

Welsh Government

M4 Corridor around Newport

December 2016 Environmental
Statement Supplement
Appendix SS10.2

Bat Survey 2016

M4CaN-DJV-EBD-ZG_GEN-AX-EN-047

AT ISSUE | December 2016



2016 Bat Surveys

M4 Corridor around Newport

For

RPS

Project No.: MRPS108 / 010

December 2016

London & South East
Compass House
Surrey Research Park
Guildford
GU2 7AG . UK
t: +44 (0)1483 466 000

North & Borders
Calls Wharf
2 The Calls
Leeds
LS2 7JU . UK
t: +44 (0)113 247 3780

Wales & South West
Williams House
11-15 Columbus Walk
Cardiff
CF10 4BY . UK
t: +44 (0)2920 020 674

Scotland
20-23 Woodside Place
Glasgow
G3 7QF . UK
t: +44 (0)141 582 1333

Enquiries

e: enquiries@thomsonecology.com

w: www.thomsonecology.com



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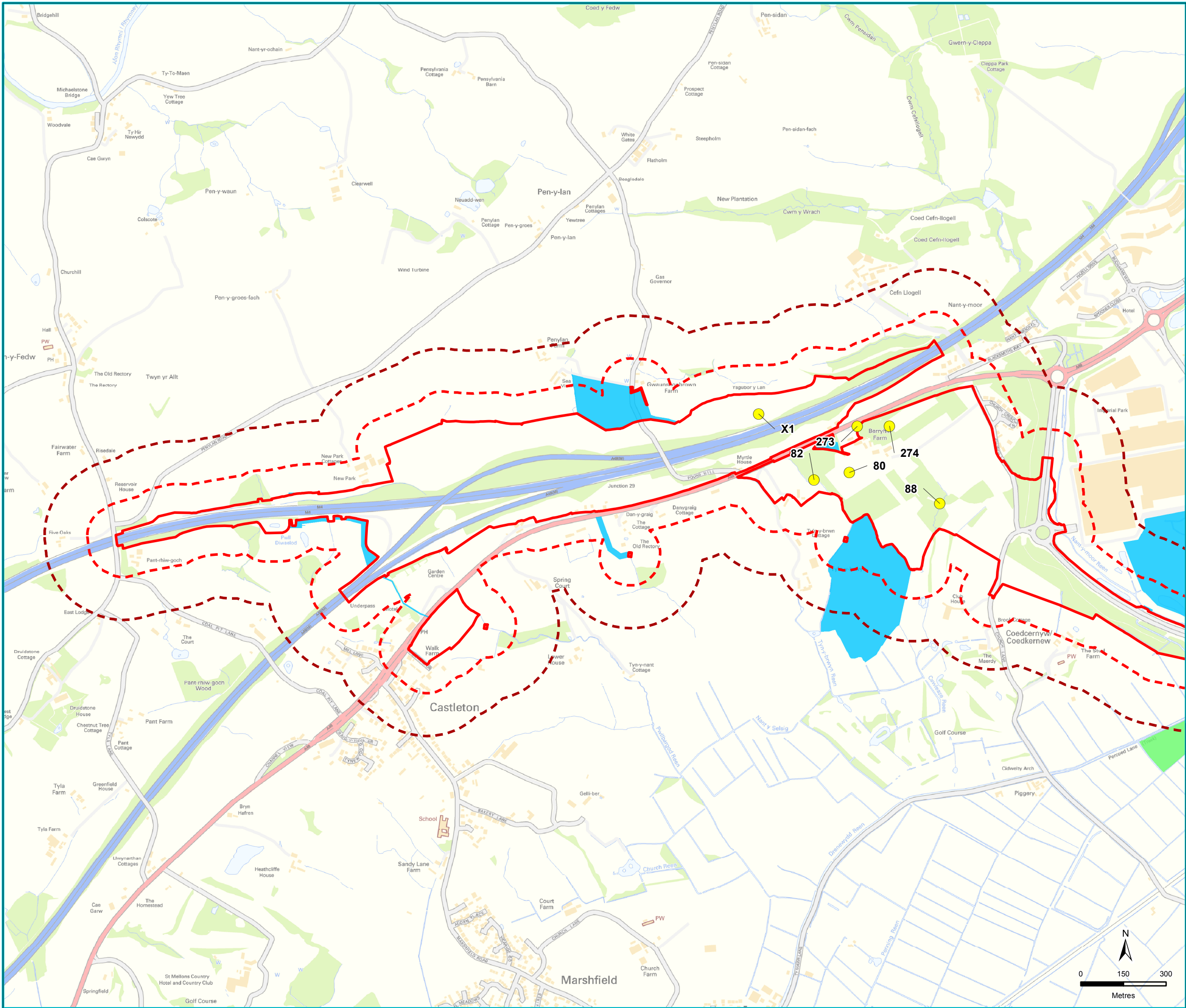
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1. Summary and Main Recommendations

1.1 Summary

- 1.1.1** The Welsh Government proposes to build a new section of motorway to the south of Newport, Gwent. The proposals, including a range of Complementary Measures, are known as M4 Corridor around Newport (M4CaN, see Figures 1a to 1f).
- 1.1.2** In 2015, Thomson Ecology carried out dusk emergence and dawn return to roost surveys of 16 trees and one building within the footprint of the proposed land-take for the Scheme, during which three confirmed bat roosts and two probable bat roosts in trees were recorded. Due to a number of limitations, further surveys of 14 of the 16 trees and the one building surveyed in 2015 were recommended.
- 1.1.3** RPS commissioned Thomson Ecology to undertake the further surveys recommended and also to carry out dusk emergence and dawn return to roosts surveys of an additional three trees that had been identified as having high potential for bats. One of these additional trees was the subject of a ground level tree inspection as well as two dusk and dawn surveys. In total dusk and dawn surveys of 17 trees and one building were undertaken, see Figures 2a to 2c.
- 1.1.4** During the 2016 dusk emergence and dawn return to roost surveys, one tree (T80 on Figure 2a) was confirmed as a roost for common pipistrelle (*Pipistrellus pipistrellus*) bats and a disused lime kiln building (T335 on Figure 2c) was confirmed as a roost for long-eared bats (*Plecotus* sp.). Probable bat roosts were recorded in trees T274 (soprano pipistrelle, *Pipistrellus pygmaeus*, and noctule, *Nyctalus noctula*) and X3 (common pipistrelle). Photographs of trees supporting roosts identified in 2016 are shown on Figure 3.
- 1.1.5** Trees should be considered as supporting the highest level of bat roost confirmed over the two years of surveys (2015 and 2016), this is shown on Figures 2a to 2c. The summary of bat roosts recorded is as follows:
- Tree T39 - Probable common pipistrelle roost (See Figure 2b).
 - Tree T45 - Probable common pipistrelle roost (See Figure 2b).
 - Tree T80 - Confirmed common pipistrelle and long-eared bat roost (See Figure 2a).
 - Tree 274 - Confirmed unknown bat species roost, probable soprano pipistrelle and noctule roost (See Figure 2a).
 - Building T335 - Confirmed long-eared bat roost (See Figure 2c).
 - Tree T375 - Confirmed unknown bat species roost (See Figure 2c).
 - Tree X3 - Probable common pipistrelle roost (See Figure 2c).
- 1.1.6** A European Protected Species Licence will be required to allow for the destruction of bat roosts, which should be supported by a method statement that includes details of how the works will be undertaken to avoid killing or injuring a bat, and details of the proposed compensation measures, including replacement roosts.

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Legend

- Tree Location
- Ecological Mitigation
- Temporary Construction Land
- Permanent Land Take
- Permanent Land Take 100m Buffer
- Permanent Land Take 250m Buffer

Site Grid Reference: 325,981 184,040

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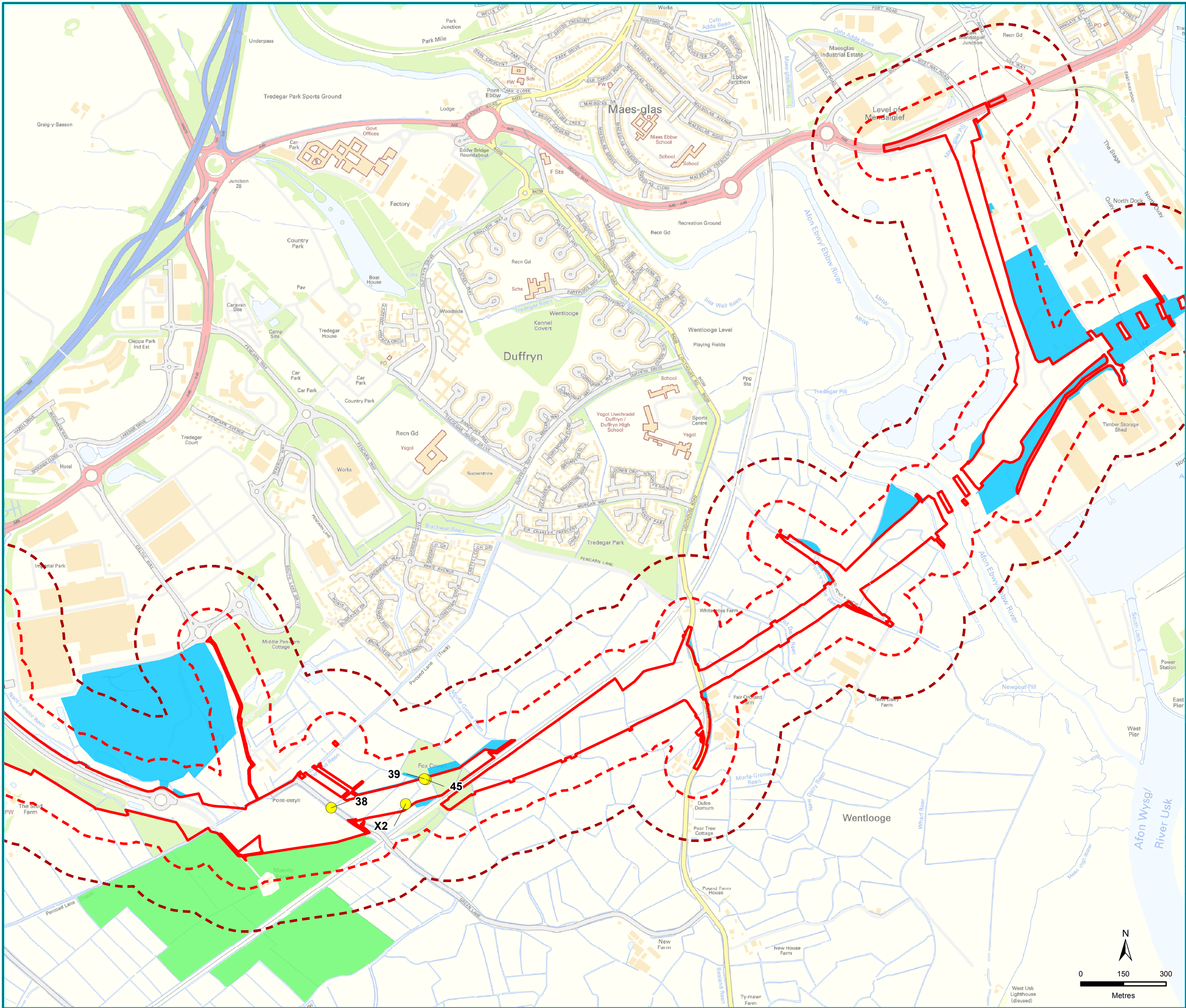
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Client
RPS Group PLC

Figure Number
1a

Figure Title
Site Location and
Tree Locations

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- Legend
- Tree Location
 - Ecological Mitigation
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Site Grid Reference: 329,706 184,586

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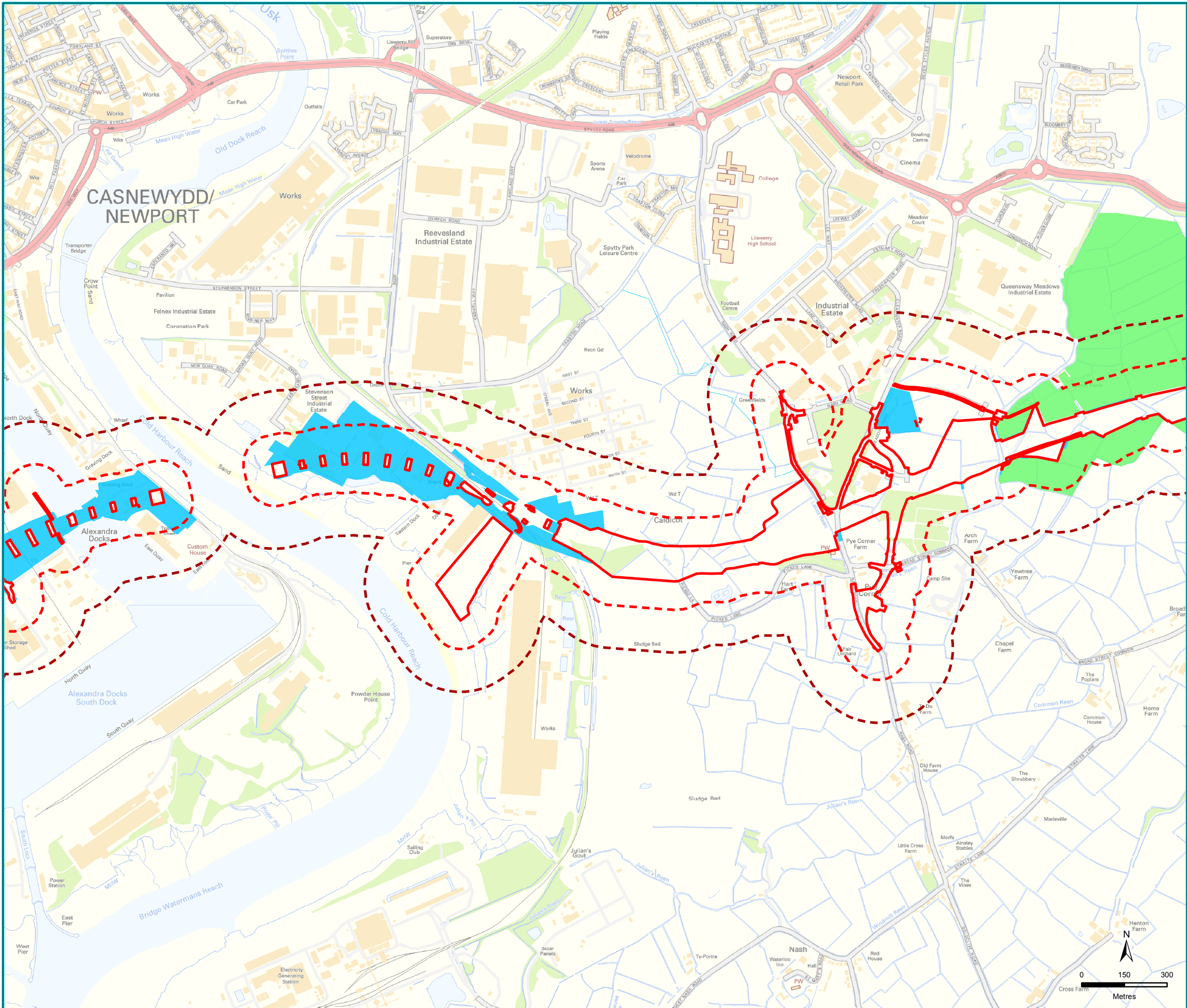
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1b

Figure Title
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Legend

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- Temporary Construction Land
- Permanent Land Take
- Permanent Land Take 100m Buffer
- Permanent Land Take 250m Buffer

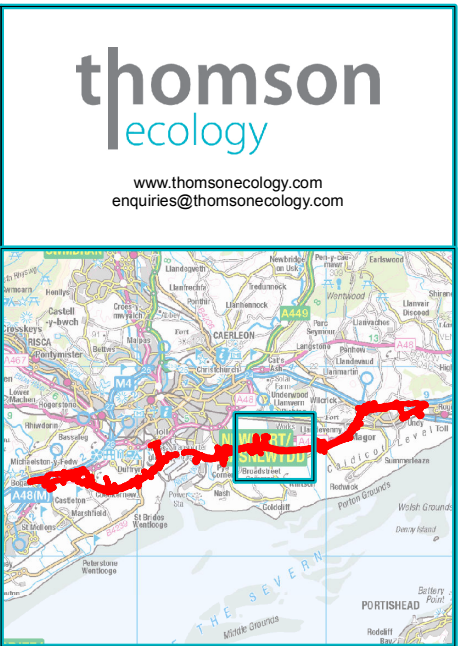
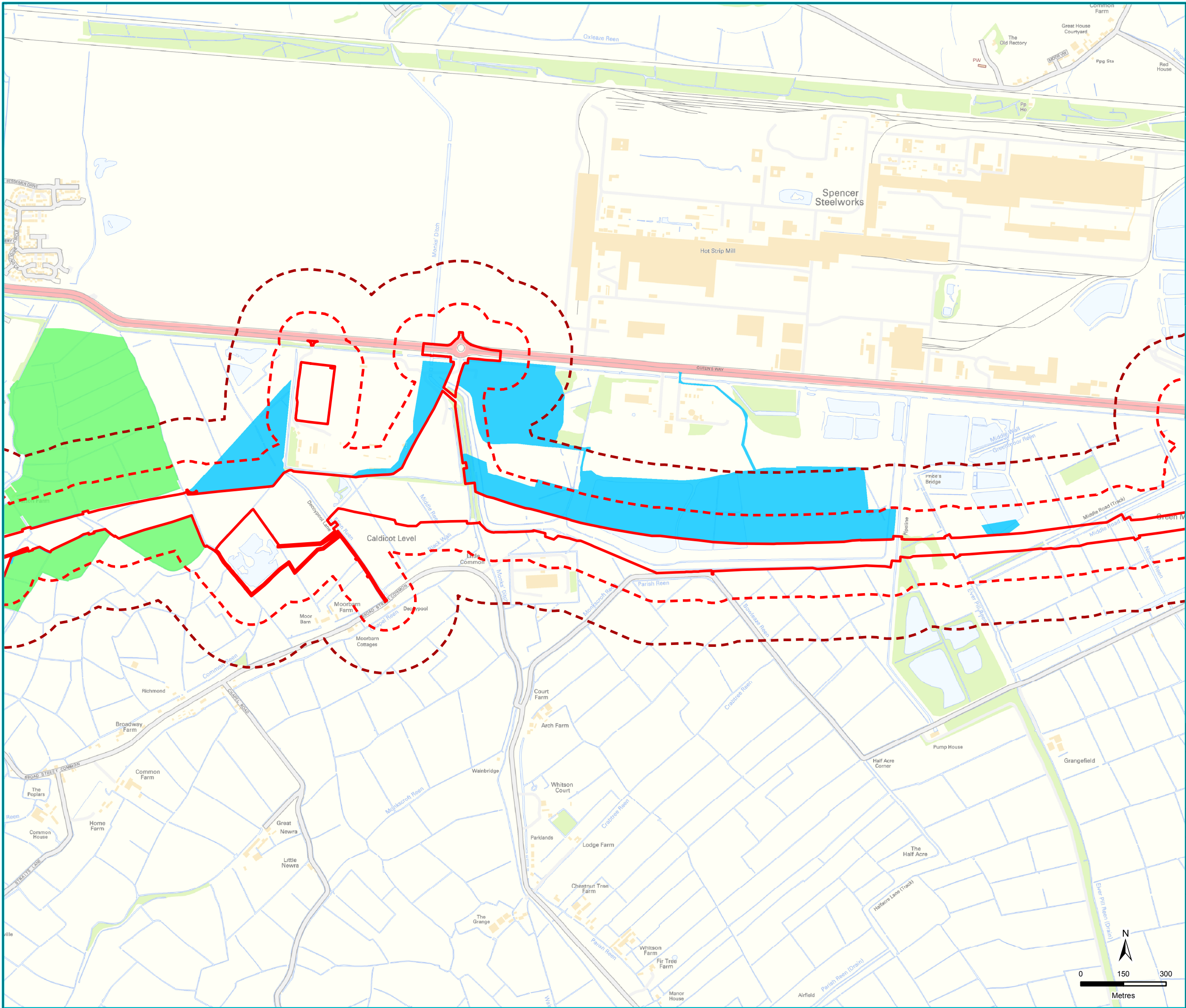
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Figure Title	
Site Location and Tree Locations	

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- Legend
- Ecological Mitigation
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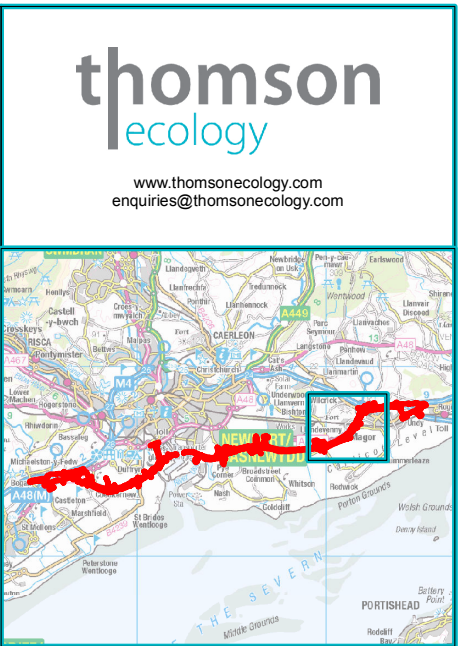
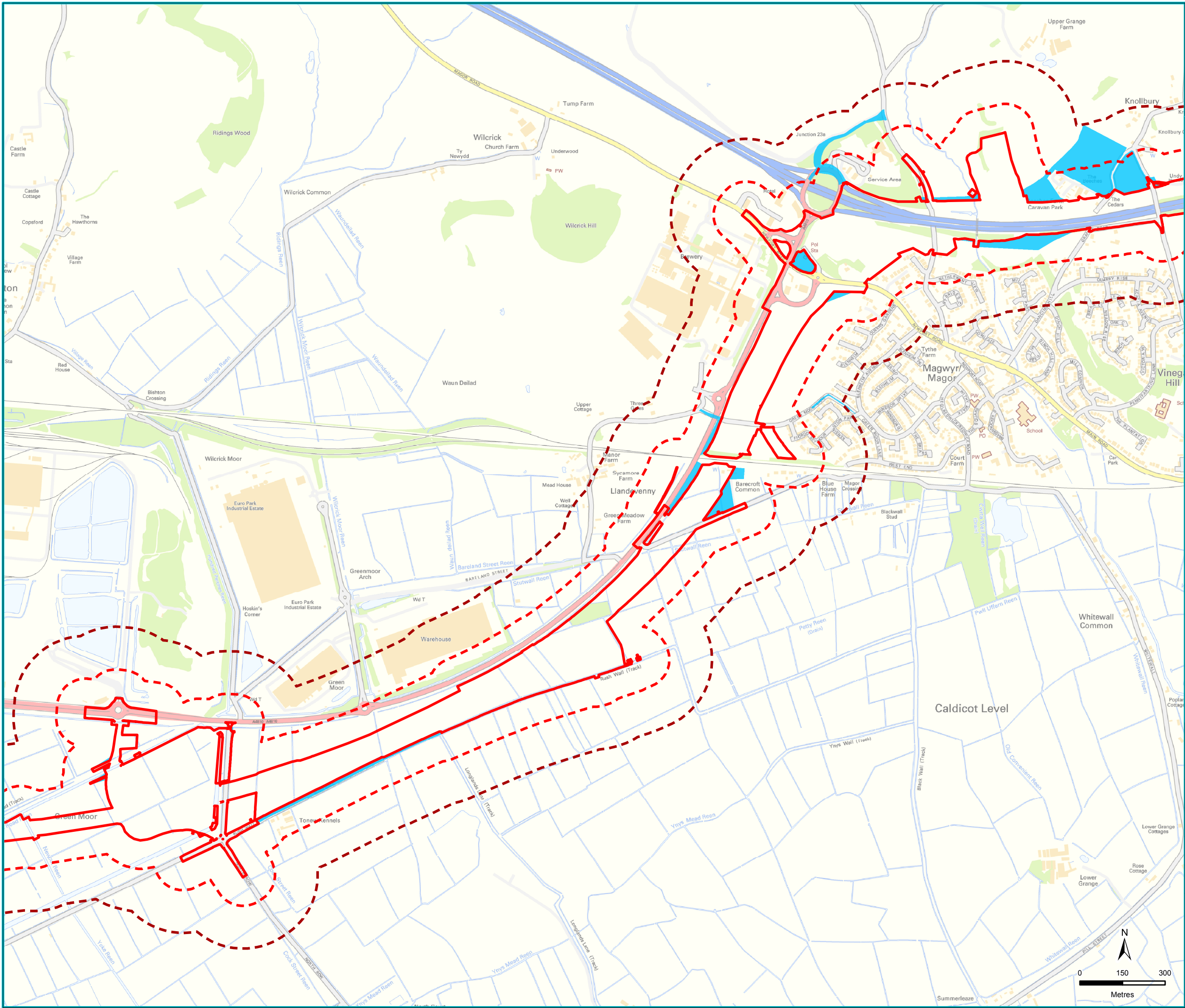
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Client			
RPS Group PLC			
Figure Number		1d	
Figure Title			
Site Location and Tree Locations			

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- Legend
- Temporary Construction Land
 - Permanent Land Take
 - Permanent Land Take 100m Buffer
 - Permanent Land Take 250m Buffer

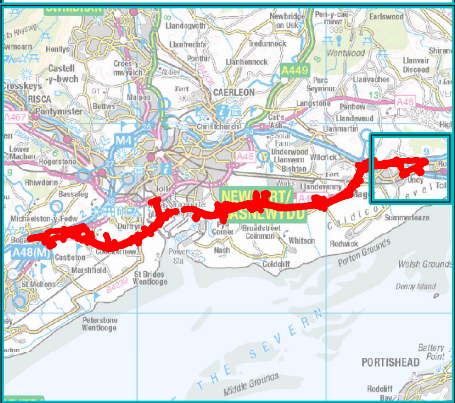
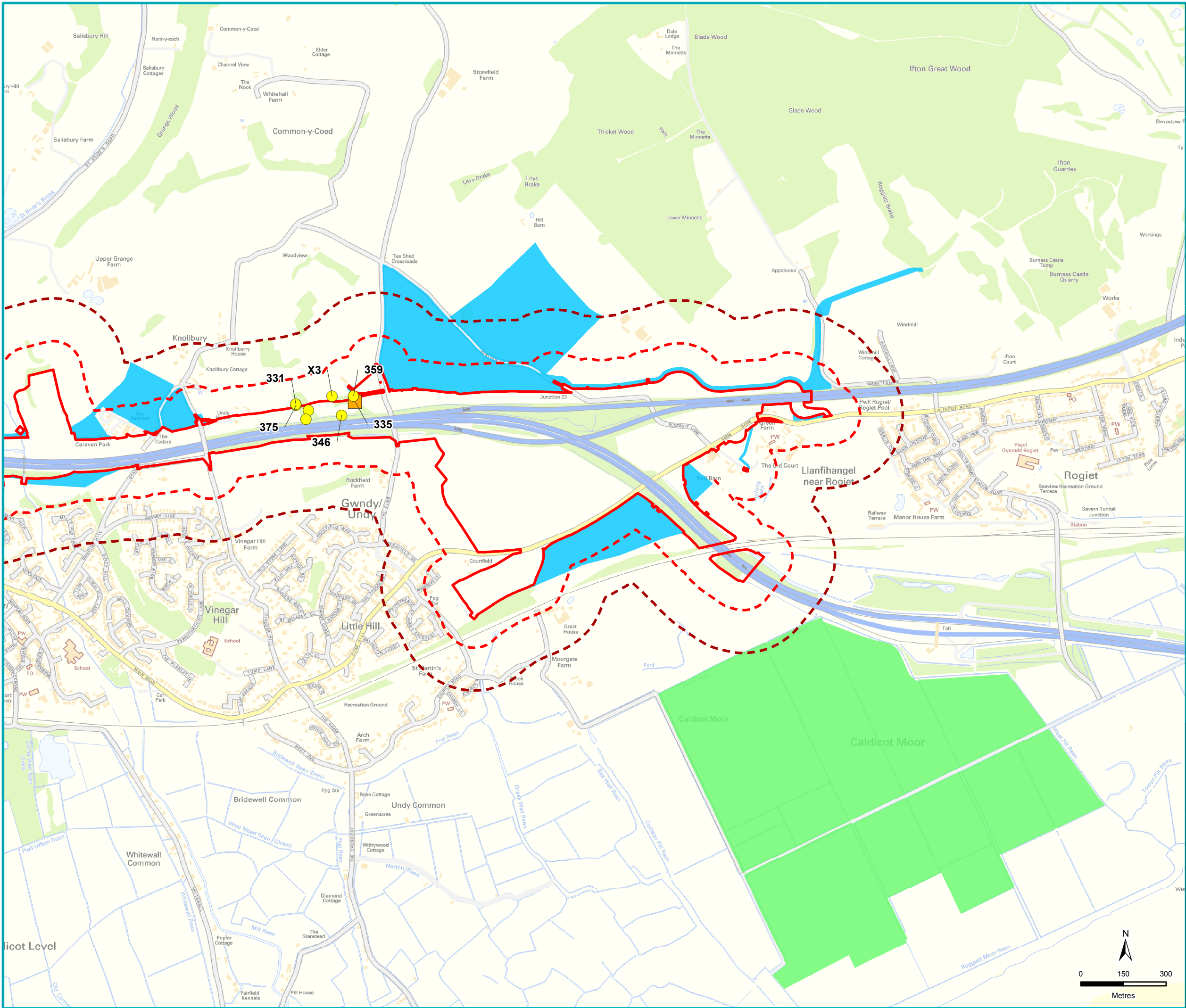
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Figure Title		Site Location and Tree Locations	

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Legend

- Building Location
- Tree Location
- Ecological Mitigation
- Temporary Construction Land
- Permanent Land Take
- Permanent Land Take 100m Buffer
- Permanent Land Take 250m Buffer

Site Grid Reference: 344,499 187,639

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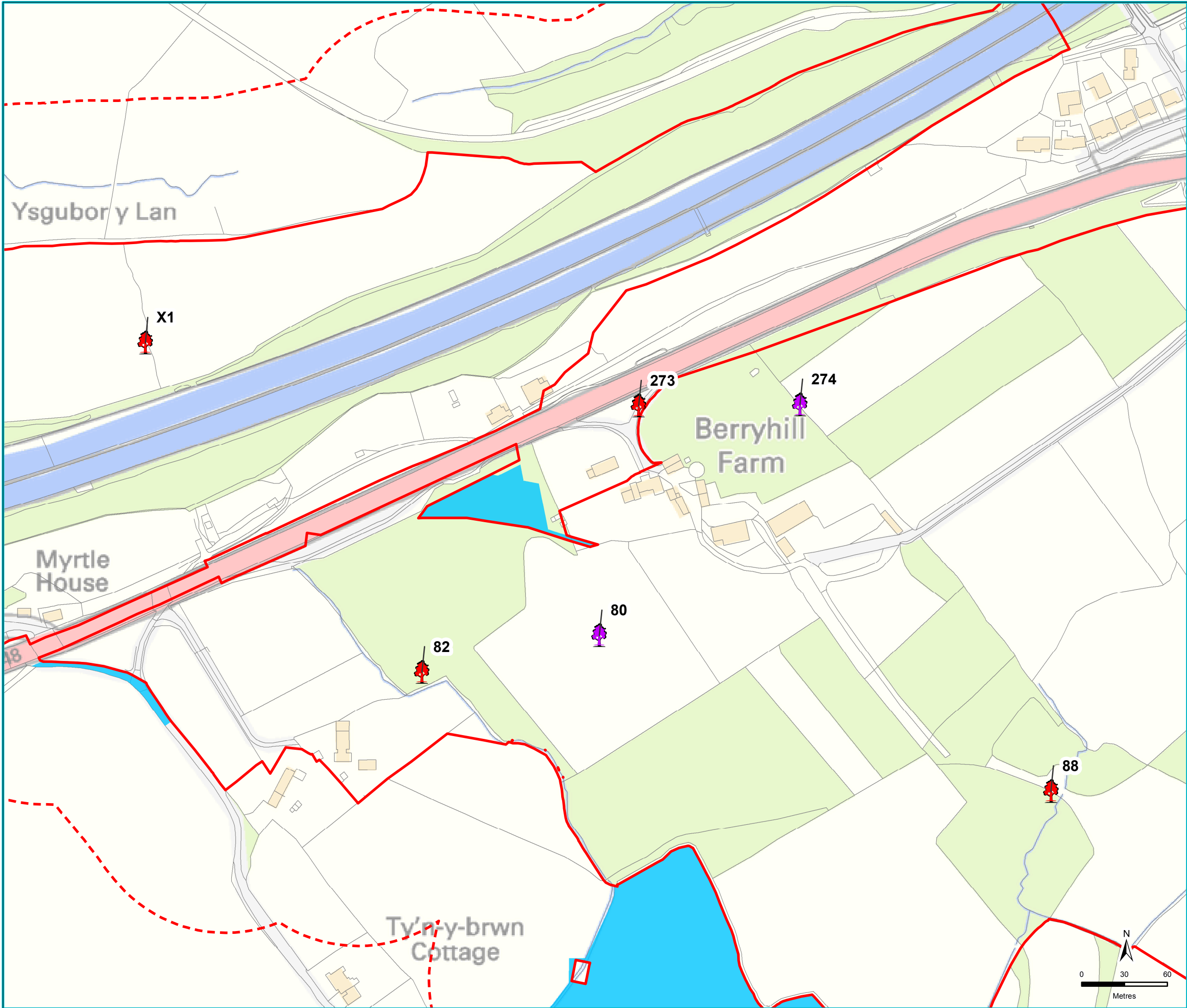
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Client
RPS Group PLC

Figure Number
1f

Figure Title
Site Location and
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Legend

Potential of Trees to Support Roosting Bats

-  Confirmed Roost
-  High
-  Temporary Construction Land
-  Permanent Land Take
-  Permanent Land Take 100m Buffer
-  Permanent Land Take 250m Buffer

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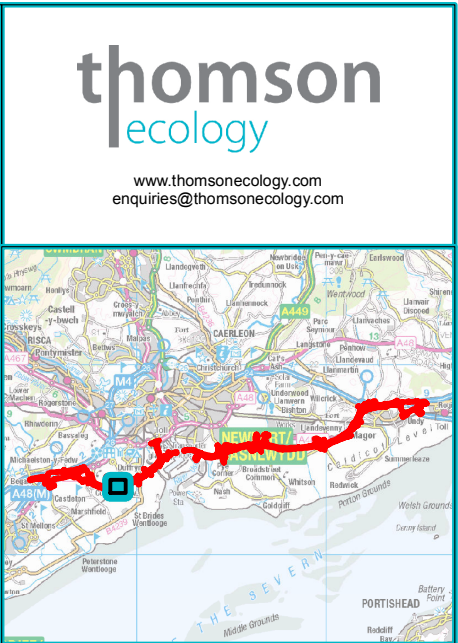
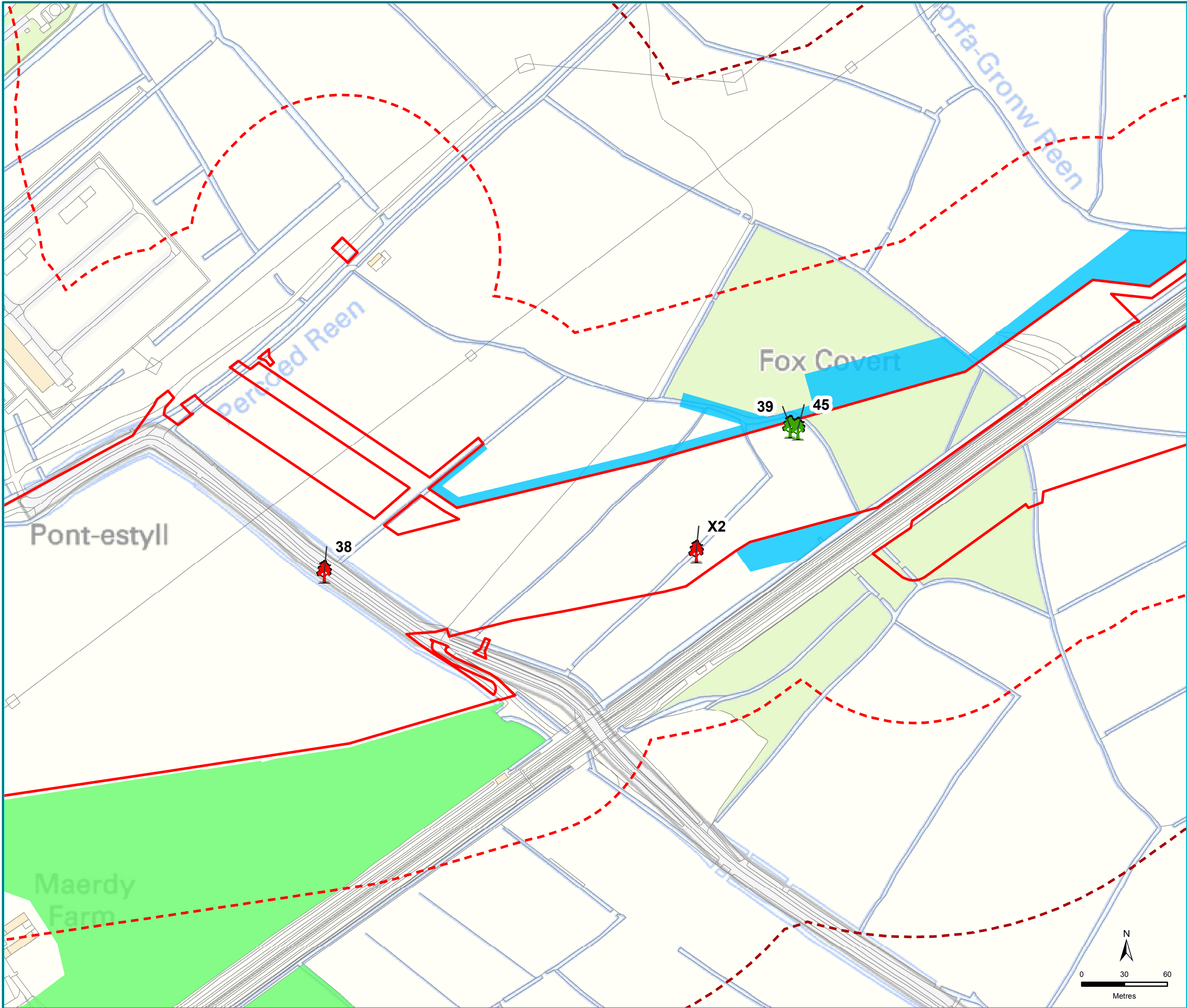
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2a	
Figure Title	

Confirmed and
Potential Bat Tree Roosts

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Legend

Potential of Trees to Support Roosting Bats

- High
- Probable
- Ecological Mitigation
- Temporary Construction Land
- Permanent Land Take
- Permanent Land Take 100m Buffer
- Permanent Land Take 250m Buffer

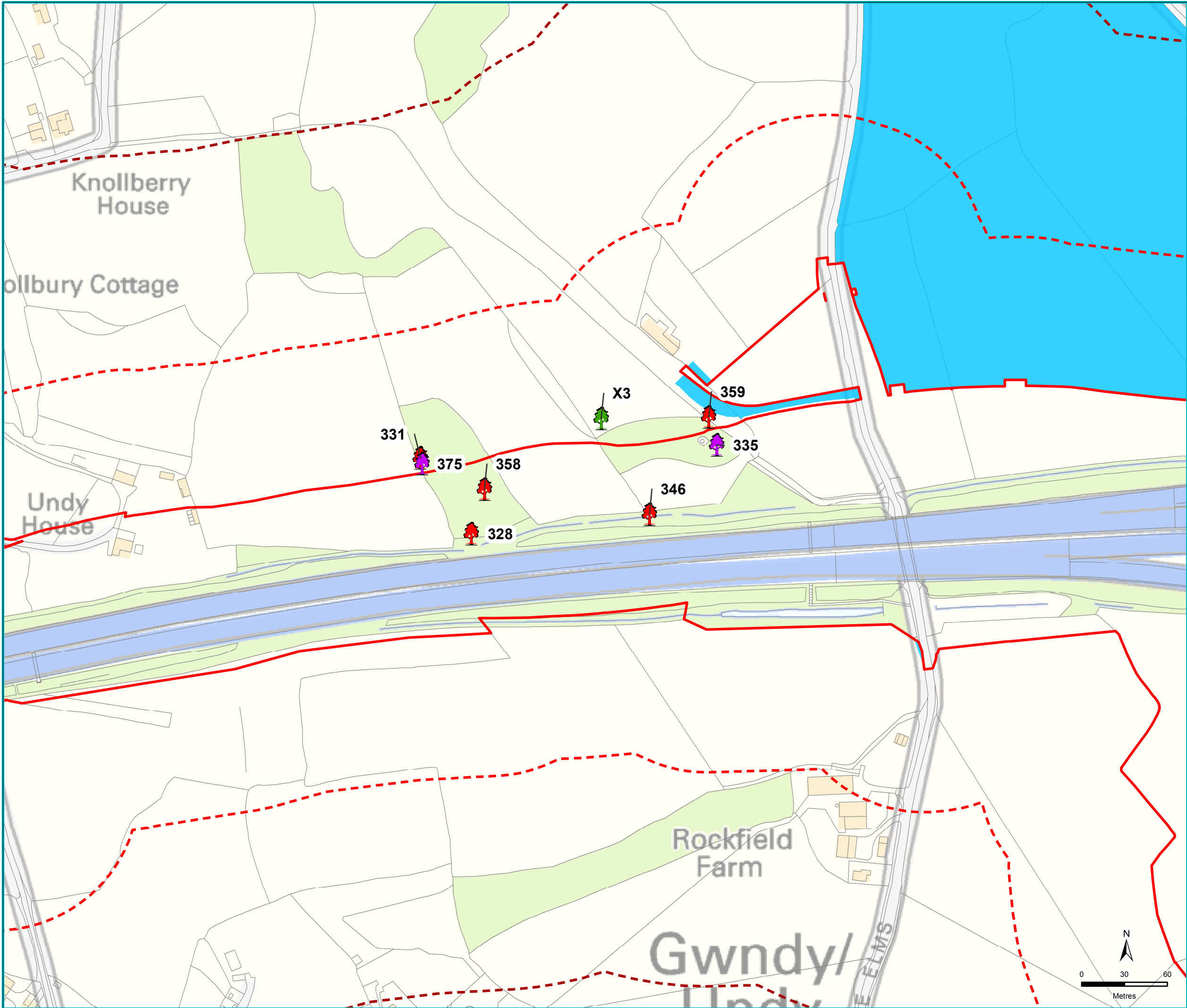
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RPS Group PLC	
Figure Number	
2b	
Figure Title	
Confirmed and Potential Bat Tree Roosts	

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Legend

Potential of Trees to Support Roosting Bats

- Confirmed Roost
- High
- Probable
- Temporary Construction Land
- Permanent Land Take
- Permanent Land Take 100m Buffer
- Permanent Land Take 250m Buffer

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Client	
RPS Group PLC	
Figure Number	
2c	
Figure Title	
Confirmed and Potential Bat Tree Roosts	



Photograph 1:
Tree X3 – Probable bat roost.



Photograph 2:
Tree T80 – Confirmed bat roost in both 2015 and 2016 surveys.



Photograph 3:
Disused lime kiln building (T335) – Confirmed bat roost in 2016.



Photograph 4:
Tree T274 – Confirmed bat roost in 2015, probable bat roost in 2016.



Photograph 5:
Tree X1 – High bat roost potential (identified by RPS).



Photograph 6:
Tree X2 – High bat roost potential (identified by RPS).

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			Date	07/09/2016	Date 07/09/2016

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2. Introduction

2.1 Development Background

- 2.1.1 The Welsh Government proposes to build a new section of motorway to the south of Newport, Gwent. The proposals, including a range of Complementary Measures, are known as M4 Corridor around Newport (M4CaN) and will hereinafter be referred to as “the Scheme”. The proposed new section of motorway would be located between Castleton to the west and Magor to the east, extending approximately 23 km in length (see Figure 1a to 1f).

2.2 Ecology Background

- 2.2.1 Surveys of trees within 250 m of the 2007/08 alignment were carried out in 2014 by Arup to record features suitable for use by bats. Details of potential roost features in trees identified as having high potential to support bats within or adjacent to (i.e. up to approximately 100 m from) the proposed new section of motorway were provided to Thomson Ecology in a spreadsheet.
- 2.2.2 In July 2015, Thomson Ecology carried out surveys to inspect for evidence of use by bats, trees which had been identified by RPS as having high potential to support bat roosts and which are located within 250 m of the proposed new section of motorway and/or proposed construction compounds. A ground level tree inspection was carried out of 36 trees and one building, followed by tree climbing inspections of 23 trees which were accessible and/or safe to climb (see Appendix 10.24 of the March 2016 Environmental Statement (ES)). The surveys resulted in the reclassification of the bat roost potential of four trees as negligible and two trees as low. Dusk emergence and dawn return to roost surveys were recommended for all other trees.
- 2.2.3 Thomson Ecology was commissioned to carry out dusk emergence and dawn return to roost bat surveys of those trees confirmed to have high potential following the tree inspections within the footprint of the proposed new section of motorway. There were 17 trees and one building meeting these criteria, however, following health and safety concerns at one location, the brief was amended to exclude tree T237 (see Appendix 10.24 of the March 2016 ES).
- 2.2.4 During the dusk emergence and dawn return to roost bat surveys in 2015, three trees (T80, T274 and T375 on Figure 2a and 2c) were confirmed as bat roosts for common pipistrelle (*Pipistrellus pipistrellus*) and long-eared bat species (*Plecotus* sp.). High levels of bat activity were recorded around the canopy of two trees (T39 and T45 on Figure 2b). Bats were not seen directly emerging from or returning to roost in these trees, but were also not seen to fly in from the surrounding area, and therefore in 2015 trees T39 and T45 were classified as being probable roosts.
- 2.2.1 Due to the timings of the 2015 surveys, it was recommended that additional surveys be carried out in the 2016 maternity season (June to August inclusive) of all trees, and that hibernation surveys be carried out of trees T38, T62, and T335 (a disused lime kiln building).
- 2.2.2 In February 2016, RPS commissioned Thomson Ecology to undertake hibernation roost inspections of two trees (T38 and T62) and one building (T335); the trees were inspected for evidence of bats through ground inspection and tree climbing surveys (see Appendix S10.7 of the September 2016 ES Supplement).

- 2.2.3 No bats or evidence of bats were found during the hibernation inspections of T38, T62 and T335 although the features present on T38, T62 and T335 still have the potential to support hibernating bats.

2.3 The Brief and Objectives

- 2.3.1 RPS commissioned Thomson Ecology on 6th June 2016 to undertake the recommended further dusk and dawn bat surveys, specifically to carry out:

- Two dusk and dawn surveys of trees T80, T274, T375, T39, T45, T38, T328, T331, T335 (building), T346, and T359.
- One dusk and dawn survey of trees T82, T88, T273, and T358.
- Three dusk and dawn surveys of two additional trees identified by RPS (Tree 1 to the north of the M4 and Tree 1 on Maerdy Farm, hereafter known as trees X1 and X2 respectively).
- An update to the existing M4CaN Bat Tree Surveys Report.
- Appropriate digitised mapping.

- 2.3.2 During the surveys, a possible roost was recorded in a tree near to one of the trees being surveyed in the eastern section of the new section of motorway. It was recommended that the following further surveys of this tree be undertaken and be incorporated into the report:

- A ground level tree inspection of the probable roost identified at grid reference ST4357888023, hereinafter known as tree X3.
- Two dusk and dawn surveys, to be undertaken in August and September 2016.

2.4 Limitations

- 2.4.1 Several of the survey visits were carried out in sub-optimal conditions for bat surveys due to light rain/drizzle (at trees T88, T274, T346, T359, T375, X1 and X3) or due to the temperature dropping below 10°C (the temperature at the start of dawn survey at building T335 was recorded at 9°C).

- 2.4.2 Two survey visits were stopped before the required time had elapsed due to the onset of rain; during the first dusk survey at tree T82 the survey was halted 30 minutes before the end of the survey and at tree T88 the dawn survey was stopped 55 minutes before sunrise. One dusk survey visit at tree X3 was cancelled due to heavy rain.

- 2.4.3 These limitations are not thought to have had a significant effect on the survey outcomes because:

- The sub-optimal conditions only affected one “half” of one survey visit (i.e. either a dusk or a dawn from one survey visit was affected, with the exceptions of tree T375 where drizzle was recorded during both the dusk and dawn of the first survey visit, and at tree X2 where one half of two survey visits were in sub-optimal conditions).
- The sub-optimal conditions were only minor, i.e. light rain or drizzle, or one degree below the optimal temperature range, which would not have a major effect on bat activity.

- Bat activity was recorded during all surveys where sub-optimal conditions were recorded.

3. Methodology

3.1 Ground Level Tree Inspection

3.1.1 Tree X3 (see Figure 1f) was inspected from ground level for roosting opportunities for bats. Close-focusing binoculars and a high-powered torch were used. Potential roosting opportunities searched for included:

- Natural crevices and holes.
- Woodpecker and rot holes.
- Loose bark, splits and cracks.
- Bird and bat boxes.
- Presence or absence of dense ivy or dense epicormic growth.

3.1.2 The search for bats and evidence of bats focused on these roosting opportunities and the surfaces and ground beneath them. Where possible a ladder was used to reach accessible potential roost features so that they could be inspected using a torch and endoscope.

Categorisation of Results

3.1.3 Tree X3 was assigned a level of potential to support a bat roost. This was achieved by placing the results for each of five attributes recorded during the survey into three categories (see Table 1). The combination of categories for each tree was then used, together with the judgement of the surveyor, to arrive at a level of potential (see Table 2). Trees which could not be thoroughly inspected, but were nevertheless of a type which typically support bat roosts, were assumed to have high potential for roosting bats.

Table 1: Attributes influencing the likelihood of a bat occupying a tree as a roost.

Category Attribute	A	B	C
Life Stage	Veteran, Senescing or Dead	Mature or Mid- aged tree	Formative growth, before optimum crown size achieved
Exposure of crevice/void to wind and rain	Low	Moderate	High
Setting	Rural	Sub-urban	Urban
Distance from woodland or water body	>200m	200m - 400m	>400m
Level of disturbance/ lighting	Low	Moderate	High

Table 2: Levels of bat potential together with an indication of the types of tree which qualify.

Type of roost Level of potential	Maternity roost	Summer or transitional roost used by non-breeding bats	Hibernation roost
Confirmed	Presence of bats or evidence of bats. Determining the level of current use and the type and number of bats may require further survey.		
High bat potential	Tree with suitable maternity roost space* and Category As only.	Tree with accessible crevice(s) and Category As only.	As summer roost and Category As only.
Moderate bat potential	Tree with suitable maternity roost space* and mostly Category As, maximum 2 Category Bs and maximum 1 Category C.	Tree with accessible crevice(s) and mostly Category As, maximum 2 Category Bs and maximum 1 Category C.	As summer roost.
Low bat potential	Tree with suitable maternity roost space* and more than 2 Category Bs or maximum of 2 Category Cs.	Tree with accessible crevice(s) and more than 2 Category Bs or maximum of 2 Category Cs.	As summer roost.
Negligible bat potential	Tree without a suitable maternity roost space* or with one but lacking access points or more than 2 Category Cs.	Tree without crevices or with them but lacking access points or more than 2 Category Cs.	Tree without voids or crevices or with them but lacking access points or more than 2 Category Cs.

* void or large crevice which is accessible to bats.

3.2 Dusk Emergence and Dawn Return to Roost Surveys

3.2.1 Between one and three survey visits were carried out at each location; the survey effort undertaken is summarised in Table 3.

Table 3: Survey effort carried out at each location.

Survey Effort	Tree Numbers	Rationale for Survey Effort
Three dusk and dawn surveys	X1, X2	Newly identified trees not surveyed before.
Two dusk and dawn surveys	T39, T45, T80, T274, T375	Confirmed or probable roosts in 2015 requiring further survey during the maternity season.
	T38, T328, T331, T335, T346, T359	High potential bat roosts without sufficient survey effort, and had not been surveyed during the maternity season.
	X3	Possible bat roost identified in 2016, but without sufficient time to undertake three surveys at an appropriate time of year.
One dusk and dawn survey	T82, T88, T273, T358	High potential bat roosts that had not been surveyed during the maternity season.

3.2.2 During each survey visit, a minimum of two ecologists were stationed on opposite sides of each tree, chosen to give the best view of as much of the potential roost features as possible. At dusk potential egress points were watched constantly by the ecologists. At dawn bats were tracked back to any access points within the view of the ecologist.

3.2.3 A Duet frequency division bat detector was used by each ecologist to detect bats emerging from or returning to the potential roost site. An MP3 player (Zoom H1 or Transcend MP870) attached to the detector was used to record all bat passes. Bat calls were retained for later analysis using Adobe Audition software where emergence or return to roost is confirmed or probable.

3.2.4 The length of each survey visit was adjusted from what had been carried out in 2015, in line with the updated recommendations for bat survey effort in the third edition of the Bat Survey Guidelines (Collins, 2016). The recommended start/end times for surveys of trees with the potential to support bat species that are known to leave the roost late, or return to roost early, were followed. The dusk surveys began 15 minutes before sunset and ended 120 minutes after sunset. The dawn surveys began 120 minutes before sunrise and ended 15 minutes after sunrise (or 15 minutes after last bat was recorded if later). The cloud cover, wind strength, rain and temperature were all noted.

3.3 Dates of Surveys and Weather Conditions

3.3.1 The dates and times of the dusk emergence and dawn return to roost surveys are provided in Table 4. Weather conditions recorded during the surveys are provided in Appendix 1.

Table 4: Dates and times of the dusk emergence and dawn return to roost surveys.

Date	Tree No. (Surveyor Aspects)	Survey Type (Dusk Or Dawn)	Sunset / Sunrise Time	Survey Start And Finish Time
13/06/2016	T80 (NE + SW)	Dusk	21:29	21:14 - 23:29
14/06/2016		Dawn	04:55	02:55 - 05:10
	T274 (E + W)	Dusk	21:29	21:14 - 23:29
15/06/2016		Dawn	04:55	02:55 - 05:10
16/06/2016	T82 (NE + NW)	Dusk	21:30	21:15 - 23:00*
17/06/2016		Dawn	04:55	02:55 - 05:10
20/06/2016	T273 (N + S). X2 (N + S)	Dusk	21:32	21:17 - 23:32
21/06/2016		Dawn	04:55	02:55 - 05:10
	T88 (N + S)	Dusk	21:32	21:17 - 23:32
22/06/2016		Dawn	04:55	02:55 - 04:00*
	T328 (E + W), T358 (E + W)	Dusk	21:32	21:17 - 23:32
23/06/2016		Dawn	04:56	02:56 - 05:11
	T38 (NE + SW), T39 (S + SE), T45 (SE + SW)	Dusk	21:32	21:17 - 23:32
24/06/2016		Dawn	04:56	02:56 - 05:11
28/06/2016	T346 (NE + NW)	Dusk	21:32	21:17 - 23:32
29/06/2016		Dawn	04:58	02:58 - 05:13
	T359 (NW + SE)	Dusk	21:31	21:16 - 23:31
30/06/2016		Dawn	04:59	02:59 - 05:14
04/07/2016	T375 (E + W)	Dusk	21:30	21:15 - 23:30
05/07/2016		Dawn	05:03	03:03 - 05:18

Date	Tree No. (Surveyor Aspects)	Survey Type (Dusk Or Dawn)	Sunset / Sunrise Time	Survey Start And Finish Time
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Date	Tree No. (Surveyor Aspects)	Survey Type (Dusk Or Dawn)	Sunset / Sunrise Time	Survey Start And Finish Time
05/07/2016	T335 (E + W)	Dusk	21:29	21:14 - 23:29
06/07/2016		Dawn	05:04	03:04 - 05:19
07/07/2016	X1 (NE + NW)	Dusk	21:28	21:13 - 23:28
08/07/2016		Dawn	05:06	03:06 - 05:21
12/07/2016	T331 (N + S)	Dusk	21:24	21:09 - 23:24
13/07/2016		Dawn	05:11	03:11 - 05:26
25/07/2016	T80 (NE + SW), T274 (E + W)	Dusk	21:09	20:54 - 23:09
26/07/2016		Dawn	05:28	03:28 - 05:43
27/07/2016	T328 (E + W), T335 (E + W), T45 (SE + SW)	Dusk	21:06	20:51 - 23:06
28/07/2016		Dawn	05:31	03:31 - 05:46
	T346 (NE + NW), T359 (NW + SE)	Dusk	21:04	20:49 - 23:04
29/07/2016		Dawn	05:32	03:32 - 05:47
08/08/2016	X1 (NE + NW)	Dusk	20:46	20:31 - 22:46
09/08/2016		Dawn	05:49	03:49 - 06:04
	T38 (NE + SW), X2 (N + S), T39 (S + SE)	Dusk	20:44	20:29 - 22:44
10/08/2016		Dawn	05:51	03:51 - 06:06
	T375 (E + W), T331 (N + S)	Dusk	20:42	20:27 - 22:42
11/08/2016		Dawn	05:52	03:52 - 06:07
25/08/2016	X3 (N + S)	Dusk	20:11	19:56 - 22:11
26/08/2016		Dawn	06:16	04:16 - 06:31

Date	Tree No. (Surveyor Aspects)	Survey Type (Dusk Or Dawn)	Sunset / Sunrise Time	Survey Start And Finish Time
06/09/2016	X1 (NE + NW)	Dusk	19:45	19:30 - 21:45
07/09/2016		Dawn	06:35	04:35 - 06:50
	X2 (NW + NE)	Dusk	19:42	19:27 - 21:42
08/09/2016		Dawn	06:37	04:37 - 06:53
13/09/2016	X3 (N + S)	Dusk	19:29	19:14 - 21:29
14/09/2016		Dawn	06:46	04:46 - 07:01

* Survey finished early due to unsuitable weather conditions

3.4 Surveyors

3.4.1 The ground level tree inspection survey was undertaken by Nia Bowen BSc (Hons) GCIEEM and Chris Wildblood BSc (Hons) MSc GCIEEM. Nia Bowen is a bat licenced ecologist (NRW licence number 66610:OTH:SA:2015) and has extensive survey experience with bats with over four years' experience of bat roost tree inspections. Chris Wildblood also has over three years' experience of assisting on bat roost tree inspections.

3.4.2 The dusk emergence and dawn return to roost surveys were undertaken by Sali Palmer BSc (Hons) MSc MCIEEM, Nia Bowen BSc (Hons) GCIEEM (NRW bat licence number 66610:OTH:SA:2015), Janine Burnham BSc (Hons) MRes ACIEEM, Karen Akehurst BSc (Hons) MSc GCIEEM, Chris Wildblood BSc (Hons) MSc GCIEEM, Zoe Costas-Michael BSc (Hons) MSc ACIEEM, Andrew Bone BSc (Hons) MSc ACIEEM, Chris Lawrence BSc (Hons) MSc, Lisa Handscomb BSc (Hons), and Amy Macliston BSc (Hons). The ecologists have between one to nine years' experience in undertaking dusk emergence and dawn return to roost surveys.

4. Results

4.1 Ground Level Tree Inspection

- 4.1.1 The ground level tree inspection of tree X3 (see Figure 2c, Photograph 1 on Figure 3) recorded only two features that could be potential roost features. Details of the inspection results are given in Table 5.

Table 5: Summary of ground level inspection.

Tree ID	X3
Tree Species	Pedunculate oak (<i>Quercus robur</i>)
Approximate Height (m)	10
Diameter at Breast Height (cm)	79
Life-stage	Mature
Condition	Good
Potential Roost Features	Raised bark on northern aspect Rot hole on northern aspect, approx. 10-15 cm deep
Evidence of Bats	None
Potential	Transitional- Low Maternity - Negligible Hibernation - Negligible

4.2 Dusk Emergence and Dawn Return to Roost Surveys

- 4.2.1 One common pipistrelle bat was seen returning to a roost in tree T80 (see Figure 2a, Photograph 2 on Figure 3) during the first dawn survey visit. Three long-eared bats (*Plecotus* sp., most likely brown long-eared bat (*Plecotus auritus*)), were observed flying under the arches of a disused lime kiln building, although they were not seen directly emerging they were not observed flying in to the building (T335 on Figure 2c, Photograph 3 on Figure 3). The bats were observed “light sampling” (i.e. flying in and out from the roost) before exiting the location to the west.
- 4.2.2 A soprano pipistrelle (*Pipistrellus pygmaeus*) bat was seen flying around tree T274 (see Figure 2a, Photograph 4 on Figure 3) during the first dawn survey at this location and was not seen leaving the area so was assumed to have entered a roost in the tree. A noctule (*Nyctalus noctula*) bat was also seen flying directly towards tree T274 during the second dusk survey visit,

and not seen leaving the area, although this was during a dusk survey, it was assumed to have entered a roost in the tree.

4.2.3 A common pipistrelle bat was tracked back to tree X3 during a dawn survey at tree T359 (the second dawn at that location) and was thought to enter a roost. Further survey of tree X3 only recorded two potential roost features (see Section 4.1.1), and it was classified as having low potential for transitional roosts only. However, due to the tracking of the bat back to the tree, it is considered probable that it is a bat roost.

4.2.4 Table 6 provides a summary of all trees that were confirmed as supporting a bat roost. Table 7 provides a summary of the probable bat roost trees where high levels of activity were recorded. For photographs of these roosts see Figure 3.

Table 6: Summary of trees confirmed as bat roosts.

Tree Number	Visit Number	Date	Sunrise/Sunset Time	Surveyor Location	Details of Bat Emerging/Returning
T80	1	Dawn 14/06/16	04:55	NE	One common pipistrelle bat circled the tree before entering to roost at 04:57
T335	1	Dusk 05/07/16	21:29	E	Three long-eared bats seen flying under the arches of the lime kiln, they were observed light sampling (flying in and out of the building) between 22:44 and 22:51, before flying away to the west of the kiln.

Table 7: Summary of trees with probable bat roosts.

Tree Number	Visit Number	Date	Sunrise/Sunset Time	Surveyor Location	Details of Bat Emerging/Returning
T274	1	Dawn 06/07/16	04:55	W	One soprano pipistrelle bat foraging along the hedge line before disappearing from sight under canopy at 04:27. The bat was not seen again and probably returned to roost in tree T274.
T274	2	Dusk 25/07/16	21:09	W	One noctule bat flying directly to tree T274 at 22:47 and not observed again, assumed to have roosted in the tree.

Tree Number	Visit Number	Date	Sunrise/Sunset Time	Surveyor Location	Details of Bat Emerging/Returning
X3	-	Dawn 29/07/16	05:32	-	When surveying nearby tree T359, a common pipistrelle bat was tracked back to tree X3 at 04:54.

4.3 Summary of 2015 and 2016 Confirmed and Probable Bat Roosts

4.3.1 For precautionary reasons, each tree should be assigned the highest level of bat roost status recorded over the two years (i.e. either confirmed or probable). The overall bat roost status and species recorded is given in Table 8 with the results shown on Figures 2a to 2c. The maximum number of each species recorded at each roost is given in brackets.

Table 8: Summary of bat roost status in 2015/2016 and final bat roost status.

Tree ID	Bat Roost Status 2015	Bat Roost Status 2016	Species	Bat Roost Status Final
T39	Probable	No evidence	Common pipistrelle (1)	Probable
T45	Probable	No evidence	Common pipistrelle (1)	Probable
T80	Confirmed	Confirmed	Common pipistrelle (1)	Confirmed
	Confirmed	No evidence	Long-eared bat (1)	
T274	Confirmed	-	Unknown (1)	Confirmed
	-	Probable	Soprano pipistrelle (1)	
	-	Probable	Noctule (1)	
T335	-	Confirmed	Long-eared bat (3)	Confirmed
T375	Confirmed	-	Unknown (1)	Confirmed
X3	-	Probable	Common pipistrelle (1)	Probable

5. Recommendations

5.1 Mitigation

- 5.1.1 All activities which may result in the killing and injury of bats and the disturbance or destruction of a bat roost, may only take place under a European Protected Species Licence (EPSL) granted by Natural Resources Wales.
- 5.1.2 Trees T80, T274, and T375 and building T335 (see Figures 2a to 2c) are confirmed bat roosts, and trees T39, T45 and X3 are probable bat roosts, therefore an EPSL should be applied for to ensure works are carried out lawfully. A project licence is recommended that will include mitigation for all known roosts that will be impacted and roosts in trees which have not been surveyed (trees with low or medium potential).
- 5.1.3 The licence will be supported by a Method Statement that will outline compensation measures to replace lost roosts and how the works will be undertaken to avoid causing death or injury to individual bats (i.e. soft felling when bats are least likely to be present).
- 5.1.4 Bat boxes would be suitable replacement roosts for low significance tree roosts. The Method Statement should include siting of several different types; tree crevice type boxes for crevice dwelling pipistrelle species and tree hollow type boxes for long-eared bats and noctules. The boxes should be situated as close to the site of the lost roosts as possible, but taking into consideration features such as commuting lines and foraging areas. Boxes should be situated following the guidelines in the Bat Workers Manual (Mitchell-Jones and McLeish, 1999). All replacement roosts should be *in situ* before the destruction of known bat roosts.

6. References

- 6.1.1 Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists, Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
- 6.1.2 Mitchell-Jones, A.J. & McLeish, A.P. (1999). Bat Workers' Manual (2nd Edition). Joint Nature Conservancy Committee, Peterborough.
- 6.1.3 Thomson Ecology (2015) Bat Tree Inspections, Dusk Emergence and Dawn Return to Roost Bat Surveys, M4 Corridor around Newport. Report reference MRPS108/005/002/003.
- 6.1.4 Thomson Ecology (2016) Bat Hibernation Roost Surveys, M4 Corridor around Newport. Report reference MRPS108/008/003/004.

Appendix 1 - Date, Time and Weather Data for Dusk Emergence and Dawn Return to Roost Bat Surveys

Date	Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
13/06/16	T80 (SW + NE)	Dusk	21:29	21:14 - 23:29	16	15	2	Dry	1	Optimal
14/06/16	T80 (SW + NE)	Dawn	04:55	02:55 - 05:10	14	14.5	3	Dry	2	Optimal
14/06/16	T274 (E + W)	Dusk	21:29	21:14 - 23:29	16	14.5	3	Dry	2	Optimal
15/06/16	T274 (E + W)	Dawn	04:55	02:55 - 05:10	13	13	3	Drizzle	1	Sub-optimal
16/06/16	T82 (NE)	Dusk	21:30	21:15 - 23:00*	14	13	2	Dry until 23:00	2	Optimal (*survey halted when sub-optimal conditions started)
17/06/16	T82 (NE)	Dawn	04:55	02:55 - 05:10	12.5	13	2	Dry	0	Optimal
20/06/16	T273 (N + S), X2 (N + S)	Dusk	21:32	21:17 - 23:32	16	14	1	Dry	1	Optimal
21/06/16	T273 (N + S), X2 (N + S)	Dawn	04:55	02:55 - 05:10	14	14	1	Dry	1	Optimal

Date	Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
21/06/16	T88 (N + S)	Dusk	21:32	21:17 - 21:32	16	15	3	Dry	0	Optimal
22/06/16	T88 (N + S)	Dawn	04:55	02:55 - 04:00*	11	11	3	Light rain, heavy rain from 03:50	0	Sub-optimal (*survey halted when became unsuitable)
22/06/16	T328 (E + W), T358 (E + W)	Dusk	21:32	21:17 - 23:32	18	16	3	Dry	1	Optimal
23/06/16	T328 (E + W), T358 (E + W)	Dawn	04:56	02:56 - 05:11	16	15	3	Dry	0	Optimal
23/06/16	T38 (N + S), T39 (N + S), T45 (E + W)	Dusk	21:32	21:17 - 23:32	18	16	2	Dry	0	Optimal
24/06/16	T38 (N + S), T39 (N + S), T45 (E + W)	Dawn	04:56	02:56 - 05:11	13	14	2	Dry - rain between 03:25 and 03:35	2	Optimal (for majority of survey time)
28/06/16	T346 (NE + NW)	Dusk	21:32	21:17 - 23:32	14	12	3	Dry	5	Optimal
29/06/16	T346 (NE + NW)	Dawn	04:58	02:58 - 05:13	12	13	1	Dry	1	Optimal

Date	Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
29/06/16	T359 (N +S)	Dusk	21:31	21:16 - 23:31	14	13	3	Dry	1	Optimal
30/06/16	T359 (N + S)	Dawn	04:59	02:59 - 05:14	12	13	2	Dry	1	Optimal
04/07/16	T375 (E + W)	Dusk	21:30	21:15 - 23:30	16.5	14	3	Drizzle	3	Sub-optimal
05/07/16	T375 (E + W)	Dawn	05:03	03:03 - 05:18	15	15	3	Drizzle	2	Sub-optimal
05/07/16	T335 (E + W)	Dusk	21:29	21:14 - 23:29	16	14	1	Dry	1	Optimal
06/07/16	T335 (E + W)	Dawn	05:04	03:04 - 05:19	9	10	1	Dry	1	Sub-optimal
07/07/16	X1 (E + W)	Dusk	21:28	21:13 - 23:28	16	16	2	Drizzle	1	Sub-optimal
08/07/2016	X1 (E + W)	Dawn	05:06	03:06 - 05:21	11	11	1	Dry	1	Optimal
12/07/2016	T331 (N + S)	Dusk	21:24	21:09 - 23:24	14	12	3	Dry	1	Optimal
13/07/2016	T331 (N + S)	Dawn	05:11	03:11 - 05:26	11	11	1	Dry	2	Optimal
25/07/2016	T80 (NE + SW), T274 (E + W)	Dusk	21:29	20:54 - 23:09	16	15	1	Dry	1	Optimal

Date	Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
26/07/2016	T80 (NE + SW), T274 (E + W)	Dawn	05:28	03:28 - 05:43	13	13.5	2	Dry	1	Optimal
27/07/2016	T45 (E + W)	Dusk	21:06	20:51 - 23:06	17	16	0	Dry	1	Optimal
27/07/2016	T328 (E + W), T335 (E + W)	Dusk	21:06	20:51 - 23:06	16	13	1	Dry	0	Optimal
28/07/2016	T45 (E + W)	Dawn	05:31	03:31 - 05:46	13.5	10	1	Dry	1	Optimal
28/07/2016	T328 (E + W), T335 (E + W)	Dawn	05:31	03:31 - 05:46	13	12	1	Dry	1	Optimal
28/07/2016	T346 (NE + NW), T359 (N + S)	Dusk	21:04	20:49 - 23:04	17	16	2	Light Drizzle	2	Sub-optimal
29/07/2016	T346 (NE + NW), T359 (N + S)	Dawn	05:32	03:32 - 05:47	15	16	1	Dry	1	Optimal
08/08/2016	X1 (NE + NW)	Dusk	20:46	20:31 - 22:46	16	15	1	Dry	3	Optimal
09/08/2016	X1 (NE + NW)	Dawn	05:49	03:49 - 06:04	10	10	0	Dry	2	Optimal

Date	Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
09/08/2016	X2 (N + S), T38 (N + S), T39 (N + S)	Dusk	20:44	20:29 - 22:44	14	14	1	Dry	1	Optimal
10/08/2016	X2 (N + S), T38 (N + S), T39 (N + S)	Dawn	05:51	03:51 - 06:06	14	13	1	Dry	1	Optimal
10/08/2016	T331 (N + S), T375 (E + W)	Dusk	20:42	20:27 - 22:42	14	12	3	Dry	3	Optimal
11/08/2016	T331 (N + S), T375 (E + W)	Dawn	05:52	03:52 - 06:07	14	13	1	Dry	2	Optimal
26/08/2016	X3 (N + S)	Dawn	06:16	04:16 - 06:31	14	11	1	Light rain	0	Sub-optimal
06/09/16	X1 (NE+ NW)	Dusk	19:45	19:30 - 21:45	21	15	3	Dry	1	Optimal
07/09/16	X1 (NE + NW)	Dawn	06:35	04:35 - 06:50	18	18	3	Dry	1	Optimal
07/09/16	X2 (N + S)	Dusk	19:42	19:27 - 21:42	20	18	1	Dry	1	Optimal
08/09/16	X2 (N + S)	Dawn	06:37	04:37 - 06:53	16	15	2	Rain	6	Sub-optimal
13/09/16	X3 (N+S)	Dusk	19:29	19:14 - 21:29	26	25	3	Dry	0	Optimal

Date	Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
14/09/16	X3 (N+S)	Dawn	06:46	04:46 - 07:01	18	18	3	Dry	3	Optimal