not contain any SSSI, NNR or LNR. | Does not contain any SSSI, NNR or LNR. |
| Local biodiversity designations | No Local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified. | No Local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified. |
| Habitat description (CCW Phase 1 Habitat Mapping and OS mapping) | The majority of Study Area A was recorded as improved grassland, with an area of coniferous woodland plantation recorded in the south-east. This is outside the boundary of the substation itself. Also noted was a tributary of the Afon Gam running just south of the study area. | The majority of Study Area B was recorded as improved grassland, with an area of broadleaved woodland directly within the proposed sub-station site. Near the south-eastern perimeter of Study Area B, marsh/marshy grassland was recorded. Also noted was a small watercourse running south-west to north-east through the proposed study area. |
| Notable habitats | No Ancient Woodland sites were identified within Study Area A. Powys BAP Habitats which may be associated with Study Area A include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear habitats Rivers and Streams | No Ancient Woodland sites were identified within Study Area B. Powys BAP Habitats which may be associated with Study Area B include: Upland Oak Woodland Scrub and Ffridd Linear habitats Rivers and Streams Lowland meadows |

| | | |
|----------------|--|--|
| | <p>Lowland meadows</p> <p>Farmland</p> <p>Rhos Pastures</p> <p>Upland Lowland Heath</p> | <p>Farmland</p> <p>Rhos Pastures</p> <p>Upland Lowland Heath</p> |
| Species | <p>There is the potential for protected and notable species to occur within Study Area A. It is not possible to provide meaningful guidance without ground surveys. However, issues may arise in relation to bats given the woodland within Study Area A, and the presence of possible commuting routes such as hedgerows, woodland and watercourses Riparian fauna such as fish, water vole and otter also need consideration due to the watercourse within the Study Area.</p> | <p>There is the potential for protected and notable species to occur within Study Area B. Without ground surveys it is not possible to provide meaningful guidance, however issues may arise in relation to riparian species such as fish, water vole and otter. Bats will also need to be considered given the presence of possible commuting routes such as watercourses, woodland edge and hedgerows.</p> |

Findings and Discussion

Designated Sites

1.2.11 The results of the previous Ecology Assessment (LUC, 2011) concluded that there were no major constraints with regard to biodiversity designations either at the international, national or local level. Neither of the Study Areas considered in this report intersect with any designated sites and therefore this assessment remains appropriate to the revised broad route corridors extending through Study Areas A and B.

Habitats

1.2.12 Valuable habitats identified within the original report, and intersecting within the routes included:

- Upland habitats
- Woodland habitats
- Lowland agricultural habitats
- Rivers and watercourses

1.2.13 These habitats remain a consideration for the amended siting of the substations as discussed in the table above, both as valuable habitats in their own right, and in relation to the protected species they potentially support. Therefore the assessment of the previous report in regard to habitats remains appropriate to the revised locations of substations within Study Areas A and B.

Species

1.2.14 In terms of impacts on species, it is not within the scope of this updated assessment to provide greater detail. However, as stated in the previous report, the analysis of habitat impacts can provide an indication of potential impacts on protected species, and this remains an appropriate assessment.

1.2.15 The National Grid Cefn Coch substation location will be subject to ground based ecological surveys to identify the habitats present and their suitability to support protected and

notable species, and the presence/probable absence of such species, as part of the ongoing National Grid environmental assessment.

- 1.2.16 For the Llanbrynmair Wind Farm onsite substation, protected species data is discussed in the August 2013 CSEI which concluded species will not present a constraint to development.

1.3 Conclusions

- 1.3.1 LUC have revisited the broad study area to review the consequential changes required to the broad route corridors between the Llanbrynmair Wind Farm onsite substation and the selected National Grid Cefn Coch substation. It is judged that the changes required to extend the broad route corridors (F3 and F4) between the selected National Grid substation and the Llanbrynmair Wind Farm onsite substation do not alter the findings of the 2010 grid connection assessment study and that electricity could be delivered to the 400kV substation location via a technically feasible and environmentally viable 132kV overhead line grid connection from the proposed Llanbrynmair Wind Farm.
- 1.3.2 The original study was conducted on the assumption that the cable connection type will be overhead lines supported by wooden poles (approximately 14m in height). It is recognised that where multiple connections from different wind farms come together, steel towers may be used instead of wooden poles, as a means of avoiding the need to double up on infrastructure. Reference to the suitability of each broad route corridor for both wooden poles and steel towers is included in the original grid connection assessment (Appendix 1) where this is relevant (i.e. where one of the types will be unsuitable). As a general rule, where steel towers could be accommodated, then it is also considered that the landscape has capacity to accommodate wooden poles.
- 1.3.3 It is judged that the landscape of the identified preferred broad route corridors F3 and F4, and Study Areas A and B can accommodate the necessary overhead line infrastructure.
- 1.3.4 The required amendments to the broad route corridors, F3 and F4, which would be accommodated within Study Area A and Study Area B to connect Llanbrynmair Wind Farm to the selected National Grid Cefn Coch substation does not alter the findings of the 2011 ecology assessment study and that electricity could be delivered to the 400kV substation via a technically feasible and environmentally viable 132kV overhead line grid connection.
- 1.3.5 It is judged that the identified preferred broad route corridors F4 and F4, and Study Areas A and B can accommodate the necessary overhead line infrastructure to connect Llanbrynmair Wind Farm to the selected National Grid Cefn Coch substation without unacceptable detrimental effects on ecologically designated sites, habitats or species.

1.4 Summary

- 1.4.1 The content and findings of the LUC studies are still current and will remain as such until more detailed information about the Mid Wales Connections Project is made publicly available to RES and other developers by SPEN and National Grid.
- 1.4.2 At this time it is not considered feasible that a more detailed grid connection routeing study can be provided.

1.1 Introduction

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Background

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- 1.1.11 In August 2011 LUC was commissioned by RES to undertake a desk based analysis of the ecological characteristics of the preferred route corridors identified within the 2010 assessment to identify potential ecological constraints which may deem the preferred route corridors unfeasible from an ecological perspective. The *Llanbrynmair Wind Farm Grid Connection: Ecology Assessment*⁶ was included within *Appendix 4.4 of CSEI 2013 Volume II A - Supporting Appendices*, and the assessed corridors are shown on **Figure 4 and Figure 5** which accompany this review. No field based assessment or analysis was undertaken to inform this study.

Updated Information

- 1.1.12 Since the preparation of the grid connection assessment and ecological assessment by LUC in 2010 and 2011 respectively, the preferred National Grid substation location west of Cefn Coch has been identified and published within the National Grid Mid Wales Connection Project Substation Site Report⁷ (herein referred to in relation to Study Area B) and the location of a single onsite substation for the Llanbrynmair Wind Farm (herein referred to in relation to Study Area A) has been amended.

⁴ NGC, (updated 1993, 2003) *The Holford Rules, and SHETL clarification notes*

⁵ Land Use Consultants (LUC), 2010. *Llanbrynmair Wind Farm Grid Connection Assessment*. LUC, Glasgow.

⁶ Land Use Consultants (LUC), 2011. *Llanbrynmair Wind Farm Grid Connection: Ecology Assessment*. LUC, London.

⁷ National Grid, (September 2013). *Mid Wales Connection Project, Connecting Wind Farms through Mid Wales and Shropshire: Substation Site Report* (Draft for Consultation)

Cefn Coch National Grid Substation

- 1.1.13 The selected Cefn Coch National Grid substation (NW) was one of eight substation site options identified by National Grid as shown on Page 25, Figure 8.1 of the Substation Site Report, is located ‘approximately 500m to the north-west of the Cefn Coch Substation Siting Area and outside the Preferred Route Corridor’ (Page 37, Para. 10.2.1) and within the boundary of the consented Tirgwynt Wind Farm, west of and outside the original National Grid Cefn Coch substation search area, as shown on **Figure 1**. The substation location lies adjacent to the broad route corridors, F3 and F4, identified within the 2010 grid connection assessment. The draft route alignment of the National Grid 400kV grid connection is also shown on **Figure 1**, including where it connects to the proposed Cefn Coch substation.
- 1.1.14 The selected substation (NW) is described within the Substation Site Report at paragraphs 10.2.1-10.2.5 where the site is described as occupying ‘a remote rural situation, on the edge of TAN 8 SSAB and adjacent to the proposed Tirgwynt wind farm. Whilst currently a substation in this location would represent a detracting urban element, which would be inconsistent with the local landscape character, this situation is likely to change with the construction of the Tirgwynt wind farm and Mynydd Waen Fawr wind farm⁸ (if constructed) as the proposed substation would potentially be seen alongside above ground equipment such as overhead electricity lines, pylons and the turbines of the Tirgwynt Wind farm and other planned wind farms.’
- 1.1.15 A site appraisal for the selected substation site is found in the substation site report at paragraphs 10.2.6-10.2.32 outlining the potential environmental constraints and opportunities for the site. The substation site report states that: ‘There are fewer potential negative effects associated with this site than any of the others being assessed. There is a concern that the movements and noises associated with the construction of the substation may have a detrimental effect upon the curlews and other breeding bird that nest nearby. However the EIA for the consented Tirgwynt Wind Farm did not identify this as a significant impact.’ and in conclusion: ‘Overall, and taking into account the above assessments, Site NW is identified as the preferred location for the substation.’
- 1.1.16 It is understood that through winter 2013 National Grid will be undertaking further detailed environmental assessments and investigations at the preferred substation location. Following the consultation period with stakeholders, interested parties and members of the public, the intended detailed design of the substation will be subject to further environmental assessment and public consultation prior to the submission of a consent application for the proposed development.
- 1.1.17 No assessment of the selected National Grid Cefn Coch substation site has been undertaken by LUC as part of this review or the August 2013 CSEI.

Llanbrynmair Onsite Substation

- 1.1.18 The original infrastructure design for Llanbrynmair Wind Farm identified three substations serving the northern, central and southern groups of turbines. Natural Resources Wales (NRW) expressed concerns during the third round of SEI about the potential significant effects of the substations from a visual perspective. In particular, this related to effects on Glyndŵr’s Way National Trail and other recreational routes. The central substation was redesigned to act as the primary substation, carrying out all of the electrical functions of the wind farm. Having undertaken an environmental review to determine the most appropriate location, in consultation with NRW, the central substation was relocated to SH 947 053.

⁸ The planning application for Mynydd Waun Fawr Wind Farm was withdrawn by Vattenfall in 2013.

- 1.1.19 In winter 2012/2013 the onsite substation was relocated adjacent to the proposed Carnedd Wen substation and next to an area of coniferous woodland. The location of the revised onsite Llanbrynmair Wind Farm substation is shown on **Figure 1** which accompanies this review and Figure 3.6 of the CSEI 2013.
- 1.1.20 The design of the substation is discussed in more detail within chapter 4 of the August 2013 CSEI and is fully assessed with respect to potential environmental effects within the CSEI. It is understood that the turbines of the proposed Llanbrynmair Wind Farm will be connected to the onsite substation via underground cables, as outlined within Chapter 3 of the CSEI.

Broad Route Corridors

- 1.1.21 The preferred Cefn Coch National Grid substation and the revised onsite Llanbrynmair Wind Farm onsite substation fall outside the preferred broad route corridors, F3 and F4, identified in the original grid connection assessment, shown on **Figure 2** and **Figure 3**. As a consequence the broad route corridors require extension and amendment to ensure a viable connection between the Llanbrynmair Wind Farm onsite substation and the Cefn Coch National Grid Substation search area is possible.

1.2 Updated Environmental Advice

- 1.2.1 A high level review to identify potential environmental constraints has been undertaken to accompany the original assessments included within the August 2013 CSEI, considering the potential changes in the environmental advice previously provided in relation to the broad route corridors F3 and F4.
- 1.2.2 A broad review of landscape and visual sensitivities and constraints, along with desk based ecological analysis and assessment of the preferred broad route corridors to identify potential ecological constraints located out with the proposed substation areas and the broad route corridors, where a grid connection corridor may extend. Study areas extending to 200m radius from the selected substation locations were identified as outlined below:
- Study Area A - 200m radius from Llanbrynmair onsite substation site (see para. 1.2.5 below)
 - Study Area B - 200m radius Cefn Coch National Grid substation site

Grid Connection Assessment in Relation to the Updated Substation Locations

Updated Grid Connection Assessment Advice

- 1.2.3 The review in relation to general grid routing principles, landscape and visual issues is outlined in Table 1.1, and should be read in conjunction with the original grid connection assessment contained within *Appendix 4.4 of the CSEI 2013 Volume II A - Supporting Appendices*.
- 1.2.4 When considering Table 1.1, it should be noted that the landscape and visual constraints and effects associated with the Llanbrynmair Wind Farm onsite substation have been fully assessed within the August 2013 CSEI.

Table 1.1: Landscape and Visual Considerations

| Criterion | Study Area A - 200m radius from Llanbrynmair Wind Farm Onsite Substation | Study Area B - 200m radius from National Grid Cefn Coch Substation |
|--|--|--|
| International, National or Local landscape designations | Not covered by any international, national or local landscape designations. | Not covered by any international, national or local landscape designations. |
| Areas of highest environmental value⁹ | Study Area A not likely to affect areas of highest environmental value. | Study Area B not likely to affect areas of highest environmental value. |
| LANDMAP considerations | Study Area A lies outside a LANDMAP area of High or Outstanding value for <i>Landscape Habitats</i> and <i>Visual and Sensory</i> and within a LANDMAP area of High value for <i>Historic, Geological and Cultural Landscapes</i> . | Study Area B lies outside a LANDMAP area of High value for <i>Landscape Habitats</i> and partially out with an area of High value for <i>Historic Landscapes</i> . The area lies within an area of High value for <i>Visual and Sensory, Geological and Cultural Landscapes</i> . |
| Topographic/ Technical Constraints | Topography of Study Area A is not likely to result in increased sky lining of infrastructure or grid connections leading from it and offers opportunities to screen the substation through the introduction of subtle earth bunding to the north-east. | Topography of Study Area A is not likely to result in increased sky lining of infrastructure or grid connections leading to it and is not likely to require substantial earthworks to accommodate the infrastructure. The network of existing and proposed wind farm developments was deemed to create a physical constraint for the routing of OHLs in the original assessment, |
| Other landscape considerations | Study Area A lies within an area of semi-improved grassland/grazed moorland, flanked by commercial coniferous forestry plantation and is of low landscape value. If consented and built, the introduction of Llanbrynmair Wind Farm will contribute to significant landscape change. The grid connection will appear in context with the turbines and substation. It will make an additional, albeit minor, contribution to landscape change alongside the wind farm. | Study Area B lies predominantly within the boundary of the consented Tirgwynt Wind Farm. Once Tirgwynt is constructed the grid connection from Llanbrynmair will appear in the context of Tirgwynt Wind Farm alongside the turbines, and other above ground equipment such as OHLs, pylons and onsite substations. The study area consists of semi-improved grassland and enclosed grazing of typical low-medium landscape value. |

⁹ Areas of Highest Environmental Value are defined within the methodology contained within the original *Llanbrynmair Wind Farm Grid Connection Assessment*. (2010), LUC

| Criterion | Study Area A - 200m radius from Llanbrynmair Wind Farm Onsite Substation | Study Area B - 200m radius from National Grid Cefn Coch Substation |
|------------------------------|--|---|
| Visual considerations | <p>The revised onsite substation was designed to minimise visibility from the Glyndŵr's Way National Trail, and included mitigation earth bunding and tree planting as outlined in the August 2013 CSEI.</p> <p>The visual effects of the onsite substation are fully assessed in the CSEI 2013.</p> <p>An OHL grid connection between the onsite substation and the broad route corridors previously identified is likely to be backclothed against the surrounding higher ground of the wind farm site and adjacent coniferous forestry.</p> | <p>The proposed substation location is within the boundary of the consented Tirgwynt Wind Farm where significant visual change is predicted as a result of the construction and operation of the wind farm. The introduction of the grid connection will be in the context of the neighboring Tirgwynt Wind Farm and will not extend the visual influence of energy related infrastructure over a larger area than the broad route corridors identified in the previous grid connection assessment.</p> |

Findings and Discussion

Designated Landscapes

- 1.2.5 Changes to the broad route corridors, as a result of the substation changes outlined will not result in any changes to the advice outlined in the original grid connection assessment in relation to internationally, nationally or locally designated landscapes.

Landscape

- 1.2.6 The Llanbrynmair Wind Farm and Tirgwynt Wind Farm are located within TAN 8 SSA-B where there is an expectation to accept significant landscape change as a result of onshore wind energy development. The extension of the broad route corridors within study areas A and B will not substantially add to the level of landscape change experienced across each wind farm development site, due to the presence of the adjacent wind farms and substation infrastructure.

Visual

- 1.2.7 The amendments to the broad route corridors (F3 and F4) will not substantially alter the potential visual change highlighted within the original grid connection assessment. Once constructed the consented (Tirgwynt) and/or proposed (Llanbrynmair) wind farm developments will result in significant visual effects across the development sites and the local surrounding areas (as assessed in the CSEI 2013 and the Tirgwynt Wind Farm Environmental Statement). The location of the substations within these areas will not substantially add to the level of visual change experienced across each wind farm development site and the local surrounding areas.
- 1.2.8 The revised substations are located within close proximity to the broad route corridors identified within the original grid connection assessment; it is judged that the original broad route corridors require only minor amendment and therefore the original environmental advice in relation to the identified preferred broad route corridors and potential landscape effects is still current.

Ecology Assessment in Relation to the Updated Substation Locations

Updated Ecology Assessment Advice

- 1.2.9 An updated ecological assessment was required to determine if the conclusions of the previous reports remain appropriate when including Study Area A and Study Area B in relation to the amended substation locations and the consequential changes required to the broad route corridors. Table 1.2 below outlines the ecological constraints associated with the new locations of the substations plus a 200m radius study area, as shown on **Figure 6** and **Figure 7**.
- 1.2.10 When considering Table 1.2, it should be noted that the ecological constraints and effects associated with the Llanbrynmair Wind Farm onsite substation have been fully assessed within the August 2013 CSEI.

Table 1.2: Ecological Considerations

| Criterion | Study Area A - 200m radius from Llanbrynmair Wind Farm Onsite Substation (see Figure 7) | Study Area B - 200m radius from National Grid Cefn Coch Substation (see Figure 6) |
|---|---|--|
| International biodiversity designations | Does not contain any internationally designated biodiversity sites. | Does not contain any internationally designated biodiversity sites. |
| National biodiversity designations | Does not contain any SSSI, NNR or LNR. | Does not contain any SSSI, NNR or LNR. |
| Local biodiversity designations | No Local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified. | No Local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified. |
| Habitat description (CCW Phase 1 Habitat Mapping and OS mapping) | The majority of Study Area A was recorded as improved grassland, with an area of coniferous woodland plantation recorded in the south-east. This is outside the boundary of the substation itself. Also noted was a tributary of the Afon Gam running just south of the study area. | The majority of Study Area B was recorded as improved grassland, with an area of broadleaved woodland directly within the proposed sub-station site. Near the south-eastern perimeter of Study Area B, marsh/marshy grassland was recorded. Also noted was a small watercourse running south-west to north-east through the proposed study area. |

| Criterion | Study Area A - 200m radius from Llanbrynmair Wind Farm Onsite Substation (see Figure 7) | Study Area B - 200m radius from National Grid Cefn Coch Substation (see Figure 6) |
|-------------------------|--|--|
| Notable habitats | <p>No Ancient Woodland sites were identified within Study Area A. Powys BAP Habitats which may be associated with Study Area A include:</p> <ul style="list-style-type: none"> Wet Woodland Coniferous Woodland Scrub and Ffridd Linear habitats Rivers and Streams Lowland meadows Farmland Rhos Pastures Upland Lowland Heath | <p>No Ancient Woodland sites were identified within Study Area B. Powys BAP Habitats which may be associated with Study Area B include:</p> <ul style="list-style-type: none"> Upland Oak Woodland Scrub and Ffridd Linear habitats Rivers and Streams Lowland meadows Farmland Rhos Pastures Upland Lowland Heath |
| Species | <p>There is the potential for protected and notable species to occur within Study Area A. It is not possible to provide meaningful guidance without ground surveys. However, issues may arise in relation to bats given the woodland within Study Area A, and the presence of possible commuting routes such as hedgerows, woodland and watercourses Riparian fauna such as fish, water vole and otter also need consideration due to the watercourse within the Study Area.</p> | <p>There is the potential for protected and notable species to occur within Study Area B. Without ground surveys it is not possible to provide meaningful guidance, however issues may arise in relation to riparian species such as fish, water vole and otter. Bats will also need to be considered given the presence of possible commuting routes such as watercourses, woodland edge and hedgerows.</p> |

Findings and Discussion

Designated Sites

- 1.2.11 The results of the previous Ecology Assessment (LUC, 2011) concluded that there were no major constraints with regard to biodiversity designations either at the international, national or local level. Neither of the Study Areas considered in this report intersect with any designated sites and therefore this assessment remains appropriate to the revised broad route corridors extending through Study Areas A and B.

Habitats

- 1.2.12 Valuable habitats identified within the original report, and intersecting within the routes included:
- Upland habitats
 - Woodland habitats
 - Lowland agricultural habitats
 - Rivers and watercourses

- 1.2.13 These habitats remain a consideration for the amended siting of the substations as discussed in the table above, both as valuable habitats in their own right, and in relation to the protected species they potentially support. Therefore the assessment of the previous report in regard to habitats remains appropriate to the revised locations of substations within Study Areas A and B.

Species

- 1.2.14 In terms of impacts on species, it is not within the scope of this updated assessment to provide greater detail. However, as stated in the previous report, the analysis of habitat impacts can provide an indication of potential impacts on protected species, and this remains an appropriate assessment.
- 1.2.15 The National Grid Cefn Coch substation location will be subject to ground based ecological surveys to identify the habitats present and their suitability to support protected and notable species, and the presence/probable absence of such species, as part of the ongoing National Grid environmental assessment.
- 1.2.16 For the Llanbrynmair Wind Farm onsite substation, protected species data is discussed in the August 2013 CSEI which concluded species will not present a constraint to development.

1.3 Conclusions

- 1.3.1 LUC have revisited the broad study area to review the consequential changes required to the broad route corridors between the Llanbrynmair Wind Farm onsite substation and the selected National Grid Cefn Coch substation. It is judged that the changes required to extend the broad route corridors (F3 and F4) between the selected National Grid substation and the Llanbrynmair Wind Farm onsite substation do not alter the findings of the 2010 grid connection assessment study and that electricity could be delivered to the 400kV substation location via a technically feasible and environmentally viable 132kV overhead line grid connection from the proposed Llanbrynmair Wind Farm.
- 1.3.2 The original study was conducted on the assumption that the cable connection type will be overhead lines supported by wooden poles (approximately 14m in height). It is recognised that where multiple connections from different wind farms come together, steel towers may be used instead of wooden poles, as a means of avoiding the need to double up on infrastructure. Reference to the suitability of each broad route corridor for both wooden poles and steel towers is included in the original grid connection assessment (Appendix 1) where this is relevant (i.e. where one of the types will be unsuitable). As a general rule, where steel towers could be accommodated, then it is also considered that the landscape has capacity to accommodate wooden poles.
- 1.3.3 It is judged that the landscape of the identified preferred broad route corridors F3 and F4, and Study Areas A and B can accommodate the necessary overhead line infrastructure.
- 1.3.4 The required amendments to the broad route corridors, F3 and F4, which would be accommodated within Study Area A and Study Area B to connect Llanbrynmair Wind Farm to the selected National Grid Cefn Coch substation does not alter the findings of the 2011 ecology assessment study and that electricity could be delivered to the 400kV substation via a technically feasible and environmentally viable 132kV overhead line grid connection.
- 1.3.5 It is judged that the identified preferred broad route corridors F4 and F4, and Study Areas A and B can accommodate the necessary overhead line infrastructure to connect Llanbrynmair Wind Farm to the selected National Grid Cefn Coch substation without unacceptable detrimental effects on ecologically designated sites, habitats or species.

1.4 Summary

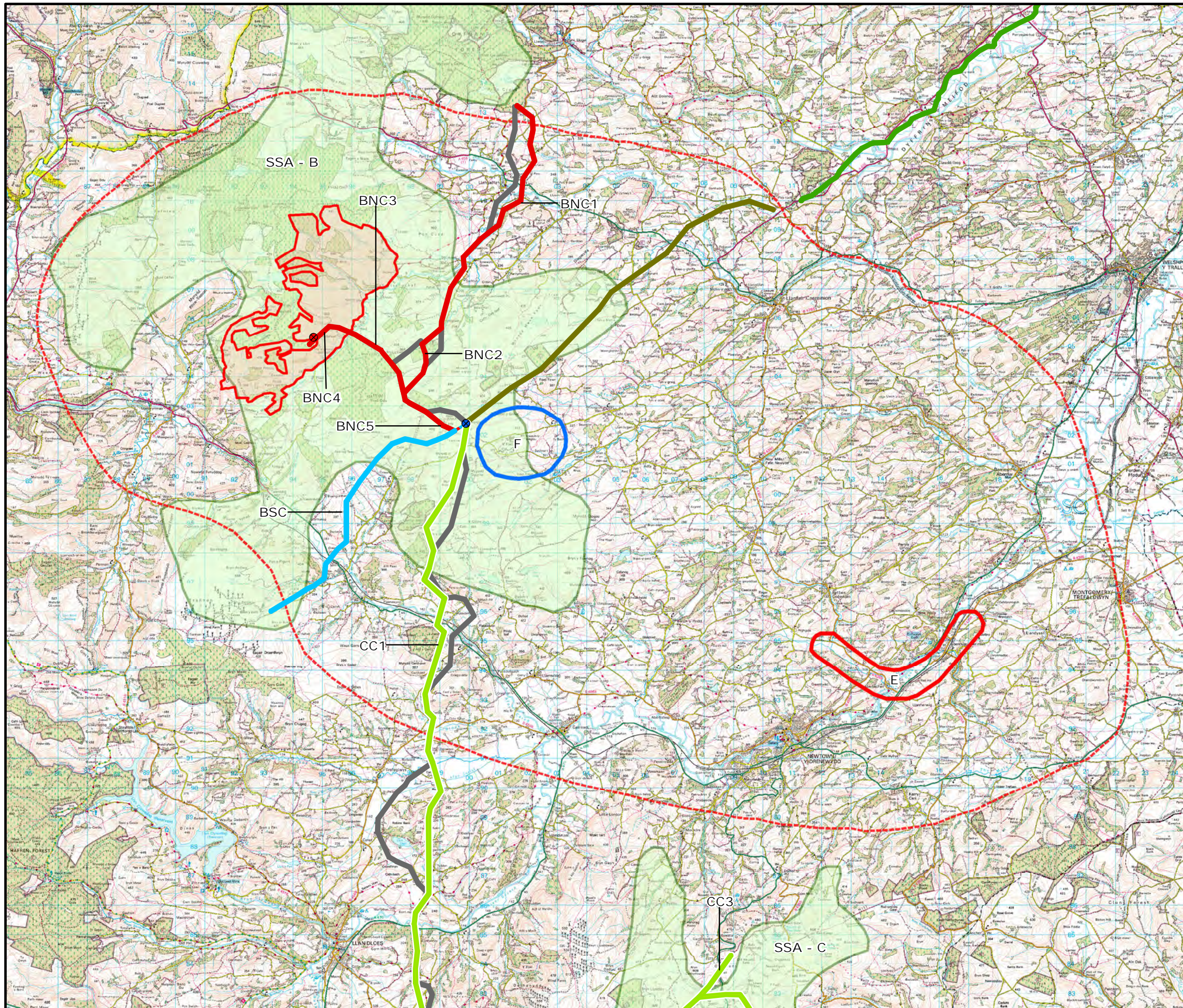
- 1.4.1 The content and findings of the LUC studies are still current and will remain as such until more detailed information about the Mid Wales Connections Project is made publicly available to RES and other developers by SPEN and National Grid.
- 1.4.2 At this time it is not considered feasible that a more detailed grid connection routeing study can be provided.



LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 1

BROAD STUDY AREA



- Llanbrynmair Onsite Substation
- National Grid Substation Site
- Broad Study Area Boundary
- Llanbrynmair WF Boundary
- Llanbrynmair WF Area
- TAN8 Strategic Search Area (SSA)
- NG Substation Hub Location**
 - Hub E - Aberbechan
 - Hub F - Cefn Coch
- SPEN Grid Connection Route Corridors**
 - BNC
 - BSC
 - CC
 - Alternative Line Route Options
- NG Grid Connection Route Corridor**
 - 400kV Draft National Grid Route Overhead
 - 400kV Draft National Grid Route Underground



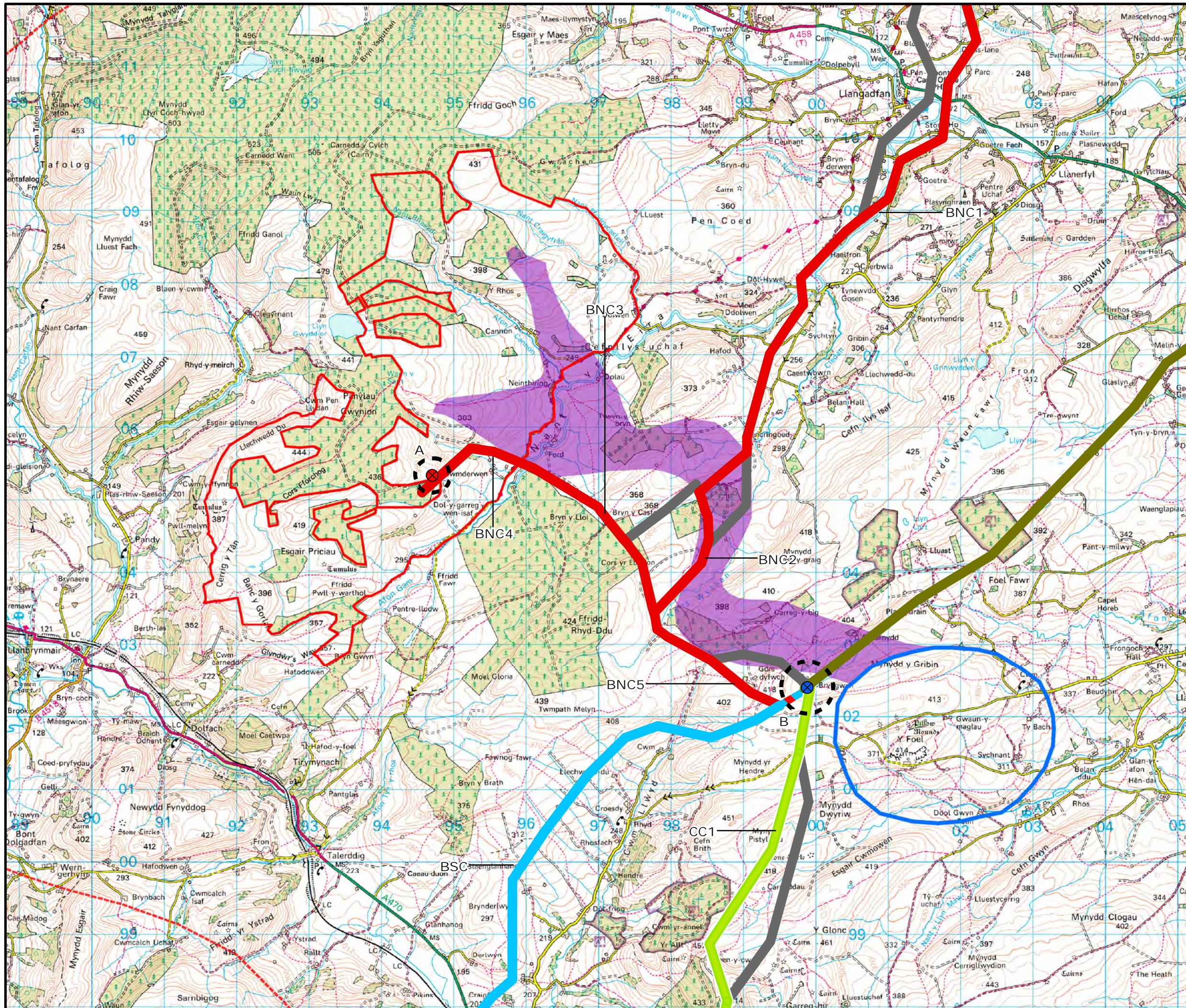
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LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 2

BROAD ROUTE CORRIDOR F3



- Llanbrynmair Onsite Substation
- National Grid Substation Site
- Study Areas (2013 Review)
- Broad Study Area Boundary
- Llanbrynmair WF Boundary
- NG Substation Hub Location**
- Hub F - Cefn Coch
- LUC Broad Route Corridor**
- F3
- SPEN Grid Connection Route Corridors**
- BNC
- BSC
- CC
- Alternative Line Route Options
- NG Grid Connection Route Corridor**
- 400kV Draft National Grid Route Overhead



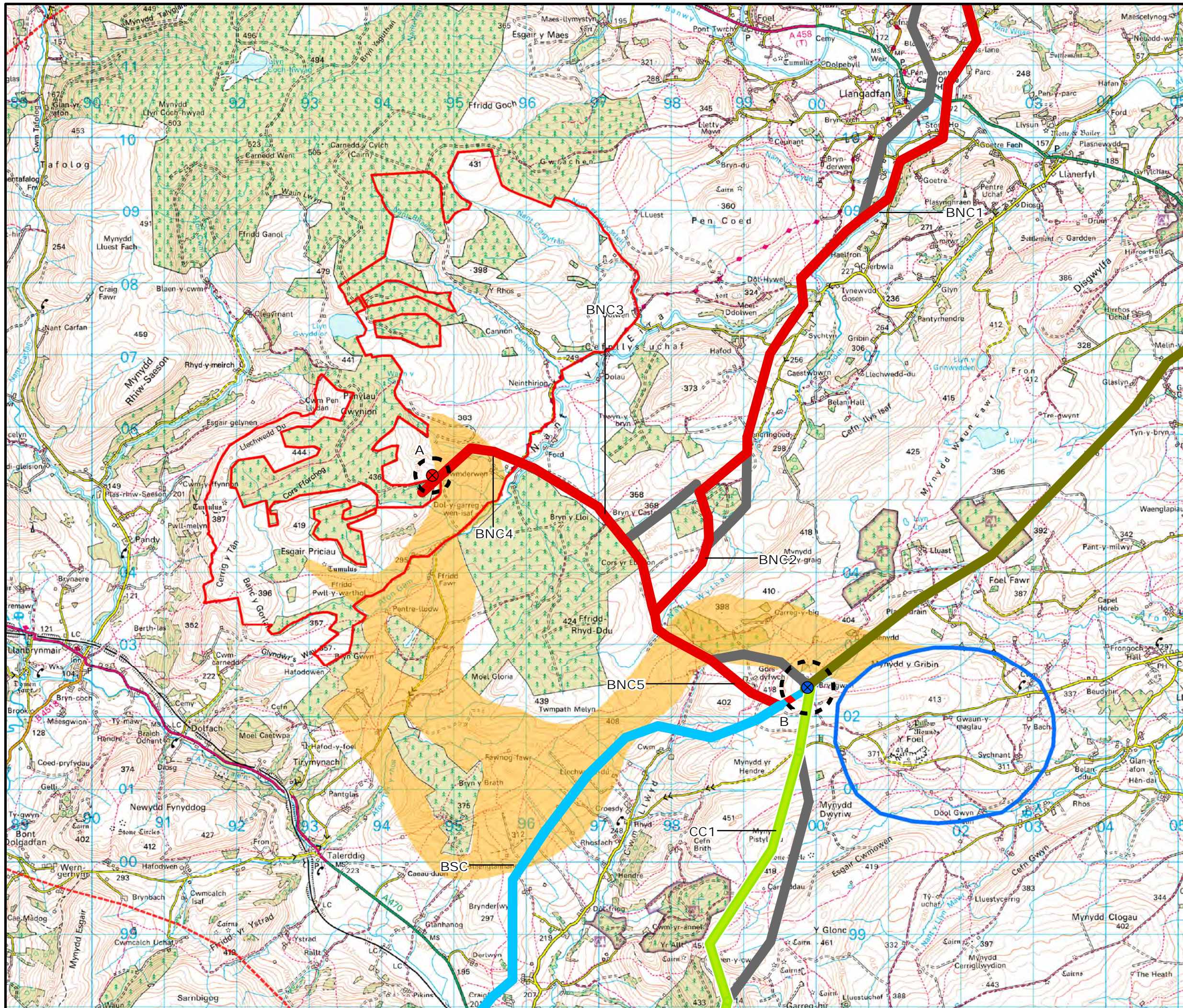
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LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 3

BROAD ROUTE CORRIDOR F4



⊗ Llanbrynmair Onsite Substation

⊗ National Grid Substation Site

⊡ Study Areas (2013 Review)

⊡ Broad Study Area Boundary

⊡ Llanbrynmair WF Boundary

NG Substation Hub Location

⊡ Hub F - Cefn Coch

LUC Broad Route Corridor

F4

SPEN Grid Connection Route Corridors

BNC

BSC

CC

Alternative Line Route Options

NG Grid Connection Route Corridor

400kV Draft National Grid Route Overhead



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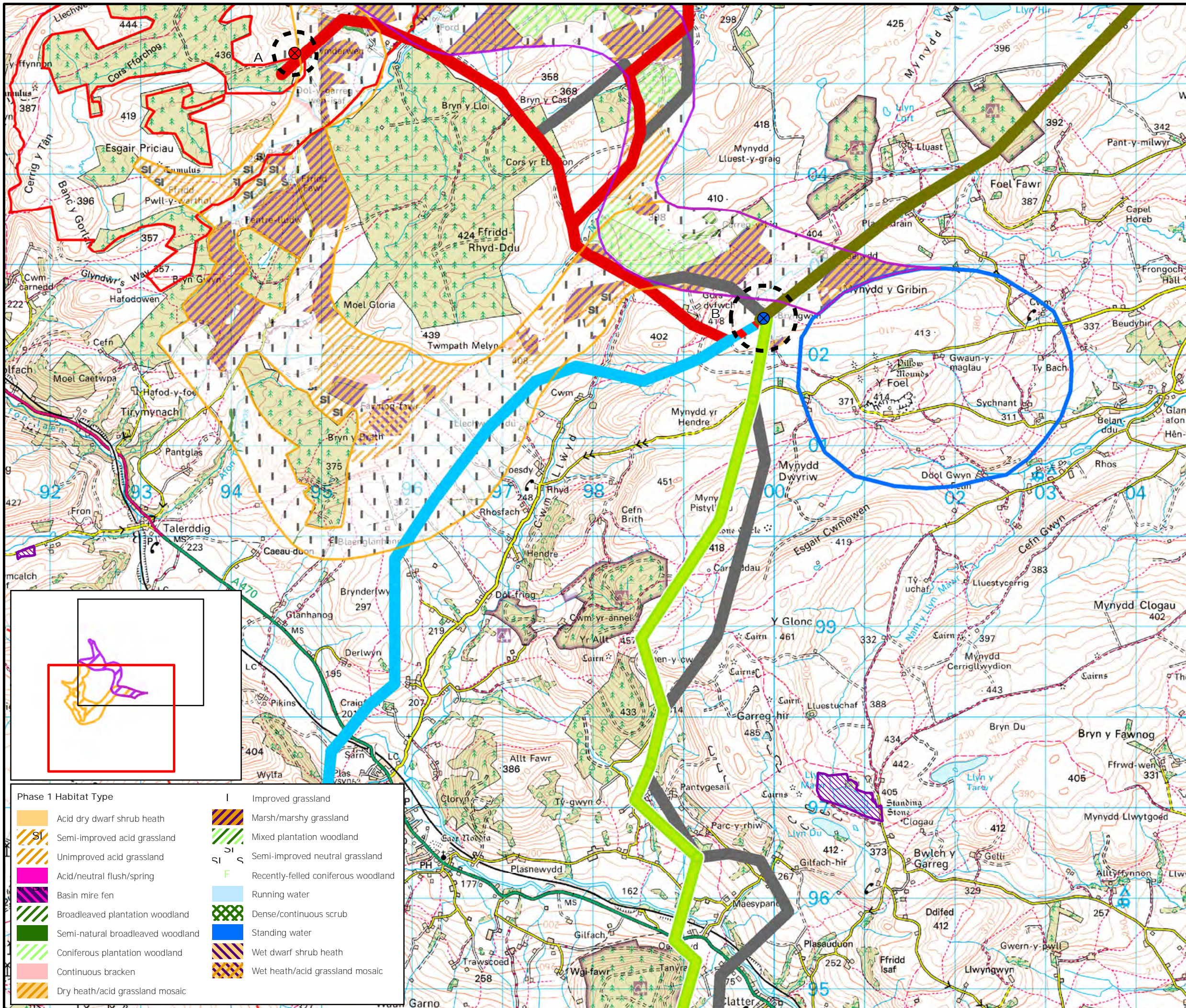
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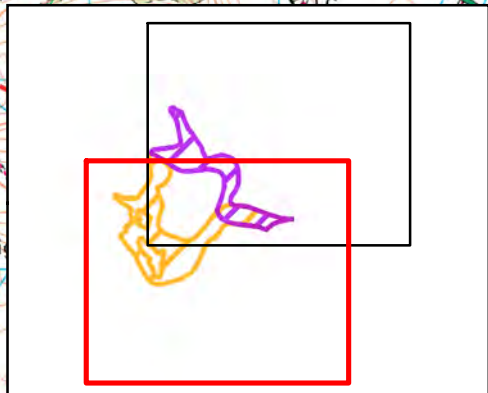
LLANBRYNMAIR WIND FARM
GRID CONNECTION

FIGURE 5

BROAD ROUTE CORRIDOR F4:
BIODIVERSITY DESIGNATIONS
AND PHASE 1 HABITAT
MAPPING



- Llanbrynmair Onsite Substation
- National Grid Substation Site
- Study Areas (2013 Review)
- Broad Study Area Boundary
- Llanbrynmair WF Boundary
- Site of Special Scientific Interest (SSSI)
- NG Substation Hub Location
 - Hub F - Cefn Coch
- LUC Broad Route Corridors
 - F3
 - F4
- SPEN Grid Connection Route Corridors
 - BNC
 - BSC
 - CC
 - Alternative Line Route Options
- NG Grid Connection Route Corridor
 - 400kV Draft National Grid Route Overhead



| Phase 1 Habitat Type | |
|----------------------|-------------------------------------|
| | Acid dry dwarf shrub heath |
| | Semi-improved acid grassland |
| | Unimproved acid grassland |
| | Acid/neutral flush/spring |
| | Basin mire fen |
| | Broadleaved plantation woodland |
| | Semi-natural broadleaved woodland |
| | Coniferous plantation woodland |
| | Continuous bracken |
| | Dry heath/acid grassland mosaic |
| | Improved grassland |
| | Marsh/marshy grassland |
| | Mixed plantation woodland |
| | Semi-improved neutral grassland |
| | Recently-felled coniferous woodland |
| | Running water |
| | Dense/continuous scrub |
| | Standing water |
| | Wet dwarf shrub heath |
| | Wet heath/acid grassland mosaic |



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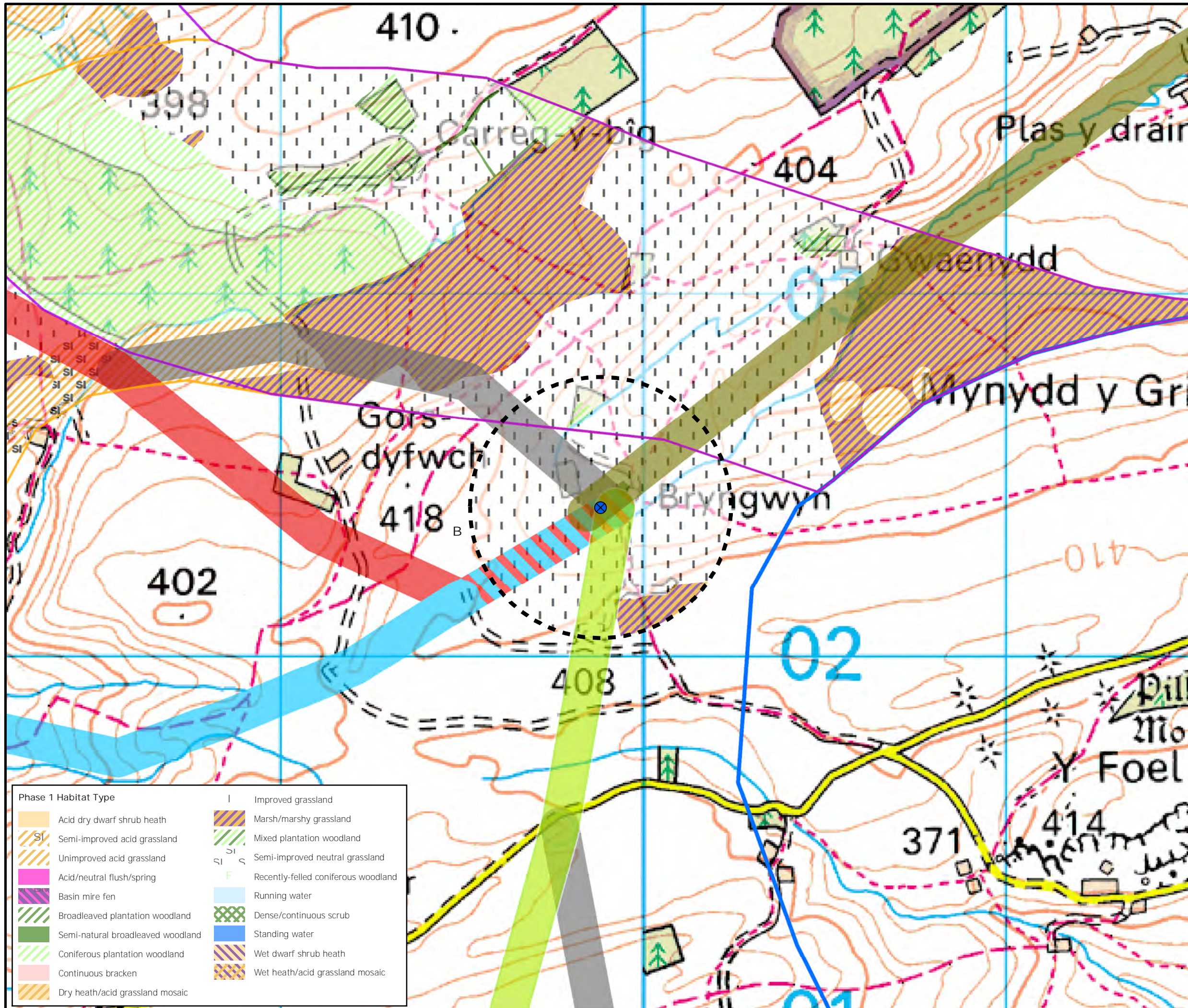
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LLANBRYNMAIR WIND FARM
GRID CONNECTION

FIGURE 6

CEFN COCH NATIONAL GRID
SUBSTATION: BIODIVERSITY
DESIGNATIONS AND PHASE 1
HABITAT MAPPING
(STUDY AREA B)



⊗ National Grid Substation Site

Study Area B

NG Substation Hub Location

Hub F - Cefn Coch

LUC Broad Route Corridors

F3

F4

SPEN Grid Connection Route Corridors

BNC

BSC

CC

Alternative Line Route Options

NG Grid Connection Route Corridor

400kV Draft National Grid Route
Overhead

| Phase 1 Habitat Type | |
|-----------------------------------|-------------------------------------|
| Acid dry dwarf shrub heath | Improved grassland |
| Semi-improved acid grassland | Marsh/marshy grassland |
| Unimproved acid grassland | Mixed plantation woodland |
| Acid/neutral flush/spring | Semi-improved neutral grassland |
| Basin mire fen | Recently-felled coniferous woodland |
| Broadleaved plantation woodland | Running water |
| Semi-natural broadleaved woodland | Dense/continuous scrub |
| Coniferous plantation woodland | Standing water |
| Continuous bracken | Wet dwarf shrub heath |
| Dry heath/acid grassland mosaic | Wet heath/acid grassland mosaic |



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GRID CONNECTION ASSESSMENT

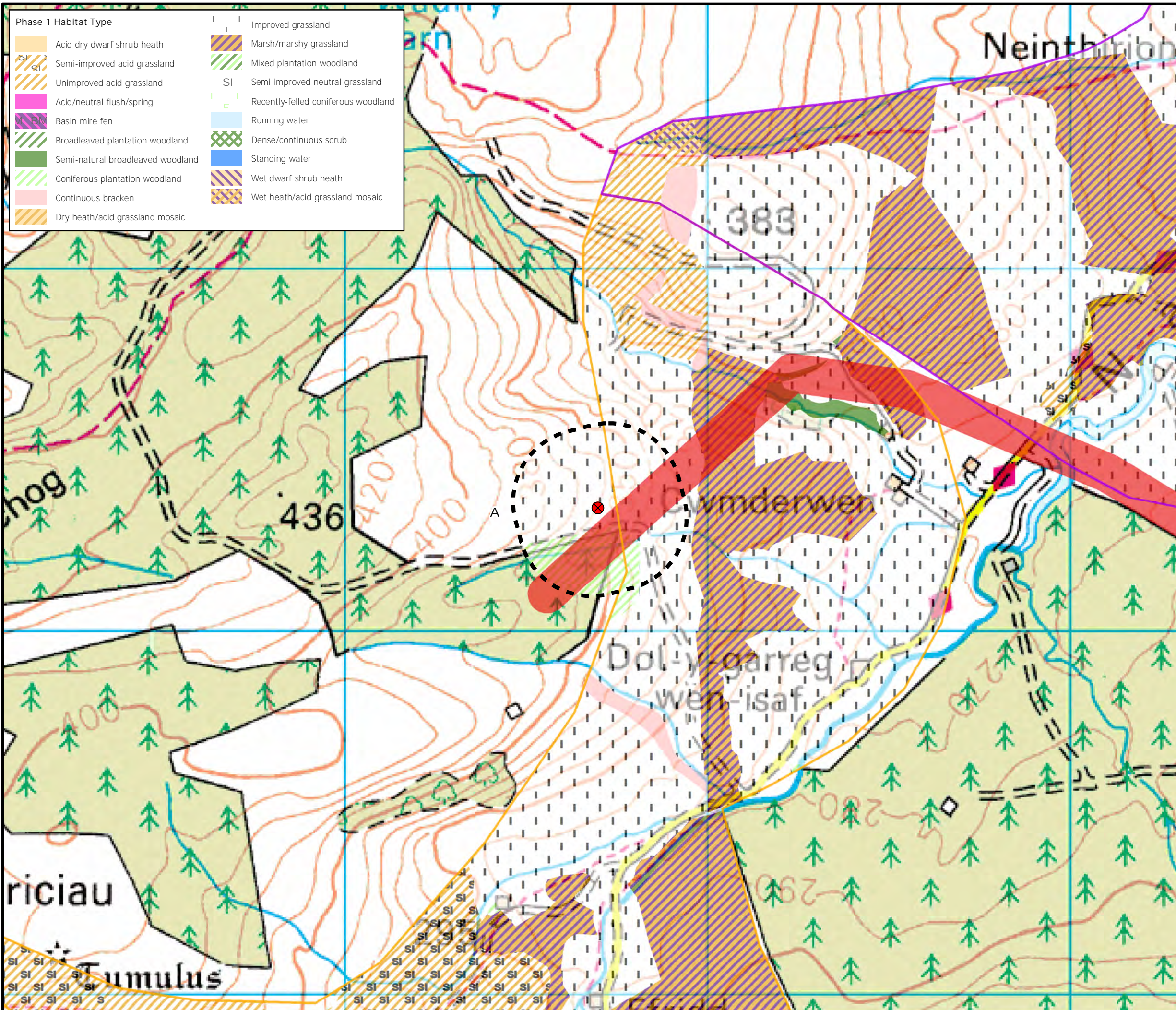
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LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 7

ONSITE LLANBRYNMAIR WIND FARM SUBSTATION: BIODIVERSITY DESIGNATIONS AND PHASE 1 HABITAT MAPPING (STUDY AREA A)



| Phase 1 Habitat Type | |
|----------------------|-------------------------------------|
| | Acid dry dwarf shrub heath |
| | Semi-improved acid grassland |
| | Unimproved acid grassland |
| | Acid/neutral flush/spring |
| | Basin mire fen |
| | Broadleaved plantation woodland |
| | Semi-natural broadleaved woodland |
| | Coniferous plantation woodland |
| | Continuous bracken |
| | Dry heath/acid grassland mosaic |
| | Improved grassland |
| | Marsh/marshy grassland |
| | Mixed plantation woodland |
| | Semi-improved neutral grassland |
| | Recently-felled coniferous woodland |
| | Running water |
| | Dense/continuous scrub |
| | Standing water |
| | Wet dwarf shrub heath |
| | Wet heath/acid grassland mosaic |

Llanbrynmair Onsite Substation

Study Area A

LUC Broad Route Corridors

F3

F4

SPEN Grid Connection Route Corridors

BNC

NG Grid Connection Route Corridor

400kV Draft National Grid Route Overhead



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