

COG MOORS WWTW - PROPOSED ADVANCED ANAEROBIC DIGESTION (AAD) PLANT

Biodiversity Strategy

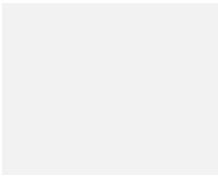
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Cog Moors WwTW - Proposed Advanced Anaerobic Digestion (AAD) Plant

Biodiversity Strategy

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This report dated 28 March 2018 has been prepared for Dwr Cymru Welsh Water (the "Client") in accordance with the terms and conditions of appointment dated 01 July 2014 (the "Appointment") between the Client and **Arcadis Consulting (UK) Limited** ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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APPENDICES

Dormouse nest box specification

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Bat box specification

Non-technical Summary

The mitigation, compensation and enhancement measures for the proposed Development at Cog Moors WwTW can be summarised as:

- Minimising the construction footprint;
- Minimising the areas for temporary works and maximising use of habitats of low ecological value (e.g. hard standing and amenity grassland) for temporary compounds;
- Retaining all trees covered by a Tree Preservation Order (TPO);
- Provision of compensatory habitat and improved managed of retained habitats (in accordance with a Habitat Management Plan) to increase the overall ecological value of the site;
- Adoption of best practice methods during construction (in accordance with a Project Environmental Management Plan (PEMP));
- Creation of a hibernaculum to enhance the site for reptiles and amphibians;
- Ecological supervision during vegetation clearance with trees and scrub cleared only once a dormouse licence is obtained from Natural Resources Wales;
- Provision of bird, bat, and dormouse nest boxes;
- Pre-felling check of trees to confirm the presence/absence of roosting bats; and
- Sensitive lighting post-construction.

1 Introduction

This report presents the mitigation, compensation and enhancement measures that would be adopted as part of the proposed Advanced Anaerobic Digestion (AAD) plant at Cog Moors Wastewater Treatment Works (WwTW) in Dinas Powys, Vale of Glamorgan. It has been prepared by Arcadis Consulting (UK) Ltd for Dwr Cymru Welsh Water (hereafter referred to as Welsh Water).

The proposed Development would result in habitat loss, with broadleaved plantation woodland, species-rich neutral grassland and mature trees being particularly affected. Five ephemeral drainage ditches would be removed or diverted, and one ephemeral drainage ditch would be partially removed. There is also potential for degradation of retained habitats during the construction phase. Plant and animal species associated with these habitats would also be affected.

The mitigation, compensation and enhancement measures presented in this strategy are required to mitigate impacts of the proposed Development on ecological resources. A drainage scheme has been incorporated into the Proposed Development design, to mitigate adverse hydrological and hydrogeological effects on habitats both within the Application Site and downstream during the operational phase.

The mitigation, compensation and enhancement measures presented in this strategy also include measures to address the legislative and policy requirements associated with protected species and valuable habitats. They also include additional measures designed to enhance biodiversity within the proposed Development site. These have been developed in consultation with the Welsh Water, Natural Resources Wales (NRW) and the Vale of Glamorgan Council Ecologist (Arcadis, 2017).

The locations within the proposed Development site where compensation, mitigation and enhancement would take place are indicated on Drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06) (Landscape Mitigation Plan).

Specific details of the nature and/or timings of the various mitigation, compensation and enhancement measures are documented within a Habitat Management Plan (Arcadis, 2018a). The Habitat Management Plan also includes detail of the ecological monitoring that is required to measure the effectiveness of the various mitigation, compensation and enhancement measures following completion of the proposed Development.

2 Aims

The overall aims of the Biodiversity Strategy are to:

- Minimise impacts to Cog Moors Site of Importance for Nature Conservation (SINC) and improve the quality and biodiversity value of this designated site in the long-term;
- Ensure the favourable conservation status of dormice is maintained; and
- Maintain a network of high quality habitats of value to bats, amphibians and nesting birds.

3 Proposals

The proposed AAD plant comprises several new process and storage tanks and buildings, together with the demolition and modifications to some existing items of plant and equipment. The AAD plant will operate in conjunction with the existing treatment facilities and is located to the east of the existing sewage sludge treatment infrastructure.

Part of the new development will be sited within the existing operational area of the WwTW whilst the remainder will be sited to the east within part of the Cog Moors SINC. Temporary construction compounds will also be sited on an area of mown grassland within the existing WwTW and within Cog Moors SINC and an upgrade to the electricity connection will also be required through part of the SINC.

During the construction period, appropriate ecological mitigation measures will be implemented to protect wildlife in accordance with a Project Environment Management Plan (PEMP) and compensatory planting will be undertaken. The site layout including proposed habitats are shown on Drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06).

4 Embedded design measures

In accordance with the mitigation hierarchy, the proposed Development incorporates a numbers of embedded design measures to avoid and/or minimise biodiversity impacts. These include:

- Minimal construction footprint – land take for the construction footprint has been minimised with, for example, the use of retaining walls along the eastern boundary of the site instead of re-graded embankments to minimise vegetation clearance/works required within Cog Moors SINC. The layout and positioning of structures within the proposed Development has also been designed to make most efficient use of space;
- Minimal temporary works within Cog Moors SINC – the construction compound would be located within Cog Moors SINC due to insufficient space within the existing WwTW. The existing WwTW does however provide sufficient space for parking and offices and the design has been developed with these separated from the main construction compound. This maximises use of space of low ecological value (amenity grassland and hard standing) within the existing WwTW to accommodate temporary offices and parking and minimises the remaining area required for the construction compound within Cog Moors SINC; and
- Retention of trees covered by a Tree Preservation Order (TPO) – the layout has been designed to ensure retention of all trees along the north-eastern boundary of the site which are protected under a TPO. The trees provide important screening and ecological connectivity around the site.

5 Summary of Mitigation, Compensation and Enhancement Measures

Table 1 (below) provides a summary of the mitigation, compensation and enhancement measures that would be implemented as part of the proposed Development. Measures are presented for each of the ecological resources as indicated on drawings 4798-S-202-MMB-O6-LP-N1-G1-01001 and 4798-S-202-HYD-XX-XX-DR-NX-00005 (Rev P02). Where appropriate, the species associated with each of the ecological resources are listed.

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Table 1: Compensation, mitigation and enhancement measures for ecological resource habitats

| Ecological resource ¹ | Associated habitats and species | Effects | Mitigation, compensation and enhancement measures ² |
|---|---|--|--|
| Cog Moors SINC | <p>Habitats: species-rich semi-improved neutral grassland, broadleaved plantation woodland, scrub, marshy grassland, species-poor semi-improved grassland and ephemeral ditches</p> <p>Species: Pepper Saxifrage, badger, amphibians, foraging/commuting/roosting bats, nesting birds and dormice</p> | <p>Loss of:</p> <p>0.02 ha of marshy grassland;</p> <p>0.01 ha species-poor semi-improved grassland;</p> <p>0.09 ha dense scrub;</p> <p>181 linear m ephemeral ditches;</p> <p>0.36 ha broadleaved plantation woodland; and</p> <p>0.28 ha species-rich neutral grassland.</p> | <p>Reinstatement and long-term management of 0.39 ha species-rich neutral grassland.</p> <p>Creation and long-term management of:</p> <p>1.22 ha broadleaved plantation woodland³; and</p> <p>175 linear m ephemeral ditches.</p> <p>Improved management (enhancement) of the following retained habitats:</p> <p>0.63 ha species-rich neutral grassland within Cog Moors SINC and 0.63 ha amenity grassland within existing WwTW;</p> <p>1.39 ha broadleaved plantation woodland⁴; and</p> <p>453 linear m ephemeral ditches.</p> <p>Long-term management of invasive species with the aim of eradication.</p> <p>The above to be carried out in accordance with the Habitat Management Plan.</p> |
| Trees, woodland (outside of Cog Moors SINC) | Habitats: Broadleaved plantation woodland, semi-natural woodland and | <p>Loss of:</p> <p>0.2 ha broadleaved plantation woodland;</p> | <p>Planting of 16 individual trees.</p> <p>Improved management (enhancement) of 1.39 ha retained broadleaved plantation woodland¹.</p> |

¹ As shown on drawings 4798-S-202-MMB-O6-LP-N1-G1-01001 and 4798-S-202-HYD-XX-XX-DR-NX-00005 (Rev P02)

² As shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06)

³ Area refers to broadleaved plantation woodland within the planning application boundary i.e. includes broadleaved plantation woodland within Cog Moors SINC and the existing WwTW.

⁴ Area refers to broadleaved plantation woodland within the planning application boundary i.e. includes broadleaved plantation woodland within Cog Moors SINC and the existing WwTW.

| Ecological resource ¹ | Associated habitats and species | Effects | Mitigation, compensation and enhancement measures ² |
|----------------------------------|---|--|--|
| | standalone trees, hedgerows/tree and shrub planting Species: Amphibians, nesting birds, foraging/commuting/roosting bats and dormice | 0.37 ha semi-natural broadleaved woodland and 1x standalone (dead) tree Potential for degradation of retained habitat due to trampling/tracking, potential pollution event or spread of invasive plants. | Best practice methods during construction, to be detailed in the PEMP. Measures to control the spread of invasive species during construction in accordance with best practice guidelines. Long-term management of invasive species with the aim of eradication. |
| Amenity grassland | n/a | Loss of 0.63 ha | Habitat of limited ecological value – no specific compensation/mitigation required, although 0.02 ha amenity grassland will be provided as part of landscaping works |
| Tall ruderal | Species: Amphibians | Loss of 0.27 ha | Habitat of limited ecological value – no specific compensation/mitigation required. |
| Ditches (outside Cog Moors SINC) | Species: Amphibians | Loss of: 80 linear m ephemeral ditches; and 63 linear m dry ditches. | Improved management (enhancement) of 453 linear m ephemeral ditches |

Table 2 (below) gives mitigation, compensation and enhancement measures required for specific animal and plant species. Further detail on the measures summarised in these tables is presented in Sections 4 and 5 of this report.

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Table 2: Mitigation measures for animals and plants

| Species | Effects | Mitigation, compensation and enhancement measures ⁵ |
|------------------|---|--|
| Pepper Saxifrage | Loss of individual plants within species-rich neutral grassland | Improved management (enhancement) of 0.63 ha retained species-rich neutral grassland within Cog Moors SINC and long-term management of 0.39 ha species-rich neutral grassland reinstated within Cog Moors SINC post-construction. |
| Amphibians | Loss of terrestrial habitat | Woodland and grassland planting. Enhancement of retained grassland and woodland. Creation of habitat piles and a hibernaculum using cut/cleared vegetation. |
| | Potential for injury or mortality during site clearance | All contractors to receive toolbox talk prior to site clearance. Staged clearance under ecological supervision and destructive search of natural refugia during site clearance. Mitigation to be implemented under licence from the appropriate licensing authority (NRW) if any great crested newts are identified. |
| | Loss of aquatic habitat | Creation of 175 linear m ephemeral ditches. Improved management of 453 linear m ephemeral ditches. |
| | Habitat fragmentation | Retention and enhancement of ecological network around the perimeter of the site to allow movement of amphibians. |
| Dormice | Loss of habitat | Woodland planting. Provision of nest boxes. Enhancement of retained woodland. |
| | Potential for injury or mortality during site clearance | All contractors to receive toolbox talk prior to site clearance. Sensitive clearance under ecological supervision. Mitigation to be implemented under licence from the appropriate licensing authority (NRW). |
| | Habitat fragmentation as a result of built development | Retention and enhancement of ecological network around the perimeter of Cog Moors SINC to allow movement of dormice. |

⁵ As shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06)

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| Species | Effects | Mitigation, compensation and enhancement measures ⁵ |
|-----------------|---|--|
| Nesting birds | Loss of roosting, foraging and nesting sites | <p>Woodland planting to connect fragmented habitats.</p> <p>New planting to comprise a variety of native trees and shrubs of value to nesting and foraging birds.</p> <p>Habitat enhancement of 0.05 ha wildlife area post-construction in accordance with a Habitat Management Plan.</p> <p>Improved management (enhancement) of grassland to improve abundance/diversity of invertebrate prey species.</p> <p>Provision of nest boxes.</p> |
| | Potential for damage/destruction of nests and/or disturbance of birds during vegetation clearance | Clearance of potential bird nesting habitat to take place outside the bird nesting season or under ecologist watching brief, in accordance with provisions in the PEMP. |
| Bats | Loss of potential roosting site (1x mature tree with low potential for roosting bats) | <p>Pre-felling check to be undertaken to confirm presence/absence of bats.</p> <p>Mitigation to be implemented under licence from the appropriate licensing authority (NRW) should pre-felling check confirm presence of roosting bats.</p> <p>Trees to be felled outside of bird nesting season (when bats least likely to be present).</p> <p>Provision of bat boxes.</p> |
| | Fragmentation of commuting routes/foraging habitat | <p>Commuting routes to be retained and protected.</p> <p>New planting to connect fragmented habitats.</p> |
| | Loss of foraging and commuting habitat | <p>Woodland planting.</p> <p>Enhancement of retained woodland.</p> |
| Invasive plants | Potential to cause spread of Indian (Himalayan) Balsam and Japanese Knotweed during construction | A strategy to control the growth and spread of invasive species within the proposed Development site would be developed following best practice guidance. This would be included in the PEMP. |
| | Natural spread of Indian (Himalayan) Balsam and Japanese Knotweed during operation phase | Long-term Habitat Management Plan to be implemented, including measures for the control/eradication of invasive plants |

6 Mitigation, Compensation and Enhancement Measures for Ecological Resource Habitats

The following compensation and mitigation measures are shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06).

6.1 Cog Moors SINC

6.1.1 Habitat loss

6.1.1.1 Species-rich grassland

An area of 0.23 ha species-rich neutral grassland would be lost because of the installation of a high voltage (HV) cable, and creation of, and access to, a compound during the construction phase. A further 0.05 ha species-rich neutral grassland would be lost due to woodland planting provided to supplement/strengthen woodland connectivity around the perimeter of Cog Moors SINC (see section 6.1.1.2). The reinstatement of species-rich grassland along the wayleave/easement of the HV cable, access route and temporary compound would compensate for this loss. Further enhancement would be provided by long-term management of 0.63 ha unaffected species-rich neutral grassland within Cog Moors SINC and 0.63 ha of amenity grassland outside of Cog Moors SINC but within the existing WwTW.

Management of reinstated and existing grassland areas would take place during the operational phase over a period of ten years as detailed in the Habitat Management Plan (Arcadis, 2018a). Management would involve “hay” cuts and the removal of extensive areas of scrub, perennial weeds and injurious species. Ecological monitoring would take place over the management period, the results of which would inform ongoing management.

These measures aim to ensure no net loss of habitat of SINC quality and improve the overall quality of large blocks of grassland within the existing WwTW and Cog Moors SINC to encourage a diverse structure and wildlife (Arcadis, 2018a).

6.1.1.2 Broadleaved plantation woodland

An area of 0.36 ha broadleaved plantation woodland would be lost because of the installation of a HV cable and construction of the proposed Development. This loss would be compensated for by the creation and long-term management of:

- 0.05 ha broadleaved plantation woodland which will be planted immediately adjacent to retained broadleaved plantation woodland in the west of Cog Moors SINC (to strengthen woodland connectivity); and

- 1.17 ha planted within a field immediately north-west of the existing WwTW. This planting would utilise root balls/stools translocated from within the construction footprint as well as new planting using native species to create a diverse woodland habitat. The field is immediately adjacent to existing woodland to ensure connectivity for wildlife is maintained. The field is currently under private ownership with sale to Welsh Water underway.

Further enhancement would be provided by the long-term management of 1.39 ha of existing (retained) broadleaved plantation woodland within the planning application boundary.

Management of the created and existing (retained) areas of broadleaved plantation woodland would take place during the operational phase over a period of ten years as detailed in the Habitat Management Plan (Arcadis, 2018a). Management of woodland areas would involve selective removal of limbs and coppicing of shrubs to promote healthy growth, tree felling, where appropriate, to create openings to allow woodland structure (especially ground flora and understorey) to develop and the control of invasive plants with the aim of eradication.

These measures aim to improve the overall quality of the woodlands within the planning application boundary to encourage the development of good woodland structure and wildlife (Arcadis, 2018a).

6.1.1.3 Ephemeral ditches

Ephemeral ditches would be lost as a result of the construction of the proposed Development. Infilling of ditches would take place under Ordinary Watercourse Consent granted by the Lead Local Flood Authority. This loss would be partially compensated for by the creation of new open channels, constructed of earth banks with depth and profile to match existing ditches which they would connect into, and a box culvert along the eastern boundary of the proposed Development. The remaining loss would be mitigated for by the improved management of existing ditches within the existing WwTW site.

New and existing ditches/drains would be managed during the operational phase over a period of ten years as detailed in the Habitat Management Plan. Management of ditches would involve de-silting/clearance where appropriate. These measures aim to ensure continued functionality of the ditches (Arcadis, 2018a).

6.1.1.4 Other habitats

The proposed Development would also result in the loss of small areas of scrub, marshy grassland and species-poor semi-improved grassland. Due to their small size, these habitats are not considered to be of SINC quality and no specific compensation measures are proposed. Long-term management of habitats within Cog Moors SINC as described above aims to improve the overall biodiversity value of the SINC rather than focus on like-for-like compensation for individual habitat types and plant species.

6.1.2 Habitat degradation

Best practice methods would be adopted during site clearance and construction to prevent habitat degradation of the retained ephemeral ditch and this would be detailed in the PEMP. Such measures would include silt screens/fencing and the implementation of standard construction site procedures to prevent pollution incidents and uncontrolled surface water run-off. The PEMP would be implemented at all stages of construction to avoid adverse hydrological effects.

Protective fencing would be erected to demarcate the boundaries of working areas and protect retained habitats (including trees) before site clearance and/or construction commences and would be kept in place for the duration of construction operations to protect these habitats from being trampled or tracked over. Standard construction practices for avoiding and minimising environmental effects (in particular dust suppression) would be implemented at all stages of construction and would be detailed in the PEMP, thus avoiding degradation of habitats as a result of airborne contamination.

Measures to control the spread of invasive plant species during construction would be implemented following best practice guidelines and detailed within the PEMP. Further information is included in section 7.6.1.

6.2 Trees and woodland (outside of Cog Moors SINC)

6.2.1 Habitat loss

The loss of 0.2 ha broadleaved plantation woodland within the existing WwTW as a result of the construction of the proposed Development would be compensated for by planting 16 individual trees on the periphery of the site where there are gaps in existing tree/shrub planting, and planting 1.17 ha of broadleaved plantation woodland within a field immediately north-west of the WwTW. Further enhancement will be provided by long-term management of retained broadleaved plantation woodland within the planning application boundary.

Management of the retained areas of broadleaved plantation woodland would take place during the operational phase over a period of ten years as detailed in the Habitat Management Plan (Arcadis, 2018a).

Management of woodland areas would involve selective removal of limbs and coppicing of shrubs to promote healthy growth, tree felling where appropriate to create openings to allow woodland structure (especially ground flora and understorey) to develop and the control of invasive plants with the aim of eradication.

These measures aim to improve the overall quality of the woodlands within the planning application boundary to encourage the development of good woodland structure and wildlife (Arcadis, 2018a).

6.2.2 Habitat degradation

Measures to mitigate for habitat degradation would be the same as those employed within Cog Moors SINC (see section 6.1.2).

6.3 Amenity Grassland

6.3.1 Habitat loss

Amenity grassland within the existing WwTW would be lost as a result of the construction of the proposed Development and post-construction changes to the management regime. This habitat is considered to be of limited ecological value and specific compensation/mitigation is not required.

6.4 Tall Ruderal

6.4.1 Habitat loss

Tall ruderal habitat within the existing WwTW would be lost as a result of the construction of the proposed Development. Although used terrestrially by amphibians (Arcadis, 2018b), this habitat is considered to be of limited ecological value and specific compensation/mitigation is not required.

6.5 Dry and Ephemeral Ditches (outside Cog Moors SINC)

6.5.1 Habitat loss

Dry and ephemeral ditches would be lost as a result of the construction of the proposed Development. Infilling of ditches would take place under Ordinary Watercourse Consent granted by the Lead Local Flood Authority. This loss would be mitigated by the long-term maintenance of retained ephemeral ditches within the existing WwTW.

Management of the ditches would take place during the operational phase over a period of ten years as detailed in the Habitat Management Plan. Management of ditches would involve de-silting/clearance where appropriate. These measures aim to ensure continued functionality of the ditches (Arcadis, 2018a).

7 Compensation, Mitigation and Enhancement Measures for Animals and Plants

The following compensation and mitigation measures are shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06).

7.1 Pepper Saxifrage

7.1.1 Mitigation for loss

Pepper Saxifrage is a rare plant species in Wales (Arcadis, 2018c) and present within the species-rich neutral grassland of Cog Moors SINC. Mitigation for the loss of Pepper Saxifrage focuses on the reinstatement and long-term management of grassland within Cog Moors SINC to improve overall habitat quality as detailed in Section 6.1.1.1, rather than protection of individual plant species.

7.2 Amphibians

7.2.1 Loss of terrestrial habitat

The proposed Development would result in the loss of woodland, species-rich neutral grassland and tall ruderal vegetation which has been found (or has potential to support) amphibians, including great crested newts (*Triturus cristatus*). This loss would be compensated for by reinstating areas of Cog Moors SINC disturbed during construction with species-rich neutral grassland and providing compensatory woodland planting on a field immediately adjacent to the WwTW. Further enhancement will be provided by the improved management of amenity grassland and reinstated and retained species-rich grassland and broadleaved plantation woodland to improve species diversity and ecological value. Further details on grassland and woodland management are included in Sections 6.1.1.1 and 6.2.1.

Cut/cleared vegetation from the working corridor will be used to create habitat piles within retained woodland outside of the working corridor. A hibernaculum will also be built within retained woodland in Cog Moors SINC under ecologist guidance using logs and arisings from vegetation clearance.

These measures will enhance woodland habitat for amphibians, providing additional places to shelter/overwinter.

7.2.2 Preventing injury or mortality during site clearance

All contractors would receive a toolbox talk prior to starting work on site. The toolbox talk would cover the identification of amphibians, mitigation (as detailed below and including areas of avoid/remain undisturbed) and action to be taken in the event of discovering amphibians unexpectedly, ensuring contractors can act/respond appropriately if the ecologist is not on site.

Vegetation removal will be carried out in stages, gradually reducing the suitability of the working corridor for amphibians and encouraging them to move into adjacent habitat. This will be followed by a destructive search to remove natural refugia. Vegetation clearance and destructive search will be carried out under the guidance and supervision of an ecologist, following a method statement and only undertaken between March and September to avoid the sensitive hibernation period. Any amphibians encountered (excluding great crested newts) would be allowed to move away of their own accord or translocated to suitable, retained habitat within the proposed Development.

Should great crested newts be found at any time, all works would cease, and advice sought from the ecologist. Where required, a licence would be sought from NRW to enable works to continue.

7.2.3 Loss of aquatic habitat

The creation of new ditches and improved management of retained ditches as described in sections 6.1.1.3 and 6.5.1 will ensure the provision of ephemeral habitat for amphibians.

7.2.4 Habitat fragmentation

Compensatory planting within the proposed Development as described in sections 6.1.1.1, 6.1.1.2 and 6.2.1 will ensure ecological networks and connectivity are maintained.

7.3 Dormice

7.3.1 Loss of terrestrial habitat

Compensation and mitigation for loss of woodland would be provided by tree and woodland planting and improved woodland management as detailed in sections 6.1.1.2 and 6.2.1.

Cut/cleared vegetation from the working corridor will be used to create habitat piles within retained woodland outside of the working corridor to enhance woodland habitat for dormice, providing additional places to shelter/overwinter.

Dormouse nest boxes (see Appendix A) will be provided prior to vegetation clearance taking place – 10 nest boxes will be provided in retained woodland within Cog Moors SINC to provide a safe place of shelter for dormice dispersing from the construction footprint. A further four nest boxes will be provided in existing woodland along Green Lane (immediately adjacent to the field being planted with woodland) to enhance existing habitat and provide a safe place of shelter while compensatory planting matures. Recommended locations for nest boxes are shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06) and exact locations will be decided on site in consultation with an ecologist.

These measures aim to: maintain the favourable conservation status of dormice; enhance habitat connectivity around the perimeter of the site to facilitate dormice dispersal; and improve the quality of woodlands within the application boundary for dormice to forage and shelter.

7.3.2 Preventing injury or mortality during site clearance

All contractors would receive a toolbox talk prior to starting work on site. The toolbox talk would cover the identification of dormice, mitigation (as detailed below and including areas of avoid/remain undisturbed) and

action to be taken in the event of discovering dormice unexpectedly, ensuring contractors can act/respond appropriately if the ecologist is not on site.

Vegetation clearance will be carried out under the guidance and supervision of an ecologist, following a method statement and subject to a development licence obtained from NRW. The vegetation clearance method is dependent on project programme (i.e. receipt of planning permission and subsequent construction start date); however, a summary (based on the current programme) is provided below and will be reviewed and confirmed during licence application.

Subject to the purchase of the proposed compensation land (see section 6.1.1.2), planning approval and European Protected Species development licence, the vegetation clearance work will be carried out in September and October 2018. No vegetation clearance will take place during June, July or August.

The vegetation clearance will be undertaken in sections working from the centre of the existing WwTW towards retained habitat. Vegetation clearance will be limited to 900sqm per day, allowing dormice time to disperse into adjacent retained habitat of their own accord. The retained vegetation for dormouse dispersal comprises broadleaved plantation woodland around the perimeter of Cog Moors SINC which is of a similar quality to that which is being lost.

Removal of trees will be undertaken using a tracked excavator fitted with tree shears. This will allow the trees (up to approximately 350 mm diameter) to be removed efficiently with a single cut and lifted out of the working area in a controlled manner with no risk of damage/disturbance to adjacent trees or the ground. This is preferable to other felling methods (e.g. directional felling) which may cause damage/disturbance to adjacent trees and/or the ground and would require significant manual labour time on site.

The excavator would initially work to clear a dedicated haul route which would be cleared to a height of 30 cm. After at least 24 hours (to allow time for reptiles/amphibians to disperse (see section 7.2.2)), the roots/stools would be excavated and translocated to the habitat creation area (see section 6.1.1.2). From this haul route, the excavator would be able to access the remaining areas of woodland to be cleared using the method described above (e.g. cut to 30 cm and translocate roots after at least 24 hours).

Any trees too large for the tree shears would be section-felled with sections carefully lowered to the ground (where practical this would be to an area which has already been cleared).

Areas of scrub will be removed using hand tools (e.g. chain saw/brush cutter) only.

All vegetation clearance will be overseen by a licensed dormouse ecologist according to the following:

- the ecologist will inspect the area of suitable dormouse habitat to be removed for dormice nests; and
- providing there are no dormouse nests present, the ecologist will authorise the cutting and removal of the area of vegetation in accordance with the clearance methods above.

For areas of dense scrub which cannot be fully inspected, these will be inspected and removed in sections (e.g. 1-2 m at a time) depending on how thoroughly the scrub can be checked.

If an empty dormouse nest is found, it will be removed by the ecologist and placed in a bag/box for removal out of the works footprint to avoid any confusion that may otherwise result from an empty dormouse nest being discarded.

If a dormouse nest containing a lone male or female dormouse is found by the ecologist, the nest will be carefully moved to a dormouse nest box located within 100 m of the nest's original location.

If a dormouse nest containing a nursing female dormouse with young is found by the ecologist, the nest will be left in-situ and an exclusion zone of at least 30 m radius from the nest will be established. No further vegetation clearance will take place within the exclusion zone until the female and young have left the nest. The ecologist will ensure that an appropriate amount of suitable dormouse habitat is present within the exclusion zone to provide for the foraging requirements of the nursing female and that the habitat within the exclusion zone remains connected to retained vegetation linking to a wider network of suitable dormouse habitat. This will allow dormice within the exclusion zone to forage beyond the construction footprint. The dormouse nest containing the nursing female and young will be inspected by the ecologist at least weekly and

clearance of the vegetation within the exclusion zone will only take place once the ecologist has confirmed the dormice have left the nest.

The use of the persuasion methodology detailed above will minimise the risk of killing and/or injury to dormice and allows root balls to be excavated and transplanted at an appropriate time of year to maximise the chance of successful establishment within the habitat compensation area.

7.3.3 Habitat fragmentation

The proposed Development has been designed to minimise woodland fragmentation to retain/create large blocks of woodland where possible. Compensatory planting (see section 6.2.1) has been designed to connect and strengthen smaller woodland remnants and fill gaps in existing tree lines to ensure ecological networks and connectivity are maintained.

7.4 Nesting Birds

7.4.1 Habitat loss

Habitat creation and enhancement has been designed to include/encourage the growth of a range of native trees and shrubs including Holly (*Ilex aquifolium*), Wild Cherry (*Prunus avium*) and Pedunculate Oak (*Quercus robur*) which are of value to nesting and foraging birds and will also improve the abundance and diversity of invertebrate prey species.

Eight nest boxes will be provided throughout woodland areas to provide secure sites for nesting/shelter. Recommended locations are shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06) and exact locations will be decided on site in consultation with an ecologist. Schwegler 1B nest boxes (see Appendix A) will be installed – four with a 26mm opening and four with a 32mm opening to benefit a range of bird species.

The enhancement and long-term management of a dedicated wildlife area located on top of a storm tank in the south of the existing WwTW currently covered with Butterfly-bush aims to improve the overall ecological value of this habitat to benefit a range of species, notably nesting birds.

Management of the wildlife area would take place during the operational phase over a period of ten years as detailed in the Habitat Management Plan. Management would involve selected clearance and replacement with native species proven to benefit wildlife. These measures aim to create a more diverse flora and structure to encourage wildlife (Arcadis, 2018a).

7.4.2 Preventing damage/destruction of nests during site clearance

Mitigation to meet the requirements of legislative protection for birds would be implemented during the removal of any potential nesting bird habitat within the proposed Development site. Vegetation clearance of woodland, scrub and trees would be undertaken outside of the nesting bird season. Where this is not possible, an inspection for nests would be undertaken by a suitably experienced ecologist no more than 48 hours prior to the removal of this vegetation. If the presence of nesting birds was established, works in the vicinity of the nest would cease until the young had fledged. Such measures would be included in the PEMP.

7.5 Bats

7.5.1 Loss of potential roosting sites

All trees would be felled outside of the bird nesting season (see section 7.4.2) when roosting bats are least likely to be present. Where this is not possible, trees with low potential for roosting bats (Arcadis, 2018d) would be felled under the guidance and supervision of an experienced licenced bat ecologist. Should any roosting bats be found within trees requiring felling, mitigation would be implemented under licence from the appropriate licensing authority (NRW).

In addition, five Schwegler 2F bat boxes (see Appendix A) will be provided throughout the woodland within Cog Moors SINC to provide secure sites for roosting. Recommended locations are shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06) and exact locations will be decided on site in consultation with an ecologist.

7.5.2 Fragmentation of commuting routes/foraging habitat

Bat commuting routes and areas used by bats for foraging were concentrated within the SINC, predominantly along woodland edge. The proposed Development has been designed to minimise woodland fragmentation to retain large blocks of woodland (and their associated margins) where possible. Compensatory planting (see section 6.2.1) has been designed to strengthen the woodland corridor around the perimeter of Cog Moors SINC while restoring the area disturbed by installation of the HV cable will increase the amount of woodland edge habitat within Cog Moors SINC.

7.5.3 Loss of foraging and commuting habitat

Compensation and mitigation for loss of woodland would be provided by woodland planting and improved woodland management as detailed in sections 6.1.1.2 and 6.2.1.

An area of 1.17 ha of woodland will be planted within a field currently used for cattle grazing to provide a net gain in the overall amount and quality of foraging habitat.

7.5.4 Mitigating effects of artificial light

Some species of bats, such as brown long-eared bats, are light-averse and could be prevented from using areas that are artificially lit at night. It is possible that temporary lighting from the construction site, or the permanent external lighting that would be installed as part of the proposed Development, could affect the emergence or foraging behaviour of bats. A sensitive lighting scheme would be implemented to ensure dark corridors for bats, in particular within the SINC, where bat activity was highest.

The lighting scheme for the proposed Development includes such measures as the use of intelligent lighting technology with lights linked to motion sensors and normally switched off between 7pm and 7am and/or during routine maintenance/emergency works (Arcadis, 2018e). In these instances, lighting is expected to be of relatively short duration and use of lighting during the winter months is not anticipated to have a negative impact on bat behaviour as bats will be in hibernation.

7.6 Invasive plants

7.6.1 Preventing the spread of invasive plants during construction

A strategy to control the growth and spread of Japanese Knotweed and Indian (Himalayan) Balsam within the proposed Development site would be developed following best practice guidance and included in the PEMP. Possible approaches are outlined below:

One stand of Japanese Knotweed was identified within the proposed Development site, just outside of the site entrance (see Target Note 12 on drawing 4798-S-202-MMB-06-LP-N1-G1-01001). Although not within the footprint of the proposed works, the area should be demarcated with fencing (Heras/hi-visibility netlon) to prevent unintended entry. Signs should be erected on the fencing notifying contractors of the presence of invasive species. Two further stands of Japanese Knotweed and one stand of Rhododendron (*Rhododendron ponticum*) were identified in the verge adjacent to Green Lane (see drawing 4798-S-202-HYD-XX-XX-D-NX-08022 (Rev 03)). No works are proposed along Green Lane therefore these stands currently pose no risk to the works and the works pose no risk of causing further spread of these species into the wild.

The Indian (Himalayan) Balsam stands are located within/adjacent to areas of woodland in the east of the WwTW (see drawing 4798-S-202-HYD-XX-XX-D-NX-08022 (Rev 03)). Vegetation clearance and excavation would be required in all of these areas with all but one of the areas entirely within the construction footprint. The plant material and the excavated soil from these areas would ideally be re-used on site (within an area already containing Indian (Himalayan) Balsam or buried to sufficient depth to prevent the dormant seeds from germinating). Where this is not possible, any material excavated from areas containing Indian (Himalayan) Balsam will be removed to an appropriately licensed off-site tip with such material treated as a 'controlled waste'.

Fencing (as detailed above) would be required around Indian (Himalayan) Balsam in Area 2 (see drawing 4798-S-202-HYD-XX-XX-D-NX-08022 (Rev 03)) which is only partially within the construction footprint to prevent unintended entry to retained habitat.

Appropriate site hygiene (GB Non-native Species Secretariat, 2017) would be adopted throughout construction to minimise contact with potentially contaminated soil/plant material and reduce the risk of spreading invasive plants.

7.6.2 Control the spread of invasive plants during operation

To improve biodiversity and habitat quality at the WwTW, long-term measures to control the spread/eradicate invasive species within the site are detailed within the Habitat Management Plan (Arcadis, 2018a).

Control/eradication of Indian (Himalayan) Balsam will be achieved through cutting in early June (prior to flowering). Small areas/individual plants may be hand-pulled. Arisings will be left in-situ and either exposed to dry or covered with a tarpaulin to compost.

Control/eradication of Japanese Knotweed will be achieved through spot herbicide treatment or stem injection where any plants are identified within the WwTW.

8 CONCLUSION

The key mitigation, compensation and enhancement measures presented in this strategy are as follows:

- Minimising the construction footprint and areas for temporary works to minimise impacts to ecologically valuable habitats (e.g. Cog Moors SINC);
- Retaining all trees covered by a Tree Preservation Order (TPO);
- Reinstatement of 0.39 ha species-rich neutral grassland and improved management of a further 0.63 ha species-rich neutral grassland and 0.63 ha amenity grassland;
- Creation of 1.22 ha broadleaved plantation woodland, planting of 16 individual trees and improved management of a further 1.39 ha broadleaved plantation woodland to maintain and enhance connectivity for bats and dormice;
- Creation of 175 linear m ephemeral ditches and improved management of a further 453 linear m;
- Long-term management of invasive species with the aim of eradication;
- Staged vegetation clearance under ecological supervision as a precautionary approach in case of amphibians;
- Sensitive vegetation clearance under ecological supervision and a development licence issued by NRW to avoid significant impacts on dormice;
- Adoption of best practice methods during construction (in accordance with a PEMP) to avoid degradation of retained habitats;
- Creation of a hibernaculum to enhance the site for reptiles and amphibians;
- Provision of features to enhance the site for birds, bats, dormice, reptiles and amphibians;
- Pre-felling check of trees to confirm the presence/absence of roosting bats; and
- Sensitive lighting post-construction to minimise impacts on foraging/commuting bats.

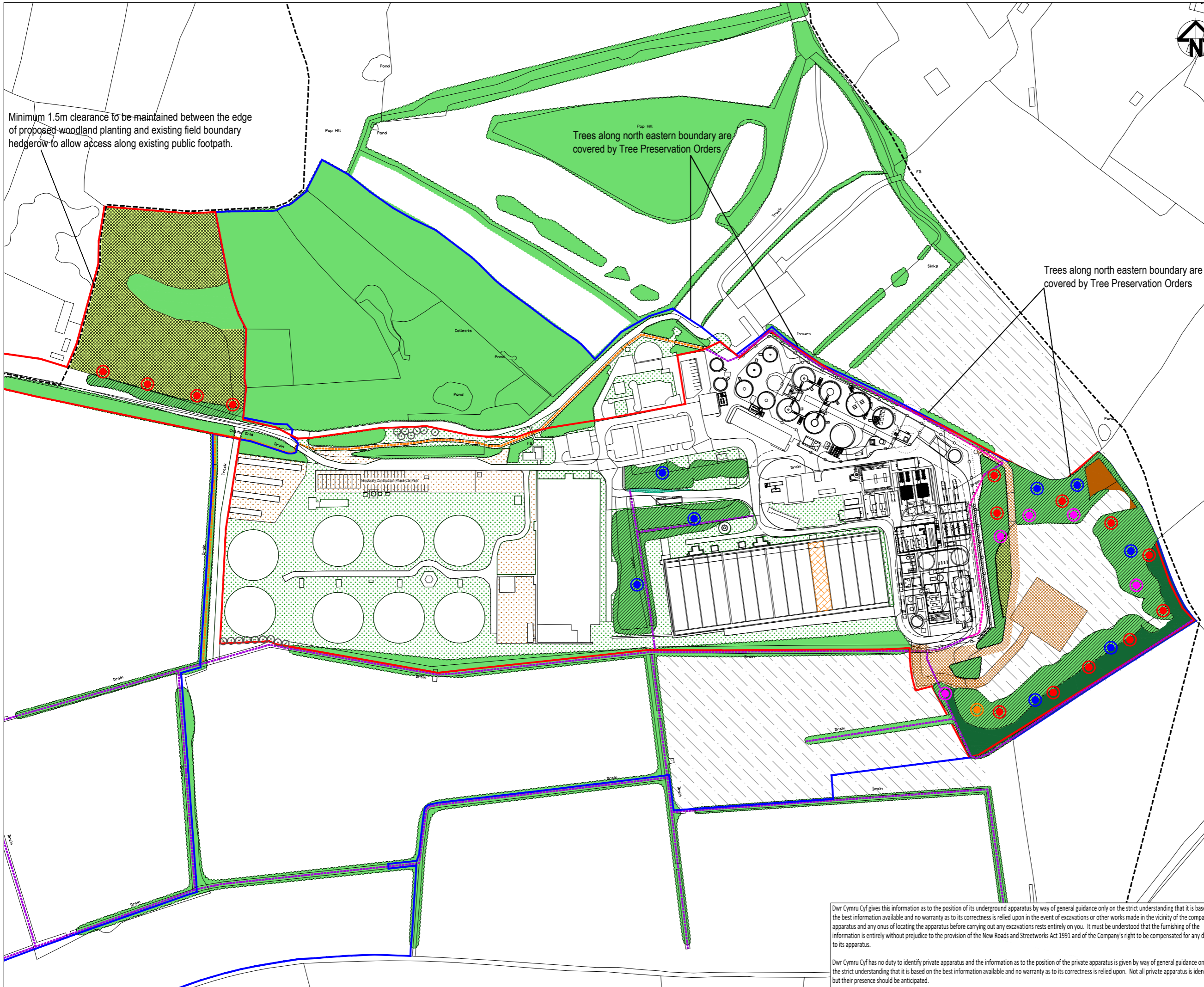
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Cog Moors WwTW - Proposed Advanced Anaerobic Digestion (AAD) Plant

DRAWINGS

Drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (P06) – Landscape Mitigation Plan



- LEGEND:**
- Planning Application Boundary
 - DCWW Land Ownership Boundary
 - Public Rights of Way
 - Site of Importance for Nature Conservation (SINC)
 - Existing Amenity Grass
 - Existing Tree and shrub planting
 - Existing Tree planting to be managed for biodiversity
 - Existing Grassland to be managed as Species Rich Grassland
 - SINC Grassland Management Area
 - Proposed Amenity Grassland
 - Proposed Species Rich Grassland
 - Proposed Woodland Belt Planting
 - Tall Ruderal
 - Dense Scrub
 - Proposed Individual Tree Planting
 - Area to be Managed for Wildlife
 - Bird Nest Box
 - Bat Box
 - Hibernaculum to be created
 - Dormouse Nest Boxes
 - Existing Ephemeral Ditch
 - Existing Dry Ditch
 - Proposed Drainage Ditch

| Latin Name | Common Name | Outline Specification | % in Mix |
|---|-----------------|---|----------|
| Proposed Woodland Belt Forestry Transplant Mix | | | |
| <i>Corylus avellana</i> | Hazel | 1+1 Forestry transplant; Bare root; 1.5m spacing. | 24% |
| <i>Quercus robur</i> | Pedunculate Oak | As above. | 24% |
| <i>Carpinus betulus</i> | Hornbeam | As above. | 6% |
| <i>Crataegus monogyna</i> | Hawthorn | As above. | 6% |
| <i>Prunus avium</i> | Wild Cherry | As above. | 5% |
| <i>Ligustrum vulgare</i> | Wild Privet | As above. | 4% |
| <i>Malus sylvestris</i> | Crab Apple | As above. | 4% |
| <i>Acer campestre</i> | Field Maple | As above. | 4% |
| <i>Viburnum lantana</i> | Wayfaring-Tree | As above. | 4% |
| <i>Sorbus aucuparia</i> | Rowan | As above. | 3% |
| <i>Cornus sanguinea</i> | Dogwood | As above. | 3% |
| <i>Lonicera periclymenum</i> | Honeysuckle | 2L Pot; 1.5m spacing. | 2% |
| <i>Frangula alnus</i> | Alder Buckthorn | 1+1 Forestry transplant; Bare root; 1.5m spacing. | 2% |
| <i>Rhamnus cathartica</i> | Buckthorn | As above. | 2% |
| <i>Euonymus europaea</i> | Spindle | As above. | 2% |
| <i>Prunus padus</i> | Bird Cherry | As above. | 2% |
| <i>Sambucus nigra</i> | Elder | As above. | 2% |
| <i>Ilex aquifolium</i> | Holly | 2L Pot; 1.5m spacing. | 1% |
| <i>Hedera helix</i> | Ivy | 2L Pot; 1.5m spacing. | 1% |
| Individual Trees | | | |
| <i>Quercus robur</i> | Pedunculate Oak | 2x, 3 Breaks, Fthd, BR, 1.5-1.75m, 10m spacing. | 40% |
| <i>Alnus glutinosa</i> | Alder | As above. | 30% |
| <i>Prunus avium</i> | Wild Cherry | 2x, 5 Breaks, Fthd, BR, 1.5-1.75m, 10m spacing. | 30% |

| | | | | | | |
|------|----------|-------|--------------------|------|------|----------|
| P06 | 13.03.18 | DM | UPDATED BOUNDARY | LF | LW | 13.03.18 |
| P05 | 12.02.18 | DM | SOLAR PANELS MOVED | LF | LW | 12.02.18 |
| P04 | 31.01.11 | DM | THIRD ISSUE | LF | LW | 31.01.11 |
| P03 | 19.12.17 | RG | SECOND ISSUE | SF | LW | 19.12.17 |
| P02 | 25.10.17 | RG | SECOND ISSUE | SF | LW | 25.10.17 |
| P01 | 27.07.17 | RG | FIRST ISSUE | SF | LW | 21.06.17 |
| Rev. | Date | Drawn | Description | Chkd | Appd | Date |

Capital Delivery Alliance
Cynghair Cyflawni Cyfalaf
 Ty Awon, Spooner Close, Coed Kernes, Newport, NP108FZ

Project Name: **COG MOORS WwtW AAD**

Drawing Title: **FIGURE 10 LANDSCAPE MITIGATION PLAN**

Suitability: **INFORMATION** Suitability Code: **S2**

Originator: **R.G.** Designer: **S.F.** Date: **21.06.17**

Internal Project Number: **UA007902** Scale: **1:1250@A1** Rev: **P06**

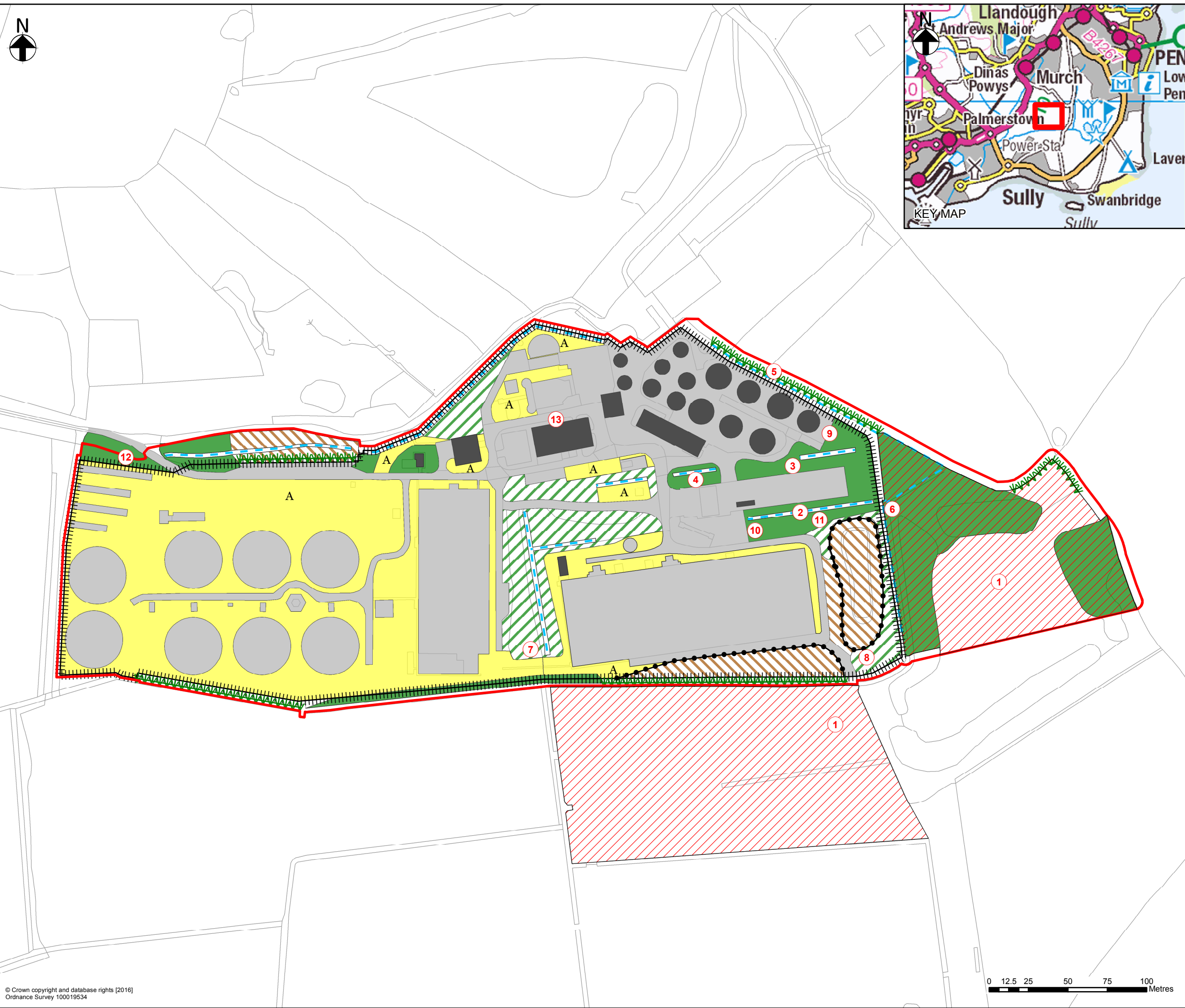
Drawing Number: **4798-S-202-HYD-XX-XX-DR-NX-06127**

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Cog Moors WwTW - Proposed Advanced Anaerobic Digestion (AAD) Plant

Drawing 4798-S-202-MMB-06-LP-N1-G1-01001 – Phase 1 Habitat Map



Legend

- ① Target note
- 🌿 J2.3.1 - Hedge with trees - native species-rich
- ||||| J2.4 - Fence
- - - J2.6 - Dry ditch
- J2.8 - Earth bank
- 🌳 A1.1.1 - Broadleaved woodland - semi-natural
- 🌿 A1.1.2 - Broadleaved woodland - plantation
- 🌾 C3.1 - Other tall herb and fern - ruderal
- 🟡 A J1.2 - Cultivated/disturbed land - amenity grassland
- 🏠 J3.6 - Buildings & infrastructure
- 🏗️ J5 - Hardstanding
- 🔴 Site Boundary
- 🚫 Restricted Access - Not surveyed during PEA

| | | | | | | |
|------|------------|-------|-------------------|-------|-------|------------|
| P2 | 02/11/2016 | JW | Preliminary issue | JB | CW | 02/11/2016 |
| Rev. | Date. | Drawn | Description. | Chkd. | Appd. | Date. |


Mott MacDonald Bentley

Cynghair Cyflawni Cyfalaf
 Ty Awon, Spooner Close, Coed Kernew, Newport, NP108FZ

Project Name: South Sludge Strategy

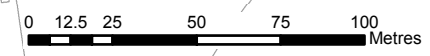
Drawing Title: Phase 1 Habitat Map

Suitability: Preliminary Suitability Code: PRE

Originator: JW Designer: JJB Date: 02/11/2016

Internal Project Number: QN29 Scale: 1:2,250 Rev: P2

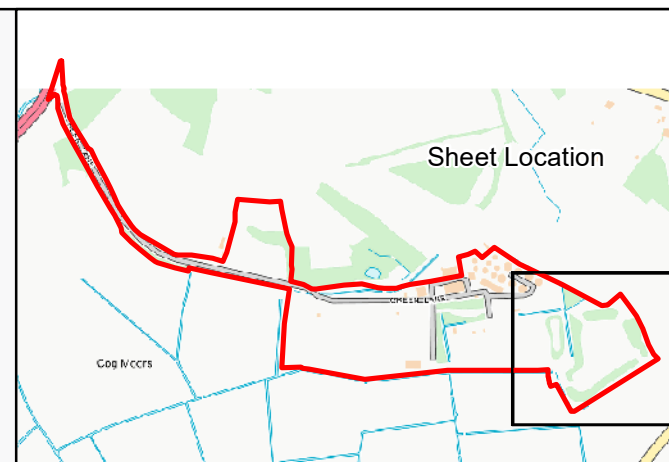
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Cog Moors WwTW - Proposed Advanced Anaerobic Digestion (AAD) Plant

**Drawing 4798-S-202-HYD-XX-XX-DR-NX-00005 (Rev P02) – Cog Moors
WwTW Phase 1 Habitat Survey**



LEGEND

- Planning Application Boundary
- Target Note
- × Scattered Scrub
- Intact Species Poor Hedgerow
- Fence
- Dry Ditch
- Scattered Tree

Habitat Type

- Hardstanding
- Semi-Natural Broadleaved Woodland
- Bare Ground
- Tall Ruderal
- Scattered Scrub
- Dense Scrub
- Marshy Grassland
- Broadleaved Woodland - Plantation
- SI Neutral Grassland - Semi-Improved
- SI Poor Grassland (Semi-Improved)

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| Rev. | Date. | Drawn | Description. | Chkd. | Appd. | Date. |
|------|---------|-------|---------------|-------|-------|---------|
| 01 | 19JUN17 | AH | Initial Issue | JP | | 19JUN17 |


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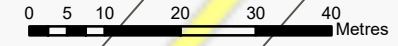
Project Name: Cog Moors WwTW

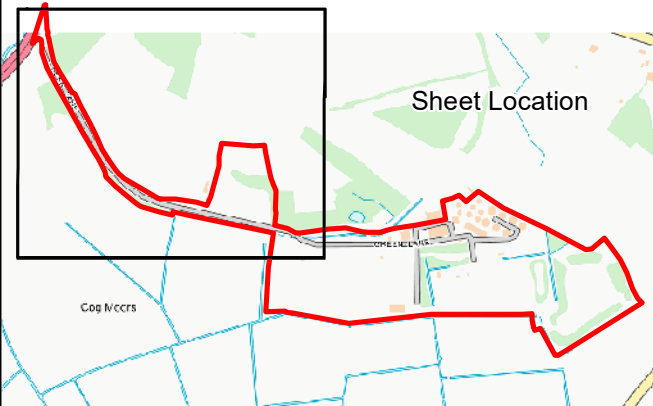
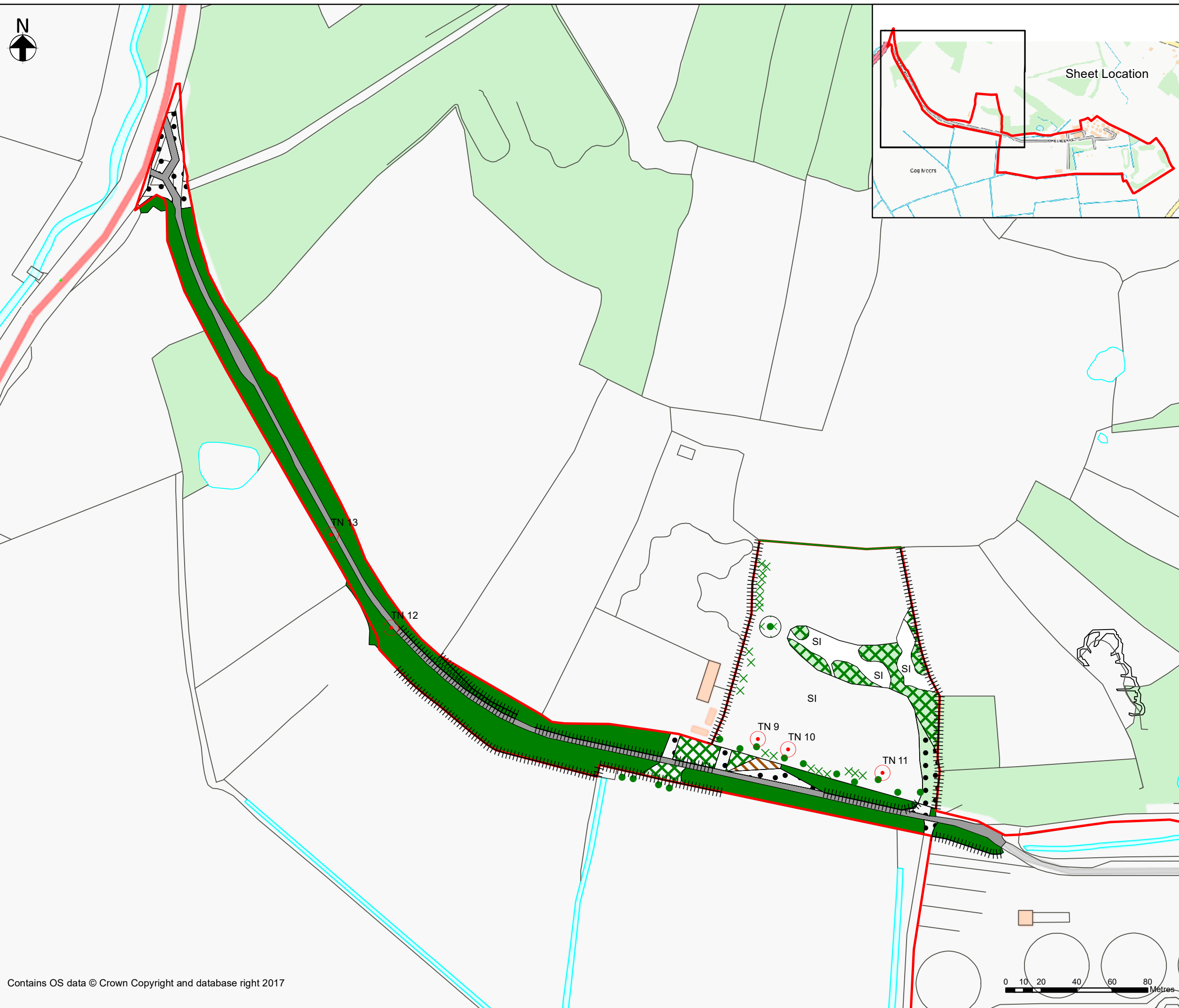
Drawing Title: Cog Moors WwTW Phase 1 Habitat Survey

Suitability: For Information Suitability Code: S2

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| Originator A.Hankinson | Designer J.Player | Date. 19JUN17 |
| Internal Project Number UA007902 | Scale 1:1,000 | Rev. P02 |

Drawing Number: 4798-S-202-HYD-XX-XX-DR-NX-00005





LEGEND

- Planning Application Boundary
- Target Note
- × Scattered Scrub
- Intact Species Poor Hedgerow
- Fence
- Dry Ditch
- Scattered Tree

Habitat Type

- Hardstanding
- Semi-Natural Broadleaved Woodland
- Bare Ground
- Tall Ruderal
- Scattered Scrub
- Dense Scrub
- Marshy Grassland
- Broadleaved Woodland - Plantation
- SI Neutral Grassland - Semi-Improved
- SI Poor Grassland (Semi-Improved)

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| Rev. | Date. | Drawn | Description. | Chkd. | Appd. | Date. |
|------|---------|-------|---------------|-------|-------|---------|
| 01 | 19JUN17 | AH | Initial Issue | JP | | 19JUN17 |

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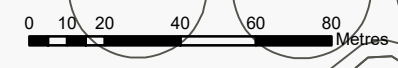
Project Name: **Cog Moors WwTW**

Drawing Title: **Cog Moors WwTW Phase 1 Habitat Survey**

Suitability: **For Information** Suitability Code: **S2**

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| Originator A.Hankinson | Designer J.Player | Date. 19JUN17 |
| Internal Project Number UA007902 | Scale 1:2,000 | Rev. P02 |

Drawing Number: **4798-S-202-HYD-XX-XX-DR-NX-00005**





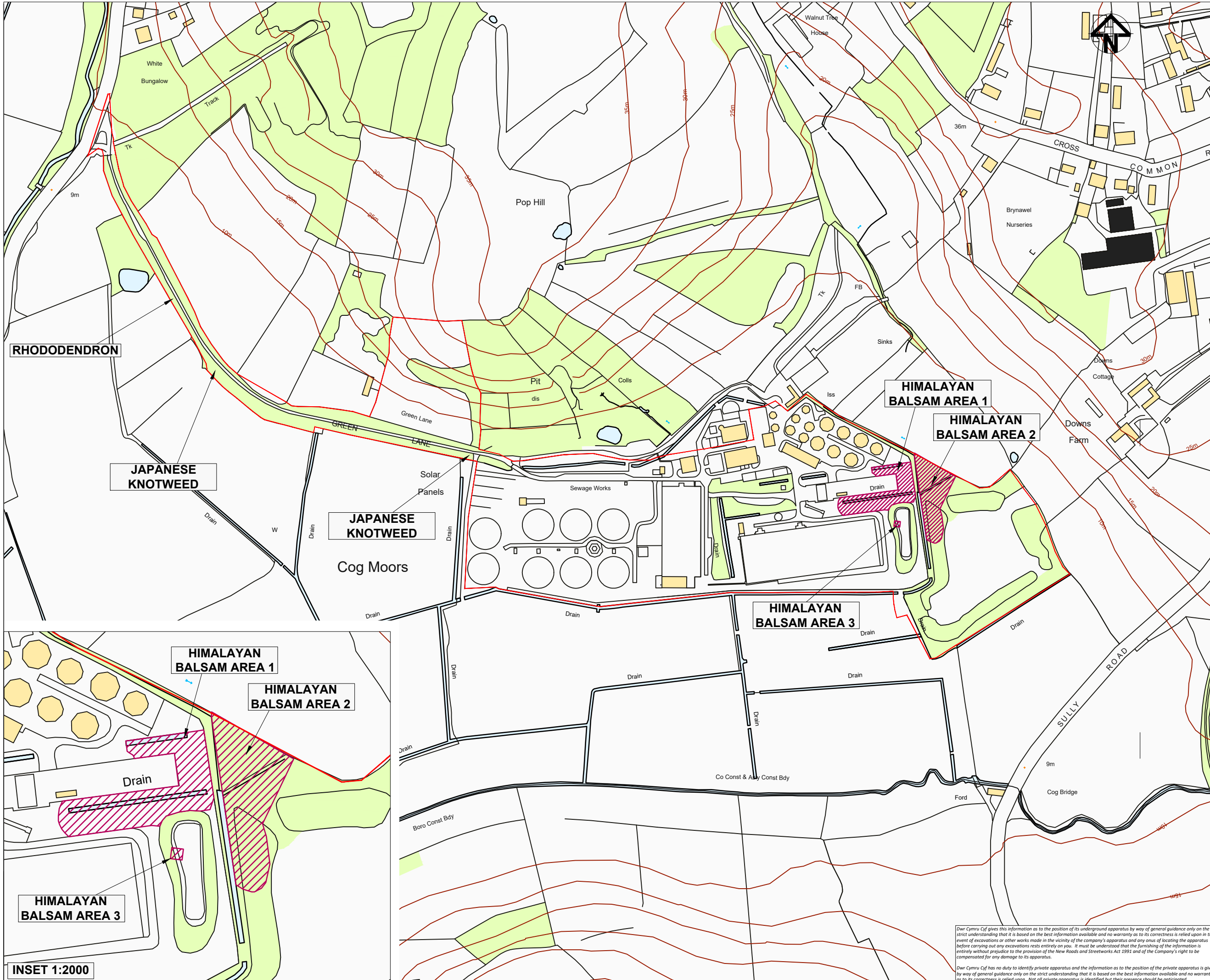
Cog Moors WwTW - Proposed Advanced Anaerobic Digestion (AAD) Plant

Drawing 4798-S-202-HYD-XX-XX-D-NX-08022 (Rev 03) – Invasive Species Plan

NOTES:

Legend:

-  Planning Application Boundary
-  Humalayan Balsam



RHODODENDRON

JAPANESE KNOTWEED

JAPANESE KNOTWEED

Cog Moors

HIMALAYAN BALSAM AREA 1

HIMALAYAN BALSAM AREA 2

HIMALAYAN BALSAM AREA 3

HIMALAYAN BALSAM AREA 1

HIMALAYAN BALSAM AREA 2

HIMALAYAN BALSAM AREA 3

INSET 1:2000

| Rev. | Date | Drawn | Description | Chkd. | Appd. | Date |
|------|----------|-------|-----------------|-------|-------|----------|
| 03 | 28/08/17 | RG | FOR INFORMATION | LF | LF | 28/08/17 |

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Project Name: COG MOORS WwTW AAD

Drawing Title: INVASIVE SPECIES PLAN

Suitability: FOR INFORMATION
 Suitability Code: S2

| | | |
|-----------------------------------|------------------|----------------|
| Originator: NA | Designer: NA | Date: 18/08/17 |
| Internal Project Number: UAO07902 | Scale: 1:4000@A3 | Rev: 03 |

Drawing Number: 4798-S-202-HYD-XX-XX-D-NX-08022

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50mm on Original

APPENDIX A

Dormouse nest box specification

Timber dormouse nest box (<https://www.nhbs.com/timber-dormouse-nesting-box>) – Image taken from NHBS (2018)



Bird nest box specification

Schwegler 1B Nest Box – Image taken from NHBS (2017a)



Bat box specification

Schwegler 2F Bat Box (General Purpose) – Image taken from NHBS (2017b)



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