ARCADIS Design & Consultancy for natural and built assets

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

Biodiversity Strategy

NOVEMBER 2017

Incorporating

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

Biodiversity Strategy

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Report No	4798-S-202-HYD-XX-XX-RP-NX-10192
Date	NOVEMBER 2017

VERSION CONTROL

Version	Date	Author	Changes
001	November 2017	Lucy Fay	Issue of final document

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APPENDIX A

Bird nest box specification

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;
- Provision of bird and bat 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 Waste water Treatment Works (WwTW) in Dinas Powys, Vale of Glamorgan. It has been prepared by Arcadis Consulting (UK) Ltd for Dwr Cymru Welsh Water (DCWW).

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 DCWW and the Vale of Glamorgan Council Ecologist (Arcadis, 2017a).

The locations within the proposed Development site where mitigation would take place are indicated on Drawing 4798-S-202-HYD-XX-XX-DR-NX-06127 (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, 2017b). 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:

- Improve the quality and biodiversity value of Cog Moors Site of Importance for Nature Conservation (SINC); and
- maintain a network of high quality habitats of value to bats, dormice, amphibians and nesting birds.

3 Proposals

The proposed AAD plant comprises a number of 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 mitigation planting will be undertaken. The site layout including proposed habitats are shown on Drawing 4798-S-202-HYD-XX-XX-DR-NX-06127.

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 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. Where appropriate, the species associated with each of the ecological resources are listed.

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	Habitats: species-rich semi-improved neutral grassland, broadleaved plantation woodland, scrub, marshy grassland, species-poor semi-improved grassland and ephemeral ditches Species: Pepper Saxifrage, badger, amphibians, foraging/commuting/roosting bats, nesting birds and dormice (if present – surveys ongoing)	Loss of: 0.02 ha of marshy grassland; 0.01 ha species-poor semi-improved grassland; 0.03 ha dense scrub; 181 linear m ephemeral ditches; 0.41 ha broadleaved plantation woodland; and 0.29 ha species-rich neutral grassland.	Creation of: 0.31 ha species-rich neutral grassland; 0.28 ha broadleaved plantation woodland; and 175 linear m ephemeral ditches. Improved management (enhancement) of: 0.56 ha species-rich neutral grassland within Cog Moors SINC and 0.69 ha amenity grassland within existing WwTW; 0.63 ha broadleaved plantation woodland[3]; and 453 linear m ephemeral ditches. Long-term management of invasive species with the aim of eradication. The above to be carried out in accordance with the Habitat Management Plan.
		Potential for degradation of retained habitats due to trampling/tracking, potential pollution event or spread of invasive plants.	Best practice methods during construction, to be detailed in the Project Environmental Management Plan (PEMP). Measures to control the spread of invasive species during construction in accordance with best practice guidelines.
Trees, woodland (outside of Cog Moors SINC)	Habitats: Broadleaved plantation woodland, semi-natural woodland and standalone trees, hedgerows/tree and shrub planting Species: Amphibians, nesting birds, foraging/commuting/roosting bats and	Loss of: 0.04 ha broadleaved plantation woodland; 0.68 ha semi-natural broadleaved woodland and 1x standalone (dead) tree	Planting of 16 individual trees. Improved management (enhancement) of 0.63 ha broadleaved plantation woodland[1].

[1] As shown on drawings 4798-S-202-MMB-O6-LP-N1-G1-01001 and 4798-S-202-HYD-XX-XX-DR-NX-00005
[2] As shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127
[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.

Ecological resource[1]	Associated habitats and species	Effects	Mitigation, compensation and enhancement measures[2]
	dormice (if present – surveys ongoing)	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 0.69 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.

Table 2: Mitigation measures for animals and plants

Species	Effects	Mitigation, compensation and enhancement measures[4]
Pepper Saxifrage	Loss of individual plants within species-rich neutral grassland	Improved management (enhancement) of 0.56 ha species-rich neutral grassland within Cog Moors SINC.
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 to allow movement of amphibians.
Dormice	Loss of habitat	Woodland planting. Enhancement of retained woodland.
	Potential for injury or mortality during site clearance	All contractors to receive toolbox talk prior to site clearance[5]. Staged clearance under ecological supervision. Mitigation to be implemented under licence from the appropriate licensing authority (NRW) if any dormice are identified[6].
	Habitat fragmentation as a result of built development	Retention and enhancement of ecological network around the perimeter to allow movement of dormice.

[4] As shown on drawing 4798-S-202-HYD-XX-XX-DR-NX-06127
[5] Only required if surveys confirm presence of dormice
[6] Only required if surveys confirm presence of dormice

Species	Effects	Mitigation, compensation and enhancement measures[4]
		Woodland planting to connect fragmented habitats.
Nesting birds	Loss of roosting, foraging and nesting sites	New planting to comprise a variety of native trees and shrubs of value to nesting and foraging birds. Habitat enhancement of 0.05 ha wildlife area post-construction in accordance with a Habitat Management Plan. Improved management (enhancement) of grassland to improve abundance/diversity of invertebrate prey species. Provision of nest boxes.
	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)	Pre-felling check to be undertaken to confirm presence/absence of bats. Mitigation to be implemented under licence from the appropriate licensing authority (NRW) should pre-felling check confirm presence of roosting bats. Trees to be felled outside of bird nesting season (when bats least likely to be present). Provision of bat boxes.
	Fragmentation of commuting routes/foraging habitat	Commuting routes to be retained and protected. New planting to connect fragmented habitats.
	Loss of foraging and commuting habitat	Woodland planting. Enhancement of retained woodland.
	Emergence and foraging behaviour affected by artificial lighting.	Lighting from construction site to be designed to avoid illumination of retained/new planting. Permanent lighting has been designed in consultation with a bat ecologist to minimise light spill using motion sensors and intelligent lighting technology.
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, and 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.

6.1 Cog Moors SINC

6.1.1 Habitat loss

6.1.1.1 Species-rich grassland

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. The reinstatement of species-rich grassland along the wayleave/easement of the HV cable would provide partial compensation for this loss. The remaining habitat loss would be mitigated for by long-term management of unaffected species-rich neutral grassland within Cog Moors SINC and areas 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, 2017b). 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 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, 2017b).

6.1.1.2 Broadleaved plantation woodland

Broadleaved plantation woodland would be lost because of the installation of a HV cable and construction of the proposed Development. This loss would be partially compensated for by the creation and long-term management of broadleaved plantation woodland which will be planted on the area used for the temporary construction compound. The remaining habitat loss would be mitigated for by the enhancement and long-term management of two areas of existing broadleaved plantation woodland within the planning application boundary.

Management of the created and existing 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, 2017b). Management of woodland areas would involve selective removal of limbs and coppicing of shrubs to promote healthy growth, 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, 2017b).

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, 2017b).

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 broadleaved plantation woodland within the existing WwTW as a result of the construction of the proposed Development would be partially compensated for by planting 16 individual trees. Trees will be planted on the periphery of the site where there are gaps in existing tree/shrub planting. The remaining habitat loss would be mitigated by the enhancement and 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, 2017b). Management of woodland areas would involve selective removal of limbs and coppicing of shrubs to promote healthy growth.

These measures aim to improve the ecological connectivity around the perimeter of the site and improve the overall quality of the woodlands to encourage the development of good woodland structure and wildlife (Arcadis, 2017b).

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, 2017c), 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, 2017b).

7 Mitigation Measures for Animals and Plants

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

7.1 Pepper Saxifrage

7.1.1 Mitigation for loss

Pepper Saxifrage is a rare plant species in Wales (Arcadis, 2017d) and present within the species-rich neutral grassland of Cog Moors SINC. Mitigation for the loss of Pepper Saxifrage focuses on the long-term management of retained 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 partially compensated for by reinstating areas of Cog Moors SINC disturbed during construction with woodland and species-rich neutral grassland. The remaining loss would be mitigated for by the improved management of retained woodland and amenity and species-rich grassland 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 of 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 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.

These measures aim to maintain/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[7]

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 removal will be carried out in stages, gradually reducing the suitability of the working corridor for dormice and encouraging them to move into adjacent habitat. This will comprise clearance of woodland habitat to a height of no less than 500mm during the period November-March, followed by clearance to ground level between May and September once dormice have emerged from hibernation. Vegetation clearance will be carried out under the guidance and supervision of an ecologist, following a method statement. Should surveys confirm the presence of dormice, vegetation clearance will be subject to a development licence obtained from NRW.

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 smaller/isolated woodland remnants and fill gaps in existing tree lines to ensure ecological networks and connectivity are maintained.

[7] Only required if surveys confirm dormice are present on site.

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 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, 2017b).

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, 2017e) 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 (Natural Resources Wales (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 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 connect to smaller/isolated woodland remnants.

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.

Woodland will be planted either side of the HV cable wayleave/easement to create a woodland ride effect, increasing the amount of woodland edge habitat within the SINC.

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, the intelligent exterior lighting would normally be switched off between 7pm and 7am subject to routine maintenance/emergency works/operational need and the lighting activation would be linked to motion sensors to maximise efficiency. (Arcadis, 2017f). 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.

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). 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) 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, 2017b).

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);
- Creation of 0.31 ha species-rich neutral grassland and improved management of a further 0.56 ha species-rich neutral grassland and 0.69 ha amenity grassland;
- Creation of 0.28 ha broadleaved plantation woodland, planting of 16 individual trees and improved management of a further 0.63 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
- Adoption of best practice methods during construction (in accordance with a Project Environmental Management Plan (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, 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.

9 References

Arcadis, 2017a. Cog Moors WwTW – Ecology Review. Minutes of meeting held on 20th July 2017 between Arcadis and Vale of Glamorgan Council Ecologist.

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NHBS, 2017a. 1B Schwegler Nest Box. https://www.nhbs.com/1b-schwegler-nest-box [Accessed 17th October 2017].

NHBS, 2017b. 2F Schwegler Bat Box (General Purpose). https://www.nhbs.com/2f-schwegler-bat-box-general-purpose [Accessed 17th October 2017].

DRAWINGS

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

A1

Trees along north eastern boundary are covered by Tree Preservation Orders

Trees along north eastern boundary are covered by Tree Preservation Orders

Pond
Pop Hill
Pond
Track
FB
Sinks
Issues
Sewage Treatment Plant
Solar Panels
Employee Contribution Phase 2 Only
Sewage Works
Track
Drain
Drain
Drain
Drain
Drain
Drain
Drain
Drain
Drain
Cog Moors
Drain
Drain

N

LEGEND:

- Planning Application Boundary
- DCWW Land Ownership Boundary
- 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
- Proposed Individual Tree Planting
- Area to be Managed for Wildlife
- Bird Nest Box
- Bat Box
- Hibernaculum to be created
- Existing Ephemeral Ditch
- Existing Dry Ditch
- Proposed Drainage Ditch

Rev.	Date.	Drawn	Description.	Chkd	Appd.	Date.
P02	25.10.17	RG	SECOND ISSUE	SF	LW	25.10.17
P01	27.07.17	RG	FIRST ISSUE	SF	LW	21.06.17

Capital Delivery Alliance
Cynghrair Cyflawni Cyfalaf

Ty Awen, Spooner Close, Coed Kernew, Newport, NP108FZ

Project Name.
COG MOORS WwTW AAD

Drawing Title.
FIGURE 10
LANDSCAPE MITIGATION PLAN

Suitability.	Suitability Code.
INFORMATION	S2

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

Internal Project Number.	Scale.	Rev.
UA007902	1:1250@A1	P02

Drawing Number.
4798-S-202-HYD-XX-XX-DR-NX-06127

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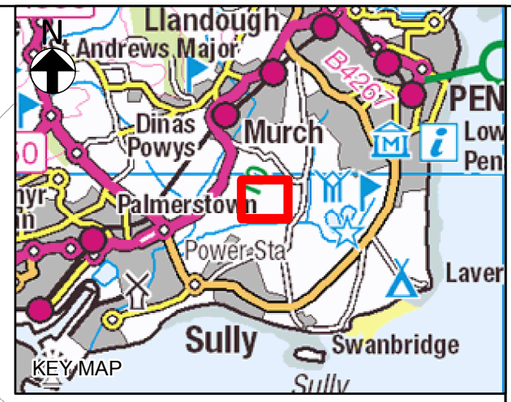
Dwr Cymru Cyf has no duty to identify private apparatus and the information as to the position of the private apparatus is given by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon. Not all private apparatus is identified but their presence should be anticipated.

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



A3

Legend

- 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
- J1.2 - Cultivated/disturbed land - amenity grassland
- J3.6 - Buildings & infrastructure
- J5 - Hardstanding
- Site Boundary
- Restricted Access - Not surveyed during PEA

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

Mott MacDonald Bentley

Capital Delivery Alliance
Cynghrair Cyflawni Cyfalaf

Ty Awen, Spooner Close, Coed Kernew, Newport, NP108FZ

Project Name.
South Sludge Strategy

Drawing Title.
Phase 1 Habitat Map

Suitability.	Suitability Code.
Preliminary	PRE

Originator	Designer	Date.
JW	JJB	02/11/2016

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

Drawing Number.
4798-S-202-MMB-06-LP-N1-G1-01001

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Drawing 4798-S-202-HYD-XX-XX-DR-NX-00005 – Cog Moors WwTW Phase 1 Habitat Survey

A3

LEGEND

- Planning Application Boundary
- Dry Ditch
- Scattered Tree

Habitat Type

- Tall Ruderal
- Dense Scrub
- Marshy Grassland
- Broadleaved Woodland - Plantation
- Neutral Grassland - Semi-Improved
- SI — Poor Grassland (Semi-Improved)

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

Capital Delivery Alliance
Cynghrair Cyflawni Cyfalaf
Ty Awen, Spooner Close, Coed Kernew, Newport, NP108FZ

Project Name.
Cog Moors WwTW

Drawing Title.
Cog Moors WwTW Phase 1 Habitat Survey

Suitability.	Suitability Code.
For Information	S2

Originator	Designer	Date.
A.Hankinson	J.Player	19JUN17

Internal Project Number	Scale	Rev.
UA007902	1:1,000	01

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

K:\projects\UA007902-Cog Moors\E-Our Drawings\UA007902-Reptile Refuge Locations-A4.mxd

Drawing 4798-S-202-HYD-XX-XX-D-NX-08022 – Invasive Species Plan

A3

NOTES:

Legend:

- Planning Application Boundary
- Humalayan Balsam

HIMALAYAN BALSAM AREA 1

HIMALAYAN BALSAM AREA 2

HIMALAYAN BALSAM AREA 3

White Bungalow

Track

Tk

9m

Pop Hill

Walnut Tree House

CROSS COMMON RO

Brynawel Nurseries

FB

Sinks

Iss

Downs Cottage

Downs Farm

Pit

dis

Colls

Green Lane

GREEN LANE

Solar Panels

Sewage Works

Drain

Cog Moors

W

Co Const & Asby Const Bdy

Boro Const Bdy

Ford

SULLY ROAD

Cog Bridge

INSET 1:2000

50mm on Original

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Rev.	Date.	Drawn.	Description.	Chkd.	Appd.	Date.
02	18/08/17	JN	FOR INFORMATION	LF	LF	18/08/17

Capital Delivery Alliance
Cynghrair Cyflawni Cyfalaf

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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.	UA007902
Scale.	1:4000@A3
Rev.	02
Drawing Number.	4798-S-202-HYD-XX-XX-D-NX-08022

APPENDIX A

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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