

ST. MODWEN DEVELOPMENTS LTD



ECOLOGYSOLUTIONS

Part of the ES Group

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LLANDARCY, NEATH

**Information to Enable a
Habitat Regulations Assessment
of the Impacts on
Crymlyn Bog SAC and Ramsar
Pursuant to Regulation 63 of
The Conservation of
Habitats & Species
Regulations 2017 (as Amended)**

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1. INTRODUCTION

1.1. Background

- 1.1.1. Ecology Solutions was commissioned by St. Modwen Developments Ltd to assess the implications of the Development Proposals on nearby designated sites of European importance, namely the Crymlyn Bog Special Area of Conservation (SAC) and Ramsar.
- 1.1.2. The findings of this assessment are set out within this 'Information for Habitats Regulations Assessment' (iHRA) document, such that the competent authority (in this instance, Neath Port Talbot County Borough Council - NPTCBC) has all the necessary information before them in order to carry out their duties in considering the application in line with relevant legislation, including specifically The Conservation of Habitats and Species Regulations 2017 (as Amended), hereinafter referred to as the Habitats Regulations.
- 1.1.3. The 'Site' forms part of a larger landholding that was granted permission in 2008 for an outline planning application for redevelopment to provide 4,000 new homes, business and retail space, and other facilities and services (reference P2005/03983). In January 2016, Neath Port Talbot adopted their Local Development Plan (LDP), which includes the Site (as part of the wider Coed Darcy landholding) as a Strategic Regeneration Area. Both the 2008 consented outline application and the LDP were subject to HRA. These previous assessments concluded development of the wider Coed Darcy site (including the Site) could come forward without resulting in adverse impacts on integrity of the Crymlyn Bog SAC/Ramsar.
- 1.1.4. Notwithstanding this previous assessment work, given the proximity of the Site to the Crymlyn Bog, the time since previous assessment work was undertaken, the revised (smaller scale) of the Development Proposals, and the publication of additional case law in the intervening period, (not least 'People Over Wind' and the Sweetman ruling (April 2018)), it is necessary to undertake a further assessment of the proposals with reference to Regulation 63 of the Habitat Regulations 2017 (as amended).
- 1.1.5. Development Proposals for the Site are for "*Outline planning application, with all matters reserved except for strategic access, for residential uses (C2 & C3 use class), including land for education (D1 use class) with associated public open space, commercial uses (A1, A2, A3, B1, D1 & D2), commercial / employment (B2 & B8) uses, public open space, highway works, sustainable drainage, ecological mitigation and enhancement, landscaping, ground remediation, and associated engineering and infrastructure works*"

1.2. Purpose of this Report

- 1.2.1. This report specifically assesses the potential effects of the Development Proposals on the nearby Crymlyn Bog SAC and Ramsar, in line with the staged assessment process under Regulation 63 of the

Habitat Regulations. It has been produced considering recent case law. It is submitted to ensure the competent authority has all necessary information before it when discharging its legal obligations in granting a consent (should it be minded to do so).

- 1.2.2. Within this document specific regard is had to the test under Regulation 63(1) of the Habitats Regulations. Regulation 63(1) is described and considered further in Section 2 of this document.
- 1.2.3. The proximity of the Site to the SAC and Ramsar site (as well as the underpinning Crymlyn Bog SSSI [Site of Special Scientific Interest] and Pant-y-Sais SSSI) are described in detail at Section 3 of this report and also shown on Plan ECO1.
- 1.2.4. As part of this assessment professional judgement has been applied in some instances, in order to interpret information. Ecology Solutions is a member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and the Institute of Environmental Management and Assessment, and its professional ecologists are qualified to make such judgements where appropriate.
- 1.2.5. This document assesses the likely significant effects of the Development Proposals associated with the Site as a whole, both alone and in combination with other plans/projects.

1.3. Site Characteristics

- 1.3.1. The Site is located to the north of Llandarcy, Neath and is approximately 131ha in size. The Site is bounded to the east by the current Coed Darcy built form, with the M4 beyond. The south of the Site is bounded by existing brown field land (part of the wider Coed Darcy landholding) with localised areas of broad-leaved woodland and Coed Darcy Great Crested Newt (GCN) area SINC beyond. To the south-east of the Site lies an existing built form (industrial estate), with Jersey Marine Woods Site of Importance for Nature Conservation (SINC) beyond. Much of the west of the Site is bounded by Crymlyn Bog SSSI, SAC and Ramsar with Crymlyn Bog and Pant Y Sais NNR extending from the south-east boundary to the south-east beyond. The immediate north of the Site is bounded by the North Site Reservoir and areas of scrubby woodland, with existing residential development beyond.
- 1.3.2. Further to the west and south of the Site lies open countryside and agricultural fields, with existing built form further afield to the north, west and east of the Site. To the far south lies existing building with Crymlyn Burrows SSSI further south still, before Swansea Bay.
- 1.3.3. The Site itself comprises an area of previously developed land, the former site of the Llandarcy Oil Refinery, which has been subject to extensive remediation, re-profiling, and habitat clearance over an extended period. As a result of these works large areas of the site comprise predominantly bare ground with very limited semi-natural habitats present. Where remediation works were completed less recently, substantial areas of the Site have recolonised with a range of early successional habitats. These early successional habitats are

complemented by the Site's topographical variety, as well as the presence of numerous ponds and mature vegetation such as scrub, tree belts and woodland.

2. LEGISLATIVE AND PLANNING POLICY BACKGROUND

Legislation and relevant case law

- 2.1. The proximity of the Site to nearby designated sites of European importance, namely the Crymlyn Bog SAC and Ramsar, means the EC Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (Habitats Directive) is relevant in this instance. This Directive (alongside the EC Directive on Wild Birds - the Birds Directive) is transposed in UK legislation through the Habitats Regulations 2017 (as Amended).
- 2.2. The relevant Directive and UK legislation are discussed below.

Habitats and Birds Directives

- 2.3. Under the EC Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna, commonly referred to as the Habitats Directive (Council Directive 92/43/EEC), Member States are required to take special measures to maintain the distribution and abundance of certain priority habitats and species (listed in Annexes I and II of the Directive).
- 2.4. In particular, each Member State is required to designate the most suitable sites as SACs. All such SACs will form part of the Natura 2000 network under Article 3(1) of the Habitats Directive.
- 2.5. Article 2(3) sets out that Member States have a duty in exercising their obligations under the Habitats Directive to:

“... take account of economic, social and cultural requirements and local characteristics.”
- 2.6. Under the EC Directive on Wild Birds (the Birds Directive) (Council Directive 2009/147/EEC, previously 79/409/EEC), Member States are required to take special measures to conserve the habitats of certain rare species of birds (listed in Annex I of the Directive) and regularly occurring migratory birds.
- 2.7. In particular, each Member State is required to classify the most suitable areas of such habitats as Special Protection Areas (SPAs). This is designed to protect wild birds, to provide sufficient diversity of habitats for all species, and maintain populations at an ecologically sound level. All Bird Directive SPAs will also be part of the Natura 2000 network under Article 3(1) of the Habitats Directive.
- 2.8. Thus, there is an obligation under the Habitats Directive and the Birds Directive for Member States to designate sites before turning to measures for their protection.
- 2.9. The protection afforded to SACs and SPAs is delivered through Article 6 of the Habitats Directive. Article 6(2) requires Member States to take appropriate steps to avoid the deterioration of natural habitats and disturbance of species for which the sites have been designated, in so far as the disturbance could be significant in relation to the objectives of the Directive. Article 6(3) and Article 6(4) require a plan or project, not directly connected with the management of the site, but likely to have a significant

effect upon it, either individually or in combination with other plans or projects, must be subject to an Appropriate Assessment of its implications on the site, in view of the site's Conservation Objectives.

- 2.10. Having undertaken an Appropriate Assessment, the competent authority may agree to a plan or project where it can be concluded it will not adversely affect the integrity of the site. In light of a negative assessment on the implications for the integrity of the site, Article 6(4) provides that the plan or project may still proceed where it can be demonstrated there are no alternatives, and there are imperative reasons of over-riding public interest as to why it must proceed. In the event a plan or project is to proceed on the basis of imperative reasons of over-riding public interest, by direction of Article 6(4), compensatory measures must be put in place to ensure the overall coherence of the Natura 2000 network is protected.

The Conservation of Habitats and Species Regulations 2017 (as Amended)

- 2.11. The Conservation of Species and Habitats Regulations 2017 (as Amended), commonly referred to as the Habitats Regulations, transpose the requirements of the Habitats Directive and the Birds Directive into UK legislation. The Habitats Regulations aim to protect a network of sites in the UK that have rare or important habitats and species, in order to safeguard biodiversity. The Habitats Regulations 2017 consolidate all the previous amendments made to the Habitats Regulations 2010.
- 2.12. Following Brexit, the Habitats Regulations have been amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 ('the 2019 Amendment Regulations') to ensure the Habitats Regulations are 'fit for purpose'. A number of the changes involve transferring functions from the European Commission to the appropriate authorities in England and Wales. The basic obligations of the competent authorities have not changed.
- 2.13. As a result of the 2019 Amendment Regulations the SACs and SPAs in the UK no longer form part of the European Union's Natura ecological network. The 2019 Amendment Regulations have created a national site network ('NSN') which includes existing SACs and SPAs, and any new SACs and SPAs designated under the Regulations.
- 2.14. The NSN is subject to network objectives which are set out at Regulation 16A of the Amendment Regulations.
- 2.15. Under the Habitats Regulations, competent authorities have a duty to ensure all the activities they regulate have no adverse effect on the integrity of any of the Natura 2000 sites (e.g. SPAs and SACs). Regulation 63 of the Habitats Regulations requires:

"63(1) A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for a plan or project, which:-

(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects) and

(b) is not directly connected with or necessary for the management of the site,

must make an appropriate assessment of the implications of the plan or project for that site in view of that site's Conservation Objectives.

63(3) The competent authority must for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority specifies.

63(5) In the light of the conclusions of the assessment, and subject to regulation 64, the authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be).

63(6) In considering whether a plan or project will adversely affect the integrity of the site, the authority must have regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which it proposes that the consent, permission or other authorisation should be given."

- 2.16. Some key concepts of the Habitats Directive and Habitats Regulations have been clarified through case law. The most pertinent cases in relation to the Development Proposals are the *Waddenzee* Judgment, the *Sweetman* Case, the *Dilly Lane* Case, the *Exminster* Judgment and the *People over Wind* Judgment. These are discussed below.

Waddenzee Judgment

- 2.17. In the *Waddenzee* case the European Court of Justice decided an Appropriate Assessment is required for a plan or project where there is a probability or a risk that it will have a significant effect on the European site. The Judgment states (at paragraph 3(a)):

"...any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's Conservation Objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects."

- 2.18. Hence, the need for an Appropriate Assessment should be determined on a precautionary basis.
- 2.19. The Judgment gives clarity that the test of 'likely significant effect' should also be undertaken in view of the European site's Conservation Objectives. It is stated at paragraph 3(b):

"where a plan or project not directly connected with or necessary to the management of a site is likely to undermine the site's

Conservation Objectives, it must be considered likely to have a significant effect on that site.”

- 2.20. Paragraph 4 of the Judgment emphasises the requirement for the Appropriate Assessment to rely on objective scientific information:

“...an appropriate assessment...implies that, prior to its approval, all the aspects of the plan or project which can, by themselves or in combination with other plans or projects, affect the site's Conservation Objectives must be identified in the light of the best scientific knowledge in the field. The competent national authorities, taking account of the appropriate assessment of the implications...for the site concerned in the light of the site's Conservation Objectives, are to authorise such an activity only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects.”

Sweetman Case

- 2.21. Further guidance in relation to the consideration of impacts in light of the Habitats Regulations is provided in the Sweetman case. The case, as set out by the Advocate General, considered in detail the test for likely significant effect in paragraphs 50 and 51:

“50. The test which that expert assessment must determine is whether the plan or project in question has ‘an adverse effect on the integrity of the site’, since that is the basis on which the competent national authorities must reach their decision. The threshold at this (the second) stage is noticeably higher than that laid down at the first stage. That is because the question (to use more simple terminology) is not ‘should we bother to check’ (the question at the first stage) but rather ‘what will happen to the site if this plan or project goes ahead; and is that consistent with “maintaining or restoring the favourable conservation status” of the habitat or species concerned’...

51. It is plan, however, that the threshold laid down at this stage of Article 6(3) may not be set too high, since the assessment must be undertaken having rigorous regard to the precautionary principle. That principle applies where there is uncertainty as to the existence or extent of risks. The competent national authorities may grant authorisation to a plan or project only if they are convinced that it will not adversely affect the integrity of the site concerned. If doubt remains as to the absence of adverse effects, they must refuse authorisation.”

- 2.22. The Court of Justice of the European Union (CJEU) agreed with the Advocate General's conclusions, and held:

“40. Authorisation for a plan or project, as referred to in Article 6(3) of the Habitats Directive, may therefore be given only on condition that the competent authorities – once all aspects of the plan or project have been identified which can, by themselves or in combination with other plans or projects, affect the Conservation Objectives of the site

concerned, and in the light of the best scientific knowledge in the field – are certain that the plan or project will not have lasting adverse effects on the integrity of that site. That is so where no reasonable scientific doubt remains as to the absence of such effects.”

- 2.23. Hence, a plan or project may be authorised only if no reasonable scientific doubt remains as to the absence of effects. Reasonable scientific doubt will exist if the evidence is not sufficiently conclusive, or if there are gaps in the information.

Dilly Lane Case

- 2.24. The Secretary of State's decision to allow an appeal in relation to applications for a total of 170 new homes on a greenfield site off Dilly Lane, Hartley Wintney was challenged in the High Court by Hart District Council. The legal challenge was made on the grounds the Secretary of State had erred in departing from her Inspector's conclusions as to the effects on the Thames Basin Heaths SPA.
- 2.25. A key issue for the case was whether mitigation measures should be disregarded when assessing whether the project would have a significant effect on the SPA. Mr Justice Sullivan (subsequently Lord Justice Sullivan) ruled in favour of the Secretary of State after concluding there was no absolute legal rule that mitigation measures should be disregarded during the first stage – 'the likely significant test':

“55. The competent authority is not considering the likely effect of some hypothetical project in the abstract. The exercise is a practical one which requires the competent authority to consider the likely effect of the particular project for which permission is being sought. If certain features (to use a neutral term) have been incorporated into that project, there is no sensible reason why those features should be ignored at the initial, screening, stage merely because they have been incorporated into the project in order to avoid, or mitigate, any likely effect on the SPA.”

- 2.26. The position adopted in 'People over Wind' (see below) revokes the position summarised above, albeit other issues considered within the Judgment remain sound.

Exminster Judgment

- 2.27. Also of note is the Judgment handed down by Lord Justice Sales on 5 March 2015 in *Dianne Smyth v The Secretary of State for Communities and Local Government* [2015] EWCA Civ 174. This case concerned an appeal by Mrs Smyth against the decision of Mrs Justice Patterson, sitting in the High Court, [2013] EWHC 3844, who dismissed an application made by Mrs Smyth to quash the appeal decision to grant planning permission to Bellway for the development of 65 residential dwellings on land at Sentry's Farm, Exminster, Devon. In this case the development site was located close to the Exe Estuary SPA ("the SPA"), which is also notified as a SSSI. The SPA incorporates the Dawlish Warren SAC ("the SAC").

- 2.28. Amongst other matters, this case considered the weight that should be attributed to an expert's professional judgment.
- 2.29. Lord Justice Sales makes clear that an expert's experience can be classed as objective information, as set out in paragraphs 46 and 47 of the Judgment. These paragraphs state:

46. Mr Jones submitted that Mr Goodwin's evidence amounted merely to assertion, unsupported by any objective evidence. I do not agree. Three points should be made. First, I consider that on a fair reading of Mr Goodwin's proof of evidence it can be seen that he has drawn on specific information relevant to the SPA and the SAC, as well as the development site and proposed mitigation measures, in a manner which supports in an entirely conventional and acceptable way his expressions of opinion as an ecological expert. By way of example, at paras. 10.4 and 10.5 of his proof, he pointed out that, contrary to the suggestion made by GIE's representative at the inquiry, it was not appropriate to use the analogy of mitigation measures developed for heathland sites (a 400m exclusion zone), where ground nesting birds might be subject to predation by cats, since for the SPA "the designating bird features are wintering or passage species and access to large parts of the site is not possible in any event" (because it is marshland or cut off by water). He referred to the Interim Report and the Disturbance Study, as appropriate. Mr Goodwin demonstrated a good understanding of the particular ecological and mitigation features relevant to the SPA and the SAC. Contrary to Mr Jones's contention, Mr Goodwin's evidence was very far from being unsupported, free-standing assertion.

47. Secondly, in my view it is acceptable and to be expected that an expert will draw on his own background knowledge, experience and expertise in the field to inform the opinions which constitute his evidence to a relevant decision-maker (here, the Inspector). That is, indeed, in large part the point of looking to expert witnesses to provide assistance on technical matters. In this case, Mr Goodwin's own practical experience, the practical experience of ecologists generally and the knowledge shared between them all informed the expertise which he was able to bring to bear in giving his views regarding the effects of the development and the practical impact and viability of the mitigation options which he reviewed in his proof of evidence.

- 2.30. Paragraph 84 of the Judgment further clarifies that expert evidence can be considered as objective, stating:

...Mr Goodwin's evidence set out careful reasoning by him, with reference back as appropriate to underlying facts, to explain his opinion and expressions of view. It was expert evidence in conventional form and of good quality. Mr Goodwin was entitled to draw on his own experience and expertise as well, in forming his opinion: see paras. [46]-[48] above.

- 2.31. The *Exminster* case further considered the appropriate procedures for assessing in-combination impacts which may arise through combined development within the Zone of Influence (ZI) of a European Site.

Wealden v SSCLG [2017] ('the Wealden Judgment 2017')

- 2.32. The *Wealden* Judgment considers the appropriate approach to adopt when undertaking an in-combination assessment where several plans or projects, with no significant impacts alone, could together reach a threshold deemed to be significant. This Judgment specifically considers matters of air quality, although is relevant where any matters of threshold arise.
- 2.33. The Judgment was handed down by Mr Justice Jay in the case between Wealden District Council and the Secretary of State for Communities and Local Government, Lewis District Council, and the South Downs National Park Authority [*Wealden v SSCLG* (2017) EWHC 351 (Admin)], and was concerned with matters relating to air quality impacts on European Sites (in that case the Ashdown Forest SPA/SAC).
- 2.34. A critical issue explored within the Judgment was whether it is correct to test a plan or project against threshold values (in that case relating to the deposition of Nitrogen from increased road traffic) in isolation, with no recourse to undertake a true in combination test.
- 2.35. This matter was specifically considered by Mr Justice Jay at paragraph 108 of his Judgment. Here he concludes the only rational approach would be for plans or projects which would cumulatively exceed a threshold value (such as Nitrogen deposition) to be considered in-combination. The premise of this paragraph is Mr Justice Jay's view that it would be illogical not to consider the residual impacts of a plan or project alongside residual impacts of other relevant schemes (i.e. in combination).
- 2.36. As such it is clear; where matters of threshold arise (such as recreational pressure) impacts should be considered cumulatively.

People over Wind Case (Sweetman II) [C323/17]

- 2.37. The CJEU in *People over Wind v Coillte Teoranta* has revoked the position adopted under the *Dilly Lane* Decision that it was right and proper for mitigation or avoidance measures, which formed a feature of a plan/project, to be viewed as integral to the plan/project and not excluded when considering the likely significance test at Regulation 63(1).
- 2.38. The decision by the CJEU ruled:

"Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site."

- 2.39. In accordance with this ruling, avoidance or mitigation measures cannot be considered at the first stage of the test (the 'Likely Significant Effect' stage) and can only be considered at the Appropriate Assessment stage.
- 2.40. In considering the above, it is logical to distinguish between measures which are specifically "*intended to avoid or reduce the harmful effects*" (i.e. mitigation measures for the purposes of a HRA) and measures which would come forward in any event (i.e. intrinsic elements of scheme design). Notwithstanding these latter measures may, by default, avoid or reduce harmful effects on a European site(s), if they are integral elements of a development proposal, it remains appropriate to consider them at the first stage of the test.

ESB Wind Developments (Sweetman III) [Case C-164/17]

- 2.41. In this case a request for a preliminary ruling was made to the CJEU concerning the interpretation of Articles 6(3) and 6(4) of Council Directive 92/43/EEC (the Habitats Directive). The request was made in relation to proceedings brought by Mr Peter Sweetman and Edel Grace against the decision of An Bord Pleanála (National Planning Appeals Board, Ireland) concerning the latter's decision to grant ESB Wind Developments Limited and Coillte permission for a wind farm project within an SPA. The ruling was handed down on 25 July 2018.
- 2.42. This ruling distinguishes between, for the purpose of the application of Articles 6(3) and 6(4) of the Directive, 'mitigation' that consists of measures intended to avoid or reduce harm to the protected site, and measures intended to compensate for any harm (compensatory measures). It is stated:

"Article 6 of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora must be interpreted as meaning that, where it is intended to carry out a project on a site designated for the protection and conservation of certain species, of which the area suitable for providing for the needs of a protected species fluctuates over time, and the temporary or permanent effect of that project will be that some parts of the site will no longer be able to provide a suitable habitat for the species in question, the fact that the project includes measures to ensure that, after an appropriate assessment of the implications of the project has been carried out and throughout the lifetime of the project, the part of the site that is in fact likely to provide a suitable habitat will not be reduced and indeed may be enhanced may not be taken into account for the purpose of the assessment that must be carried out in accordance with Article 6(3) of the directive to ensure that the project in question will not adversely affect the integrity of the site concerned; that fact falls to be considered, if need be, under Article 6(4) of the directive."

- 2.43. The ruling clarifies (in the context of the specifics of that project), what constitutes mitigation, and what should correctly be termed compensation. It confirms mitigation should be subject to Appropriate Assessment under Article 6(3), but that measures designed to compensate for any harm rather than prevent it, cannot be considered under Article 6(3) (Appropriate Assessment). In such instances, the proposal must be considered under

Article 6(4) and thus it cannot be permitted unless there are, “Imperative Reasons of Overriding Public Interest”.

Holohan Judgment

2.44. In the case of *Holohan v. An Bord Pleanála* the CJEU considered the Appropriate Assessment procedure to be adopted when considering potential impacts on a European site. In considering this case, the CJEU ruled, amongst other matters:

- a) *An Appropriate Assessment (AA) must catalogue the entirety of the habitat types and species for which a site is protected.*
- b) *It must also identify and examine the implications of the proposed project for the species present on that site and for which that site has not been listed. Additionally, it must examine the implications for habitat types and species outside the boundaries of the protected site, insofar as those implications are liable to affect the site’s Conservation Objectives.*
- c) *Where the competent authority rejects findings of an expert that additional information must be obtained, the Appropriate Assessment must include a detailed statement dispelling all reasonable scientific doubt concerning effects on the protected site.*

2.45. This assessment document is fully compliant with the relevant parts of the *Holohan* Judgment. The qualifying interest features are referred to wherever appropriate (described in detail at paragraphs 5.1 to 5.5 of this assessment report). The relevant information, as submitted to Europe relating to such matters, is included at Appendices 2 to 5, and referenced where appropriate. Consideration has been given to implications for habitats and species located outside the designated sites, with reference to the sites Conservation Objectives and the possibility that an adverse effect on the integrity of the site(s) could arise.

The Dutch Nitrogen Cases

2.46. On 7 November 2018 the Judgment of the CJEU was handed down pursuant to a reference for a Preliminary Ruling relating to the application of Article 6 of Directive 92/43/EEC (the Habitats Directive) in joined cases C-293/17 and C-294/17.

2.47. The cases concerned authorisation schemes for agricultural activities which cause Nitrogen deposition on Natura 2000 (European) sites in the Netherlands.

2.48. Key parts of the ruling (insofar as they are relevant to this assessment) are discussed below.

2.49. In line with preceding case law (*Waddenzee* and *Sweetman*, discussed above), the need for scientific rigour and firm conclusions as to the absence of effects are a pre-requisite for authorisation of a plan/project. Ruling 3 in the case states:

“Article 6(3) of Directive 92/43 must be interpreted as not precluding national programmatic legislation which allows the competent authorities to authorise projects on the basis of an ‘appropriate assessment’ within the meaning of that provision, carried out in advance and in which a specific overall amount of Nitrogen deposition has been deemed compatible with that legislation’s objectives of protection. That is so, however, only in so far as a thorough and in-depth examination of the scientific soundness of that assessment makes it possible to ensure that there is no reasonable scientific doubt as to the absence of adverse effects of each plan or project on the integrity of the site concerned, which it is for the national court to ascertain.”

[emphasis added]

2.50. Ruling 4 in the case states:

“Article 6(3) of Directive 92/43 must be interpreted as not precluding national programmatic legislation, such as that at issue in the main proceedings, exempting certain projects which do not exceed a certain threshold value or a certain limit value in terms of Nitrogen deposition from the requirement for individual approval, if the national court is satisfied that the ‘appropriate assessment’ within the meaning of that provision, carried out in advance, meets the criterion that there is no reasonable scientific doubt as to the lack of adverse effects of those plans or projects on the integrity of the sites concerned.”

[emphasis added]

2.51. Ruling 5 in the case states:

“Article 6(3) of Directive 92/43 must be interpreted as precluding national programmatic legislation, such as that at issue in the main proceedings, which allows a certain category of projects, in the present case the application of fertilisers on the surface of land or below its surface and the grazing of cattle, to be implemented without being subject to a permit requirement and, accordingly, to an individualised appropriate assessment of its implications for the sites concerned, unless the objective circumstances make it possible to rule out with certainty any possibility that those projects, individually or in combination with other projects, may significantly affect those sites, which it is for the referring court to ascertain.”

[emphasis added]

2.52. Ruling 6 in the case confirms any measures which are relied upon to mitigate or avoid adverse effects on the integrity of the European site in question must be certain at the time of assessment. It is stated:

“Article 6(3) of Directive 92/43 must be interpreted as meaning that an ‘appropriate assessment’ within the meaning of that provision

may not take into account the existence of 'conservation measures' within the meaning of paragraph 1 of that Article, 'preventive measures' within the meaning of paragraph 2 of that Article, measures specifically adopted for a programme such as that at issue in the main proceedings or 'autonomous' measures, in so far as those measures are not part of that programme, if the expected benefits of those measures are not certain at the time of that assessment."

[emphasis added]

Guidance and Other Relevant Documents

- 2.53. Guidance on the interpretation of key terms and concepts contained within the European and UK legislation of relevance to European designated sites is provided through several documents issued by the European Commission and national organisations such as the Joint Nature Conservation Committee (JNCC), Natural Resources Wales (NRW) and Natural England (NE). This guidance is discussed below. This iHRA has been further informed through the Scoping Response comments received from NRW in relation to the Development Proposals.

Natura Standard Data Forms

- 2.54. A standard reporting format has been developed for Natura 2000 sites (SPAs and SACs) to ensure the relevant site selection information is reported and stored in a consistent manner which can easily be made available.
- 2.55. A standard reporting form for SPAs and SACs was developed by the European Commission and published in 1996. The form is used for all designated sites, or sites proposed to be designated as SPAs and SACs, under the relevant Directives, with the information to be stored on a central database.
- 2.56. Article 4 of the Habitats Directive provides the legal basis for providing the data. Article 4 states that information shall include a map of the site, its name, location, extent, and the data resulting from application of the criteria specified in Annex III, and that this shall be provided in a format established by the Commission. Under Article 4 (paragraph 3) of the Birds Directive Member States are required to provide the Commission with all relevant information to enable it to take any appropriate steps to protect relevant species in areas where the Directive applies.
- 2.57. Whilst it is the relevant country agency (i.e. NRW) that is responsible for designating a site, it is the JNCC who are responsible for collating the lists of European and international designated sites, together with relevant supporting information. The Natura 2000 Data Forms for SPAs and SACs are therefore made available by the JNCC.
- 2.58. Within the explanatory notes for Natura Standard Data Forms (European Commission 1996) the following "main objectives" of the Natura data form/database are given:

1. *“to provide the necessary information to enable the Commission, in partnership with the Member States, to co-ordinate measures to create a coherent NATURA 2000 network and to evaluate its effectiveness for the conservation of Annex I habitats and for the habitats of species listed in Annex II of Council Directive 92/43/EEC as well as the habitats of Annex I bird species and other migratory bird species covered by Council Directive 79/409/EEC.”*
2. *“to provide information which will assist the Commission in other decision making capacities to ensure that the NATURA 2000 network is fully considered in other policy areas and sectors of the Commission's activities in particular regional, agricultural, energy, transport and tourism policies.”*
3. *“to assist the Commission and the relevant committees in choosing actions for funding under LIFE and other financial instruments where data relevant to the conservation of sites, such as ownership and management practice, are likely to facilitate the decision making process.”*
4. *“to provide a useful forum for the exchange and sharing of information on habitats and species of Community interest to the benefit of all Member States.”*

Managing Natura 2000 Sites (European Communities 2000)

- 2.59. The document entitled “Managing Natura 2000 Sites the Provisions of Article 6 of the Habitats Directive 92/43/CEE”, published by the European Commission in 2000, provides guidelines to the Member States on the interpretation of certain key concepts used in Article 6 of the Habitats Directive. It should be noted that the section relating to Article 6(4) has subsequently been replaced by the publication in 2007 of a further guidance document by the European Commission entitled “Guidance Document on Article 6(4) of the ‘Habitats Directive’ which is considered below under the relevant heading.
- 2.60. This guidance document states at section 2.3.3 that conservation measures must correspond to the ecological requirements of the habitats and species present for which the site is designated, and that these requirements “involve all the ecological needs necessary to ensure their favourable conservation status”.
- 2.61. At section 3.5 the guidance states, in relation to deterioration and disturbance of habitats or species:

“Deterioration or disturbance is assessed against the conservation status of species and habitats concerned. At a site level, the maintenance of the favourable conservation status has to be evaluated against the initial conditions provided in the Natura 2000 standard data forms when the site was proposed for selection or designation, according to the contribution of the site to the ecological coherence of the network. This notion should be interpreted in a dynamic way

according to the evolution of the conservation status of the habitat or the species.”

- 2.62. Section 4.4.1 sets out that in determining what may constitute a likely ‘significant’ effect, one should take into account the Conservation Objectives for the site and other relevant baseline information. In the second paragraph of this section of the document it is stated:

“In this regard, the Conservation Objectives of a site as well as prior or baseline information about it can be very important in more precisely identifying conservation sensitivities.”

- 2.63. Section 4.5.3 of the document sets out the duty of Member States to provide certain specific information in support of the inclusion of a site within the Natura 2000 network. This information is to be provided in a format specified by the European Commission (the Natura 2000 Standard Data Form).

- 2.64. A link is drawn between the Standard Data Form and the formation of the site’s Conservation Objectives within the text box at the end of section 4.5.3 of the guidance where it is stated:

“The information provided according to the standard data form established by the Commission forms the basis for a Member State’s establishment of the site’s Conservation Objectives.”

- 2.65. With regard to an assessment of the effects of a plan/project on the integrity of a site, the ‘integrity of the site’ is defined at section 4.6.3 as:

“... the coherence of the site’s ecological structure and function, across the whole area, or the habitats, complex of habitats and / or populations of species for which the site is or will be classified.”

- 2.66. The guidance is clear, within the text box at the foot of page 39, that an assessment as to the implications of the plan/project on the integrity of the site should be limited to an assessment against the site’s Conservation Objectives:

“The integrity of the site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site’s Conservation Objectives.”

Assessment of Plans and Projects Significantly Affecting Natura 2000 sites - Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission 2001)

- 2.67. This document, published by the European Commission in 2001, gives guidance on carrying out and reviewing those assessments required under Articles 6(3) and (4) of the Habitats Directive. It is provided as supplementary guidance and does not over-ride or replace any of that set out within Managing Natura 2000 (European Commission 2000), which “is the starting point for the interpretation of the key terms and phrases contained in the Habitats Directive”. The guidance provided is not mandatory and it is clearly set out that its use is “optional and flexible” and that it is for “Member States to determine the procedural requirements deriving from the Directive”.

- 2.68. The guidance sets out the key stages in following the tests contained within the Habitats Directive. Pertinent to this Application, stages one and two are relevant. Stage one is the screening stage, assessing the likelihood of a plan/project resulting in a significant effect upon the European site. The second comprises the Appropriate Assessment.
- 2.69. Section 3.2.4 is concerned with Appropriate Assessment and, specifically, the assessment against the Conservation Objectives of the European Site. Box 9 provides a list of five example Conservation Objectives for differing broad habitat types. One such example, for a coastal site, taken from Box 9 is provided below:

“to maintain the status of the European features of this coastal site in favourable condition, allowing for natural change. Features include coastal shingle vegetation and lagoons (within a candidate special area of conservation (SAC), which is also an SPA).”

Internal Guidance to decisions on ‘Site Integrity’: A framework for provision of advice to competent authorities (English Nature 2004)

- 2.70. NE (formerly English Nature [EN]) has produced an internal guidance document on the provision of advice to competent authorities regarding the concept of “site integrity” in undertaking an Appropriate Assessment. This guidance is considered to remain relevant in Wales. The concept of site integrity is further addressed within Technical Advice Note 5 (TAN 5), as discussed in subsequent Sections of this iHRA.
- 2.71. This guidance sets out a definition for integrity. It states that integrity is considered at the site level and gives the following definition, as taken from PPG9:

“The coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or levels of populations of the species for which it was classified”.

- 2.72. Integrity is further defined within Section 3.0 where it is stated:

“In a dynamic context ‘integrity’ can be considered as a site having a sense of resilience and ability to evolve in ways that are favourable to conservation.”

- 2.73. The need to maintain or restore the site to ‘Favourable’ conservation status is dealt with in the final paragraph of Section 3.0. NE quotes guidance issued jointly by the Environment Agency (EA), EN, and Countryside Council for Wales (CCW) (now NRW).
- 2.74. The guidance provides a checklist within Section 4.1, for assessing the likelihood of an adverse effect on integrity occurring as a result of the proposed plan/project. It is stated that if the answer to all the questions posed within the checklist is “yes” then it is reasonable to conclude there will be no adverse effect upon integrity. In the event one or more of the answers is “no”, then the guidance suggests a series of further site specific factors, listed at 4.2 to 4.7 of the guidance, must be considered.

Common Standards Monitoring (JNCC February 2004)

- 2.75. Common Standards Monitoring (CSM) is a means by which condition objectives for habitats, species, or other features of designated sites (e.g. SSSIs and SACs) are set, based on key attributes of the features.
- 2.76. The JNCC and the country conservation agencies (e.g. NRW) developed guidance on the setting and assessing of condition objectives, as required under the Birds and Habitats Directives, and set out a framework for this in 1999. This framework is provided in the form of CSM guidance which comprises a suite of documents including an "Introduction to the Guidance Manual on Common Standards Monitoring" and several species/habitat specific documents, including those for lowland heathland, birds, reptiles, and invertebrates. The introduction to the Guidance Manual covers various relevant concepts and terms. It also provides a background to the setting of Conservation Objectives, and sets out the desired approach to setting targets, monitoring, management, and reporting on conservation measures in designated sites.
- 2.77. The Introduction to CSM Guidance and CSM Guidance for individual site attributes (e.g. its bird interest) set out specific criteria regarding the identification of interest features, targets and methods of assessment. There is in-built flexibility and allowances for 'judgements to be made' when assessing, for example, 'Favourable' condition.
- 2.78. It is understood that NRW give due regard to the CSM approach to European designated sites when undertaking an assessment of the condition of that site (or the features within it). The assessment does not necessarily relate to the Conservation Objectives of the European site but provides a tool for tailoring future management that 'Favourable' condition of the interest features can be maintained or restored as appropriate.

Planning Policy Wales (Edition 11, February 2021) and Technical Advice Note 5 (TAN 5)

- 2.79. Paragraphs 6.4.10 to 6.4.19 of Planning Policy Wales are of direct relevance, identifying the level of protection that should be afforded designated sites, including sites of European Importance.
- 2.80. Paragraphs 6.4.11 to 6.4.13 are concerned with the hierarchy of international, national, and locally designated sites, with 6.4.13 stating that "*Differentiation should be given to the relative significance of the designation within the hierarchy, when considering the weight to be attached to nature conservation interests*". Paragraph 6.4.14 goes on to state that "*development should be refused where there are adverse impacts on the features for which a site has been designated*" and "*International and national responsibilities and obligations for conservation should be fully met, and, consistent with the objectives of the designation, statutorily designated sites protected from damage and deterioration, with their important features conserved and enhanced by appropriate management*". Paragraph 6.4.15 concerns the management of statutorily designated sites and the importance of

appropriate management, with paragraph 6.4.16 emphasising that opportunities to restore habitats should be considered. Paragraph 6.4.18 relates specifically to sites of international importance (SPA, SAC, Ramsar) and summarises the duties imposed by the Habitat Regulations. Paragraph 6.4.19 identifies that 'Proposed' SACs or SPAs should be granted the same levels of planning protection as that afforded formally designated sites.

- 2.81. Further guidance on European designates sites is provided through TAN5, namely within Section 5 and Annex 3 of that document. This includes for guidance on the determination of whether an effect on a European designated site is likely to be significant, together with the scope of Appropriate Assessments and ascertaining the effect on the integrity.

- 2.82. With respect to the significance test, TAN5 states at paragraph 5.3.2:

"The decision as to whether an appropriate assessment is necessary should be made on a precautionary basis".

- 2.83. The *Waddenzee* Judgment is specifically referred to at paragraph 5.3.2. With regards to the need to undertake an Appropriate Assessment; this is only required where it is not possible to conclude, on the basis of objective information, that the plan/project will not have a significant effect on the European site, either individually or in combination with other plans/projects.

- 2.84. Paragraph 7 at Annex 3 of TAN5 clarifies that in considering the likely significance of an effect, the decision taker should assess whether the effect would be significant in terms of the site's Conservation Objectives.

- 2.85. Paragraph 11 at Annex 3 clarifies the importance of assessing the likely significant effect on each of the interest features for which the site is designated.

- 2.86. Guidance on the scope of an Appropriate Assessment is provided at paragraph 17 of the Circular:

"If the decision-taker concludes that a proposed development not directly connected with site management is likely to significantly affect a European site or European offshore marine site, they must make an appropriate assessment of the implications of the proposal for the site in view of the site's Conservation Objectives. These relate to each of the interest features for which the site was classified ... The scope and content of an appropriate assessment will depend on the nature, location, duration and scale of the proposed project and the interest features of the relevant site. It is important that an appropriate assessment is made in respect of each interest feature for which the site is classified or listed; and for each designation where a site is classified or listed under more than one international obligation..."

- 2.87. At paragraph 19 of Annex 3, the definition of "integrity" for the purpose of interpreting the tests contained within the Habitats Regulations is given as:

"The integrity of a site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat,

complex of habitats and/or the levels of populations of the species for which it was classified...

- 2.88. Annex 3 also includes a flow diagram (see Appendix 1) setting out the series of steps competent authorities are required to take in considering proposals affecting internationally designated Nature Conservation Sites.
- 2.89. The information contained within this report follows the steps outlined in the flow diagram and takes account of the EC guidance, on the basis of information currently available on the nature of the development in relation to those Internationally Designated Nature Conservation Sites identified within this assessment. Professional judgement has been applied to interpret this information within the context of the site's Conservation Objectives and the criteria under which they are designated.

Guidance document on Article 6(4) of the 'Habitats Directive' (European Commission 2007)

- 2.90. This document, published by the European Commission in 2007, is intended to provide clarification on key terms/concepts as referred to within "Managing Natura 2000 Sites" and replaces the Section on Article 6(4) within that earlier document.
- 2.91. The Guidance document covers, in particular, the concepts of Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensation Measures, Overall Coherence and the Opinion of the Commission.
- 2.92. With regard to ensuring the quality of an Appropriate Assessment, and to define exactly what needs to be compensated, it is stated at Section 1.3:

"Assessment procedures of plans or projects likely to affect Natura 2000 sites should guarantee full consideration of all elements contributing to the site integrity and to the overall coherence of the network, both in the definition of the baseline conditions and in the stages leading to identification of potential impacts, mitigation measures and residual impacts. These determine what has to be compensated, both in quality and quantity."

- 2.93. The need to use information contained within the Natura Standard Data Form, in tandem with the site's Conservation Objectives when undertaking an Appropriate Assessment is specifically referred to (under the second hyphenated point at Section 1.3 on page 5).
- 2.94. Section 1.3.2 gives guidance on the application of Article 6(4) in respect of reasons of overriding public importance, and Section 1.4.1 gives guidance on the application of Article 6(4) in respect of compensatory measures.

Conservation Objectives

- 2.95. In Wales, Conservation Objectives are detailed within site specific Core Management Plans.
- 2.96. Within these Core Management Plans, NRW define Conservation Objectives as *"The expression of the desired state of a feature, expressed as a*

composite statement defining the condition that we wish the feature to be in. Each feature has one conservation objective.” It is further identified that the overall aim of Conservation Objectives is such that they must allow the Favourable Conservation Status (FCS) of a site (and its qualifying habitat and species) to be met.

- 2.97. At a site level, a Conservation Objective describes the aspiration for the condition of the habitats/features present, and identifies performance indicators which must be met to achieve Favourable Condition.
- 2.98. The Conservation Objectives for designated sites are published by NRW. Those for the Crymlyn Bog SAC are included in Appendix 2, The citation and Information Sheet for Crymlyn Bog Ramsar is included in Appendix 3.

3. KEY TERMS AND CONCEPTS RELEVANT TO THE TESTS CONTAINED WITHIN THE HABITATS REGULATIONS

- 3.1. The application of the Habitats Regulations when deciding to grant a consent/permission for a plan or project has several individual steps but two main stages.
- 3.2. The first main stage of the process is, in accordance with Regulation 63(1), to ascertain whether, either alone or in combination, the plan/project is likely to give rise to any significant effects on the European site ("the likely significance test"). This is essentially a broad sieving stage, whereby if it can be shown that no significant effects are likely, then a consent can safely be granted without the need to move to the second main stage. If conversely the plan or project is likely to have a significant effect, or it cannot be determined with the required level of certainty whether an effect would arise, then the second main stage is triggered and an appropriate assessment should be undertaken. In line with the Waddenzee judgement, the test at the sieving stage should be undertaken in view of the Conservation Objectives of the European site, on the basis that a plan or project which is likely to undermine a site's Conservation Objectives, must be likely to have a significant effect upon it.
- 3.3. The second main stage, Regulation 63(5), where necessary, is to assess the implications of the plan/project on the integrity of the European site, again in view of a site's Conservation Objectives. This second main stage of the process (Appropriate Assessment or "the integrity test") is a more detailed and thorough examination of the proposals and the impacts on the European site.
- 3.4. In the event that in undertaking the Appropriate Assessment the competent authority cannot conclude that the plan/project will not have an adverse effect on the integrity of a European site, the plan/project may still be consented where the competent authority is satisfied that, there being no alternative solutions, the plan/project must be carried out for imperative reasons of overriding public interest. This is set out at Regulation 64 of the Habitats Regulations.
- 3.5. Regulation 68 provides that where a project is agreed to, notwithstanding a negative assessment, the appropriate authority must secure that any necessary compensatory measures are taken to ensure that the overall coherence of Natura 2000 is protected.

Defining "Integrity"

- 3.6. The "Managing Natura 2000 guidance document"¹ contains guidance as to the meaning of "integrity" for the purpose of addressing the provision of Article 6 of the Habitats Directive. It states at Section 4.6.4 that:

"The 'integrity of the site' can be usefully defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the

¹ Managing Natura 2000 Sites – The provisions of Article 6 of the habitats Directive 92/43/EEC (2019)

habitats, complex of habitats and / or populations of the species for which the site is designated.”

- 3.7. The text box at the foot of page 47 of the Managing Natura 2000 guidance document goes on to state:

“The integrity of the site involves its constitutive characteristics and ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the habitats and species for which the site has been designated and the site’s Conservation Objectives.”

- 3.8. Section 4.6.4 is also helpful in defining the types of effect which could constitute an adverse effect on integrity. It is stated:

“It is clear from the context and from the purpose of the Directive that the ‘integrity of a site’ relates to the site’s Conservation Objectives (see point 4.6.3 above). For example, it is possible that a plan or project will adversely affect the site only in a visual sense or only affect habitat types or species other than those listed in Annex I or Annex II for which the site has been designated. In such cases, the effects do not amount to an adverse effect for purposes of Article 6(3).

In other words if none of the habitat types or species for which the site has been designated is significantly affected then the site’s integrity cannot be considered to be adversely affected.

However, if just one of them is significantly affected, taking into account the site’s Conservation Objectives, then the site integrity is necessarily adversely affected.”

- 3.9. It is further stated:

“The integrity of the site involves its constitutive characteristics and ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the habitats and species for which the site has been designated and the site’s Conservation Objectives.”

The term ‘Conservation Objectives’

- 3.10. Whilst Regulation 63 of the Habitats Regulations is explicit in setting out that any assessment of the implications of the plan/project on a European designated site should be undertaken in view of the site’s “Conservation Objectives”, the term ‘Conservation Objective’ is not defined within the Regulations. The term “Conservation Objectives” appears at Article 6(3) of the Habitats Directive which sets out the process of assessment for a plan or project which may be likely to have an effect on a designated site. However, the term itself is not defined.

- 3.11. It is useful to bear in mind that the Directive has two distinct objectives:

- a. To protect particular species of community interest which are under threat (Article 1(g) and Annex II, Part 3 of the Habitats Regulations). They are species which are endangered, vulnerable, rare, or otherwise require attention.
 - b. To protect habitats of community interest which are deteriorating (Article 1(c) and Annex I, Part 2 of the Habitats Regulations).
- 3.12. In order to do this the Directive requires the establishment of a coherent European ecological network of SACs' under the title Natura 2000 (Article 3(1)). The network is to comprise of sites hosting the natural habitat types listed in Annex I of the Directive, and habitats of the species listed in Annex II of the Directive. Article 3(1) provides that the network 'shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favorable conservation status in their natural range.'
- 3.13. As discussed above, as a result of the 2019 Amendment Regulations the SACs and SPAs in the UK no longer form part of the European Union's Natura ecological network although the basic obligations of the competent authorities have not changed.
- 3.14. Regulation 63 is clear that an Appropriate Assessment must still be carried out in light of a site's Conservation Objectives. As the term "Conservation Objective" is not defined, it is necessary to look at the Habitats Directive in light of relevant European and other guidance. That guidance is not always consistent or clear about the use of the term "Conservation Objectives". For the purposes of this iHRA it is the formal "Conservation Objectives" mentioned in Article 6(3) and Regulation 63 as "Conservation Objectives".
- 3.15. The term "conservation" is defined within the Habitats Directive at Article 1(a):

"conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status as defined in (e) and (i)".
- 3.16. The term "conservation status of a natural habitat" is defined within the Habitats Directive at Article 1(e):

"conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species within the territory referred to in Article 2."
- 3.17. The term "conservation status of a species" is defined within the Habitats Directive at Article 1(i):

"conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2:

The conservation status will be taken as 'favourable' when:

- *Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is it likely to be reduced for the foreseeable future, and*
- *There is and will probably continue to be a sufficiently large habitat to maintain its populations on a long-term basis."*

3.18. Article 3 of the Habitats Directive sets out that Member States have a duty to designate (in accordance with Article 4 of the Directive) special areas of conservation and that, where necessary, Member States shall endeavour to improve the ecological coherence of Natura 2000.

3.19. Article 4(1) of the Habitats Directive states that Member States must provide a list of sites, indicating which Annex I habitats and species occurring on Annex II are present. This Article also clarifies the type of information which must be submitted for each listed site (map, name, location, extent, and the results of the application of qualification criteria listed at Annex III of the Directive). This information provides the basis of the Natura 2000 Data Form. Article 4(4) states:

"Once a site of Community importance has been adopted in accordance with the procedure laid down in paragraph 2, the Member State concerned shall designate that site as a special area of conservation as soon as possible within six years at most, establishing priorities in the light of the importance of the sites for the maintenance or restoration, at a favourable conservation status, of a natural habitat type in Annex I or a species in Annex II and for the coherence of Natura 2000, and in the light of the threats of degradation or destruction to which those sites are exposed."

3.20. There is a need for sufficient information to be provided to the European Commission, in a standardised format, at the designation stage (Article 4(1)), and also to the fact that "priorities" must be established for the "maintenance or restoration, at a favourable conservation status" of Annex I natural habitats or Annex II species. Article 4(4) is slightly ambiguous as to exactly when the establishment of the "priorities" should take place, but it is inferred this should be at the designation stage, within six years of the adoption of the site.

3.21. The European Commission guidance document titled "Managing Natura 2000 Sites – The Provisions of Article 6 of the Habitats Directive 92/43/EEC (2019)" provides guidelines to Member States on the interpretation of key concepts used in Article 6 of the Habitats Directive. In relation to "Conservation Objectives" Section 4.6.3 gives clarification as to what information should form the basis of establishing the site's Conservation Objectives. It is stated:

"As explained in section 2.3.1, 'Conservation Objectives' should be set at the level of each individual site and should concern, within that site, all the species and habitat types for which the site has been designated under the Habitats Directive or classified under the Birds Directive."

These Conservation Objectives should be based on the ecological requirements of the species and habitats present and should define the desired conservation condition of these species and habitat types on the site. This should be established in function of the conservation condition of each species and habitat type as recorded in the Standard Data Form. The Conservation Objectives should also reflect the importance of the site for the coherence of Natura 2000 so that each site contributes in the best possible way to achieving Favourable Conservation Status at the appropriate geographical level within the natural range of the respective species or habitat types.

Where such Conservation Objectives have been set for a site, the effects must be assessed against these objectives.”

- 3.22. Regulation 37(3) of the Habitats Regulations provides:

*“(3) As soon as possible after a site becomes a European marine site, the appropriate nature conservation bodies must advise other relevant authorities as to –
(a) The Conservation Objectives for that site.
(b)”*

- 3.23. It is therefore clear from the legislation and guidance that the Conservation Objectives are formally established for each European Site.

Assemblages

- 3.24. “Assemblage” is not a term or concept used in the Directive. Section 14 of the Introduction to the CSM Introduction describes what may constitute an assemblage, with specific reference to SSSIs, SPAs and Ramsar sites. Under the title, “What is an Assemblage?”, the following information is given:

“ASSIs/SSSIs, SPAs and Ramsar sites may each be notified because of the presence of important assemblages of species. This might seem straightforward, but in the context of species features two situations can be envisaged:

- 1. A colony of different species all occurring / living together, where the total number of individuals is the key aspect of the interest on the site (e.g. more than 20,000 seabirds on a SPA site).*
- 2. A number of characteristic species which together form the feature and usually share similar ecological or habitat requirements (e.g. the co-occurrence of woodland or upland bird species, or heathland invertebrates).*

The term 'assemblage' can also be used in a third, functional, way; when there are a number of features which co-exist, yet are individually notified (i.e. they are features in their own right). While it may be possible to assess them using the same or very similar attributes, these species must be assessed as individual features independently of any assemblage of which they may also form a part (e.g. under scenario 1).”

- 3.25. Thus, the quality of the 'assemblage' can be defined by the mix of species (assemblage) or the total number of characteristic species (aggregation).

Application of the "Precautionary Principle"

- 3.26. Relevant case law makes it clear that in applying the relevant tests of the Habitats Regulations, there is a need for certainty (or the absence of reasonable scientific doubt), both regarding the nature and extent of predicted effects on integrity, and in relation to the effectiveness of any preventative measures relied upon. Furthermore, enshrined within the Habitats Directive and Regulations (though not explicitly set out in either), based upon Article 191 of the Treaty on the Functioning of the European Union, is the need to apply the Precautionary Principle when assessing the risks posed to the integrity of the site(s). If a risk of significant effect to the integrity of a site cannot be excluded on the basis of objective information, then application of the precautionary principle requires no consent to be given for such a project. The Precautionary Principle is not, however, without limits. It cannot be based on a purely hypothetical approach founded simply on conjecture. A preventive measure, may be taken only if the risk appears nevertheless to be adequately backed up by scientific data available at the time the measure is taken.
- 3.27. Moreover, the document titled "Communication from the Commission on the Precautionary Principle" (2000) provides useful guidance in relation to the application of the Precautionary Principle in relation to European sites issues. Paragraph 6 sets out the six key matters for consideration when applying the Precautionary Principle. Paragraph 6 states:

"Where action is deemed necessary, measures based on the precautionary principle should be, inter alia:

- *proportional to the chosen level of protection,*
- *non-discriminatory in their application,*
- *consistent with similar measures already taken,*
- *based on an examination of the potential benefits and costs of action or lack of action (including, where appropriate and feasible, an economic cost/benefit analysis),*
- *subject to review, in the light of new scientific data, and*
- *capable of assigning responsibility for producing the scientific evidence necessary for a more comprehensive risk assessment."*

- 3.28. Under these bulleted points, the guidance gives specific definitions in relation to each of the above at pages 4 and 5, with further detail provided within Section 6.
- 3.29. In accordance with the Communication from the Commission it is clear that when deemed necessary, risk reduction measures should be proportionate and must not aim at zero risk. It is stated at Section 6.3.1 of the Communication from the Commission that:

"The measures envisaged must make it possible to achieve the appropriate level of protection. Measures based on the precautionary principle must not be disproportionate to the desired

level of protection and must not aim at zero risk, something which rarely exists. However, in certain cases, an incomplete assessment of the risk may considerably limit the number of options available to the risk managers."

- 3.30. With reference to not aiming "at zero risk" the judgement of the Appeal Court in the case of *Morge vs Hampshire County Council* [2010] EWCA Civ 608 is relevant. Lord Justice Ward considered what level of disturbance was required in addressing Article 12(1)(b) and at paragraph 35 he described the level or risk of threatened habitat and species stating that:

"... It must be certain, that is to say, identifiable. It must be real, not fanciful."

- 3.31. This is understood to mean that for the level of risk to be real and identifiable, it must be based upon objective evidence to substantiate the risk.

- 3.32. The judgment in the case of *Boggis v Natural England*² also assists in determining when it would be appropriate to invoke the precautionary principle and concludes that the objective information needed is simply not available.

- 3.33. At paragraph 37 of the Judgment, it is stated:

"...a claimant who alleges that there was a risk which should have been considered by the authorising authority so that it could decide whether that risk could be "excluded on the basis of objective information", must produce credible evidence that there was a real, rather than a hypothetical, risk which should have been considered."

- 3.34. Also of relevance is the case of *R (Champion) v. North Norfolk District Council*³, where at paragraph 41, Lord Carnwath makes it clear that Article 6(3) does not require absolute certainty of no adverse effect, and it is ultimately an issue of judgment for the decision maker. It is stated:

"As the court itself indicated in Waddenzee the context implies a high standard of investigation. However, as Advocate General Kokott said in Waddenzee [2005] All ER (EC) 353, para 107:

"The necessary certainty cannot be construed as meaning absolute certainty since that is almost impossible to attain. Instead, it is clear from the second sentence of article 6(3) of the Habitats Directive that the competent authorities must take a decision having assessed all the relevant information which is set out in particular in the appropriate assessment. The conclusion of this assessment is, of necessity, subjective in nature. Therefore, the competent authorities can, from their point of view, be certain that there will be no adverse effects even though, from an objective point of view, there is no absolute certainty"

² [2009] EWCA Civ 1061

³ [2015] UKSC 52, [2015] 1 WLR 3710,

In short, no special procedure is prescribed, and, while a high standard of investigation is demanded, the issue ultimately rests on the judgment of the authority.”

Summary Conclusions

- 3.35. Guidance issued by the European Commission states that information on which the formal (Article 6) Conservation Objectives are based should be reported on the standard Natura 2000 Data Form, this being the information held by the Commission regarding the site's quality and importance.
- 3.36. The formal Conservation Objectives are focused upon the reasons for which the site was designated. The formal Conservation Objectives are entirely different from condition objectives, which are used to assess whether interest features of a designated site are in 'Favourable' condition. In Wales, 'Favourable' condition objectives and associated attributes and targets, where produced, are found within Core Management Plans as prepared for each designated site.
- 3.37. European guidance, together with that issued by the JNCC, states that the 'Favourable' condition of qualifying interest features should be judged against the baseline condition at designation.
- 3.38. Having regard to the relevant legislation and supporting guidance it is clear the assessment at Regulation 63 of the Habitats Regulations is a two stage process, the first being the 'likely significance' test stage, the second being the 'integrity' test.
- 3.39. The competent authority should not grant a consent or other permission unless it can be ascertained the plan/project will not adversely affect the integrity of relevant European Sites. The decision taker must be certain of this, i.e. reach a judgment beyond reasonable scientific doubt in line with the Precautionary Principle. This test must be applied in light of the Conservation Objectives which have formally been adopted for each of the European Sites.
- 3.40. It is also necessary to note the Holohan Judgment. That Judgment emphasises that it may be necessary to look wider than the listed interest features when assessing against integrity. In that case the ECJ stated:

“Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora must be interpreted as meaning that an ‘appropriate assessment’ must, on the one hand, catalogue the entirety of habitat types and species for which a site is protected, and, on the other, identify and examine both the implications of the proposed project for the species present on that site, and for which that site has not been listed, and the implications for habitat types and species to be found outside the boundaries of that site, provided that those implications are liable to affect the Conservation Objectives of the site.”

- 3.41. This Judgment underlines the importance of the assessment and ultimate judgment being related to the Conservation Objectives of the site.

3.42. It is important to recognise that the species for which sites are protected (at any level) do not recognise arbitrary boundaries, and for many species/groups they will be reliant on different habitats or areas, in parts of their natural range, for different stages of their life cycle, or at different times of year (e.g. as a response to seasonal climatic changes). A protected site may serve a 'protective function' for only part, or all of a species life cycle.

3.43. Regarding European designated sites, Article 4.1 of the Habitats Directive is of direct relevance on this point. It states:

"For animal species ranging over wide areas these sites shall correspond to the places within the natural range of such species which present the physical or biological factors essential to their life and reproduction. For aquatic species which range over wide areas, such sites will be proposed only where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction."

3.44. The presence of a species within a site, and the population number at a point in time, is an important consideration in determining the quality and importance of the site to the species in question. However, in real terms, value judgments on site quality are made in relation to the contribution the site (e.g. SPA) makes to the favourable conservation status of the species generally. A reduction in numbers of a qualifying or other (e.g. typical) species within a designated site may not jeopardise the contribution the site makes to the sustainability of the species more generally and, in this respect, site integrity continues to be maintained.

3.45. Similarly, when considering bird assemblage features, the total loss of a species from an assemblage would be considered as harm in assessment terms. However, so long as the ongoing viability of that species (as a contributing facet of the assemblage), was maintained, then a level of loss would not have an adverse effect on integrity, since the coherence of the site's ecological structure, function, and ecological processes would still be maintained.

4. SITE LOCATIONS AND BACKGROUND

- 4.1. The Site is located directly adjacent (on the eastern boundary) to Crymlyn Bog SAC and Ramsar. The closest component SSSI underpinning the above European site (also known as a Habitat Site) is the Crymlyn Bog SSSI. Part of the Crymlyn Bog SAC/Ramsar is further underpinned by Pant-y-Sais SSSI.
- 4.2. All other European/international designated sites (including potential sites) are located at considerably greater distances, with no other international designations within 10 km of the Site, and no potential effect pathways to more distant internationally designated sites.
- 4.3. In reaching this conclusion it is noted that no additional designated sites have been identified by either NRW or Neath Port Talbot in their formal consultation responses to a scoping opinion submitted in respect of the proposals. Noting the above, there is no requirement to consider any other sites in the HRA.

Crymlyn Bog SAC

- 4.4. Crymlyn Bog is a large lowland fen situated in a glacial depression on the eastern edge of Swansea. In addition to Crymlyn Bog itself, the SAC also includes Pant-y-Sais fen, a smaller (approximately 20 ha) wetland located about 1 km east of the main Site.
- 4.5. Crymlyn Bog SAC is considered of international importance for its wetland communities, in particular for its mosaic of transition mires, quaking bogs, and calcareous fens, alongside its alluvial forest habitats. The SAC is additionally of importance on account of the notable plant and invertebrate species it supports.
- 4.6. Crymlyn Bog SAC covers an area of 299.42ha. The Natura Standard Data Form for the site is included at Appendix 2.

Crymlyn Bog Ramsar

- 4.7. Crymlyn Bog Ramsar is designated for its extensive and diverse wetland habitats which cover an area of approximately 243.9ha. These habitats in turn support valuable floral and faunal assemblages. The Ramsar designation is broadly consistent (in geographic extent), aside from a section of the SAC that extends an additional (approximately) 35ha northwards.
- 4.8. The Ramsar Information Sheet for the site is included at Appendix 3.

Relationship between the Crymlyn Bog SAC/Ramsar and the Site

- 4.9. The relationship between the Site and the above Habitat Sites is shown graphically at Plan ECO1.
- 4.10. Both the SAC and Ramsar designations are underpinned by Crymlyn Bog SSSI (adjacent to the Site) and Pant-Y-Sais SSSI, located approximately 0.8km south of the Site.

- 4.11. Moreover, approximately a third of Crymlyn Bog, and all of Pant-y-Sais (excluding the adjoining Tennant Canal), is declared as a National Nature Reserve (NNR). Pant-y-Sais is also a Local Nature Reserve (LNR).

5. CONSERVATION STATUS OF RELEVANT DESIGNATED SITES

5.1. Crymlyn Bog SAC Qualifying Features

5.1.1. Crymlyn Bog SAC is designated primarily for the Annex 1 habitats it supports, including:

- **7140 transition mire and quaking bogs** which supports Bottle Sedge *Carex rostrata* and Bogbean *Menyanthes trifoliata*, with Common Cottongrass *Eriophorum angustifolium*, Water Horsetail *Equisetum fluviatile*, Star Sedge *Carex echinate*, and locally rare Mud Sedge *Carex limosa*.
- **7210 Calcareous fens with *Cladium mariscus* and species of *Caricion davallianae***, with the SAC supporting the largest area of *Cladium*-dominated vegetation in south Wales.

5.1.2. Additionally, the Site supports the following Annex 1 habitat as a qualifying feature.

- **91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)**

5.1.3. Habitats listed in the Natura 2000 Form for the SAC include inland water bodies [standing water, running water] (1.6%), bogs, marshes, water fringed vegetation, fens (86%), heath, scrub, maquis and garrigue, phygrana (0.6%), humid grassland, mesophile grassland (3.5%) and broad-leaved deciduous woodland (8.3%).

5.2. Crymlyn Bog Ramsar Qualifying Features

5.2.1. Crymlyn Bog Ramsar is designated under Ramsar Criterion 1, 2A and 2B (identified as Criterion 1, 2 and 3 on the Ramsar Information Sheet issued by JNCC), on account of its diverse wetland habitats, with these identified to be of international importance. The site qualifies under Ramsar Criterion 1 on account of it supporting an extensive inter-estuarine complex, forming the largest valley floodplain mires in Wales. The site includes the adjacent Pant-y-Sais Fen and consists of a complex mosaic of vegetation communities, characteristic of both nutrient-rich and nutrient-poor conditions. This criterion recognises the diverse swamp, tall-herb fen, fen meadow, and carr communities present.

5.2.2. The Crymlyn Bog qualifies under Ramsar Criterion 2A on account of it supporting a substantial population of the nationally rare Slender Cottongrass *Eriophorum gracile* community, as well as for its rich invertebrate fauna, including nationally rare or highly localised species associated with mires.

5.2.3. The Crymlyn Bog qualifies under Ramsar Criterion 2B on account of the range of vascular plants it supports, including 199 species of which 17 are regionally uncommon. Within the site citation, reference is also made to notable summer populations of Reed Warblers *Acrocephalus scirpaceus* and Sedge Warblers *Acrocephalus schoenobaenus*.

- 5.2.4. The site citation and Ramsar Information Sheet for the site is included at Appendix 3.

5.3. Crymlyn Bog SAC Conservation Objectives

- 5.3.1. The Conservation Objectives for Crymlyn Bog SAC are provided at Appendix 2, and further set out below. Within that document, objectives have been identified for each of the three designated criteria, and can be broken down into the following four groups:

- The extent should be stable in the long term or, where appropriate, increasing.
- Quality (including in terms of ecological structure and function) should be being maintained, or where appropriate improving.
- Populations of the habitat's typical species must be being maintained or, where appropriate, increasing, and,
- Factors affecting the extent and quality of the habitat and its typical species (and thus affecting the habitat's future prospects) should be under appropriate control.

- 5.3.2. The Conservation Objectives for each qualifying feature can be found below.

Conservation objective for Feature 1: Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (EU habitat code 7210)

The extent should be stable in the long term or, where appropriate, increasing.

- 5.3.3. *The extent and distribution of calcareous fen should be as mapped in 2005 and 2009 (Bosanquet et al., 2005; Bosanquet et al., 2009).*

Quality (including in terms of ecological structure and function) should be being maintained or, where appropriate, improving.

- 5.3.4. *The calcareous fen should be of high quality throughout. At Crymlyn Bog the calcareous fen occurs in two forms: tall vegetation dominated by Great Fen-sedge *Cladium mariscus* and more open calcareous fen. The *Cladium* dominated areas should continue to be present as a minimum extent but should not increase at the expense of the open calcareous fen; ideally they should be opened up to allow increased plant diversity within them. The open calcareous fen should be species-rich, with little or no rank vegetation. Non-native species and indicators of eutrophication and/or changing water levels should be largely absent.*

- 5.3.5. *Providing these broad quality standards are met across the whole feature area, some heterogeneity in condition is both natural and acceptable, but the bulk (at least 70%) of the open calcareous fen should be referable to good quality calcareous fen habitat, where:*

- *Tufted-sedge *Carex elata* is present, with associates such as Yellow Loosestrife *Lysimachia vulgaris*, Greater Spearwort*

Ranunculus lingua, Blunt-flowered Rush *Juncus subnodulosus*,
Cyperus Sedge *Carex pseudocyperus*, Lesser Bulrush *Typha*
angustifolia, Water Dock *Rumex hydrolapathum*, Purple-
loosestrife *Lythrum salicaria*, Hemp-agrimony *Eupatorium*
cannabinum, Marsh Cinquefoil *Potentilla palustris* and Royal
Fern *Osmunda regalis*.

- Common Reed *Phragmites australis* or Great Fensedge *Cladium mariscus* are not dominant.
- Scrub is absent.
- Non-native species including Himalayan Balsam *Impatiens glandulifera* are absent.

Populations of the habitat's typical species must be being maintained or, where appropriate, increasing.

- 5.3.6. *In addition to the above typical plant species, the calcareous fen areas will also contribute to the wider fen environment of Crymlyn Bog in supporting a range of typical fenland bird and invertebrate species.*

Factors affecting the extent and quality of the habitat and its typical species (and thus affecting the habitat's future prospects) should be under appropriate control.

- 5.3.7. *Factors affecting the extent and quality of the calcareous fen habitat (including water quality, atmospheric pollution, water levels, successional change, scrub encroachment and non-native species) should be under appropriate control.*

Conservation objective for Feature 2: Transition mires and quaking bogs (EU habitat code 7140)

The extent should be stable in the long term or, where appropriate, increasing.

- 5.3.8. *The extent and distribution of transition mire should be as mapped in 2005 and 2009 (Bosanquet et al., 2005; Bosanquet et al., 2009). Plus, an additional 3 ha of transition mire should also be restored.*

Quality (including in terms of ecological structure and function) should be being maintained or, where appropriate, improving.

- 5.3.9. *The transition mire should be of high quality throughout and composed of typical native species. The stands should be species-rich, with little or no rank vegetation or scrub encroachment. Non-native species and indicators of eutrophication and/or changing water levels should be largely absent.*

- 5.3.10. *Providing these broad quality standards are met across the whole feature area, some heterogeneity in condition is both natural and acceptable, but the bulk (at least 60%) of the habitat should be referable to good quality transition mire, where:*

- Bottle Sedge *Carex rostrata* is present at high cover; or, where the vegetation is composed of mixtures of: Bogbean

Menyanthes trifoliata, Marsh Cinquefoil *Potentilla palustris*, Water Horsetail *Equisetum fluviatile*, Common Cottongrass *Eriophorum angustifolium*, Slender Cottongrass *E. gracile*, Bottle Sedge *Carex rostrata*, Bog Sedge *C. limosa*, Star Sedge *C. echinata*, Lesser Water-parsnip *Berula erecta*, Branched Bur-reed *Sparganium erectum* and the bog mosses *Sphagnum squarrosum* and *S. subnitens*.

- Common Reed *Phragmites australis* is not dominant.
- Purple Moor-grass *Molinia caerulea*, Greater tussocksedge *Carex paniculata*, Tufted-sedge *C. elata* and Great Fen-sedge *Cladium mariscus* are not abundant.
- Scrub is absent.
- Non-native species including Himalayan Balsam *Impatiens glandulifera* are absent.

Populations of the habitat's typical species must be being maintained or, where appropriate, increasing.

- 5.3.11. *In addition to the above typical plant species, the transition mire areas will also contribute to the wider fen environment of Crymlyn Bog in supporting a range of typical fenland bird and invertebrate species.*

Factors affecting the extent and quality of the habitat and its typical species (and thus affecting the habitat's future prospects) should be under appropriate control.

- 5.3.12. *Factors affecting the extent and quality of the transition mire habitat (including water quality, atmospheric pollution, water levels, successional change, scrub encroachment and nonnative species) should be under appropriate control.*

Conservation objective for Feature 3: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*) (EU habitat code 91E0)

The extent should be stable in the long term, or where appropriate increasing.

- 5.3.13. *The extent of alluvial forest should be as mapped in 2009 by the last SAC monitoring exercise (Wilkinson & Bevan, 2009). An increase in alluvial forest at the expense of important open fen vegetation is not desirable.*

Quality (including in terms of ecological structure and function) should be being maintained or, where appropriate, improving.

- 5.3.14. *The alluvial forest should be of high quality throughout and composed of typical native species. Non-native species and indicators of eutrophication and/or drying out should be largely absent.*
- 5.3.15. *Providing these broad quality standards are met across the whole woodland area, some heterogeneity in condition is both natural and acceptable, but the bulk (at least 75%) of the habitat should be referable to good quality alluvial forest, where:*

- *The canopy is composed of Alder *Alnus glutinosa*, Grey Willow *Salix cinerea* and/or Downy Birch *Betula pubescens*.*
- *Over-mature canopy trees are frequent throughout.*
- *The field layer is dominated by Greater Tussock sedge *Carex paniculata*, with associates such as Yellow Loosestrife *Lysimachia vulgaris*, Royal Fern *Osmunda regalis*, Purple-loosestrife *Lythrum salicaria*, Bittersweet *Solanum dulcamara*, Yellow Iris *Iris pseudacorus*, Skullcap *Scutellaria galericulata* and Branched Bur-reed *Sparganium erectum*.*
- *Viable regeneration of *A. glutinosa*, *S. cinerea* and/or *B. pubescens* is frequent throughout, either as saplings or as regrowth from the base of trees or fallen stems.*
- *Species indicative of drying out (e.g. Bracken *Pteridium aquilinum*) or eutrophication (e.g. Common Nettle *Urtica dioica*) are absent.*
- *Non-native species such as Himalayan Balsam *Impatiens glandulifera* are absent.*

Populations of the habitat's typical species must be being maintained or, where appropriate, increasing.

- 5.3.16. *The alluvial forest should also support species that are naturally associated with a high quality alluvial forest ecosystem, including all its components from the soil, through ground flora and shrub layer to the canopy, and the micro-habitats and structural variations that occur within them. This includes soil flora and fauna, epiphytic lower plants, breeding birds and higher plants as listed above. Characteristic plants of the habitat in this locality such as Royal Fern *Osmunda regalis* and Marsh Fern *Thelypteris palustris* should also be stable or increasing.*

Factors affecting the extent and quality of the habitat and its typical species (and thus affecting the habitat's future prospects) should be under appropriate control.

- 5.3.17. *Factors affecting the extent and quality of alluvial forest (including water quality, atmospheric pollution, water levels and grazing) should be under appropriate control.*

5.4. Underpinning SSSI qualifying features

- 5.4.1. The Crymlyn Bog SAC/Ramsar is underpinned by Crymlyn Bog SSSI and Pant-y-Sais SSSI.
- 5.4.2. Crymlyn Bog SSSI is designated for its fen communities, wet woodland, associated invertebrate assemblages, a substantial population of nationally rare Slender Cottongrass, and a population of the nationally scarce Hornet Robberfly *Asilus crabroniformis*. The site is also part of the large inter-estuarine complex including Pant-y-Sais SSSI and the Neath floodplain. The site supports a complex mosaic of vegetation types, including communities of both rich and poor fen, swamp, Alder carr, and acidic grassland, in addition to plant species and communities usually characteristic of East Anglian fens.

5.4.3. Pant-y-Sais SSSI is located approximately 0.8km south-west of the Site at its closest point. It is designated as an area of predominantly lowland fen that supports a range of fenland communities including Sphagnum, *Molinia caerulea* communities, swamp areas with abundant *Typha latifolia*, and fen carr. The Tennant Canal section functions as a refuge for aquatic plants such as county rare Flowering Rush *Butomus umbellatus*.

5.4.4. The citations for Crymlyn Bog SSSI and Pant-y-Sais SSSI are included at Appendix 4.

5.5. Condition Status of SAC/Ramsar/SSSI Features

5.5.1. The Core Management Plan prepared in respect of Crymlyn Bog SAC/Ramsar details the condition of SAC features within Section 5 of the document. A summary of management requirements is also identified such that restoration of relevant features can be achieved.

5.5.2. Feature 1 (calcareous fen) is identified to be in “Unfavourable: Declining” condition due to the prevalence of *Phragmites australis* and/or *Cladium Mariscus*, likely as a result of insufficient management. Feature 2 (transition mire) is also identified to be in “Unfavourable: Declining” condition, in part on account of the prevalence of *Phragmites australis*. Feature 3 (alluvial forest) is considered to be in “Unfavourable: Recovering” condition. The continued natural maturation of the woodland is currently assessed as likely to allow ‘Favourable’ condition to be attained without specific management intervention being required.

5.5.3. As detailed above, the Crmlyn Bog SAC/Ramsar is underpinned by

- Crymlyn Bog SSSI; and
- Pant-y-Sais SSSI.

5.5.4. Crymlyn Bog SSSI comprises 14 management units. Of these, management units 2, 3, 5, 7, 8, 10 to 13 are identified to require action to attain ‘Favourable’ condition.

5.5.5. Pant-Y-Sais SSSI comprises 2 management units, of which unit 15 requires action. Further detail is provided within the Core Management Plan at Appendix 2.

5.5.6. Management/remedial issues which are identified as requiring attention to restore or attain ‘Favourable’ status are identified to include the following:

- Reinstatement of management for open water habitats (units 2 and 3),
- Management to control ecological succession such as grazing, cutting, and removal of arisings (units 5, 7, 8, 10 to 13, 15)
- Nutrient enrichment (units 5, 7, 10 to 12)
- Water levels, namely over-wetting (units 5, 7, 10 to 12)

- 5.5.7. Further consideration is given to management issues within the SSSI Management Statements for the Crymlyn Bog and Pant-y-Sais sites, with this provided at Appendix 5.

6. ASSESSMENT OF THE IMPLICATIONS OF THE DEVELOPMENT PROPOSALS ON THE DESIGNATED SITES

- 6.1. Section 2 of this document sets out the legislation, guidance, and case law of relevance to an assessment of the implications of a plan/project on a European site. Section 3 discusses key terms and themes associated with Habitats Regulations assessments. Having regard to this legislation and supporting guidance, it is clear the assessment is a two-stage process, the first being the 'likely significant effect', and the second being the 'integrity test'.
- 6.2. It is clear the Conservation Objectives of a European site are the most important consideration in determining whether the plan/project will have an adverse effect on the site, including any effects on its integrity.
- 6.3. It is evident there is a clear hierarchical approach to assessing effects on European sites in line with the Habitats Directive/Regulations. The primary test is that against the Conservation Objectives, with other considerations following these. Such other considerations would include:
 - Other features of interest associated with the site; and
 - Other relevant baseline information for the site.
- 6.4. In line with the above, whilst the qualifying interest features of the Site, and other baseline information, have informed this assessment, the greatest weight has been placed upon the formal Conservation Objectives for the European sites, as set out by NRW. As noted above, consideration has also been afforded to the Supplementary Advice produced by NE, where relevant.
- 6.5. With reference to the relevant designated sites/features, this Section includes a description of the potentially significant effects arising from the plan/project. The potential effects are assessed within this Section in order to address the test under Regulation 63 (1) in the first instance (the 'likely significant effect' stage).
- 6.6. In undertaking this assessment, consideration has been had to the best available scientific knowledge. Further consideration under the Habitats Regulations can therefore be undertaken consistent with the *Waddenzee* Judgement (C-127/02), which requires the use of the best scientific knowledge to inform a decision where no reasonable scientific doubt remains as to the presence and/or absence of effects that would adversely affect the integrity of the designated site (see Section 2 above).
- 6.7. Furthermore, consideration is given to the *People over Wind* Judgement (C-323/17), which confirmed the view of the CJEU that avoidance or mitigation measures can only be taken into consideration at the Appropriate Assessment stage. This overrules the domestic *Dilly Lane* Judgement in the High Court (see Section 2 above).
- 6.8. As set out in Section 2 of this iHRA, it is logical to distinguish between measures which are specifically "*intended to avoid or reduce the harmful effects*" (i.e. mitigation measures for the purposes of a HRA), and measures which would come forward in any event (i.e. intrinsic elements of scheme design). Notwithstanding these latter measures may, by default, avoid or

reduce harmful effects on a European site(s), if they are integral elements of a development proposal it remains appropriate to consider them at the first stage of the test.

Potential significant effects in the absence of mitigation

- 6.9. The Development Proposals and relevant contextual information have been described in Section 1 of this assessment report. The qualifying interest features and Conservation Objectives for all relevant designated sites are described in detail within Section 4 of this assessment.
- 6.10. As detailed in Section 3, given the nature of the Development Proposals and the Site's separation from any other European/Internationally designated sites, it has been concluded that no source/receptor pathway exists which could give rise to a likely significant effect for any European Sites, with the exception of Crymlyn Bog SAC/Ramsar.
- 6.11. In view of the reasons for the qualification of the Crymlyn Bog SAC/Ramsar, the distance of the Site from these designated sites, and the nature of the Development Proposals, the following pathways for potential significant effects have been screened out of requiring further consideration:
- Matters relating to direct 'land take' or accidental damage at the SAC/Ramsar;
 - Matters relating to artificial lighting; and
 - Matters relating to supporting habitat for the SAC/Ramsar.
- 6.12. In reaching this conclusion, it is noted that no built form is proposed within close proximity of the Crymlyn Bog and, indeed, significant existing vegetation and/or chain link fencing is present as a barrier between proposed development footprints and the designated sites.
- 6.13. Regarding artificial lighting, it is noted no built form or artificial lighting is anticipated within close proximity of the Crymlyn Bog SAC/Ramsar site (in excess of 50m). Moreover, the Proposed Development seeks to retain extensive areas of mature vegetation along the western boundaries and, indeed, an extensive landscaped buffer is proposed between the Crymlyn Bog SAC/Ramsar and the Site. Noting the significant separation of built form, with extensive screening vegetation in-between, it is not considered there would be any adverse light spill upon the SAC/Ramsar/SSSI. Resultantly, it is not considered the Development Proposals would have the potential to give rise to any significant adverse impact upon any faunal assemblages supported within the adjacent SAC/Ramsar/SSSI.
- 6.14. Moreover, the habitats present within the Site are distinct from those within the Crymlyn Bog SAC/Ramsar. Indeed, (as set out in the accompanying Environmental Statement), the vast majority of on Site habitats are of recent origin, with the Site having been subject to extensive remediation over recent years. It is noted that where naturalistic wetland habitats are present within the Site (i.e. within the Coed Darcy GCN SINC), these are to be retained as part of the Proposals.
- 6.15. In reaching the above conclusion, it is noted the above pathways were equally scoped out within the LDP HRA (2013) and, indeed, no concerns in

relation to supporting habitat have been raised by either NRW nor NPTCBC during consultations with them (including within EIA scoping responses).

6.16. In light of the nature of the plan/project, the qualifying interest features site potential pathways for significant effects can be broadly distilled as follows:

- Hydrological impacts/water levels
- Water quality impacts including:
 - toxic pollutants
 - sedimentation
 - nitrification
- Air quality impacts
- Dust deposition
- Recreational impacts
- Introduction of invasive non-native species (INNS).

6.17. In addition, and notwithstanding the separation of proposed built form/infrastructure from the Crymlyn Bog SAC/Ramsar, the following pathway is also scoped in on a precautionary basis:

- Noise related disturbance impacts.

6.18. Each of these potential pathways for significant effects are considered in detail below. Where appropriate, consideration is given to previously approved works/mitigation strategies which allowed for potential effects through the above pathways to be avoided and/or mitigated.

Consideration of the implications of the proposals on the integrity of Crymlyn Bog SAC/Ramsar

Hydrological Impacts/Water Level

Vulnerability

6.19. Maintenance of appropriate water levels are essential for wetland sites, and Crymlyn Bog is no exception. If the water table is too low wetland habitats risk drying out, leaving them prone to erosion, the effects of drought, and at heightened risk of fire damage. Conversely, if the water table is too high 'over-wetting' can occur, with this having the potential to alter habitat communities, potentially leading to the transition of fen and transition mire to non-target habitat types. Within their scoping response to the Proposed Development, NRW have specifically identified the risk of over-wetting at Crymlyn Bog, a matter also identified within the Core Management Plan for the SAC/Ramsar.

Consideration of Likely Significant Effects

6.20. The Crymlyn Bog has an extensive catchment area, receiving water from hundreds of inputs across its circa 7 miles circumference. The frontage of the development site is circa 0.4 miles and thus will comprise only a small proportion of the catchment.

6.21. Whilst acknowledging the above, given the pre-existing hydrological connectivity between these designated sites and the Site, the Proposed

Development has the potential to alter the hydrological regime currently in place pre-development, in the absence of appropriate mitigation being secured.

- 6.22. To avoid this potential adverse effect, the surface water drainage strategy will be specifically designed in a way that controls the rate of discharge of water from the Site, both as a result of surface water flows and, where possible, groundwater infiltration. The drainage strategy for the Site will ensure any discharge of waters towards the SAC/Ramsar will be at greenfield rates. The detailed design of the proposed system will be such that its performance allows effective attenuation of discharges for both frequent, low volume run-off events, as well as more extreme (storm) rainfall events (including future climate change scenarios).
- 6.23. Consistent with the design intention for previously consented development, the surface water drainage strategy would be designed such that attenuated waters would be released at slower rates but over a more prolonged period, relative to the pre-existing baseline situation for the Site (circa 2008). This would allow for a more predictable hydrological regime within the adjacent SAC.
- 6.24. Importantly, the strategic SuDS infrastructure will be delivered in a phased manner and in step with the Development, ensuring elements of the operational drainage scheme will be in place prior to construction of the residential units and hard surfacing. As required, modifications to the strategic drainage infrastructure, or otherwise additional 'on-plot' drainage infrastructure, will also be implemented as individual development phases come forward.
- 6.25. The detailed design of the surface water drainage strategy (both strategic and 'on-plot') would be secured through suitably worded planning Conditions, as were also secured for the previously consented scheme. These Conditions would equally ensure the appropriate management and maintenance of drainage infrastructure for the life-time of the Proposed Development.
- 6.26. As part of a Construction Phase Environmental Management (CPEM) system a monitoring plan will be agreed prior to all works commencing. Noting that outfalls from the Site are already formally regulated and monitored, this EMP will provide a detailed description of the proposed monitoring network and the parameters to be measured at a strategic level during preparatory works, and during the plot construction phase.
- 6.27. Thus, insofar as changes to the hydrological regime are concerned, potential significant adverse effects on the integrity of the Crymlyn Bog SAC/Ramsar site (and SSSI) will be mitigated by appropriately designed SuDS and an appropriate management and monitoring regime to mitigate the effect of potential pollutants.
- 6.28. It is noted the adoption of a suitably designed drainage network by the local SABs board would form an integrated aspect of the Development Proposals, rather than a targeted mitigation measure in respect of the Crymlyn Bog SAC/Ramsar.

Water Quality

Vulnerability

- 6.29. Changes to water quality have the potential to directly impact the communities and assemblages supported within the Crymlyn Bog SAC/Ramsar site. Excessive levels of nitrates and phosphates can lead to nutrient enrichment, in turn encouraging rapid or undesirable vegetation growth, and potentially ecological succession. The release of petrochemicals or heavy metals can result in toxic contamination which has the potential to directly harm interest features, not least invertebrates and plant species. Via the uptake of toxins by these groups, knock on effects on organisms further up the food chain (e.g. birds or mammals), are also possible.

Consideration of Likely Significant Effects

- 6.30. The Site is hydrologically connected to the Crymlyn Bog SAC/Ramsar site via both surface water flows and as a result of groundwater infiltration. Therefore, without mitigation/avoidance measures, it is considered the Development Proposals would have the potential to lead to changes in the quality of surface water runoff discharged from the Site. Such effects could arise in both the construction and operational phase of the Proposed Development.
- 6.31. Potential pollutants of particular relevance in this instance include Nitrogen (N), phosphorous (P), suspended solids (SS), hydrocarbons, road salts, oil and grease (Hydrocarbons), pH, permanganate (PV), suspended solids, and Phenols.
- 6.32. Existing surface water discharge from the Site (and towards the Crymlyn Bog) is currently subject to discharge consents provided by NRW, with a series of management and monitoring plans having been approved as part of the previously consented OPP. These previously approved documents, include for the following plans which are of particular pertinence in regards water quality:
- An over-arching Strategic Environmental Management Plan (SEMP) to include:
 - Crymlyn Bog Emergency Action Plan (EAP)
 - Environmental Monitoring Plan (EnvMP)
 - Construction Environmental Management Plan (CEMP)
 - Ecological Management Plan (EcMP)
 - Code of Construction Practice (CoCP)
 - Site wide Nutrient Management Plan (NMP).
- 6.33. Prior to the adoption of the drainage systems by the SABs Board the Proposed Development, in this instance, would allow for monitoring to ensure the quality of waters discharged from the Site are maintained at environmentally appropriate standards, in line with those previously approved. Indeed, it is noted the existing discharge consents provide a legislative basis for securing this mitigation.
- 6.34. It is intended for the Proposed Development to be supported by a comprehensive CEMP which will secure comparable safeguards to that

achieved through the SEMP. For clarity, this document, which would be secured by planning condition, would include for the preparation of relevant plans/documents/chapters including a Crymlyn Bog EAP, EnvMP and CoCP for the Site, in addition to a NMP.

- 6.35. Collectively, these documents will detail the specific safeguards which will be secured during the construction phase of the proposals, ensuring there is no significant decline in the quality of waters being discharged from the Site. Moreover, these documents will secure a continuity of the existing monitoring regime for both groundwater and surface waters at the Site, and will identify appropriate remedial/contingency measures in the event these may be required (i.e. if certain 'trigger levels' are breached/sustained). Amongst other matters, these documents will identify specific mitigation/avoidance measures in relation to:
- Ongoing earthworks and clearance work;
 - Run off from exposed ground and stockpiles;
 - Plant and wheel washing equipment;
 - Dust and mud on Site roads;
 - Disturbance of ditches;
 - Dewatering of excavations and release of sediment into the existing drainage system;
 - On-going monitoring/management of SuDS infrastructure (including habitat management);
 - Safe storage of construction materials/liquids.
- 6.36. Noting the viability of appropriate construction safeguards have previously been demonstrated for both remediation and construction related works at the Site (as part of a wider landholding), that comparable management and monitoring plans are again proposed to be secured by planning Condition, and noting the existing discharge consents which are in place at the Site, it can be concluded that potential adverse effects on the integrity of the Crymlyn Bog SAC/Ramsar site (and SSSI), as a result of water quality, will be avoided during construction of the Proposed Development.
- 6.37. Regarding the operational phase of the development, as detailed above, an appropriately designed drainage strategy will be secured for the Site (either by legal agreement or suitably worded planning Condition). This will ensure any discharged waters (either surface water or groundwater infiltration) will be treated to appropriate environmental standards. The approved drainage strategy will adopt a minimum three-stage treatment train and will include for a number of measures adopted in accordance with CIRIA guidance, to manage the amount and quality of surface water generated prior to discharge from the Site. At this stage, it is anticipated such measures may include:
- Permeable paving;
 - Filter drains;
 - Swales; and
 - Basins/ponds.
- 6.38. Permeable paving will allow rainwater through to underlying layers which provide treatment by filtration, adsorption, biodegradation, and sedimentation. Such paving would be used on private hardstanding areas (plot driveways, for example).

- 6.39. Filter drains will filter fine sediments, metals, hydrocarbon, and other pollutant out of surface water, whilst also encouraging adsorption and biodegrading.
- 6.40. Swales will convey surface water towards the SuDS ponds/basins while also treating runoff via filtration.
- 6.41. Basins/ponds will gather surface water after periods of rain, and will utilise natural processes, such as bacteria and sunlight, to break down pollutants, before discharging it from the Application Site.
- 6.42. The drainage measures listed above may additionally include measures to control and remove silt and petrochemicals within the drainage system. This will include silt traps, allowing silt to be removed from surface water run off before it is discharged from the drainage system. A monitoring and maintenance regime would be secured as part of the drainage proposals, ensuring the continuing effective function of these traps.
- 6.43. Importantly, it should be noted the Proposed Development is intrinsically linked to the long-term and on-going remediation of the Site following its prior use as an oil refinery. The extensive historic decommissioning of the previous structures/operations, large scale remediation, and the implementation of previous management and monitoring plans have already contributed significantly to the safeguarding of the Crymlyn Bog SAC/Ramsar. The Proposed Development will further ensure such safeguards are re-enforced and secured for the lifetime of the development. This is deemed to represent a significant betterment relative to the historic baseline of the Site.
- 6.44. Regarding the treatment of foul water, this would be discharged to an identified WWTW following confirmation of local capacity. Waste water will either be pumped, or a gravity system may be employed, depending on the results of further work to be undertaken at the detailed design stage. Foul waters will be drained or be pumped east and away from the Crymlyn Bog catchment. There will be no foul water infrastructure within or adjacent the Crymlyn Bog margins.
- 6.45. As a further measure, again consistent with the previous OPP, it is proposed for a 'Welcome Pack' to be prepared and provided to all new residents, alongside the provision of information boards and signage within the Site. Amongst other information, it is proposed for this literature to include an overview of the Crymlyn Bog, its ecological importance, sensitivities, and the specific measures incorporated into the Proposed Development to safeguard the designated site. Welcome Packs would highlight potential harm pathways arising from occupiers, as well as proactive measures they could take to positively contribute to the wider water environment.
- 6.46. In light of the above, it is considered, subject to the adoption of an appropriately designed scheme, any potential water quality impacts on the Crymlyn Bog SAC/Ramsar during the operational phases would be fully avoided or mitigated. Long-term monitoring and management of the adopted drainage strategy (i.e. for the lifetime of the development) would also be secured by Condition or legal obligation.

- 6.47. As set out above, these avoidance and mitigation measures would form an intrinsic element of the emerging Development Proposals for the Site (as opposed to being mitigation measures targeted to the SAC), and are essential to ensure compliance with wider water quality and nature Conservation Objectives, in line with adopted guidance, existing discharge consents and legislation.

Air Quality Impacts

Background and Vulnerability

- 6.48. Qualifying habitats within a number of designated sites are known to be particularly sensitive to changes in air quality. Exceeding critical values for air pollutants may result in changes to the chemical status of habitats, accelerating or damaging plant growth, altering vegetation structure and composition, and thereby affecting the quality and availability of habitats and, in turn, their suitability to support qualifying species.
- 6.49. Critical loads and levels are thresholds below which such harmful effects on sensitive habitats will not occur to a notable level, according to the best available scientific evidence. There is significant variation in the sensitivity of habitats, with some identified to be very sensitive (such as heathland and species-rich grassland) and others comparatively less so (such as open water).
- 6.50. Emissions from vehicular traffic arising as a result of the Development Proposals provide a potential pathway for air quality effects to arise on designated sites. The primary pollutants which can (in some circumstances), give rise to adverse effects on European designated sites are oxides of Nitrogen (NO_x), sulphur dioxide (SO₂) and Ammonia (NH₃).
- 6.51. SO₂ is mainly derived from emissions from the combustion of fuels in industry (e.g. electricity generation), and domestic fuel combustion. Shipping is also a significant source of increased SO₂ around busy ports. SO₂ concentrations attributable to vehicle emissions has, however, fallen drastically over recent years as a result of reductions in the sulphur content of vehicle fuels. Indeed, by 2015 traffic related emissions of SO₂ accounted for only 1% of the total SO₂ emissions in the UK.
- 6.52. In terms of environmental effects, SO₂ is identified as a contributor to the acidification of soils and aquatic environments. However, given it is no longer a significant component of traffic emissions due to improvements in vehicle technology, there is no requirement to consider it further within this assessment.
- 6.53. Nitrogen oxides are mainly formed through the (high temperature) combustion of Nitrogen containing fuels and atmospheric Nitrogen. Road traffic is a dominant source of NO_x in the UK, with diesel engines the major contributor. Over the last few decades NO_x emissions from traffic has fallen with the use of catalytic converters and stricter regulations (e.g. Euro Standards).
- 6.54. Regarding environmental effects, NO_x contributes to eutrophication (enrichment of nutrients/minerals) and acidification. In addition, NO_x

contributes to the formation of ground level ozone when in the presence of Volatile Organic Compounds (VOCs). Ozone causes direct damage to vegetation. It enters leaves through the stomata during normal gas exchange and, being a strong oxidant, it can cause significant damage to the plant.

- 6.55. Acid deposition relates to the acidifying effect of pollutants, which can be either acidic, such as in the case of nitric acid, or basic as in the case of Ammonia, on soils and hydrological systems. Acidification can occur through either wet (affiliated with precipitation) or dry deposition (gasses or particles). With reductions in SO₂, NO_x (and reduced Nitrogen compounds) is now the major contributor to acid deposition in the UK. Acid deposition can cause direct damage to plants, with liverworts and lichens, heather, and moss species being susceptible to cell membrane damage due to excessive levels. Acidification causes a change in the chemical balance of soils and hydrological systems and can substantially reduce microbial activity.
- 6.56. Nitrogen deposition is the input of (reactive) Nitrogen compounds, most notably in the form of NO_x, NH₃ (Ammonia), nitrous oxide and nitrates, along with other chemical forms of Nitrogen. These inputs can be in the form of dry deposition or wet deposition. The key effects of Nitrogen deposition are acidification (as described above), eutrophication, and an increase in the availability of reduced forms of Nitrogen such as ammonium.
- 6.57. Nitrogen is a key plant growth nutrient and is required by all plants to grow. Vascular plants take up the majority of their Nitrogen through their root system, but some Nitrogen can be absorbed via stomata or the cuticle. Non-vascular plants (e.g. lichens and bryophytes) can absorb Nitrogen through their entire surface. Most plants use reactive Nitrogen (see above), but some can use organic Nitrogen (e.g. amino acids). In the event carbon assimilation is restricted, for example by insufficient phosphorous, light, or water availability, then Nitrogen can accumulate to excess and become toxic.
- 6.58. Eutrophication is the term given to the enrichment of soils and the aquatic environment by increased nutrients/minerals. Nitrogen deposition (by various means) is a major source of eutrophication. Those plant communities most at risk from Nitrogen eutrophication are those which are rich in lichens and bryophytes and where species richness and value, in ecological terms, comprises slow growing species. Aside from direct effects on non-vascular plants, over time adverse effects can occur on those plants which do not have capacity to assimilate Nitrogen in the presence of increased Nitrogen availability (for example from deposition). In this scenario such plants can be outcompeted by plants that can, such as many grass (graminoid) species. Overall species loss within the community is caused by shading and/or an inability to compete for other resources. Low growing species and non-vascular plants are at increased risk.
- 6.59. All the above is of relevance to the consideration for potential effects to arise on Crymlyn Bog SAC/Ramsar, noting the qualifying habitats associated with the site include mire, bog, fen and alluvial forest.
- 6.60. It is important to consider the extent to which road traffic can give rise to impacts from air pollution on sensitive habitats and species. It is a commonly held view by air quality specialists that in the majority of instances deposition at 200m from a road is at a level which is so small as to be insignificant

(*nugatory*). Resultantly, and as is consistent with advice issued by statutory consultees in England (and considered to remain of relevance in Wales), 200m is proposed as an appropriate screening distance for use in assessment purposes^{4,5}. Guidance produced by the Institute of Air Quality Management (IAQM) also reflects this position⁶.

- 6.61. As such, potential effects can be screened out of the assessment process where the qualifying interest features of a European designated site do not fall within 200m of a road affected by the plan or project. This position is reflected in the Design Manual for Roads and Bridges (DMRB).
- 6.62. The Air Pollution Information System (APIS) is a primary source of information relating to air pollution sensitivities and effects in relation to European designated sites and their relevant qualifying interest features. The APIS website is hosted and maintained by the Centre for Ecology and Hydrology (CEH), with the following partner organisations: the JNCC; NE; the EA; Northern Ireland Environment Agency (NIEA); Scottish Natural Heritage (SNH); Scotland and Northern Ireland Forum for Environmental Research (Sniffer); NRW; and the Scottish Environment Protection Agency (SEPA).
- 6.63. To define pollution impacts, empirical evidence has been used to derive a series of thresholds, above which an adverse effect on a species or habitat may arise. These are termed Critical Loads and critical levels. A Critical Load relates specifically to the quantity of pollutant deposited from the air to the ground. A critical level relates specifically to the gaseous concentration of a pollutant in the air.
- 6.64. In accordance with the APIS website, Critical Loads are defined as:
- "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge."*
- 6.65. Critical levels are defined by APIS as:
- "concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge".*
- 6.66. APIS provides Critical Loads and levels for pollutants relevant to each of the qualifying interest features of the Crymlyn Bog SAC. Table 1 below summarises relevant critical levels of relevance.

⁴ Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations (June 2018). Natural England, Peterborough.

⁵ Design manual for Roads and Bridges, LA105 – Air Quality. Highways England.

⁶ A guide to the assessment of air quality impacts on designated nature conservation sites (June 2019). Institute of Air Quality Management.

Crymlyn Bog SAC		
Feature	Pollutant	Critical Level (annual mean)
Transition mires and quaking bogs H7140	NOx	30 µg NOx/m ³
	NH ₃	1 µg NH ₃ /m ³
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> H91E0	NOx	'The feature is not sensitive'
	NH ₃	1 µg NH ₃ /m ³
Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae H7210	NOx	30 µg NOx/m ³
	NH ₃	'Site specific advice'

Table 1: Relevant critical levels for Crymlyn Bog SAC (annual mean)

- 6.67. Critical loads for relevant qualifying interest features are provided as thresholds for nutrient Nitrogen and acidity.
- 6.68. Regarding nutrient Nitrogen, 'transition mires' have a relevant Critical Load of 5 to 10 kgH/ha/yr and 'Calcareous fens' have a relevant Critical Load of 13 to 20 kgH/ha/yr. Alluvial forest is '*not sensitive to eutrophication*'.
- 6.69. Regarding acidity, only transition mire and quaking bogs are identified as sensitive to acidity, with the following Critical Loads given:

MinCLminN: 0.321
MinCLmaxS: 0.34
MinCLmaxN: 0.661

- 6.70. Useful information in relation to the current baseline situation is also available from APIS. The information obtained from APIS demonstrates the relevant (maximum) Critical Load is exceeded for 'transition mire and quaking bog' habitat, with the minimum Critical Load exceeded in respect of calcareous fens.
- 6.71. Of significant note is the "source attribution" information available from APIS in relation to air quality impacts at both of the European designated sites.
- 6.72. For Crymlyn Bog SAC, the findings of modelling work show that, for Nitrogen deposition, road transport accounts for 13.9% of the annual deposition. In comparison, it is stated that livestock accounts for 23.1% of annual Nitrogen deposition, imports from Europe (long range atmospheric deposition) 20.5%, 'non-agricultural non-abatable' 8.3%, and other transport 6.6%. Other cited pathways include international shipping, fertiliser application, Republic of Ireland NH₃ sources, and other non-agricultural sources.

Consideration of Likely Significant Effects

- 6.73. As set out in Section 5 of this iHRA, SAC/SSSI habitat condition information available from NRW can also be used to assist in determining whether relevant qualifying interest features are currently being adversely affected.

- 6.74. Within the CMP for the Crymlyn Bog SAC/Ramsar the potential for atmospheric pollution to adversely affect the extent or quality of all the qualifying habitats is noted. NRW reference the sensitivity of raised bog and transitional mire habitats within their EIA scoping response to the Proposed Development.
- 6.75. The CMP identifies Feature 1 (Calcareous fen, **H7140**) to be in 'Unfavourable: declining' condition, albeit this assessment is based on high cover of *Phragmites australis* and/or *Cladium mariscus*, with habitat management required as the principle remedial measure. No reference is made to atmospheric pollutants/air quality as a reason for 'Unfavourable' condition. Similarly, the 'Unfavourable: declining' condition of Feature 2 (transition mire and quaking bog) is identified as primarily arising from *Phragmites australis* and scrub cover. However, nutrient enrichment was identified as a factor encouraging this vegetative change. It is acknowledged that atmospheric pollutants could be a contributing factor to enrichment. Feature 3 (Alluvial forest) is in 'Unfavourable: recovering' condition. The 'Unfavourable' condition relates to a lack of over mature trees, and therefore is not influenced by air quality.
- 6.76. In view of the available evidence, it can be concluded air quality effects are relevant to Crymlyn Bog SAC/Ramsar, and it can at least be said that defined Critical Loads/levels are exceeded across the designated site, such that increases in traffic emissions could potentially exacerbate the situation in very localised areas where no improvements to background levels are achieved. However, it would plainly be wrong to conclude traffic emissions are the sole or primary source of air quality impacts at the European designated site.
- 6.77. Traffic emissions are part of the perceived problem relating to an exceedance of Critical Loads and levels, but evidence strongly suggests other sources, when considered together, have at least as great, if not greater, bearing on deposition rates at the SAC than traffic emissions.
- 6.78. With regard to the potential for air quality effects to arise as a result of increased road traffic emissions, particular regard has been given to the guidance produced by NE. The approach towards assessment is outlined in an Internal Guidance Note, entitled "Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations" (June 2018). The information and guidance within this document is considered equally relevant to development in Wales.
- 6.79. Section 4 of the Internal Guidance Note provides advice on screening for likely significant effects and details a number of sequential steps which should be followed. Consideration has been afforded to each of these steps, below, in light of detailed analysis of likely effects arising from the Development Proposals.
- 6.80. Throughout this Section reference is made to air quality assessment work undertaken by Atkins Limited, with this informed by traffic modelling data collected to inform the Proposed Development. This assessment is detailed within the Air Quality Chapter (Chapter 6) of the ES Chapter. The assessed receptors are detailed within Table 6.10 and shown in Figures 6.2 and 6.3 of the Air Quality ES Chapter.

Step 1 – Does the proposal give rise to emissions which are likely to reach a European site?

- 6.81. In the first instance, the guidance seeks to identify whether development proposals give rise to emissions that could reach a European site. The key factor to consider at this initial stage is the distance between an emission source (in this case, the road network) and the receptor (the European site).
- 6.82. As outlined above, it is a commonly held view by air quality specialists that in the majority of instances deposition at 200m from a road is at a level which is so small as to be insignificant (i.e. *nugatory*).
- 6.83. Traffic data modelled for the Proposals identified only one road within 200m of the SAC to have experienced a predicted change in traffic flows, this being the B4290. This road runs along the northern edge of Pant-y-Sais SSSI (SAC Unit 15), additionally running in close proximity to Crymlyn Bog SSSI (SAC Unit 4). Units 1 and 14, both of which comprise sections of the Tennant Canal, are also located within 200m of the B4290 road. The locations of the modelled road links are detailed on Figure 6.2 of the ES (included at Appendix 6 of this Assessment).
- 6.84. Whilst it is acknowledged there are other roads within the study zone, the routes assessed represent the main roads which are likely to facilitate the vast majority of road traffic, and therefore represent the most likely locations for any effect from air quality to arise.

Step 2 – Are the qualifying features of sites within 200m of a road sensitive to air pollution?

- 6.85. The next point to consider is whether or not the qualifying features of the European site are sensitive to air quality impacts. Initially this is undertaken at a broad scale, considering the qualifying features (habitats and species) for which the site has been classified or designated.
- 6.86. As outlined above, the qualifying features of Crymlyn Bog SAC (and its underpinning SSSIs) are indeed sensitive to air quality impacts; as such, in line with this step, further consideration is therefore required.

Step 3 – Could the sensitive qualifying features of the site be exposed to emissions?

- 6.87. It is axiomatic that not all qualifying features associated with a European designated site are distributed evenly throughout each site. It would therefore be incorrect to assume all qualifying features are present at any given location within the designated site. On this basis, as outlined in the NE Internal Guidance note, the Conservation Objectives of the site are “*unlikely to apply equally to all parts of a site*”.
- 6.88. Consideration has therefore been afforded as to whether the qualifying features associated with each of the European designated sites are (or may be) located within 200m of the affected strategic road network.

- 6.89. Whilst detailed assessment of all features in each zone has not been undertaken (for instance, by undertaking specific habitat survey work within the designated site itself), regard has been afforded to the information and datasets available on NRW's Interactive Map Viewer⁷, as well as information provided within the CMP for the Crymlyn Bog.
- 6.90. In particular, consideration has been afforded to the Phase 1 Habitat Survey dataset which illustrates the geographic distribution and extent of habitats. Whilst in some instances there are differences (for instance, between the Annex I habitats associated with SACs and Phase 1 Habitats), this dataset provides very useful information for the purposes of this Assessment. Where a data set is not available, a review of aerial imagery, in comparison with data within the CMP has been undertaken. For example, this approach was used to confirm the predominant habitat within SAC Unit 4 as 'Wet Woodland' and 'Alluvial Forest'.
- 6.91. It is apparent from the above exercise that the parts of the designated site which lie within 200m of the B4290 noted include Alluvial Forest, Transition Mire and Calcareous Fen. On this basis, assessment is clearly required in respect of the qualifying Annex habitats for which the site is designated (in accordance with information on APIS and the CMP for the site).

Step 4 – Application of screening thresholds

- 6.92. As outlined in the Internal Guidance Note, if a plan or project has not been screened out, the next step is to consider the risk from road traffic emissions associated with the proposal. Guidance from NE (and Highways England) considers the process contribution can be considered either in terms of the predicted average annual daily traffic flow (also referred to as 'AADT', as a proxy for emissions) or the predicted emissions themselves (the actual process-contribution).
- 6.93. In accordance with the Internal Guidance Note, an increase in 1000 AADT for traffic numbers or 1% of the Critical Load or level for emissions is considered significant. It is stated that these thresholds are:
- "...considered by Natural England's air quality specialists (and by industry, regulators and other statutory nature conservation bodies) to be suitably precautionary, as any emissions below this level are widely considered to be imperceptible and, in the case of AADT, undetectable through the DRMB model. There can therefore be a high degree of confidence in its application to screen for risks of an effect."*
- 6.94. Where the screening assessment indicates effects are screened out alone, the screening assessment is then applied in combination.
- 6.95. In order to identify the relevant increase in traffic movements as a result of the Development Proposals, when considered in combination with other relevant plans or projects, notably the emerging Local Plan, recent consents/committed developments and wider general traffic growth, specific assessment work was undertaken by Atkins Transportation. This assessment work has in turn informed Air Dispersion Modelling for the

⁷ <https://maps.cyfoethnaturiolcymru.gov.uk/>

Proposals, with this completed using ADMS-Roads (Version 5) Software. The methodology, underlying assumptions, and findings of this specific assessment work are outlined in Chapter 6 of the ES (Air Quality Chapter).

- 6.96. As above, this traffic assessment considered all relevant roads with potential to experience increases in traffic flows. This assessment work identified one affected road (B4290), situated within 200m of Crymlyn Bog SAC, for at least part of its extent. As noted above, the locations of assessed roads are shown at Appendix 6.2 of the ES Chapter, with further information provided at Appendix 6.1 of the ES Chapter. Relevant extracts are provided at Appendix 6 of this iHRA.
- 6.97. In the first instance, consideration was afforded to the predicted change in AADT at appropriate locations on the strategic road network, with 41 locations tested. Where potential for an effect was identified, detailed air quality modelling was subsequently undertaken, as outlined in Section 6 below, and in Chapter 6 of the ES.
- 6.98. Baseline traffic flows along each of these identified locations has been estimated (based on 2019 survey information), with consideration afforded to anticipated (planned/committed) change to predict the Future Baseline. Consideration has also been afforded to Local Plan trips and those associated with committed developments before inclusion of the anticipated change associated with the Development Proposals. As a result, for HRA purposes, an 'in combination' assessment of AADT has been undertaken. Further details regarding the assumptions made are presented in the Air Quality Chapter of the ES.
- 6.99. The 'future' assessment year for traffic flows was taken to be 2026, at which point the assessment assumes development will be 'complete'. However, it is important to note, in accordance with the proposed construction programme, full occupation of the Development is not anticipated to occur until 2033 (i.e. a 10 year build programme). By assuming the full potential for an increase in road traffic could arise by 2026 a particularly precautionary stance has therefore been adopted. It is considered this approach fully accords with the precautionary principle and allows robust assessment of the potential for adverse effects to arise on the integrity of Crymlyn Bog SAC.
- 6.100. The results of the air quality modelling work undertaken by Atkins, insofar as they relate to the Crymlyn Bog, are summarised in Tables 6.16 to 6.18 of the Air Quality Chapter. Table 6.10 is also of relevance, detailing the qualifying features, Nitrogen deposition Critical Loads and background Nitrogen deposition (kg N/ha/yr) at the Crymlyn Bog and its underpinning designations.
- 6.101. For completeness, Tables 2 to 5, below, summarise the baseline position and the predicted change in relevant pollutants at the two receptor locations (ECO1 and ECO2) along the B4290, with these receptor locations representing the closest point of the road to respective parts of the Crymlyn Bog SAC. The locations of these receptors are detailed at Appendix 6.

Receptor ID	Site Name and Designations	Habitat Type	Critical Load Range	APIS Background N dep (max)
ECO1	Crymlyn Bog SAC/SSSI	Transition mires and quaking bogs (H7140)	5-10	17.1
ECO2	Crymlyn Bog SAC and Ramsar, Pant- Y-Sais SSSI, NNR and LNR,	Transition mires and quaking bogs (H7140)	5-10	17.1

Table 2. Qualifying Features, Nitrogen Deposition, Critical Loads and Background Nitrogen Deposition (kg N/ha/yr) at Crymlyn Bog SAC/SSSI and Pant-y-Sais SSSI.

Receptor ID	Annual Mean NO _x (µg/m ³)			
	Base	DM	DS	Change (DS - DM)
ECO1 (Crymlyn Bog SSSI)	14.0	9.8	10.0	0.2
ECO2 (Crymlyn Bog SAC)	29.0	17.2	18.4	1.3

Table 3. Annual Mean NO_x Concentrations (µg/m³) at the 'Base' (baseline date of 2019), 'DM' (Do Minimum - 2026 without the Proposed Development) and 'DS' (Do Something – 2026 with Proposed Development)

Receptor ID	Total N Dep (N kg/ha/yr) (inc NH ₃)				Change in N Dep % of CL
	Base	DM	DS	Change DS - DM)	
ECO1 (Crymlyn Bog SSSI)	17.9	17.8	17.8	0.06	1.1%
ECO2 (Crymlyn Bog SAC)	21.7	20.4	20.8	0.42	8.4%

Table 4. Annual Mean Nitrogen Deposition Rates (N kg/ha/yr) at the Relevant Receptors for the 'Base' (baseline date of 2019), 'DM' (Do Minimum - 2026 without the Proposed Development) and 'DS' (Do Something – 2026 with Proposed Development) scenarios.

Receptor ID	Background NH ₃ (µg/m ³)	Annual Mean NH ₃ (µg/m ³)			
		Base	DM	DS	Change (DS - DM)
ECO2	0.8	1.0	1.3	1.5	0.3

Table 5. Annual Mean NH₃ Concentrations (µg/m³) for the 'Base' (baseline date of 2019) and the 'DM' (Do Minimum - 2026 without the Proposed Development) and 'DS' (Do Something – 2026 with Proposed Development) scenarios.

- 6.102. As outlined in the tables above, the Proposed Development is anticipated to result in increases in air quality impacts above the relevant 1% thresholds in respect of NO_x, N Deposition and Ammonia (NH₃). However, it is noted, even with the Proposed Development, there will be significant reductions in both NO_x and Nitrogen Deposition at the Crymlyn Bog. Additionally, these exceedances are predicted to occur across only a very small proportion of the Crymlyn Bog, with the vast majority of the SAC being located in excess of 200m from affected roads.
- 6.103. Noting that exceedances are in excess of 1% of the relevant critical levels, it is considered that in accordance with the Guidance Note, there is a risk of significant air quality effects when the Proposals are considered alone. As such, Appropriate Assessment is required in respect of this potential impact pathway. Information to inform an Appropriate Assessment is considered in Section 7 of this sHRA below.

Dust Deposition

Vulnerability

- 6.104. The deposition of dust can lead to contamination and/or smothering of natural habitats. Contamination could take the form of the introduction of toxins, or alternatively could result in localised changes to pH or nutrient levels.
- 6.105. Excessive smothering can in turn lead to adverse impacts such as through preventing or reducing photosynthesis, respiration, or transpiration of plants, or through allowing the penetration of phytotoxic gaseous pollutants.

Consideration of Likely Significant Effects

- 6.106. In regards dust impacts, it is noted dust arising during construction work only has a significant impact within 20m due to heavy soiling of vegetation; further than that it is dispersed and of negligible significance.
- 6.107. Noting this, and given that construction related works are anticipated to lie in excess of 20m from the SAC/Ramsar boundary, it is not considered dust deposition would have the potential to result in direct impacts on the SAC. In reaching this conclusion it is further noted that a substantial green infrastructure buffer is proposed along the full extent of the Site's western

boundary, with this including for extensive mature vegetation, including woodland. This will further prevent the dispersal of dust towards the SAC/Ramsar site, ensuring potential impacts are nugatory.

- 6.108. Notwithstanding the above conclusion, and as was secured for the previously consented OPP, the implementation of standard engineering protocols will be adopted as an integral element of the scheme, in order to ensure dust deposition impacts on off-site habitats are fully avoided. Measures in this regard would adhere to current guidance and legislation, including for storing spraying dry materials to limit airborne movement, wheel washing of vehicles, the damping down of haul roads, and seeding of long term exposed areas and will be considered, to mitigate run-off and dust generation. The details of this strategy may be provided at the planning application stage, as part of the CEMP, as is proposed to be secured via appropriate planning Conditions.
- 6.109. In addition, and in accordance with the previously consented OPP, it is proposed for monitoring of dust levels to be undertaken during construction, the details of which would be provided within an EnvMP for the Site, as would be secured by Condition. The EnvMP would include for remedial/contingency measures should monitoring exceed appropriate trigger levels, such as the temporary cessation of works whilst appropriate working practices (such as additional dampening of soils) is undertaken.
- 6.110. In light of the above, it is considered, subject to the adoption of appropriate safeguards, as detailed within a CEMP and EnvMP, this will ensure any potential dust impacts on the Crymlyn Bog SAC/Ramsar would be fully avoided or mitigated.

Recreational Impacts

Vulnerability

- 6.111. An increase in recreational pressure on a wildlife site has the potential to cause the degradation of its qualifying habitat features, and/or qualifying plant species. Evidence suggests such effects include, in particular, direct damage to habitat features through walking and other activities, leading to soil compaction, erosion, trampling of vegetation, and damage.
- 6.112. With respect to disturbance of faunal species, recreational disturbance has the potential to displace species/individuals either temporarily or sometimes permanently. If such disturbance is continuous, or very frequent, it could cause the habitat to become unsuitable, resulting in an effect on their distribution in the immediate locality. This type of disturbance is most likely to occur near well-used footpaths and may result from a range of recreational uses.
- 6.113. Increased recreational pressure may also result in nutrient enrichment of habitats (e.g. as a result of dog fouling), fly-tipping/littering, and increased fire risk. In all cases but fires, these potential pathways for impacts are directly related to the frequency of visits and management of visitors on Site. In relation to fires, research from heathland sites indicates this occurs generally as a result of anti-social behaviour (arson) or poor control of campfires, and is more prevalent in areas of habitat immediately adjacent to residential areas.

- 6.114. Furthermore, some habitat types are more susceptible to damage as a result of an increase in recreational disturbance than others. Vegetation associated with some habitats (such as dunes) can be fragile and therefore more vulnerable to disturbance and damage as a result of trampling and disturbance than other habitat types. However, sensitive habitats can be influenced by a range of other factors that are not related to recreational pressure, including scrub encroachment, natural erosion, grazing (by rabbits and stock) and hydrology.
- 6.115. Where existing tracks and public rights of way are clearly defined on the ground (well-worn tracks,) and where suitable visitor management initiatives (e.g. signage) and a maintenance plan are in place, adverse impacts from visitor pressure may, as a consequence, be far more limited in extent. This is because erosion effects, often associated with walkers, runners, horses, and cyclists, are concentrated along specific routes, leaving the wider area free from such effects.

Consideration of Likely Significant Effects

- 6.116. With regard the Crymlyn Bog SAC/Ramsar, the habitats largely comprise of mire, bog and fen habitats. As a result these habitats are largely inaccessible, which inherently restricts the potential for physical damage and degradation to occur as a result of informal recreation.
- 6.117. Notwithstanding the above, and noting the Proposed Development would give rise to a substantial number of new residential dwellings, the potential for recreational pressure upon the Crymlyn Bog SAC/Ramsar is scoped in. As above, increased recreational pressure could result in adverse impacts arising through numerous pathways, for example trampling/degradation, littering and/or fly tipping, or accidental fires.
- 6.118. Given the close proximity of the Site to the Crymlyn Bog, that the Proposed Development includes for large-scale residential led development, and noting the potential for adverse recreational impacts to arise, mitigation measures are proposed on a precautionary basis in respect of this potential harm pathway (see Section 7 of this iHRA).

Introduction of Invasive Non-Native Species

Vulnerability

- 6.119. Non-native and invasive plants can cause significant harm to natural ecosystems. Such species can outcompete or predate upon native flora and fauna, or otherwise cause indirect harm such as through altering abiotic conditions which inhibit the ability of native species to survive.

Consideration of Likely Significant Effects

- 6.120. It is understood that extensive historical remediation works at the Site have permitted for the removal of non-native species from the Site, not least Japanese Knotweed *Reynoutria japonica*. Notwithstanding these previous works, a single stand of Japanese Knotweed was recorded during the course of habitat survey work undertaken by Ecology Solutions in 2020 and 2021.

- 6.121. Japanese Knotweed is a particularly hardy and invasive plant. It is capable of growing in a wide range of habitat conditions and can spread vegetatively from even small fragments of the plant (such as could be present in contaminated soils).
- 6.122. Noting the potential for Japanese Knotweed to be easily spread, such as through soil movement or contamination of vehicle tyres, there remains a risk that this plant could be spread to other areas of the Site, potentially to locations with a heightened risk of contaminating the Crymlyn Bog SAC/Ramsar. Whilst other non-native species were recorded within the Site, for example *Buddleia* sp., and Canadian Fleabane *Erigeron canadensis*, these species are generally not considered to be invasive.
- 6.123. Noting the existing presence of non-native species within the Site, the risk of additional invasive or non-native species to be introduced to the Site or its environs during the operational phase of the development, and the impact this would have on the ecosystem including, potentially, qualifying features of the protected sites, mitigation is required. This is discussed in the following Section of this assessment report.

Noise/Vibration Related Disturbance Impacts

Vulnerability

- 6.124. Increased noise generated during construction or operational activity has potential to disturb faunal species, not least birds. Percussive (regular and/or 'sharp') noises in particular have the greatest potential to cause disturbance. While the effect is temporary and reversible, this can, in some instances, cause birds to cease feeding and/or take flight leaving the area of influence, using up valuable energy resources and potentially abandoning nests.

Consideration of Likely Significant Effects

- 6.125. Vibration levels from ground compaction are generally imperceptible at distances greater than around 20m from the source, and therefore construction vibration is not expected to lead to any significant adverse effects. At this stage it is not expected that any hammer driven piling will be required.
- 6.126. None of the SAC qualifying features are considered to be sensitive to noise related impacts, noting these comprise habitat features only. Equally, and with reference to the Ramsar Information Sheet for Crymlyn Bog, none of the qualifying criteria (all of which comprise habitats, flora, or invertebrate interests) are deemed potentially sensitive to noise/vibration.
- 6.127. It is noted that populations of Reed Warblers and Sedge Warblers are identified as 'notable' within the Ramsar citation, with these species equally noted on the SSSI citation for the Crymlyn Bog.
- 6.128. Noting that breeding birds (i.e. potentially sensitive receptors) do not form designating features of the SAC/Ramsar, it is not considered noise or vibration related impacts would have the potential to result in adverse impacts on the Conservation Objectives of the Crymlyn Bog SAC/Ramsar.

- 6.129. Notwithstanding this, further consideration has been given to noise related impacts specifically with regard the potential to adversely impact notable breeding bird assemblages within the SAC/Ramsar site.
- 6.130. In this regard, it is noted the main development footprint is significantly distanced from the SAC/Ramsar, with no built form anticipated within 50m of the designated sites and moreover with significant mature vegetation (including boundary woodland) to be retained. Given the distances involved, it can be expected that noise levels would rapidly attenuate, such that impacts of significance would be unlikely to arise. Indeed, previous assessment work undertaken in support of the previously consented OPP also concluded that (construction) noise related impacts were not expected to arise, with the EnvMP for the Site concluding at paragraph 7.4 that *"It is currently not considered that noise will pose an excessive risk to the receptors identified in Section 2, as the receptors are at a sufficient distance from the main site works to allow noise to dissipate before reaching a receptor location. Therefore, it is deemed unlikely that the works will have any effect on existing receptors within the vicinity of the former refinery."*
- 6.131. To provide further context to this conclusion, it is helpful to refer to case studies relating to noise impacts on birds. Considerable research has been undertaken into the relationship between bird disturbance and noise impacts. In general, research has focused primarily on two forms of potential disturbance which could arise: instantaneous and long-term disturbance. The former is associated with irregular (often short term) noise events, while the latter is associated with "chronic", long-term, regular noise events.
- 6.132. Instantaneous disturbance is characterised by "immediate and observable changes in behaviour, including flight, hearing loss and increases in stress" (Barber, 2010). In terms of long-term disturbance, this is associated with indirect adverse effects on birds arising from continuous noise, typically due to the masking of bird calls (both communication and alarm calls).
- 6.133. Based on the research work undertaken, it is well documented that birds will habituate to long-term, continuous noise effects. As such, the greatest potential for adverse effects to arise is likely to occur as a result of 'short, sharp' noise events, particularly where these occur in conjunction with particular conditions which are likely to exacerbate the effect (e.g. during very cold weather).

Scientific case study/literature review on potential noise impacts

- 6.134. In relation to bird disturbance at Saltend on the Humber Estuary during flood defence works, including the use of piling rigs, the following points were noted:
- 6.135. In general birds were seen to accept a wide range of steady state noise between 55dB(A) and 85dB(A);
- Despite consistent periods of piling activity on the landward side of the sea wall, birds appeared indifferent to the noise. It was concluded the screening of the sea wall was effective in minimising disturbance;

- During piling on the seaward side of the sea wall, birds were disturbed, but flocks remained at and beyond 200m from operations;
- The increased presence of people (in view of the birds) may have had a greater bearing on the disturbance levels, given that disturbance was only noted during operations on the seaward side of the sea wall;
- Other activity (aside from piling) was found to have little effect on feeding birds. Human presence on the sea wall had no effect on birds feeding 25m away and, even when disturbance was caused, effects were minimal with birds retreating only temporarily and over short distances.

6.136. Assessment work undertaken by the Institute for Estuarine and Coastal Studies⁸⁹ on wintering waterbirds provides data on the noise levels at which a behavioural response reaction from birds is elicited. This work categorises disturbance responses based on potential sources, with the following attributed to noise levels:

- | | |
|---------------------------------------|-------------------------|
| • Irregular piling noise (above 70dB) | <i>High to Moderate</i> |
| • Regular piling noise (above 70dB) | <i>Moderate</i> |
| • Irregular noise (50dB - 70dB) | <i>Moderate</i> |
| • Regular noise (50dB - 70dB) | <i>Moderate to Low</i> |
| • Noise below 50dB | <i>Low</i> |

6.137. Disturbance events generated by the noise levels as reported above were observed to lead to the interruption of birds' normal activity patterns and/or short distance displacement from the area of disturbance. The scientific studies suggest any effects are temporary, and in only a small number of cases have disturbance events actually been shown to cause birds to vacate a site permanently.

6.138. Studies on wintering waterbirds in the Waddenzee (Netherlands) showed high noise levels directly associated with military activity (shooting and low flying aircraft) can, in instances, lead to significant disturbance events, particularly in relation to roosting birds.

6.139. Smit and Visser (1993)¹⁰, in a published review of relevant information and studies, cite that, at Vlieland, bombing and rocket shooting from jets (occurring for a large part of the year) generate sound levels of 84 to 100 dB(A) at a 5km distance from the firing range. At roost sites in the area, surveys show the total numbers of ducks, waders, and gulls in the area subject to greater potential disturbance, were reduced from 69,000 prior to shooting activities (Monday to Friday) to 38,000 during the shooting activities.

6.140. It was found that roosting birds continued to respond to these shooting activities, despite the fact such activities had been ongoing for a period of 40 years. In other words, no habituation had occurred. The continued

⁸ Institute of Estuarine and Coastal Studies. Conservation goals for waterfowl in estuaries. Report to HARBASINS. 2008.

⁹ L. Mander and N. Cutts. Ornithological Monitoring, Thorngumbald: Annual Report #2 January to December 2003. Institute of Estuarine & Coastal Studies, University of Hull. 2004

¹⁰ C. J. Smit and G. J. M. Visser. Effects of disturbance on shorebirds a summary of existing knowledge from the Dutch Wadden Sea and Delta area. Wader Study Group Bulletin, 1993, 68, p. 6-19

disturbance effect is attributed to the high noise levels and the use of different ammunition types which generate strong differences in sound levels. However, it is also reported that shooting activity (at Vlieland) has little visible effect on feeding waders. The diversity of feeding shorebirds south of Vlieland was reported as being higher on days without shooting, suggesting some species are less tolerant of the high noise levels. However, prey choice, behaviour, and foraging intake rates of Oystercatcher *Haematopus* and Curlew *Numenius* were comparable on days with and without shooting.

- 6.141. An experimental study of the response of waterbirds to impulsive noise (in that instance, an air horn) by Wright *et al.* 2010¹¹ found a (statistically significant) relationship between the sound pressure level (dB(A)) experienced by the birds and the behavioural response observed. This work indicated disturbance at very low dB(A) levels is highly unlikely to elicit a behavioural response. However, noise levels at above 65.5dB(A) were more likely to illicit a behavioural response. For sudden, unexpected noises in the range of 72 to 81dB(A) flight with abandonment (no return in the short term) is the most likely outcome of such disturbance.
- 6.142. On the basis of the results of the experimental work undertaken by Wright *et al.* it was concluded that if non-response and non-flight response are taken to be relatively harmless, and flight responses (potentially costly to the individual in terms of energy expenditure), then for the waterbird species studied at the site, a 'costly outcome' becomes more likely at noise levels above 70dB(A).
- 6.143. It is noted that remote noise-making equipment was not used in the cited experiment, and it is considered likely the observed increase in severity of behavioural responses to noise levels was, to at least some extent, confounded by visual stimuli. This is due to the fact that in the study the increase in noise levels was associated with a closer approach by the recorder. Thus, the conclusions are very likely to be conservative in relation to the noise levels themselves.
- 6.144. Cutts *et al.* (2013)¹² linked the likely behavioural responses of waterbirds to typical noise levels that can arise during construction works, through the use of literature review and field observations. Disturbance effects were categorised into high, moderate, or low significance (to the birds) and these were linked to a range of noise levels. The following information is given:

- *High noise level effects* - noise disturbance is typified by regular responses to stimuli with birds moving away from the works to areas which are less disturbed (within noise tolerances). Most birds will show a degree of response to noise stimuli. Birds that remain in the affected area may not forage efficiently and if there are additional pressures on the birds (e.g. cold weather, extreme heat etc.) then this may impact upon the survival of individual birds or their ability to breed. For auditory disturbance to qualify as a high level, it must constitute a sudden noise event of

¹¹ M. D. Wright, P. Goodman and T. C. Cameron. Exploring behavioural responses of shorebirds to impulsive noise. *Wildfowl*, 2010, 60, p. 150-167.

¹² N. Cutts, K. Hemingway and J. Spencer. Waterbird disturbance mitigation toolkit. Informing estuarine planning and construction projects. Institute of Estuarine and Coastal Studies for TIDE. 2013.

over 60dB (not at source – at the receptor / bird) or a more prolonged noise of over 72dB.

- *Moderate noise level effects* - moderate noise disturbance is typified as high-level noise which has occurred over long periods so that birds become habituated to it or lower-level noise which causes some disturbance to birds. This encompasses occasional noise events above 55dB, regular noise 60-72dB and long-term regular noise above 72dB, where birds have become habituated. There is cross-over in moderate and high-level noise thresholds although the lower band can be assumed unless the species is particularly sensitive. Those species that are considered particularly sensitive are brent goose, curlew and redshank. Birds that may be more sensitive than average include shelduck & bar-tailed godwit.
 - *Low noise level effects* – low level noise is classed as that which is unlikely to cause response in birds using a fronting intertidal area. As such, noises of less than 55dB at the bird are included in this category. These effects are likely to be masked by background inputs in all but the least disturbed areas and thus would not disturb the birds close by. Noise between 55-72dB in some highly disturbed areas (e.g. industrial or urban areas and adjacent to roads) may feature a low level of disturbance provided the noise level was regular as birds will to often habituate to a constant noise level.
- 6.145. It is suggested through this study that the above categorisations, whilst useful, may be considered relatively simplistic. It is important regard be had to development specific situations. In respect of this, they note (from direct observation) that a single sudden sound will generally cause more disturbance than a constant or regular noise, regardless of noise level.
- 6.146. Habituation to a stimuli will usually entail a reduction in the level of reaction and, as well documented, this applies to both visual and noise related disturbance. Care should be exercised when considering the extent to which birds will habituate to a noise event, since other compounding factors such as visual stimuli (walkers) and low flying aircraft movements may result in a cumulative impact when considered alongside the project (construction) noise event.
- 6.147. In the light of observed responses of waterbirds (primarily, but not limited to, Mallard *Anas platyrhynchos* and Redshank *Tringa totanus*) to various noise stimuli, Cutts *et al.* (2013) set out the “TIDE Toolkit”. This utilises standard distance decay rates for noise. This enables the calculation of the likely disturbance effect for a noise level and distance of receptor from source. This toolkit is presented below:

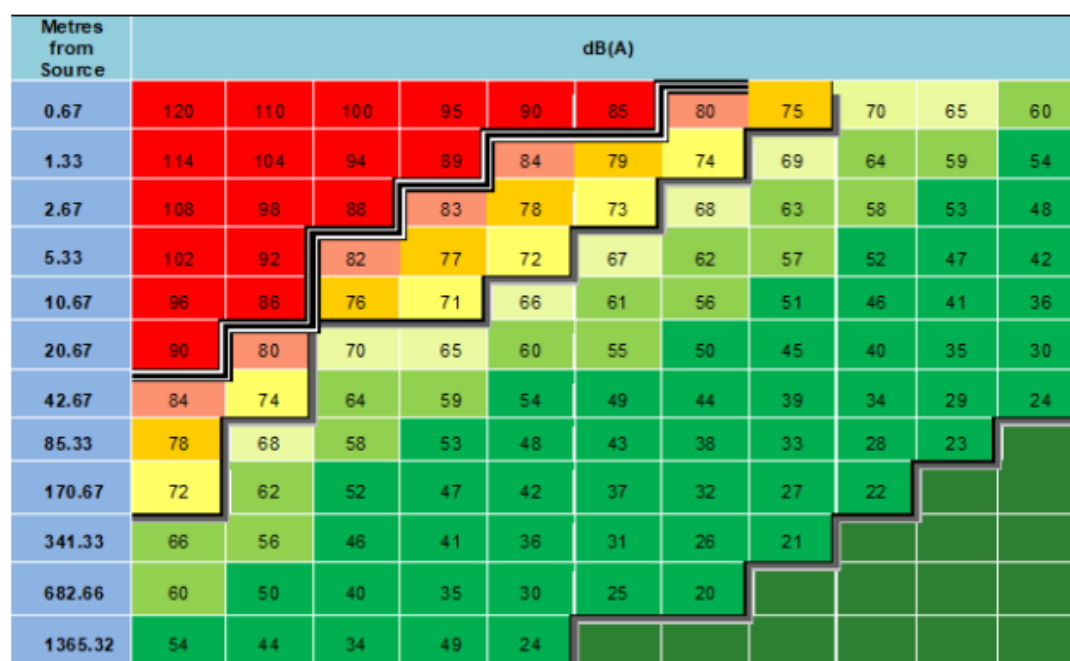


Figure 1: Standard distance decay rates for noise - Cutts *et al.* (2013)

- 6.148. With reference to Figure 1 above; acceptable noise 'dose' levels (i.e. to 70 dB(A)) are shaded green, with dark green unlikely to have any affect at all, whilst for the pale green shading the noise level might occasionally induce a low level behavioural response. This would include a "heads-up" response, where a bird temporarily ceases activity to observe its surroundings for danger. Yellow and orange shading indicate where a response is likely, but mitigation may be effective in reducing the disturbance risk. Coral/pale red indicate where mitigation is necessary and might be of significant value. Dark red indicates where a flight response is almost certain to occur, and this would be increasingly difficult to mitigate against.
- 6.149. In view of advice taken from the TIDE toolkit and elsewhere, it can be seen that where ambient noise levels are high, a masking effect of maximum levels can occur. That is to say, if the overall increase in (relatively steady) noise level from construction activities is relatively high, birds may exhibit less response reactions (become habituated) to the peak level noise events when compared to reactions exhibited when ambient levels are lower.
- 6.150. In light of information presented in the TIDE Toolkit and within Wright *et al.* (2010) and other relevant sources, a 70dB noise level (L_{Amax}) at the receptor is considered appropriate as a precautionary threshold at which the behavioural response of birds may start to become potentially costly in terms of energy expenditure. This is a threshold at which the potential for adverse effects to individual birds may start to arise and, below this level, significant effects would not be expected. Noise levels at a receptor above 75 to 80dB (L_{Amax}) are considered more likely to have an effect that may be of consequence, although, as noted by Cutts *et al.* (2013) habituation to such levels can arise.
- 6.151. Regarding the Proposed Development, the Noise Chapter (Chapter 7) of the ES identifies predicted construction noise levels at various distances from construction related works (see Table 7-11 and 7-12). These tables demonstrate that, even in the absence of mitigation and in a reasonable worst

case scenario (in which all machinery is operational simultaneously and screening is not considered), noise levels would be, at worst, 71dB at a distance of 50m. This drops to below 70dB at a distance of 75m.

6.152. Noting the separation of the vast majority of proposed construction from the SAC/Ramsar, and that any construction related work would be temporary in nature, it is considered highly unlikely the Proposals would give rise to adverse impacts on breeding bird populations within the Crymlyn Bog.

6.153. It is further pertinent to note the construction proposals for the Site will, in any event, adopt sensitive methodologies to minimise potential noise impacts, in accordance with adopted best practice measures. These measures will include the following:

- Switching off plant, equipment and vehicles when they are not in use;
- Selection of quietest plant when available (including the use of broadband “white noise”/directional reversing alarms rather than conventional audible reversing alarms);
- Ensuring all staff and operatives are briefed on the requirement to minimise noise nuisance from Site activities;
- Use of temporary noise screens or partial enclosures around particularly noisy activities, for example during earthworks; and
- Ensuring the plant to be used has been regularly maintained.

6.154. Moreover, and consistent with that previously approved for the consented OPP scheme, the following additional measures are proposed as an additional safeguard

- Where works are proposed in a closer proximity to the receptors, then noise will be further assessed based on BS 5228:2009+A1:2019. A separate assessment will be conducted for each receptor location, before works begin, to assess whether noise monitoring works are required at said receptor.
- Works should not increase the thresholds identified in BS 5228:2009+A1:2019 (either in terms of level or duration). It is proposed a range of suitable trigger levels be secured for construction works, with monitoring undertaken to inform of potential exceedances. Where works exceed the specified threshold, works will be stopped and alternative methodologies considered. Where necessary, proposed noise monitoring and assessment procedures for specific phases of works on Site will be addressed in phase specific EMPs.

6.155. As agreed as part of the previously consented OPP for the Site, it is proposed for the above safeguards to be secured for the Site through the adoption of suitably worded planning Conditions. These Conditions would, amongst other documentation, secure the following in respect of the Proposed Development:

- An over-arching CEMP which will include:
 - Environmental Monitoring Plan (EnvMP)
 - Code of Construction Practice (CoCP)

6.156. Regarding noise in the operational phase, given the type of development, the anticipated separation of built form from the SAC/Ramsar, and that birds

would become habituated to any minor increase in traffic noise, no adverse impacts are anticipated.

- 6.157. In the light of the above, and with reference to the Crymlyn Bog SAC/Ramsar/SSSI, it is concluded the Development Proposals would not be likely to give rise to a significant effect on any qualifying interest feature (or any associated typical species) as a result of noise impacts arising during construction. In this light it is concluded that no specific mitigation would be necessary in respect of the designated sites.
- 6.158. It is noted the adoption of best practice measures would come forward as an intrinsic element of the Proposals, as opposed to targeted mitigation measures.

Summary

- 6.159. Through adoption of appropriate mitigation measures (which form intrinsic elements of the scheme), in respect of potential hydrological impacts, water quality impacts, noise/vibration and dust, potential impacts arising from these pathways can be fully avoided.
- 6.160. It is considered mitigation on a precautionary basis is required in respect of the following potential adverse impacts on the SAC/Ramsar/SSSI:
- Recreational impacts (disturbance, habitat degradation);
 - Introduction invasive non-native species;
- 6.161. Appropriate avoidance and mitigation measures can be secured for the Development Proposals such that potential harm through the above pathways can be avoided. Appropriate measures in this regard are detailed in Section 7 of this iHRA. The securing of these measures would ensure potential impacts on the integrity of the Crymlyn Bog SAC/Ramsar complex would be avoided.
- 6.162. However, given these measures are specifically proposed to avoid impacts on European sites, they constitute a mitigation measure under the Habitat Regulations. As such, the correct procedural approach, as made clear in the *People Over Wind* Judgment, is for this mitigation to be considered at the Appropriate Assessment stage (see Section 7 below).
- 6.163. In the absence of appropriate avoidance and mitigation measures it is considered, on a precautionary basis, that potential adverse impacts on the SAC/Ramsar site/SSSIs could arise through recreational impacts and/or the introduction of invasive, non-native species.

7. APPROPRIATE ASSESSMENT, MITIGATION/AVOIDANCE MEASURES AND IN COMBINATION CONSIDERATIONS

- 7.1. As outlined in Section 6 above, a range of measures are to be adopted to avoid potential impacts on off-site receptors (Crymlyn Bog SAC/Ramsar). These measures include for the delivery and maintenance of extensive SuDS infrastructure, as well as the adoption of a wide range of construction safeguards, as would be secured within documents including a CEMP and a site wide NMP, and would form an integral element of scheme design. It is considered appropriate for these to be considered at the 'screening stage' of Regulation 63, as opposed to needing to be considered as part of an Appropriate Assessment.
- 7.2. Notwithstanding this position, should NPTCBC take an alternative view as to when these measures should be considered, the information provided in Section 6 would provide them with all the relevant information they require, as the competent authority, when undertaking their own Appropriate Assessment of these impact pathways.
- 7.3. Regarding other potential impact pathways, following conclusions reached in the above Assessment Section, mitigation and avoidance measures which are to be brought forward for each relevant effect pathway are described below.

Further Assessment of Air Quality Impacts

- 7.4. As outlined in Section 5 above, the Development Proposals will result in localised increases in road traffic flows along the strategic road network, including along the B4290 which lies in close proximity to Crymlyn Bog SAC. Subsequent air quality assessment work has identified these changes in traffic flows will in turn result in an increase in air pollutants (NO_x, Nitrogen deposition, Ammonia) which exceed the 1% threshold identified for screening purposes.
- 7.5. Further detailed consideration of the Proposals has therefore been undertaken in order to ascertain whether an adverse effect on the integrity of Crymlyn Bog SAC would arise as a result of the Proposed Development.
- 7.6. As above, dispersion modelling in relation to Crymlyn Bog SAC has been undertaken by Atkins. The methodology and results of the assessment work undertaken are presented in the Air Quality Chapter of the ES, extracts of which are included at Appendix 6 of this Assessment. This following Section of this assessment should be read in conjunction with this document.
- 7.7. As detailed at paragraph 6.2.40 of the Air Quality Chapter, levels of construction activity are not expected to exceed screening criteria as set out within 2017 EPUK/IAQM Land-Use Planning and Development Control Guidance. With this in mind, it is concluded the potential for air quality effects to arise during the construction period is *nugatory*.
- 7.8. Regarding operational impacts, and as outlined in the Air Quality Chapter, three scenarios were assessed:

1. Baseline figures as per 2019 (referred to as 'Base');

2. Future assessment of 2026 including traffic growth and committed developments (referred to as 'DM');
 3. Future assessment of 2026 which additionally includes the Proposed Development (referred to as 'DS');
- 7.9. The modelling approach undertaken by Atkins takes into account a number of further precautionary assumptions, such that the assessment represents what may be described as a 'realistic worst-case' scenario. These factors are in addition to precautionary assumptions made with regard to the traffic data used as the 'input' for the air quality modelling work. These further precautionary assumptions are set out at various locations within the Air Quality Chapter of the ES and are summarised below.
- 7.10. As outlined above, the traffic assessment work utilised a future assessment year of 2026, notwithstanding the fact full occupation of the Development is not anticipated to occur until 10 years post construction commencing (i.e. 2033). Similarly, the air quality assessment has assumed full occupation will occur in 2026, which considered in light of improvements over time in air quality at the SAC (see below), represents a significant further precaution.
- 7.11. As noted in the Air Quality Chapter of the ES, background pollutant concentrations are predicted to decrease over time as a result of Government policy and legislation to reduce emissions. This is the case both with and without the Proposed Development when considering NO_x and Total Nitrogen deposition (including NH₃).
- 7.12. As detailed in the Air Quality Chapter, the Emissions Factor Toolkit (EFT) has been adopted for calculating exhaust emissions, with this allowing for a conservative assessment of emissions (noting it does not recognise recent trends for electric vehicle uptake for example). Moreover, NH₃ emissions were also calculated using a precautionary approach, using emission rates taken from the National Atmospheric Emission Inventory (NAEI) for 2019. In all cases a precautionary approach was adopted using the highest emissions rates for each vehicle type. The emission rate for Petrol Light Goods Vehicles (LGVs) was used for LDVs whilst the emission rate for Artic Heavy Goods Vehicles (HGVs) was used for HDVs.
- 7.13. However, it is important to note road traffic exhaust emissions are predicted to decrease yet further over time as a result of changes to the UK fleet, with an increasing proportion of full electric and fuel cell vehicles, and a significant decline in the use of internal combustion engine vehicles. Notwithstanding these factors (which are considered below in more detail), the modelling work undertaken by Atkins has adopted a precautionary stance, and assumed there would not be an improvement in road traffic emissions over time over and above that associated with the EFT model.
- 7.14. With regard to Ammonia (which contributes to overall Nitrogen deposition), it has been assumed there will be no improvement during the period 2019 to 2026. This is considered likely to overestimate total pollution levels, noting Government policies, such as those within the *Clean Air Strategy 2019*, are designed to significantly reduce NO_x and NH₃ emissions.

- 7.15. For instance, with regard to Ammonia, measures aimed at the agricultural sector (which caused 88% of UK NH₃ emissions during 2016, and which source attribution data for Crymlyn Bog SAC identifies as being a factor) are predicted to reduce overall emissions by 8% against a 2005 baseline by 2020, and 23% by 2030.
- 7.16. Taking into account all the above, it is considered the approach utilised for the dispersion modelling work is fully robust (and indeed overly precautionary), such that it gives regard to the precautionary principle and allows robust assessment of the potential for adverse effects to arise on the integrity of Crymlyn Bog SAC.
- 7.17. The detailed results of the modelling are presented in the Air Quality Chapter of the ES, with the key findings of this work discussed below.

NO_x

- 7.18. With regard to baseline NO_x levels, and as outlined in the Table 6.16 of the Air Quality Chapter (and Table 3 above), the Proposed Development would give rise to additional NO_x emissions of up to 1.3 µg/m³ relative to the non-development (DM) scenario. This increase amounts to approximately 4.3% of the Critical Level for NO_x at the SAC. As mentioned above, it is important to note this increase in NO_x will relate to only a very localised proportion of the SAC, with the vast majority of the SAC being located in excess of 200m from affected roads.
- 7.19. Moreover, assessment results indicate total annual mean concentrations of NO_x are estimated to be below 30 µg/m³ (the relevant Critical Level) at the Crymlyn Bog either with or without the Proposed Development in place. For clarity, this is the case at each of the receptor locations tested (ECO1 and ECO2).
- 7.20. Indeed, results demonstrate the predicted concentrations of NO_x show a significant decline in concentrations between the 2019 and 2026 baseline scenarios in each of the tested locations (ECO1 and ECO2). As per Table 3, above, these declines ensure NO_x concentrations reduce from a maximum of 29.02 µg/m³ in 2019, to a maximum of 18.43 µg/m³ by 2026, when accounting for the Proposed Development. In a no development scenario (DM), maximum NO_x concentrations would be a slightly lower 17.16 µg/m³.
- 7.21. In this light, the effect of the Proposals with regard to NO_x, when considered in combination, can be considered to represent a very minor retardation of overall levels of improvement. Taking into account the precautionary approach which has been adopted at all levels within this Assessment, such that in real terms further improvements are likely to occur (as discussed further below), it can therefore be concluded there is no potential for adverse ecological effects to arise upon Crymlyn Bog SAC as a result of NO_x concentrations, either when the Development Proposals are considered alone or in combination.

Ammonia (NH₃)

- 7.22. With regards to Ammonia, the results of the modelling are outlined in Table 6.18 of the Air Quality Chapter (and Table 5 above). These results identify an increase in annual mean NH₃ concentrations both with or without the Proposed Development. In each scenario (i.e. DM or DS), the Critical Level of 1 µg/m³ is exceeded. It is noted the DS scenario gives rise to an increase in NH₃ concentrations of 0.3 µg/m³ (to 1.5 µg/m³) relative to a non-development scenario of 1.3 µg/m³.
- 7.23. However, and as detailed below (see Nitrogen Deposition), even accounting for increases in traffic based NH₃, there will be net overall declines in Nitrogen deposition at the Crymlyn Bog SAC. With this in mind, and noting a wider trend for a reduction in agricultural NH₃ emissions, in addition to trends towards electric fleets (i.e. with zero tailpipe emissions at source), it may therefore be concluded there is no potential for adverse ecological effects to arise upon Crymlyn Bog SAC as a result of Ammonia deposition, either when the Development Proposals are considered alone or in combination.

Nitrogen Deposition

- 7.24. With regard to baseline Nitrogen deposition, as illustrated in Table 6.10 of the Air Quality Chapter (and Table 4 above), the Critical Load is already significantly exceeded at all surveyed locations associated with Crymlyn Bog SAC.
- 7.25. As shown in Table 6.17 of the Air Quality Chapter (and Table 4 above), the Proposed Development will give rise to increases in Nitrogen deposition of up to 0.43N kg/ha/yr. This increase amounts to approximately 8.37% of the Critical Load for Nitrogen deposition at the SAC. As mentioned above, it is important to note this increase in Nitrogen deposition will relate to only a very localised proportion of the SAC, with the vast majority of the SAC being located in excess of 200m from affected roads. Modelling undertaken by Atkins at location ECO2 indicates the 1% threshold is exceeded until approximately 81m from the road source.
- 7.26. Notwithstanding the localised increases, and as above, assessment results identify that even with the Development (DS scenario), there will be net declines in Nitrogen deposition by 2026, with Nitrogen deposition decreasing from a maximum of 21.71N kg/ha/yr in 2019 to a maximum of 20.83N kg/ha/yr in 2026.
- 7.27. In this light, and as for NO_x above, the effect of the proposals when considered in combination, can again be considered to represent a very minor retardation of overall levels of improvement for Nitrogen deposition (including for NH₃).
- 7.28. Noting that nutrient enrichment (either through atmospheric pollutants or otherwise) have not been identified (e.g. within the CMP) as giving rise to harm on the SAC Units within 200m of affected roads, and that a decline in Nitrogen deposition is predicted in 2026, it is axiomatic that there is no potential for adverse ecological effects to arise upon Crymlyn Bog SAC as a result of Nitrogen deposition, when the Development Proposals are considered either alone or in combination.

- 7.29. It is noted this conclusion can be reached even when ongoing improvements in vehicle technology, in addition to tightening emissions standards, are disregarded. As above, it is anticipated there will in fact be further significant reductions in NO_x and Ammonia emissions over time.
- 7.30. Whilst recent developments in technology (such as the use of AdBlue in diesel engines) are anticipated to result in an increase in Ammonia emissions per vehicle, modelling work undertaken by AQC¹³ indicates the forecast reductions in NO_x emissions should more than offset the forecast increase in Ammonia emissions, such that total roadside Nitrogen deposition would continue to fall.
- 7.31. As mentioned above, the modelling exercise undertaken does not take into account changing trends in car ownership which are likely to arise in the next 10 to 20 years. It is evident an increasing proportion of the UK road fleet will comprise vehicles powered by electric motors and fuel cell technology, and a decreasing proportion of vehicles will be powered by internal combustion engines (whether hybrid or otherwise). It is anticipated this will occur to an increasing degree, due to the measures the UK Government are bringing forward to ban the sale of all new internal combustion engine vehicles by 2030, and hybrids by 2035.
- 7.32. Whilst there are inherent uncertainties with regard the rate of uptake of electric and fuel cell cars (given that this will depend on various measures such as market forces, infrastructure and policy/legislation), a number of alternative scenarios have also been assessed by AQC, in order to consider how increasing uptake of these types of vehicles could potentially affect traffic related Nitrogen deposition in the future.
- 7.33. As outlined in Figure 22 of the AQC report (a copy of which is included at Appendix 7 of this Assessment), it is evident increasing ownership of these vehicles will result in a further material reduction in Nitrogen deposition. Whilst some of the more optimistic predictions regarding ownership (for instance, 60% or more battery-electric cars by 2030) are probably reasonably unlikely to occur, even with 20% adoption the projection indicates there will be a significant further reduction in emissions compared to the current trends (which show a reduction in any event). Whilst predictions vary significantly with regards to the likely uptake of these vehicles, forecasts from the National Grid cited in an EMU Analytics report¹⁴ predict that by the early 2020s there will be over 1 million electric vehicles on the road, and there could be 9 million electric vehicles by 2030, which would account for almost 25% of vehicles.
- 7.34. Therefore, in terms of the real world situation, it is reasonable to expect total Nitrogen deposition arising as a result of road traffic emissions will decline more significantly than detailed in the precautionary assessment undertaken to inform this iHRA.
- 7.35. Taking into account the precautionary approach which has been adopted at all levels within this Assessment, that overall reductions in Nitrogen

¹³ AQC (2020). *Ammonia Emissions from Roads for Assessing Impacts on Nitrogen-sensitive Habitats*. Air Quality Consultants.

¹⁴ EMU Analytics (2018). *A Sustainable Future: Preparing for Electric Vehicles*.

deposition are predicted in the DS scenario, and that in real terms further improvements are likely to occur, it can therefore be concluded there is no potential for adverse ecological effects to arise upon Crymlyn Bog SAC as a result of Nitrogen deposition, either when the Development Proposals are considered alone or in combination

Acid Deposition

- 7.36. With regards to acid deposition, noting net declines in NO_x, and indeed total Nitrogen deposition (when also accounting for NH₃), are predicted even with development (the DS scenario) it can be reasonably assumed a downward trend in acid deposition will also occur (noting that NO_x is the major contributor to acid deposition in the UK).
- 7.37. As such, and for reasons identified above in relation to NO_x and Nitrogen deposition, it may therefore be concluded there is no potential for adverse ecological effects to arise upon Crymlyn Bog SAC as a result of acid deposition, either when the Development Proposals are considered alone or in combination.

Summary

- 7.38. As outlined above, the air quality assessment demonstrates that whilst the Proposed Development would give rise to increased emissions of NO_x and Ammonia relative to a no-development scenario, there would nonetheless be an overall reduction in Nitrogen deposition at the Crymlyn Bog SAC by 2026.
- 7.39. As such, the Proposed Development would not impede any downward 'real world' trend of declining emissions between the baseline year and the occupation of the Development. With forthcoming developments in vehicle technology, and the predicted change in the proportion of electric and fuel cell vehicles on the road, further improvement in deposition levels resulting from road traffic will occur beyond that outlined within this Assessment.
- 7.40. On this basis, in light of the detailed Assessment presented above, it is Ecology Solutions' view the Development Proposals are not likely to lead to a significant effect on the integrity of Crymlyn Bog SAC as a result of air quality impacts, either alone or in combination with other plans and projects. It is therefore considered that no avoidance or mitigation measures in this regard would be required.

Recreational Impacts

- 7.41. In the first instance, it is important to note appropriately managed levels of public access to the Crymlyn Bog SAC/Ramsar would not be viewed as harmful. Indeed, a significant component of the Crymlyn Bog is further designated as a NNR, and indeed is actively managed to promote a sustainable and desirable level of recreational use. In this regard, controlled public access to the Crymlyn Bog should be viewed as positive, providing an important educational resource for local residents, and encouraging interest in biodiversity and nature conservation.
- 7.42. Nonetheless, it is acknowledged that unmanaged access to the Crymlyn Bog, either during the construction or operational phases of the Proposed

Development, would have the potential to give rise to those adverse impacts outlined above.

7.43. In order to avoid adverse impacts during the construction phase, and as consistent with the approach adopted for the consented OPP, a series of safeguards will be secured through the proposed CEMP. Amongst other matters, this would include for the following:

- The installation/restoration (as required) of a boundary fence along the full extent of the Site's boundary with the Crymlyn Bog, such that unauthorised access can be avoided;
- The CoCP for the Proposed Development to outline, amongst other matters:
 - the potential for harm to be caused through intrusions into the Crymlyn Bog
 - protocols for the accidental breach or damage to boundary fencing adjacent the SAC/Ramsar
 - training to be provided to on-Site contractors to inform them of the potential dangers and necessary safeguards
 - associated potential harm pathways (such as through littering or pollutants); and
- The appointment of an Ecological Liaison Officer during the construction process whose role will include:
 - providing advice to construction personnel
 - providing ecological supervision of relevant works
 - ensuring appropriate construction practices and safeguards are adhered to
 - undertaking/directing Site inspections and advising on remedial actions.
 - This role will be further detailed within the CEMP, as would be secured by planning Condition.

7.44. Relative to recreational impacts during the construction phase (which are of particularly low risk), the operational phase of the Proposed Development has greater potential to contribute to unmanaged/unauthorised recreational pressure upon the Crymlyn Bog. Again, whilst the likelihood of harmful incursions arising are greatly tempered by the natural inaccessibility of much of the SAC/Ramsar site, additional mitigation measures are to be secured to ensure such impacts can be avoided.

7.45. As above, the Development Proposals will include for the erection/repair of a 2.8m high, chain link boundary fence along the full extent of the Site's western boundary, preventing informal access to the SAC/Ramsar site. This boundary fencing will be retained for the lifetime of the development (with appropriate monitoring and repair secured within a LEMP for the Site). As well as preventing recreational access, this fence (and additional landscape planting – see below), will function as a wind break, preventing litter from blowing into the SAC/Ramsar.

7.46. Moreover, as detailed for other impact pathways above, the Proposals will include for the provision of a Welcome Pack for future residents, as well as the inclusion of appropriate signage and interpretation within the Site. These measures will serve to provide an educational resource which will minimise harmful behaviour or activities (for example unauthorised access to the

Crymlyn Bog SAC/Ramsar, or through littering). The appointed management body would also play a proactive role in engaging new residents/users of the Site, promoting their interest in nature conservation, and educating them as to potential impacts upon the environment.

- 7.47. Consideration has also been given to minimising recreational impacts through masterplan design. In this regard, the Green Infrastructure proposals for the Site seek to deliver an extensive landscape buffer along the entire western boundary of the Site. This layout design ensures new development (including roads) will be well separated from the SAC/Ramsar, minimising the likelihood of fly-tipping or littering, as well as the spread of potentially invasive non-native species and garden escapes. Moreover, the detailed design of the landscape buffer will further bolster boundary fencing, discouraging indiscriminate access to the SAC/Ramsar.
- 7.48. Long-term management and monitoring of the Site will also be undertaken, commencing prior to construction, and extending for the lifetime of the development. Management and monitoring will be undertaken/directed by the appointed management body, alongside the appointed Ecological Liaison Officer for the Site. Their remit will include for regular Site inspections, alongside the instigation and coordination of appropriate management of remedial actions as may be required to address identified harm. It is proposed the role and remit of the Ecological Liaison Officer, and the adopted management body, will be further detailed within a EMP and LEMP as are proposed to be secured for the Site by planning Condition.
- 7.49. With regard to potential fire risk, it should be noted, given the nature of the habitats and the high water table within the Crymlyn Bog SAC/Ramsar, the potential for harm to arise through this pathway is inherently low.
- 7.50. Notwithstanding this assessment, precautionary safeguards and contingency measures will be secured within the CEMP, such that potential impacts can be avoided during the construction phase. In this regard, it is noted a suite of measures were previously secured within the Crymlyn Bog EAP, with this including identification of appropriate measures to extinguish fires, prevent their spread, and avoid/minimise the risk of contaminant entering the Crymlyn Bog SAC/Ramsar. It is proposed for equivalent safeguards to be secured for the Site within a revised EAP.
- 7.51. Post-development the risk of harm through fires is considered to be particularly low, not least given the presence of security fencing which will prevent direct public access to the Crymlyn Bog SAC/Ramsar. Nonetheless, and as a further safeguard, interpretation boards will be provided within the Site, which will include for ecological and environmental information as well as emergency contact numbers in the event of someone seeing fly tipping, a person or an animal in difficulty, or fire in on or adjacent to the Crymlyn Bog.
- 7.52. It is considered the adoption of the above measures will eliminate the unauthorised or unmanaged recreational use of the Crymlyn Bog SAC/Ramsar, as well as prevent harm arising through associated pathways such as littering, fly tipping, or fires. This conclusion is reached with regards to both the construction and operational phases of the Proposed Development.

- 7.53. Moreover, it is noted the Proposed Development seeks to deliver extensive new accessible Green Infrastructure and accessible open space within the Site. The design and extent of this open space will include extensive formal and informal open space, including longer circular walks. The provision of extensive high quality open space, the detailed design of which will further be secured within a LEMP, would provide high quality recreational opportunities on the doorstep for new residents, as well as for existing residents. It is considered these opportunities will more than off-set any increase in recreational pressure within formally accessible areas of the Crymlyn Bog SAC/Ramsar site (i.e. ensuring potential impacts are nugatory).

Introduction of Invasive Non-Native Species

- 7.54. The control and management of invasive and non-native species will form an essential mitigation requirement for the Site, with detailed prescriptions to be provided within an EnvMP for the Site (as is proposed to be secured by planning Condition). Comparable to that secured for the previous OPP, this EnvMP would require the submission of a suitable treatment and removal strategy to be implemented for any identified invasive species, not least Japanese Knotweed. Appropriate treatment works would be implemented prior to any construction related activities commencing in infected areas, with subsequent construction works only commencing following confirmation the plant has been eradicated. The adoption of these measures would be sufficient to ensure the Proposed Development would have no adverse impact upon the Crymlyn Bog SAC/Ramsar during the construction phase.
- 7.55. The adoption of long-term habitat monitoring and management of the Site during the operational phase will equally serve to prevent the establishment and spread of invasive and non-native species. Management in this regard is proposed to be detailed within a LEMP, with this secured by a suitably worded planning Condition. This management, which would include for regular monitoring for invasive and non-native species (with remedial measures where required), would be secured for the lifetime of the Proposed Development, and would be undertaken by the adopted management body.
- 7.56. As a further safeguard, and as detailed elsewhere, it is proposed for a Welcome Pack to be provided to all new residents, alongside the provision of information boards and signage within the Site. These resources will provide specific information on the risks associated with non-native and invasive species, including the identification of the most common and harmful species such that new residents are more able to recognise and report their presence.
- 7.57. Subject to the adoption of the above measures, it is considered the Proposed Development would not give rise to potential harm as a result of invasive or non-native species. At worst, potential impacts would be nugatory.

Summary Conclusions in Relation to Mitigation

- 7.58. In summary, no potential impacts have been identified to arise as a result of land take or accidental damage, artificial lighting or impacts to supporting habitat. Resultantly, no mitigation is required in respect of these pathways.

- 7.59. Regarding air quality impacts, any increases in traffic based emissions arising from the Proposed Development will be more than outweighed through overall reductions in Nitrogen deposition, even when adopting a highly precautionary approach to assessment. It may therefore be safely and robustly concluded that the Development Proposals are not likely to lead to a significant effect on Crymlyn Bog SAC/Ramsar via air quality effects when the proposals are considered alone.
- 7.60. In regards hydrological impacts (quantity and quality), a series of intrinsic mitigation measures, including the adoption of a suitably designed drainage strategy, will be secured, ensuring potential adverse impacts are avoided. Equally, intrinsic measures in regards dust and noise will avoid the potential for adverse impacts to arise through these pathways.
- 7.61. The potential for adverse impacts to arise through recreational impacts, as well as through the introduction of invasive non-native species has been identified. Resultantly, a package of appropriate avoidance and mitigation measures have been identified such that potential impacts can be avoided. These measures are considered to fully mitigate any potential implications for relevant European/International designated sites, and also SSSIs.
- 7.62. In all instances, the mitigation and avoidance measures proposed can be secured by planning Condition or through a Section 106 planning obligation, in order to give further comfort to the competent authority. Indeed, it is noted that a comparable approach to site safeguard was accepted in respect of the previously consented OPP for the Site.

Consideration of In-combination effects

- 7.63. Ecology Solutions considers the potential effects identified in relation to the Development Proposals will be avoided or mitigated through the implementation of the measures set out in this iHRA, such that there would be no significant residual adverse effects on the Crymlyn Bog SAC/Ramsar, their underpinning SSSIs, or indeed any other European designated sites when the plan/project is considered alone. For clarity, the Development Proposals, when considered alone, would not adversely impact the integrity of any European sites.
- 7.64. In light of the above, as made clear by Lord Justice Sales in the *Exminster* Judgment, in combination effects would therefore not be possible.
- 7.65. Since Development Proposals are scrutinised so carefully by competent authorities and the relevant statutory authorities, in light of the Habitats Regulations, recent case law and guidance, it is not likely another plan/project would come forward without sufficient mitigation or avoidance measures to offset any perceived deleterious effects on a European designated site.
- 7.66. Plans/projects which come forward in the local area do so through agreement with NRW and/or the LPA (or in some cases the Planning Inspectorate), on a package of measures designed to avoid adverse effects on relevant European designated sites, such that a lawful consent can be granted.

- 7.67. On the basis that all relevant development proposals will provide appropriate mitigation/avoidance measures, where necessary, it is therefore concluded there would not be any potential significant in-combination effects on any European sites.

Summary Conclusion of Appropriate Assessment

- 7.68. Having undertaken an Appropriate Assessment considering all of the potential significant effects which could arise from the Development Proposals, in light of the package of avoidance and mitigation measures proposed, Ecology Solutions conclude the proposals would not be likely to give rise to a significant effect on the integrity of the Crymlyn Bog SAC/Ramsar (nor any other European site), when the proposed scheme is considered either alone or in combination with other plans or projects. No additional adverse impacts have been identified in relation to the underpinning SSSIs and no additional mitigation would be required.

8. CONCLUSIONS

- 8.1. Ecology Solutions has undertaken a detailed assessment of the implications of the Development Proposals on the Crymlyn Bog SAC/Ramsar in view of the European sites' Conservation Objectives.
- 8.2. The findings of this work are set out within this information to enable a Habitats Regulations Assessment document, such that the competent authority, in exercising its duties under the Habitats Regulations, has all the necessary information before it to consider the Development Proposals against the strict tests set out in the legislation.
- 8.3. Assessment under Regulation 63 of the Habitats Regulations is required in this instance, since the Site lies in close proximity to the Crymlyn Bog SAC/Ramsar. Consideration has also been given to any additional impacts which could arise in relation to the SSSIs which underpin these European sites, wherever relevant.
- 8.4. All relevant potential pathways for significant effects to arise on the European designated site as a result of the Development Proposals have been fully examined, initially in the absence of avoidance/mitigation measures (at the 'likely significant effect' stage) and subsequently taking into account the avoidance measures proposed (at the 'Appropriate Assessment' stage). This assessment has been undertaken with due regard to relevant legislation, case law and planning decisions, guidance, and information, such as that provided by JNCC and NRW.
- 8.5. Appropriate avoidance and mitigation measures have been identified where appropriate as part of the Development Proposals. These measures give due regard to the previous assessment work, site remediation and monitoring undertaken at the Site and, indeed, seek to retain the avoidance and mitigation safeguards previously identified, where these remain of relevance.
- 8.6. Having considered all the potential significant effects that could arise from the Development Proposals, in light of the avoidance and mitigation measures proposed, Ecology Solutions conclude the proposals would not result in any adverse effects on the integrity of the Crymlyn Bog SAC/Ramsar (in view of the site's Conservation Objectives), when the Development Proposal is considered alone or in combination with other plans or projects.
- 8.7. As such, the Development Proposals would, by definition, be acceptable subject to securing the avoidance measure proposed. In those terms the competent authority could legally and safely grant an approval under the Habitats Regulations 2017 for the proposed plan/project.
- 8.8. As the project alone or in combination would not give rise to adverse impacts on the integrity of the SAC/Ramsar site (in view of the Conservation Objectives), or adverse impacts on the constituent SSSIs, the Development Proposals would by definition be acceptable, subject to securing the avoidance measure proposed. In those terms the competent authority could legally and safely grant consent for the proposed plan/project.

PLANS & APPENDICES

PLANS

PLAN ECO1

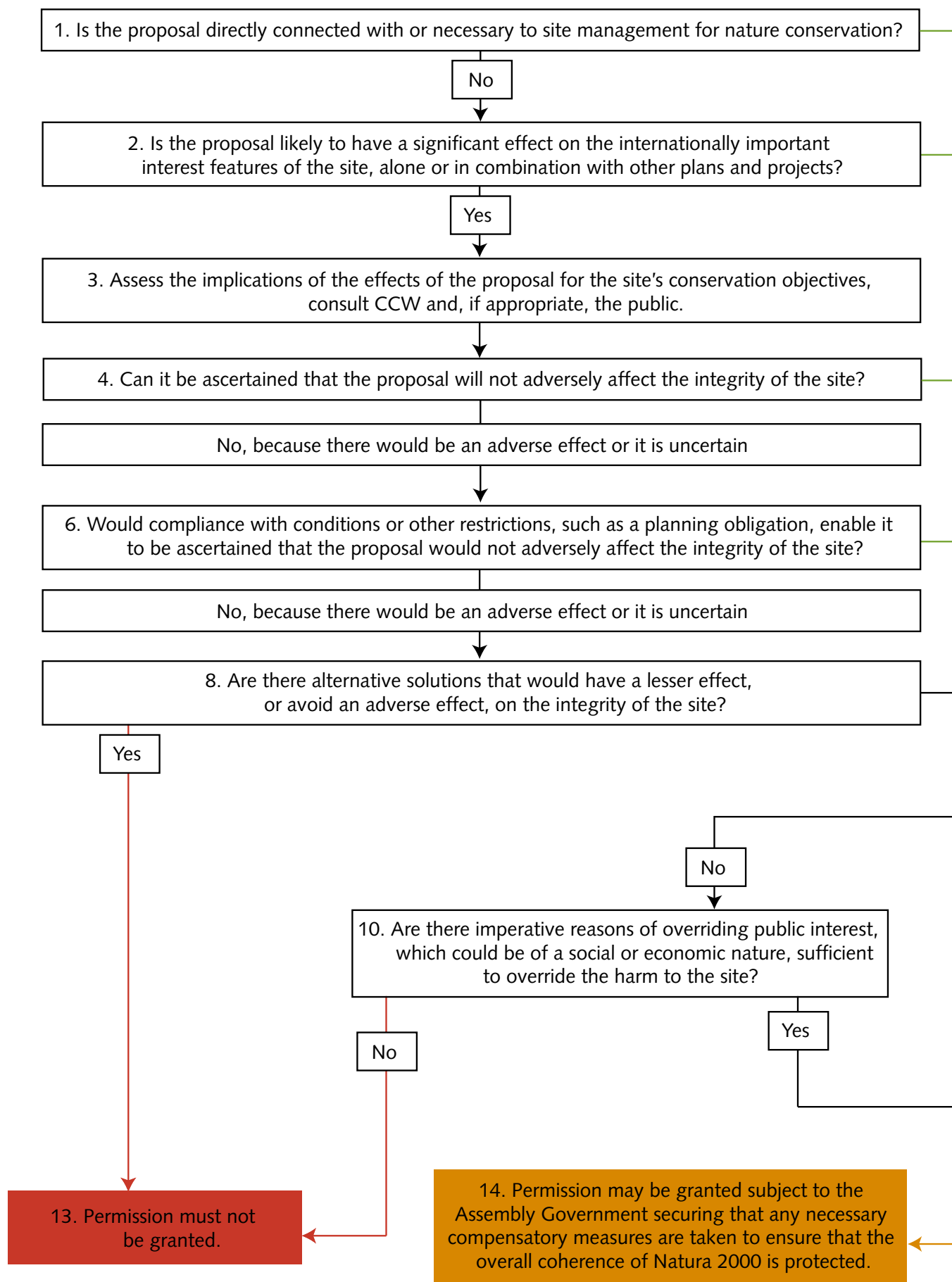
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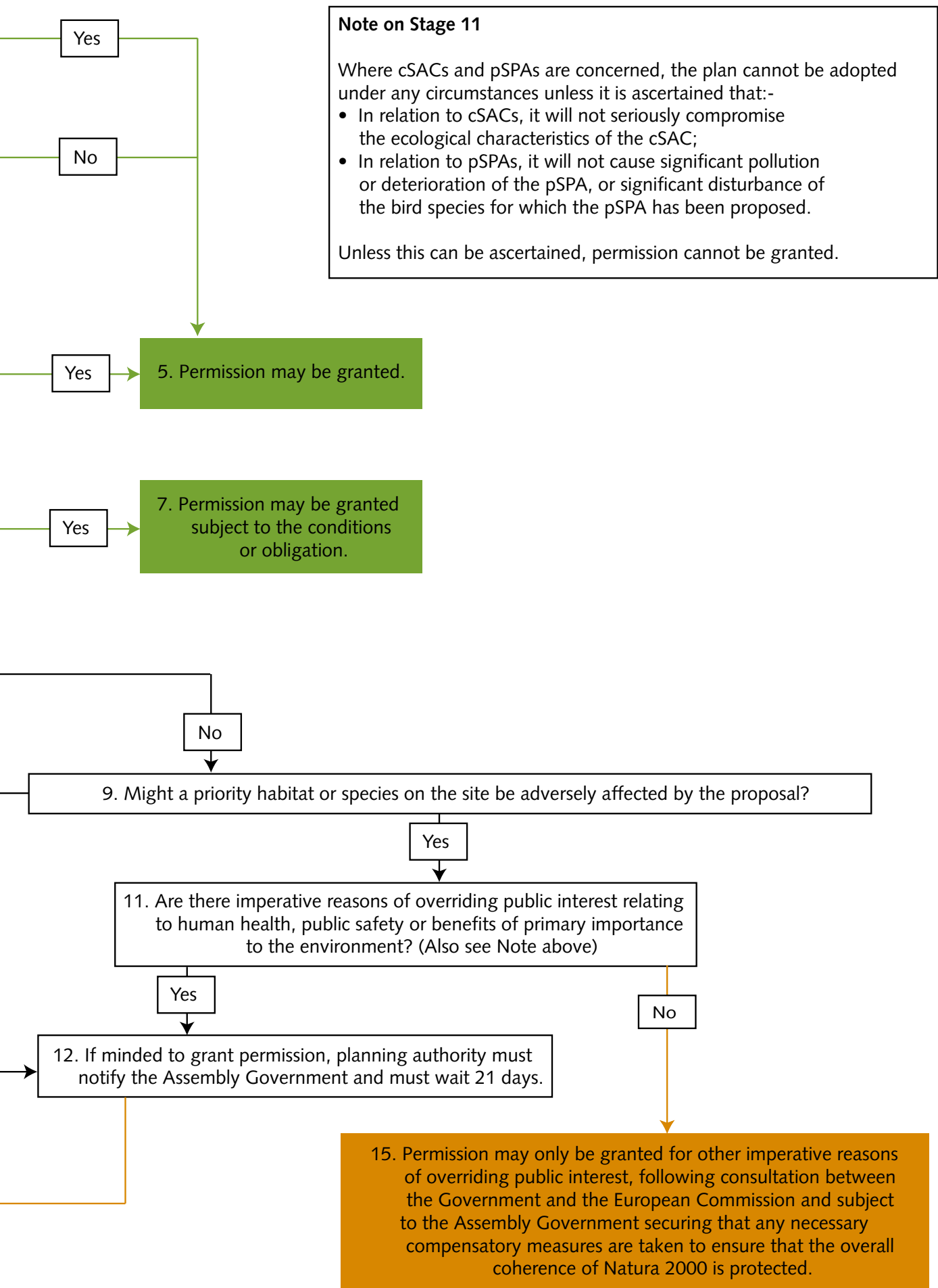
In Relation to Relevant Designated Sites

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CONSIDERATION OF DEVELOPMENT PROPOSALS AFFECTING INTERNATIONALLY





APPENDIX 2

Core Management Plan
(Conservation Objectives),
and Natura 2000 Data Form
For Crymlyn Bog SAC

CORE MANAGEMENT PLAN INCLUDING CONSERVATION OBJECTIVES

FOR

CRYMLYN BOG / CORS CRYMLYN SPECIAL AREA OF CONSERVATION (SAC)/CRYMLYN BOG RAMSAR SITE

Version	Date	Summary of changes made	Approved by
Version 6	25 April 2014	Updated to the new format. Conservation Objectives rewritten and monitoring results updated.	Mary Youell
Version 5	29 September 2010		Charlotte Gjerlov
Version 4	9 April 2008		Tracey Lovering

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PREFACE

This document provides the main elements of Natural Resources Wales' management plan for the site(s) named. It sets out what needs to be achieved on the site(s), and advice on the action required. This document is made available through Natural Resources Wales' web site and may be revised in response to changing circumstances or new information. This is a technical document that supplements summary information on the Natural Resources Wales' web site.

One of the key functions of this document is to provide Natural Resources Wales' statement of the Conservation Objectives for the relevant Natura 2000 site(s). This is required to implement the Conservation of Habitats and Species Regulations 2010, as amended. As a matter of Welsh Government Policy, the provisions of those regulations are also to be applied to Ramsar sites in Wales.

1. VISION FOR THE SITE

This is a descriptive overview of what needs to be achieved for conservation on the site. It brings together and summarises the Conservation Objectives (part 4) into a single, integrated statement about the site.

Lowland fen will be the predominant habitat at Crymlyn Bog SAC, covering approximately 80% of Crymlyn Bog itself and about 75% of Pant y Sais fen.

A range of fen communities will be represented, including the SAC Annex I habitat types 'calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*' and 'transition mires and quaking bogs'; at least 56 ha of the former habitat and 21 ha of the latter type will be present across the SAC.

Effective habitat management will be carried out to maintain the lowland fen vegetation (including its component SAC habitats) in favourable condition. This conservation management will be based on techniques such as grazing and vegetation cutting, as requirements dictate. Targeted scrub control will also be undertaken to prevent scrub development in important habitat areas. Wider protection measures will safeguard water levels, water quality and atmospheric pollution impacts at the site; this will include measures to minimise impacts from known surrounding sources including Tir John landfill site, the former Llandarcy oil refinery site (now being redeveloped as Coed Darcy urban village) and watercourses such as Crymlyn Brook.

Wet woodland will occupy approximately 10% of Crymlyn Bog, including the SAC Annex I habitat 'alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*'. This woodland will continue to develop a natural wet woodland species composition and structure, through natural dynamic processes. A strong population of marsh fern *Thelypteris palustris* will also be present.

The fen vegetation at Crymlyn Bog SAC will support a suite of uncommon plant species, including a large and sustainable population of slender cotton-grass *Eriophorum gracile*.

The range of fen and associated open water habitats will also support a suite of uncommon invertebrates. In particular a viable population of the rare fen raft spider *Dolomedes plantarius* will occupy the various canal and open water habitats at the site. A viable population of the hornet robberfly *Asilus crabroniformis* will also occur in the drier pastures on the western periphery of Crymlyn Bog.

The purpose of the designation of Natura 2000 sites is to help secure the maintenance or restoration of habitats and species to favourable conservation status *for the foreseeable future*. Given that we foresee a changing climate, despite the uncertainty of the nature, degree and timing of those changes, we must address the need to ensure the resilience of each

site to that changing environment. This will be achieved in the first instance by ensuring favourable condition of the important features, since a healthy feature is likely to be more resilient to the effects of climate change than one which is already stressed. Secondly, consideration must be given to those structures, functions and processes which maintain or boost the resilience of ecosystems to climate stress, including the avoidance, reduction or mitigation of other stress factors such as invasive species, nutrient enrichment, habitat and population fragmentation.

This site forms part of a wider network, and is ecologically connected with its surroundings and with other designated sites in the region. Although the focus of this document is on the individual site, the conservation objectives and management requirements need to be considered in the wider context. A connected network of sites is more robust than sites in isolation, and more resilient to pressures such as climate change.

2. SITE DESCRIPTION

2.1 Area and Designations Covered by this Plan

Grid reference: SS694947

Unitary authorities:

- Abertawe / Swansea
- Castell-Nedd a Porth Talbot / Neath and Port Talbot

Area (hectares): 299.45Ha

Designations covered: Crymlyn Bog / Cors Crymlyn Special Area of Conservation (SAC) comprises two component Sites of Special Scientific Interest (SSSI):

Cors Crymlyn / Crymlyn Bog SSSI;
Pant-y-Sais SSSI.

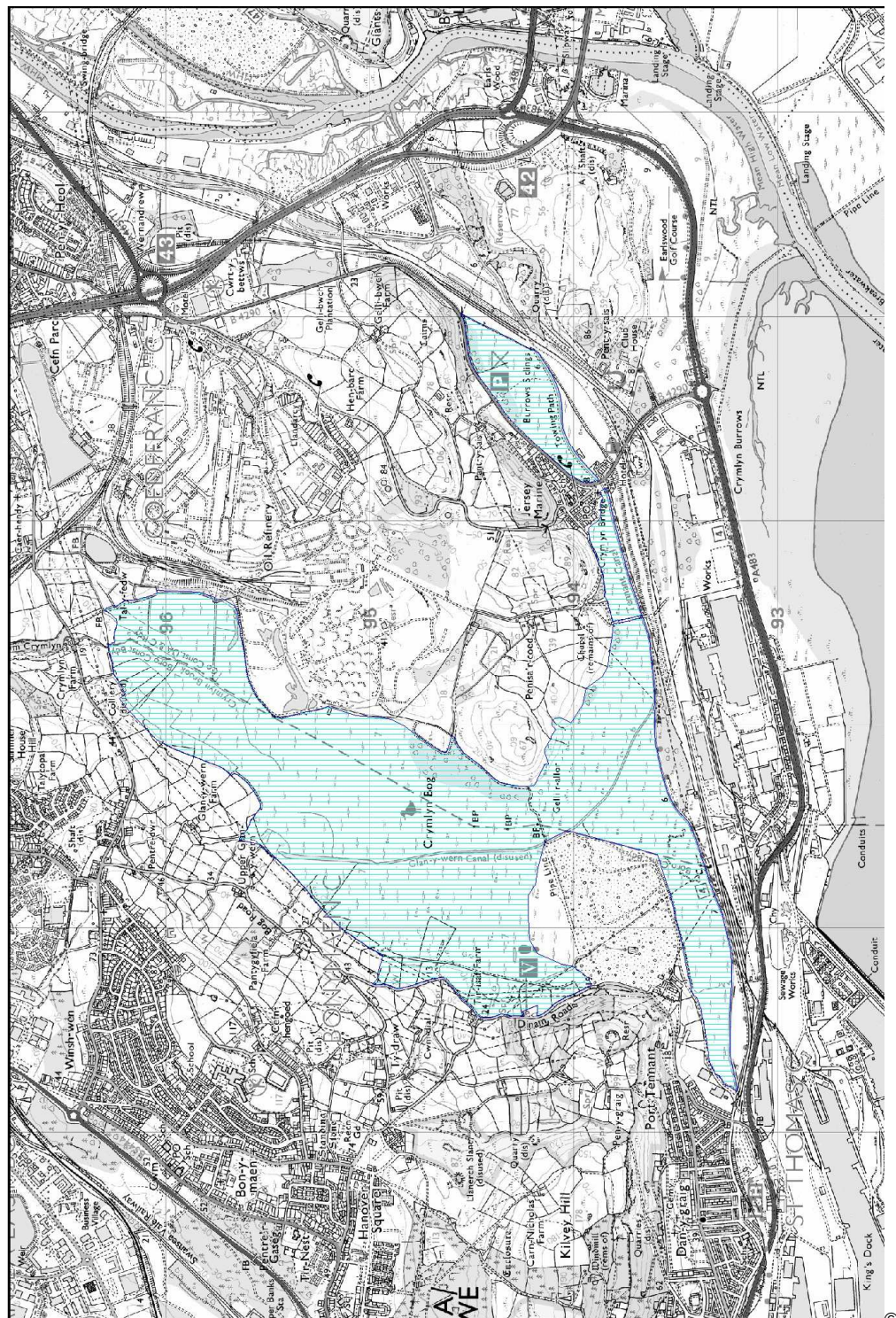
Apart from approximately 35 hectares of land at the northern end of Crymlyn Bog, the majority of the SAC (including Pant-y-Sais SSSI) is also designated a Ramsar site.

Approximately one-third of Crymlyn Bog, and all of Pant-y-Sais (excluding the adjoining Tennant Canal), is declared as a National Nature Reserve (NNR). Pant-y-Sais is also a Local Nature Reserve (LNR).

Detailed maps of the designated sites are available on the Natural Resources Wales web site.

A summary map showing the coverage of this document is shown below:

Crymlyn Bog/Cors Crymlyn SAC



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2.2 Outline Description

Crymlyn Bog is a large lowland fen situated in a glacial depression on the eastern edge of Swansea. In addition to Crymlyn Bog itself, the SAC also includes Pant-y-Sais fen, a smaller (approximately 20 ha) wetland located about 1 km east of the main site.

The predominant habitat at Crymlyn Bog and Pant-y-Sais is lowland topogenous fen, which comprises a diverse range of mire, tall-herb fen and swamp communities. Of particular interest are the stands of the SAC Annex I habitat types 'Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*' and 'Transition mires and quaking bogs'.

Also of interest are the stands of wet woodland at Crymlyn Bog, including the Annex I habitat 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*' (*Alno-Padion*, *Alnion incanae*, *Salicion albae*).

In addition the SAC supports a suite of uncommon plant species, including a large population of the nationally rare slender cotton-grass *Eriophorum gracile*; marsh fern *Thelypteris palustris* also occurs within the alluvial woodland.

The site is also of importance for its invertebrate fauna. Of particular note is the population of the fen raft spider *Dolomedes plantarius*, which is known from just two other sites in the UK. The hornet robberfly *Asilus crabroniformis* also occurs in some of the drier pastures on the western flank of Crymlyn Bog.

2.3 Outline of Past and Current Management

The main current management practices at Crymlyn Bog SAC are grazing and scrub control.

At Crymlyn Bog, a fairly extensive area of grazing has been established within the western, NRW-managed NNR block, using Welsh Mountain ponies. Other peripheral parts of the bog are also grazed by neighbouring farmers' livestock, including some of the eastern section next to Penisa'r-coed Farm (cattle grazed). Much of the rest of the bog is very wet and inaccessible, making grazing of these areas difficult, both for NRW and adjoining landowners.

No grazing takes place at Pant-y-Sais. There are no stock-proof boundaries here and the site does not lend itself to livestock management at present.

An annual programme of scrub control has been carried out since at least 1995, covering both Crymlyn Bog and Pant-y-Sais.

Open water restoration work has also been carried out in recent years, to benefit fen raft spider and other open water-dependent species.

The Tennant Canal, which forms the southern boundary of Crymlyn Bog and the south-eastern boundary of Pant-y-Sais, has been maintained as an open water channel by the canal owners. The Glan y Wern Canal, an arm of the Tennant Canal that runs through the centre of Crymlyn Bog, has received little management in recent times but still persists as an open water conduit along much of its length.

In terms of past management, it is presumed that grazing is a long-established practice at Crymlyn Bog, especially around the periphery of the bog. A local farmer has reported that grazing was formerly more extensive on the western side of the bog, using a mix of cattle and horses. However, anecdotal evidence suggests that the site has become wetter in recent times, making extensive grazing of the site less straightforward than before. Historical maps show a network of drainage ditches across the bog, which would have enabled at least parts of the site to be grazed more effectively than now.

The wetter nature of the site in recent decades is likely to be genuine, resulting from high water levels in the Glan y Wern and Tennant Canals. Regular over-topping of these canals is believed to influence the distribution of the Annex I habitats.

Scrub control may also have been carried out in the past. However, local people claim that the site was previously burned on a regular basis, as a means of controlling scrub development, preventing build up of litter and reducing rank vegetation.

2.4 Management Units

The area covered by this plan has been divided into management units to enable practical communication about features, objectives, and management. This will also allow us to differentiate between the different designations where necessary. In this plan the management units have been based mainly on tenure, but also with reference to features and land management requirements.

Maps showing the management units referred to in this plan are on this site's web page.

The following table confirms the relationships between the management units and the designations covered:

Unit reference	Unique unit number	SAC	Ramsar	SSSI	NNR	Natural Resources Wales owned/managed
Crymlyn Bog SSSI						
1	000901	✓	✓	✓		
2	000904	✓	✓	✓		
3	000906	✓	✓	✓		
4	000907	✓	✓	✓	✓	✓
5	000908	✓	✓	✓	✓	✓
6a	000909	✓		✓	✓	✓
6b	002511	✓	✓	✓	✓	✓
7	000911	✓		✓		
8	000914	✓	✓	✓	✓	✓
9	000915	✓	✓	✓	✓	✓
10	000916	✓	✓	✓		
11	000920	✓	✓	✓		
12	000922	✓		✓		
13	000923	✓	✓	✓		
Pant-y-Sais SSSI						

14	000927	✓	✓	✓		
15	000928	✓	✓	✓	✓	✓

2.5 Position within an ecological network

Crymlyn Bog is the most extensive area of lowland fen in south Wales. In terms of its important SAC habitats, calcareous fen is highly restricted in the UK, with its two main centres of distribution being the Broadlands of East Anglia and the fen systems of Anglesey. Apart from Crymlyn Bog, there are no other known examples in south Wales, although it should be noted the Crymlyn stands are a rather poorly characterised form of calcareous fen and lack any strongly calcicolous species of the *Caricion davallianae*. Transition mires and quaking bogs are more widespread in the UK, but this habitat is still scarce in a south Wales context. Wet woodlands are relatively common, although true alluvial forests in a flood plain setting are more fragmentary.

3. THE FEATURES

3.1 Confirmation of Features

Designated feature		Relationships, nomenclature etc	Conservation Objective in part 4
SAC features			
Annex I habitats that are a primary reason for selection of this site			
1. Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> (EU habitat code 7210)	Part of topogenous fen Ramsar feature and SSSI feature		1
2. <i>Transition mires and quaking bogs</i> (EU habitat code 7140)	Part of topogenous fen Ramsar feature and SSSI feature		2
Annex I habitats present as a qualifying feature, but not a primary reason for site selection			
3. <i>Alluvial forests with Alnus glutinosa and Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) (EU habitat code 91E0)	Part of wet woodland SSSI feature		3
SPA features			
Not applicable			
Ramsar features (provisional)			
<i>Note: The Ramsar features for Crymlyn Bog SAC are open to interpretation at present. They will be subject to a 'quality control' exercise in the future, to confirm the qualifying features. Hence the following list of Ramsar features is only provisional at present. Conservation objectives for the Ramsar features will be developed once the confirmed list of features has been agreed.</i>			
4. Topogenous fen	Equates to topogenous fen SSSI feature. Includes above two SAC fen features (Features 1 and 2)		To be developed, with reference to 1 and 2 above
5. Slender cotton-grass	Equates to slender cotton-grass SSSI feature		To be developed
6. Peatland invertebrate assemblage	Equates to invertebrate assemblage SSSI feature		To be developed
7. Plant species			To be developed

assemblage		
SSSI features		
8. Topogenous fen	Equates to topogenous fen Ramsar feature. Includes above two SAC fen features (Features 1 and 2)	To be developed, with reference to 1 and 2 above
9. Wet woodland	Includes above alluvial woodland SAC feature (Feature 3)	To be developed, with reference to 3 above
10. Slender cotton-grass	Equates to slender cotton-grass Ramsar feature	To be developed
11. Marsh fern		To be developed
12. Fen raft spider		Has been developed
13. Hornet robberfly		Has been developed
14. The weevil <i>Tapeinotus sellatus</i>		Has been developed
15. Peatland invertebrate assemblage	Equates to invertebrate assemblage Ramsar feature	To be developed

3.2 Features and Management Units

This section sets out the relationship between the designated features and each management unit. This is intended to provide a clear statement about what each unit should be managed for, taking into account the varied needs of the different special features. All features are allocated to one of seven classes in each management unit. These classes are:

Key Features

KH - a 'Key Habitat' in the management unit, i.e. the habitat that is the main driver of management and focus of monitoring effort, perhaps because of the dependence of a key species (see KS below). There will usually only be one Key Habitat in a unit but there can be more, especially with large units.

KS – a 'Key Species' in the management unit, often driving both the selection and management of a Key Habitat.

Geo – an earth science feature that is the main driver of management and focus of monitoring effort in a unit.

Other Features

Sym - habitats, species and earth science features that are of importance in a unit but are not the main drivers of management or focus of monitoring. These features will benefit from management for the key feature(s) identified in the unit. These may be classed as 'Sym' (sympathetic) features because:

(a) They are present in the unit but may be of less conservation importance than the key feature; and/or

- (b) they are present in the unit but in small areas/numbers, with the bulk of the feature in other units of the site; and/or
- (c) their requirements are broader than and compatible with the management needs of the key feature(s), e.g. a mobile species that uses large parts of the site and surrounding areas: and/or
- (d) key features (KH, KS) are closely associated with these features, and the conservation of key features depends on them being managed appropriately.

Nm - an infrequently used category where features are at risk of decline within a unit as a result of meeting the management needs of the key feature(s), i.e. under Negative Management. These cases will usually be compensated for by management elsewhere in the plan, and can be used where minor occurrences of a feature would otherwise lead to apparent conflict with another key feature in a unit.

Mn - Management units that are essential for the management of features elsewhere on a site e.g. livestock over-wintering area included within designation boundaries, buffer zones around water bodies, etc.

x – Features not known to be present in the management unit.

The table below sets out the relationship between the features and management units identified in this plan:

Crymlyn Bog SSSI		Management units												
Unique unit number	901	904	906	907	908	909	2511	911	914	915	916	920	922	923
Unit reference	1	2	3	4	5	6a	6b	7	8	9	10	11	12	13
Unit name	Tennant Canal – managed section	Tennant Canal – unmanaged section	Glan y Wern Canal	CCW wet woodland	CCW fen	CCW grassland A (non-Ramsar)	CCW grassland B	BP A (Non-Ramsar)	BP B	BP C	Tennant Canal Company	Crymlyn Farm A	Crymlyn Farm B (non-Ramsar)	Glan y Wern Farm
SAC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ramsar	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓		✓
SSSI	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NNR/Natural Resources Wales managed				✓	✓	✓	✓		✓	✓				
SAC features														
1. Calcareous fen	x	x	x	x	KH	x	x	KH	KH	KH	KH	KH	x	x
2. Transition mire	x	x	x	x	KH	x	x	KH	KH	x	KH	KH	KH	KH
3. Alluvial forest	x	x	x	KH	Sym	x	x	x	KH	KH	x	x	x	x
Ramsar features (provisional)														
4. Topogenous fen	x	x	x	x	KH	x	Sym	KH	KH	KH	KH	KH	KH	KH
5. Slender cotton-grass	x	x	x	x	x	x	x	Sym	x	x	Sym	Sym	x	Sym
6. Invertebrate assemblage	Sym	Sym	Sym	x	Sym	x	x	Sym	Sym	Sym	Sym	Sym	Sym	Sym
7. Plant species assemblage	x	x	x	x	Sym	x	x	Sym	Sym	Sym	Sym	Sym	Sym	Sym
SSSI features (provisional)														
8. Topogenous fen	x	x	x	x	KH	x	Sym	KH	KH	KH	KH	KH	KH	KH
9. Wet woodland	x	x	x	KH	Sym	x	x	x	KH	KH	Sym	x	Sym	x
10. Slender cotton-grass	x	x	x	x	x	x	x	Sym	x	x	Sym	Sym	x	Sym
11. Marsh fern	x	x	x	KS	x	x	x	x	x	x	x	x	x	x
12. Fen raft spider	KS	KS	KS	x	Sym	x	x	x	x	x	Sym	Sym	x	Sym
13. Hornet robberfly	x	x	x	x	x	KS	KS	x	x	x	x	x	x	x
14. The weevil <i>Tapeinotus sellatus</i>	x	x	x	x	x	x	x	x	x	x	x	x	x	x
15. Invertebrate assemblage	Sym	Sym	Sym	x	Sym	x	x	Sym	Sym	Sym	Sym	Sym	Sym	Sym

Crymlyn Bog has an additional two units to those listed above (7042 and 7044). These aren't included in the table as they have no Annex 1 habitats or Annex 2 species features.

Pant-y-Sais SSSI		Management units	
Unique unit number	927	928	
Unit reference	14	15	
Unit name	Tennant Canal	Fen	
SAC	✓	✓	
Ramsar	✓	✓	
SSSI	✓	✓	
NNR/Natural Resources Wales managed		✓	
SAC features			
1. Calcareous fen	x	KH	
2. Transition mire	x		
3. Alluvial woodland	x	x	
Ramsar features (provisional)			
4. Topogenous fen	x	KH	
5. Slender cotton-grass	x	Sym	
6. Invertebrate assemblage	Sym	Sym	
7. Plant species assemblage	x	Sym	
SSSI features (provisional)			
8. Topogenous fen	x	KH	
9. Wet woodland	x	x	
10. Slender cotton-grass	x	Sym	
11. Marsh fern	x	x	
12. Fen raft spider	KS	x	
13. Hornet robberfly	x	x	
14. The weevil <i>Tapeinotus sellatus</i>	KS	x	
15. Invertebrate assemblage	Sym	Sym	

4. CONSERVATION OBJECTIVES

Background to Conservation Objectives:

a. Outline of the legal context and purpose of conservation objectives.

Conservation objectives for individual SACs and SPAs are required by the 1992 'Habitats' Directive (92/43/EEC). The aim of the Habitats Directive is the maintenance or where appropriate the restoration, of the 'favourable conservation status' (FCS) of habitats and species listed in the Annexes to the Directive (see Box). Therefore FCS provides the overarching framework for defining the conservation objectives for individual SACs.

Although neither the Birds Directive nor the Ramsar Convention refer to FCS, Natural Resources Wales considers that the overall aim of both those legal instruments is sufficiently similar to FCS to make it practical and proportionate to use the same guiding principle when establishing the conservation objectives for SPAs and Ramsar sites, as well as SACs. Therefore the Habitats Directive definition of FCS is considered to provide the overarching framework for conservation objectives for all SACs, SPAs and Ramsar sites in Wales.

Favourable conservation as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural habitat is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:

- Its natural range and areas it covers within that range are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The conservation status of a species is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:

- population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."

The achievement of FCS is not an objective that applies at the level of the individual sites. Rather it is a wider objective to which each individual site contributes. Therefore the conservation objectives for an individual site are intended to express what is considered to be that site's appropriate contribution to achieving FCS. Since SACs are the most important mechanism in the Habitats Directive for achieving FCS, and the sites represent the most important areas for conservation of the Annex I habitat types and Annex II species, the objectives for each individual SAC should seek to ensure that the site makes a substantial contribution which properly reflects its importance in a local, national and European context and the particular reasons why the site was selected for inclusion in the network. A similar approach is taken to setting conservation objectives for SPAs and Ramsar sites.

Achieving the conservation objectives of individual sites requires appropriate management and the control of factors which are influencing, or may influence the features.

The conservation objectives have a number of specific roles:

- **Communication**
The conservation objectives should help convey to stakeholders what are the reasons for the designation and what it is intended to achieve.
- **Site planning and management**
The conservation objectives guide management of sites, to maintain or restore the designated habitats and species. They provide the basis for identifying what management is required both within the site boundary, and outside it, where achieving the objectives requires action to be taken outside the site.
- **River Basin Management Planning**
Conservation Objectives for aquatic and water dependent Natura 2000 features are also used as the "standards and objectives" referred to in Article 4 (1c) of the Water Framework Directive (WFD) (2000/60/EC). In 2009, Welsh Ministers decided that where Natura 2000 conservation objectives are more stringent than 'Good Ecological Status' (GES) as defined in the WFD, they (and the standards they contain) are the objectives referred to in Article 4(1c) of the WFD.
- **Assessing plans and projects**
Article 6(3) of the 'Habitats' Directive requires the assessment of proposed plans and projects in view of a site's conservation objectives. Subject to certain exceptions, plans or projects may not proceed unless it is established that they will not adversely affect the integrity of sites. There are similar requirements for the review of existing decisions and consents.
- **Monitoring and reporting**
In addition to foregoing purposes, conservation objectives provide the basis for defining the evidence that will be used for assessing the condition of a feature and the status of factors that affect it. That evidence is contained in a separate but closely related set of 'performance indicators' which provide the basis for monitoring and reporting. To avoid confusion between the conservation objectives and the measures specified in performance indicators, the performance indicators are set out in an Appendix to this document.

The conservation objectives in this document reflect Natural Resources Wales' current information and understanding of the site and its features and their importance in an international context. The conservation objectives are subject to review by Natural Resources Wales in the light of new knowledge.

b. Format of the conservation objectives

Each conservation objective is a composite statement defining a site-specific aspiration for each designated feature. This composite statement contains clauses that correspond to all the elements of FCS, namely:

For habitat features:

- Extent should be stable in the long term, or where appropriate increasing;
- Quality (including in terms of ecological structure and function) should be being maintained, or where appropriate improving;
- Populations of the habitat's typical species must be being maintained or where appropriate increasing;
- Factors affecting the extent and quality of the habitat and its typical species (and thus affecting the habitat's future prospects) should be under appropriate control.

For species features:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term;
- The distribution of the population should be being maintained;
- There should be sufficient habitat, of sufficient quality, to support the population in the long term;
- Factors affecting the population or its habitat should be under appropriate control.

The elements above constitute a generic checklist or guide to the elements that should normally be included in the conservation objectives, in order to ensure that the site makes an effective and appropriate contribution to achieving favourable conservation status for the habitats and species for which it is designated.

There is one conservation objective for each designated feature listed in part 3. In some cases, where there are distinct areas or forms of a designated habitat or separate populations of a designated species within a site, the conservation objective is sub-divided into different sections to enable different aspirations to be expressed for different occurrences of the features within the site.

As well as describing the aspirations for the condition of the feature, each conservation objective contains a statement that the factors which significantly affect the feature are under appropriate control.

**4.1 Conservation objective for Feature 1:
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (EU habitat code 7210)**

The extent should be stable in the long term, or where appropriate increasing.	The extent and distribution of calcareous fen should be as mapped in 2005 and 2009 (Bosanquet <i>et al.</i> , 2005; Bosanquet <i>et al.</i> , 2009).
Quality (including in terms of ecological structure and function) should be being maintained, or where appropriate improving.	The calcareous fen should be of high quality throughout. At Crymlyn Bog the calcareous fen occurs in two forms: tall vegetation dominated by Great Fen-sedge <i>Cladium mariscus</i> and more open calcareous fen. The <i>Cladium</i> dominated areas should continue to be present as a minimum extent but should not increase at the expense of the open calcareous fen; ideally they should be opened up to allow increased plant diversity within them. The open calcareous fen should be species-rich, with little or no rank vegetation. Non-native species and indicators of eutrophication and/or changing water levels should be largely absent. Providing these broad quality standards are met across the whole feature area, some heterogeneity in condition is both natural and acceptable, but the bulk (at least 70%) of the open calcareous fen should be referable to good quality calcareous fen habitat, where: • Tufted-sedge <i>Carex elata</i> is present, with associates such as Yellow Loosestrife <i>Lysimachia vulgaris</i>, Greater Spearwort <i>Ranunculus lingua</i>, Blunt-flowered Rush <i>Juncus subnodulosus</i>, Cyperus Sedge <i>Carex pseudocyperus</i>, Lesser Bulrush <i>Typha angustifolia</i>, Water Dock <i>Rumex hydrolapathum</i>, Purple-loosestrife <i>Lythrum salicaria</i>, Hemp-agrimony <i>Eupatorium cannabinum</i>, Marsh Cinquefoil <i>Potentilla palustris</i> and Royal Fern <i>Osmunda regalis</i>. • Common Reed <i>Phragmites australis</i> or Great Fen-sedge <i>Cladium mariscus</i> are not dominant. • Scrub is absent. • Non-native species including Himalayan Balsam <i>Impatiens glandulifera</i> are absent.
Populations of the habitat's typical species must be being maintained or where appropriate increasing.	In addition to the above typical plant species, the calcareous fen areas will also contribute to the wider fen environment of Crymlyn Bog in supporting a range of typical fenland bird and invertebrate species.
Factors affecting the extent and	Factors affecting the extent and quality of the calcareous fen habitat (including water quality, atmospheric pollution, water

quality of the habitat and its typical species (and thus affecting the habitat's future prospects) should be under appropriate control.	levels, successional change, scrub encroachment and non-native species) should be under appropriate control.
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4.2 Conservation objective for Feature 2: Transition mires and quaking bogs (EU habitat code 7140)

The extent should be stable in the long term, or where appropriate increasing.	The extent and distribution of transition mire should be as mapped in 2005 and 2009 (Bosanquet <i>et al.</i> , 2005; Bosanquet <i>et al.</i> , 2009). Plus an additional 3 ha of transition mire should also be restored.
Quality (including in terms of ecological structure and function) should be being maintained, or where appropriate improving.	The transition mire should be of high quality throughout and composed of typical native species. The stands should be species-rich, with little or no rank vegetation or scrub encroachment. Non-native species and indicators of eutrophication and/or changing water levels should be largely absent. Providing these broad quality standards are met across the whole feature area, some heterogeneity in condition is both natural and acceptable, but the bulk (at least 60%) of the habitat should be referable to good quality transition mire, where: • Bottle Sedge <i>Carex rostrata</i> is present at high cover; or, where the vegetation is composed of mixtures of: Bogbean <i>Menyanthes trifoliata</i>, Marsh Cinquefoil <i>Potentilla palustris</i>, Water Horsetail <i>Equisetum fluviatile</i>, Common Cottongrass <i>Eriophorum angustifolium</i>, Slender Cottongrass <i>E. gracile</i>, Bottle Sedge <i>Carex rostrata</i>, Bog Sedge <i>C. limosa</i>, Star Sedge <i>C. echinata</i>, Lesser Water-parsnip <i>Berula erecta</i>, Branched Bur-reed <i>Sparganium erectum</i> and the bog mosses <i>Sphagnum squarrosum</i> and <i>S. subnitens</i>. • Common Reed <i>Phragmites australis</i> is not dominant. • Purple Moor-grass <i>Molinia caerulea</i>, Greater tussock-sedge <i>Carex paniculata</i>, Tufted-sedge <i>C. elata</i> and Great Fen-sedge <i>Cladium mariscus</i> are not abundant. • Scrub is absent. • Non-native species including Himalayan Balsam <i>Impatiens glandulifera</i> are absent.
Populations of the habitat's typical species	In addition to the above typical plant species, the transition mire areas will also contribute to the wider fen environment of Crymlyn Bog in supporting a range of typical fenland bird and

must be being maintained or where appropriate increasing.	invertebrate species.
Factors affecting the extent and quality of the habitat and its typical species (and thus affecting the habitat's future prospects) should be under appropriate control.	Factors affecting the extent and quality of the transition mire habitat (including water quality, atmospheric pollution, water levels, successional change, scrub encroachment and non-native species) should be under appropriate control.

4.3 Conservation objective for Feature 3:

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*) (EU habitat code 91E0)

The extent should be stable in the long term, or where appropriate increasing.	The extent of alluvial forest should be as mapped in 2009 by the last SAC monitoring exercise (Wilkinson & Bevan, 2009). An increase in alluvial forest at the expense of important open fen vegetation is not desirable.
Quality (including in terms of ecological structure and function) should be being maintained, or where appropriate improving.	The alluvial forest should be of high quality throughout and composed of typical native species. Non-native species and indicators of eutrophication and/or drying out should be largely absent. Providing these broad quality standards are met across the whole woodland area, some heterogeneity in condition is both natural and acceptable, but the bulk (at least 75%) of the habitat should be referable to good quality alluvial forest, where: • The canopy is composed of Alder <i>Alnus glutinosa</i>, Grey Willow <i>Salix cinerea</i> and/or Downy Birch <i>Betula pubescens</i>. • Over-mature canopy trees are frequent throughout. • The field layer is dominated by Greater Tussock-sedge <i>Carex paniculata</i>, with associates such as Yellow Loosestrife <i>Lysimachia vulgaris</i>, Royal Fern <i>Osmunda regalis</i>, Purple-loosestrife <i>Lythrum salicaria</i>, Bittersweet <i>Solanum dulcamara</i>, Yellow Iris <i>Iris pseudacorus</i>, Skullcap <i>Scutellaria galericulata</i> and Branched Bur-reed <i>Sparganium erectum</i>. • Viable regeneration of <i>A. glutinosa</i>, <i>S. cinerea</i> and/or <i>B. pubescens</i> is frequent throughout, either as saplings or as regrowth from the base of trees or fallen stems. • Species indicative of drying out (e.g. Bracken <i>Pteridium aquilinum</i>) or eutrophication (e.g. Common Nettle <i>Urtica dioica</i>) are absent. • Non-native species such as Himalayan Balsam <i>Impatiens glandulifera</i> are absent.
Populations of the habitat's typical species must be being maintained or where appropriate increasing.	The alluvial forest should also support species that are naturally associated with a high quality alluvial forest ecosystem, including all its components from the soil, through ground flora and shrub layer to the canopy, and the micro-habitats and structural variations that occur within them. This includes soil flora and fauna, epiphytic lower plants, breeding birds and higher plants as listed above. Characteristic plants of the habitat in this locality such as Royal Fern <i>Osmunda regalis</i> and Marsh Fern <i>Thelypteris palustris</i> should also be stable or increasing.
Factors affecting the extent and quality of the	Factors affecting the extent and quality of alluvial forest (including water quality, atmospheric pollution, water levels and grazing) should be under appropriate control.

habitat and its
typical species
(and thus
affecting the
habitat's future
prospects)
should be under
appropriate
control.

5. ASSESSMENT OF STATUS AND MANAGEMENT REQUIREMENTS

This section provides:

- A summary of the assessment of the status of each feature.
- A summary of the management issues that need to be addressed to maintain or restore each feature.

5.1 Status and Management Requirements of Feature 1: Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (EU habitat code 7210)

Status of Feature 1

The calcareous fen feature was last monitored in 2012 (Wilkinson, 2013a). The feature was judged to be in **unfavourable: declining** condition. The main reason for this assessment was a high cover of *Phragmites australis* and/or *Cladium mariscus*, with a corresponding shortage of positive indicator species in places.

It is presumed that the calcareous fen vegetation has become more rank and overgrown since previous monitoring visits, with a reduction in species-richness, through natural vegetation succession. Although some of the calcareous fen areas are grazed by cattle, insufficient management is presumably the main cause of this vegetation succession.

Management Requirements of Feature 1

Grazing is the principal management requirement for restoring the calcareous fen feature to favourable condition. The calcareous fen vegetation in units 8, 9 and 10 is currently (2014) grazed by cattle belonging to the neighbouring farmer, and grazing levels have indeed increased in recent years. Despite this the calcareous fen in these units is still deemed to be unfavourable, although the quality of the vegetation may improve after grazing has been in place longer term.

The calcareous fen in units 7, 11 and 15, and parts of unit 5, is currently ungrazed. Restoring grazing to these units is highly problematic at present, given the very wet ground and inaccessibility. Nonetheless opportunities to expand grazing at the site should continue to be explored where feasible. Other techniques such as vegetation cutting and biomass removal should also be considered.

Scrub control is already carried out at the site on an annual basis. Scrub encroachment is therefore less of a problem for most of the calcareous fen areas, although targeted scrub control should continue in future to maintain this position.

5.2 Status and Management Requirements of Feature 2: Transition mires and quaking bogs (EU habitat code 7140)

Status of Feature 2

The transition mire feature was last monitored in 2011 (Wilkinson, 2013b). The feature was judged to be in **unfavourable: declining** condition. The reasons for this vary between stands, but a high cover of *Phragmites australis* and/or scrub in places, sometimes with a corresponding shortage of positive indicator species, are the main issues.

It is thought that most of the transition mire vegetation is becoming more rank and overgrown due to natural vegetation succession, probably encouraged by enrichment. Insufficient management is presumably the main cause of this vegetation succession, coupled with lack of control over the nutrient status of some key hydrological inputs. The main areas of transition mire are located in units 5, 7, 10, 11, 13 and 15.

Management Requirements of Feature 2

Grazing is one of the principal management practices required for restoring the transition mire feature to favourable condition. The transition mire in parts of units 5 and 10 is currently (2014) grazed by ponies and/or horses, but the bulk of these units are ungrazed, as are units 7, 11, 13 and 15. Restoring grazing to these units is highly problematic at present, given the very wet ground and inaccessibility. Nonetheless opportunities to expand grazing at the site should continue to be explored where feasible. Other techniques such as vegetation cutting and biomass removal should also be considered.

Scrub control is already carried out at the site on an annual basis. Targeted scrub control should continue in future, to ensure any scrub encroachment within transition mire areas is tackled.

Hydrological control is the other major management type required for restoration of the feature. It is thought that over-topping of Crymlyn Brook is leading to a replacement of transition mire habitat by more swampy vegetation in the north of Crymlyn Bog, through over-wetting and perhaps nutrient enrichment. The clearing out of Crymlyn Brook to address this issue, together with nutrient reduction measures, is currently being explored and needs to be carried forward. It is envisaged that clearing out Crymlyn Brook could lead to an overall expansion of transition mire habitat in the north of the site in future. In addition, it is believed that over-topping of the Glan y Wern Canal is limiting the extent of the influence of nutrient-poor inflows from the sides of the wetland, thus favouring swampy vegetation rather than transition mire. Coupled with re-opening the Glan y Wern Canal, the possibility of slightly lowering the water level in the Glan y Wern and Tennant Canals to reduce the extent of over-topping is being investigated.

5.3 Status and Management Requirements of Feature 3: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*) (EU habitat code 91E0)

Status of Feature 3

The alluvial forest feature was last monitored in 2009 (Wilkinson & Bevan, 2009). The feature was judged to be in **unfavourable: recovering** condition. The main reason for the unfavourable assessment is the lack of over-mature trees in certain areas, a reflection of the relatively young age of some of the woodland. However, it is felt that the woodland is developing a more mature age structure under its own devices, with no management intervention required; hence the 'recovering' status.

Management Requirements of Feature 3

Key management requirements for the alluvial forest feature are to maintain the high water table and prevent any increase in nutrient levels. There are no concerns over either of these factors at the current time. Similarly there is no threat from excessive grazing at present, as the wet ground conditions provide a natural deterrent to livestock.

A key conservation aim for the alluvial forest feature is for it to develop a natural wet woodland species composition and structure through natural dynamic processes. It is envisaged that this condition will be achieved simply through the current non-intervention management.

6. ACTION PLAN: SUMMARY

This section takes the management requirements outlined in Section 5 a stage further, assessing the specific management interventions required on each management unit. This information is presented in two parts:

- A summary of the information held in Natural Resources Wales' Actions Database for sites
- A summary of ongoing management which is not recorded in Natural Resources Wales' actions database

6.1 Actions in Natural Resources Wales' actions database

Unit reference	Unique unit number	Unit name	Summary of Conservation Management Issues	Action needed?
1	000901	Tennant Canal - managed section	Tennant Canal requires regular sympathetic management to maintain open water habitat and marginal tussocky vegetation for fen raft spider. Current management, carried out by Tennant Canal Company, is ideal.	No
2	000904	Tennant Canal - unmanaged section	This section of Tennant Canal has not been managed for many years and has become choked with encroaching vegetation. Reinstatement of management is required to provide open water habitat for fen raft spider.	Yes
3	000906	Glan y Wern Canal	The Glan y Wern Canal has not been managed for many years and has become choked with encroaching vegetation. Reinstatement of management is required to provide open water habitat for fen raft spider.	Yes
4	000907	CCW wet woodland	Current non-intervention management is ideal for alluvial forest/wet woodland feature.	No
5	000908	CCW fen	Key management issue is vegetation succession of fen vegetation to tall rank vegetation and woody scrub. Parts of unit are grazed by ponies (CCW stock); other parts are currently ungrazed. Need to consider introduction of grazing to currently ungrazed areas. Cutting of vegetation (and removal of arisings) using specialised machinery should also be considered. Burning is another possible management option. Scrub control is carried out to reduce scrub encroachment. Eutrophication linked to elevated nutrient levels in Crymlyn Brook has also been highlighted as a potential threat to the fen vegetation in this unit, as well as over-topping of Glan y Wern Canal.	Yes
6a	000909	CCW grassland A (non-Ramsar)	Grassland is grazed by horses, and scrub control is carried out to prevent scrub encroachment. Current	No