A358 Taunton to Southfields Dualling Scheme

Ecological Baseline Report - Reptiles

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Executive Summary

The A358 Taunton to Southfields Dualling scheme would provide a dual carriageway along the length of the A358 between Taunton and Ilminster in Somerset, connecting the M5 motorway to the A303 at Ilminster to the south.

Reptile surveys were part of the suite of habitat and protected species surveys commissioned in relation to the scheme. This report presents the results of the reptile surveys undertaken throughout 2021 and aims to inform the ecology baseline for the scheme.

The objectives of this report are to present the methodologies used, to identify survey limitations and to present the results of a desk study, presence/likely absence and population assessment surveys.

All native British reptiles are protected under the Wildlife and Countryside Act 1981 and the Countryside and Rights of Way Act 2000. Additionally, all native British reptiles are listed as species of principal importance under the Natural Environment and Rural Communities (NERC) Act 2006.

There are four common species of reptile within the UK, namely the common lizard, slow-worm, grass snake and adder. All four of these species are present within Somerset, although they have varying abundance. Slow-worm is widespread and locally common, grass snake is widespread and most abundant in wetland habitat, common lizard is widespread although highly localised and adder is uncommon and localised.

Following a desk study and habitat assessment surveys, 21 survey areas across the full length of the scheme were identified as potentially supporting suitable reptile habitat. These 21 survey areas were subject to presence/likely absence surveys, with those recording reptiles being subject to additional population assessment surveys.

A series of limitations were encountered during the surveys, including delayed or withdrawn land access to several survey areas and interference with a small quantity of survey equipment during the course of the surveys. Overall, the limitations are not considered significant, and the baseline detailed within this report is reliable for the purposes of the assessment of the impact of the scheme on reptiles.

Fourteen survey areas were identified as supporting reptiles. Slow-worm was present at all 14 of these, whilst grass snake was present at seven and adder was present at only one. One survey area was identified as an ‘important reptile site’, due to the assemblage of reptile species present and the importance of this assemblage within Somerset. The impact assessment upon the reptile populations present within the survey areas, as well as any mitigation measures required, will be fully detailed within the scheme Environmental Statement.

1 Introduction

1.1 Purpose and scope of this document

1.1.1 The A358 Taunton to Southfields Dualling scheme (hereafter referred to as 'the scheme') would provide a dual carriageway along the length of the A358 between Taunton and Ilminster in Somerset, connecting the M5 motorway to the A303 at Ilminster to the south. Reptile surveys were part of the suite of habitat and protected species surveys commissioned in relation to the scheme.

1.1.2 This report presents the results of the reptile surveys and aims to inform the baseline ecology for the scheme.

The objectives of this report are to:

- undertake a review of reptile species records within 2 kilometres of the scheme
- present the results of surveys undertaken to determine the presence or absence of any reptile populations within suitable habitats within the study area of the scheme
- determine a population size estimate of any reptile populations found to be present within the study area of the scheme, and the relative abundance of reptile populations
- provide sufficient information to inform an assessment of the impacts of the scheme on reptiles and to design appropriate mitigation measures (where required)

1.2 Scheme overview

1.2.1 The scheme is part of a programme of improvements planned along the A303/A358 corridor aimed at improving connectivity between London, the south-east and the south-west. The A303, alongside the A30, forms part of the strategic road network (SRN) and together with the A358, provides the link between London, the south-east and the south-west.

1.2.2 The programme of improvements, as set out in the Government's Road Investment Strategy [1] made a commitment to, "…upgrade all remaining sections of the A303 between the M3 and the A358 to dual carriageway standard, together with creating a dual carriageway link from M5 at Taunton to the A303.

1.2.3 The scheme directly addresses this long-term commitment and would provide a new rural all-purpose dual carriageway link from the M5 at Taunton to the A303 at Southfields roundabout. The new dual carriageway would comprise new and upgraded stretches of the existing A358 road. Full details of the scheme will be provided in Chapter 2 *The Project* of the Environmental Statement (ES). Please refer to Figure 1-1 for a Scheme plan.

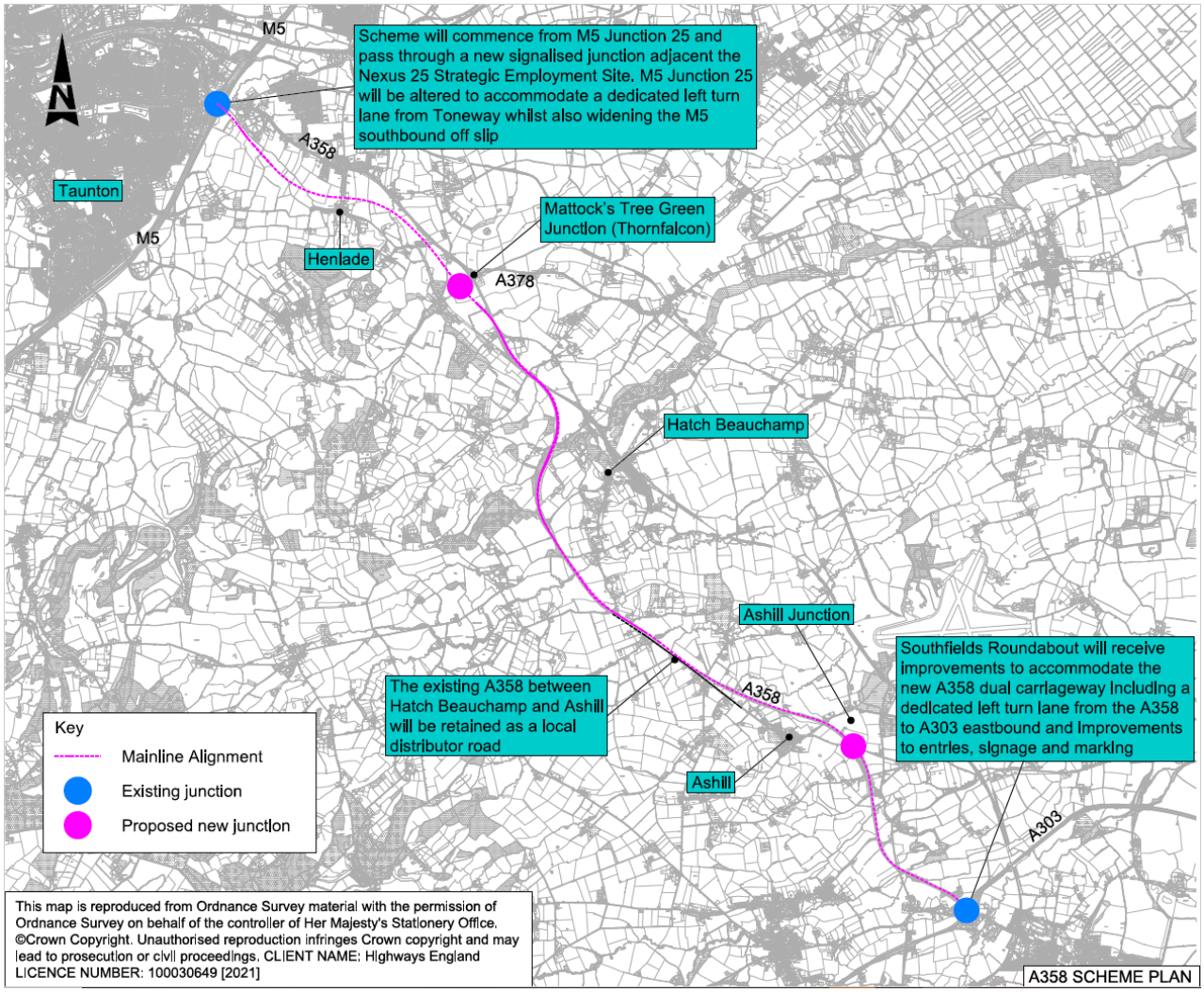

Figure 1-1 Scheme plan

1.3 Study area and zone of influence

1.3.1 The Chartered Institute for Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment* [2] recommend that all potentially important ecological features that occur within a Zone of Influence (ZoI) for a scheme are investigated. The ZoI includes:

- areas to be directly within the land take for the scheme
- areas that would be temporarily affected during construction
- areas likely to be impacted by hydrological disruption
- areas where there is a risk of pollution and noise disturbance during construction and/or operation

1.3.2 The ZoI depends on the ecological features concerned. With regard to the reptiles likely to be affected by the scheme, the ZoI has been defined as land within 100 metres of the defined ecology survey zone, which comprises the footprint of the scheme and associated site clearance area. This ZoI is hereafter referred to as the study area.

1.4 Legislation

1.4.1 A framework of international, European, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats. This legislation

will be listed in full within Chapter 8 *Biodiversity* of the ES. Legislation relevant to and discussed within this report are:

- Wildlife and Countryside Act 1981
- Natural Environment and Rural Communities (NERC) Act 2006

1.4.2 All native British reptile species are protected under Section 9 of the Wildlife and Countryside Act 1981. This legislation makes it illegal to:

- intentionally or deliberately kill, injure or take any reptile
- possess or advertise/sell/exchange a reptile (dead or alive) or any part of a reptile

1.4.3 The following reptile species are also Species of Principal Importance (SPI) for the purpose of conserving biodiversity in England, listed in accordance with the provisions of Section 41 of the NERC Act 2006, which places a duty on public organisations to 'have regard' to the conservation of the following reptile species:

- Adder (*Vipera berus*)
- Common lizard (*Zootoca vivipara*)
- Grass snake (*Natrix helvetica*)
- Sand lizard (*Lacerta agilis*)
- Slow-worm (*Anguis fragilis*)
- Smooth snake (*Coronella austriaca*)

1.4.4 Smooth snake and sand lizard are afforded additional legal protection; however, these rare species have restricted ranges, and their distribution and habitat preferences are not represented within the study area. As such they are not considered further within this report.

1.5 Status of reptiles at national level

1.5.1 Slow-worm and common lizard are widespread throughout England [3]. Adder and grass snake are slightly less widespread and are more common in the south of England than in the north. Adders have decreased in range and number considerably over the past 50 years and are noted as priority species under the UK post-2010 Biodiversity Framework [4]. Reptile populations across the UK are threatened by a number of factors including habitat degradation, fragmentation and loss, due to this species group's relatively low dispersal ability [5]. Additionally, spread of disease and persecution are also considered likely to negatively impact reptile populations.

1.6 Status of reptiles at county level

1.6.1 Slow-worm, common lizard, adder and grass snake are noted within the *Somerset Notable Species Dictionary* [6], which emphasises recording effort on species that are noted as uncommon, rare or of other ecological importance. Slow-worm are widespread and locally common throughout Somerset in most habitats and at all latitudes [7]. Common lizard are widespread across the county, although are considered to be highly localised. They are more common in the west and north of the county, with strongholds in upland heath and moor habitats. They are considered rare in and around urban areas and on farmland [8]. Grass snake is widespread across Somerset, particularly in lowland areas and is most abundant in wetland habitats. Grass snake can, however, also be found at higher elevations across the county, although are not associated with dry upland moors [9]. In Somerset, adder are likely to be near the western edge of their range in

England and are considered to be uncommon and localised throughout most of the county with the exception of three adder strongholds; the Mendips, the Quantocks and Exmoor [10].

1.7 Species-specific ecology

Grass snake

1.7.1 Due to a diet consisting largely of frogs, toads and newts, the grass snake generally utilises freshwater habitats near to areas of open grassland [3]. Grass snake hibernacula often comprise of disused rabbit holes within well-drained slopes. Individuals can be observed basking near to hibernacula during the springtime, in the evening and early morning. Grass snakes lay shelled eggs, usually within compost heaps or similar areas providing warmth to aid incubation.

Common lizard

1.7.2 Common lizard favours habitat which has a complex structure, for example mature grassland with scattered scrub, stone walls and heathland [3]. Mating takes place in spring and females give birth to live young in August. The common lizard prefers open, sunny locations for basking and is usually found in dry, exposed locations where dense cover exists close by. Common lizards feed predominantly on spiders and insects.

Slow-worm

1.7.3 Slow-worm is commonly found in low-intensity managed grassland, sheltering and foraging within grass that has developed a thatch-like structure [3]. Individuals are frequently located within disused hay meadows, landfill sites, gardens, allotments, highway verges and brownfield sites and are widespread throughout the UK. Slow-worm feed on slow-moving, soft-bodied prey items, particularly small slugs.

Adder

1.7.4 Adder are found throughout Britain, occurring most commonly in open habitats such as heathland, moorland, open woodland and sea cliffs [3]. Mating takes place in April to May and female adders incubate their eggs internally, giving birth to live young in August to September. Adders feed largely on small rodents and lizards. They are creatures of habit, returning to the same hibernacula annually.

2 Methodology

2.1 Desk study

2.1.1 A detailed biological records search was requested from Somerset Environmental Records Centre (SERC) in February 2021 for reptile species records within 2 kilometres of the scheme.

2.1.2 All potentially suitable habitats within the study area likely to be impacted by the scheme were identified using the Department for Food Environment and Rural Affairs (Defra) Multi Agency Geographic Information for the Countryside (MAGIC) online viewer tool [11], 1:10,000 Ordnance Survey mapping and/or aerial photography. A review of the *A358 Taunton to Southfields Dualling Reptile Technical Report (March 2021)* [12] and the *A358 Taunton to Southfields Preliminary Ecological Appraisal (PEA) Report (June 2016)* [13] was also undertaken. Suitable habitat areas were recorded and given a unique identifier that corresponded to the unique identifiers within the March 2021 report [12].

2.2 Habitat assessment

2.2.1 Habitats identified during the desk study within a 100 metre radius of the scheme were assessed using the following characteristics to determine if they contained appropriate habitat structure to support reptile populations:

- Location in relation to species range
- Vegetation structure
- Insolation (exposure to sun)
- Aspect
- Connectivity to other good quality habitat
- Prey abundance
- Refuge opportunities
- Hibernation habitat potential
- Disturbance
- Egg-laying site potential (for grass snake only)

2.2.2 Additional areas were identified on a precautionary basis, using aerial photography, to ensure survey locations formed a representative sample of habitats found within the study area. For example, a survey of all of the verges along the existing A358 could not be undertaken due to health and safety concerns, therefore key areas of accessible verge habitat were selected.

2.2.3 The sites identified during the desk study were subject to field based habitat assessment in early April 2021 and 21 survey areas were confirmed as having the potential to support reptile species. The habitat composition and structure of each survey area, and their connectivity to suitable potential reptile habitats outside of the study area were recorded.

2.3 Field survey

2.3.1 All surveys were undertaken by experienced ecologists meeting the CIEEM competencies for reptile surveys [14] and were familiar with *the Design Manual for Roads and Bridges (DMRB) LA 108 Biodiversity* [15]. All surveys were led by surveyors experienced in undertaking reptile surveys: Anna Burnham, Chloe Stephenson, Daniel Tackie, Felix Tuff, Jack Anderson, John Daw and Nick Mason.

2.3.2 Artificial refugia comprising a mixture of squares (minimum size 0.5m^2) of bitumen roofing felt and corrugated onduline were distributed across key habitats within each of the 21 survey areas. In linear habitats, such as road verges and field margins, refugia were placed approximately every 10 metres in suitable reptile habitats. In non-linear habitats such as fields, a density of at least ten refugia per hectare was deployed. The position of each artificial refuge was recorded using a data-enabled smart phone or tablet with ArcGIS software installed, giving location points accurate to approximately 5 metres. The number and density of artificial refugia within each survey area is summarised in Table 2-1.

2.3.3 Artificial refugia heat up during the day at a faster rate than the surrounding environment, thus making them attractive to cold-blooded reptiles for basking and shelter. Artificial refugia were left to 'bed in' for a minimum period of 14 days prior to surveys commencing to allow reptiles to become accustomed to their presence and begin to make use of them.

Table 2-1 Number and density of artificial refugia

Reptile survey area ID	Set up date	Number refugia deployed	Area of suitable habitat (ha)	Refugia density per ha
R1	6 April 2021	38	2.4	16
R2	6 April 2021	73	0.8	91
R10	6 April 2021	64	1.3	49
R11	7 April 2021	15	0.4	39
R12	7 April 2021	35	0.3	117
R13	7 April 2021	66	0.7	94
R14	7 April 2021	31	0.4	78
R15	7 April 2021	59	0.5	118
R16	8 April 2021	64	0.8	80
R17	8 April 2021	43	0.8	54
R18	8 April 2021	45	0.55	82
R19	8 April 2021	14	0.13	108
R20	6 April 2021	45	0.3	150
R21	6 April 2021	121	0.8	151
R22	6 April 2021	98	0.6	163
R23	6 April 2021	25	0.2	125
R24	9 April 2021	51	0.5	102
R25	9 April 2021	54	0.4	135
R26	9 April 2021	34	0.3	113
R27	12 April 2021	27	0.3	90
R28	27 May 2021	51	1.65	31

2.3.4 Following the bedding in period, surveys were undertaken to check for reptiles. During each visit, both the artificial refugia and any existing debris/natural refugia were carefully approached to avoid disturbance of basking reptiles, then lifted and subsequently replaced. Visual searches of the general habitat and potential basking spots for reptiles were also conducted alongside refugia checks. Details including refuge location, species, number of individuals, life stage (adult, juvenile) and sex (when possible) were recorded electronically using the ArcGIS

Survey123 application, along with the weather conditions and date and time of survey. Each visit was completed by two suitably experienced ecologists during optimal weather conditions in line with guidance [16], as summarised below:

- Time: conducted between 07:00 and 19:00.
- Air temperature: between 10°C and 20°C.
- Wind: still to moderate (no greater than Beaufort 4; 13-17 mph).
- Rain: no or light rain only at time of survey. Surveys between periods of heavy rain, when all other conditions are suitable, are also acceptable.

2.3.5 Seven survey visits, in suitable weather conditions, were conducted at each survey area between 21 April 2021 and 16 September 2021 to determine presence or likely absence of common reptile species. If reptiles were recorded during these initial seven visits, a further 13 visits were undertaken up until 24 September 2021 to estimate population size at each individual site. A total of 13 survey areas were subject to the full population estimate surveys, with one survey area where reptiles were present not being subject to the population estimate surveys and a small number not being subject to the full 13 additional visits. Justification for a reduced survey effort in is discussed in Section 2.5.

2.4 Evaluation of results

Population size and density assessment

2.4.1 Population size and the importance of a reptile population was assessed according to categories described under the *Froglife Advice Sheet 10* [16]. This advice identifies site importance for reptiles according to the maximum number of adult animals recorded during a single survey visit, where artificial refugia are at a density of 10 per hectare. As shown in Table 2-1, refugia densities at all 21 survey areas were greater than ten per hectare, and therefore the results in Section 3.4 have the potential to overestimate the reptile populations encountered.

2.4.2 Each population category present was awarded a score, and these were totalled to estimate survey area importance. Categories are summarised in Table 2-2.

Table 2-2 Reptile population score categories

Species	Low population (Score 1)	Good population (Score 2)	Exceptional population (Score 3)
Slow-worm	< 5	5-20	>20
Common lizard	< 5	5-20	>20
Adder	< 5	5-10	>10
Grass snake	< 5	5-10	>10

Source: *Froglife Advice Sheet 10* [16]

2.4.3 A population density score was calculated for each population present using the peak count (maximum number of adults recorded over a single visit) divided by the area of the habitat available. The population density categories are given in Table 2-3. The guidance [17] does not indicate the density of refugia to be used to calculate population densities of reptile species, however as good coverage of artificial refugia was achieved across each survey area, the estimated population density is judged to be a fair representation.

Table 2-3 Reptile population density categories

Species	Population density (/ha)		
	Low	Medium	High
Slow-worm	< 50	50 – 100	> 100
Common lizard	< 20	20 – 80	> 8
Adder	< 2	2 – 4	> 4
Grass snake	< 2	2 – 4	> 4

Source: Adapted from *Herpetofauna Groups of Great Britain and Ireland* [17]

2.4.4 Generally, survey areas are automatically classified as of importance to reptile species if they comply with any one of the following:

- Support three or more reptile species
- Support two snake species
- Support an exceptional population of one species
- Support an assemblage of species scoring at least four (according to a total score calculated from Table 2-1 above)
- Are of significant regional importance due to local rarity

2.4.5 The overall value of the habitats within the scheme for reptiles also takes into account several other factors, as detailed below:

- The quality and rarity of the habitat and populations
- How connected the populations are to the wider area
- The local significance of the populations
- The estimated size of the populations

2.5 Assumptions and limitations

2.5.1 Reptiles are mobile animals with some, such as grass snake, occupying large home ranges. Therefore, they may occur as transient individuals in survey areas connected to wider areas that support these species. Where reptiles have not been identified as occupying a survey area during the initial seven survey visits, this does not guarantee their absence. There is always the risk of reptiles not using artificial refugia, particularly in areas where there is an abundance of natural basking and shelter features. Large areas of natural habitat combined with potentially low population densities could lead to individuals going undetected. However, the level of survey effort undertaken, including surveys in previous years, is anticipated to have detected the reptile species present within the study area.

2.5.2 The optimal months to undertake a reptile survey are April, May and September. Due to suitable weather conditions, and relatively low temperatures, surveys were extended in the first half of the year until the end of June 2021, before being paused during the warmer weather in July, and restarted in late August 2021.

2.5.3 It is good practice to space survey visits out across the optimal months to extend the sampling period, ensure a range of environmental conditions are encountered during the survey and increase the likelihood of reptiles discovering the artificial refugia, therefore survey visits were spaced at least three days apart. However, in some instances, it was necessary to reduce the spacing between some survey visits to two days apart in order to fit in the required number of surveys within optimal survey periods and weather conditions, ensuring full population estimate

surveys could still be undertaken, with 20 visits taking place during the survey season. This occurred at survey areas R1, R2, R12, R15, R20, R24 and R27 (between visits 3 and 4) and at survey areas R13 (between visits 3 and 4, 14 and 15 and 17 and 19), R17 (between visits 14 and 15), R18 (between visits 14 and 16), R21 (between visits 16 and 18), R22 (between visits 18 and 20) and R26 (between visits 3 and 4 and 15 and 16). As the majority of surveys were undertaken with three or more days between surveys, and surveys spaced throughout the optimal survey months, the occasional reduction of spacing between survey visits is not considered a significant limitation to the validity of the results.

2.5.4 Due to a requirement by landowners to undertake farming operations that would have conflicted with the survey, survey area access was withdrawn in mid-September at survey areas R17 and R26. It was not possible to complete the full 20 surveys at these survey areas, due to survey restrictions and poor weather conditions, resulting in 15 survey visits to R17 and 16 survey visits to R26. The survey was sufficient to confirm presence or absence, however it was not sufficient to provide an assessment of the population size, therefore a precautionary approach would be taken to the assessment of impacts on this population.

2.5.5 Land access permission was not granted to survey area R28 until May 2021; therefore, survey set-up was only able to be undertaken in May, with surveys commencing at the beginning of June 2021. As such, the majority of the surveys were required to be undertaken in September and only seven survey visits were able to be achieved rather than the 20 required to calculate a population size estimate. The survey confirmed the presence of reptiles; however, it was not sufficient to assess the population size, therefore a precautionary approach would be taken to the assessment of impacts on this population.

2.5.6 Land access permission was not granted to all of the land covered by survey area R10 until July 2021. The inaccessible area comprises a disused railway corridor, the northern end of which was accessible and able to be surveyed along with adjacent suitable reptile habitats. Given the survey of the accessible section of the disused railway, and similar habitats along this corridor, the assumed presence or absence of reptiles along the railway corridor beyond the survey area can be extrapolated. The restricted land access at R10 is not therefore considered a significant limitation to the validity of the assessment.

2.5.7 Suitability of reptile habitat varied at each survey area throughout the survey period. Several survey areas were affected by ongoing maintenance, grazing and public interference. Cows were noted within fields where artificial refugia had been placed on visits one and four to survey area R25. There were also several instances of individual mats having been mown or otherwise interfered with, in particular at survey areas R1 (visit six), R11 (visit four and visit 14) and R15 (visit 10). Where refugia were lost to interference they were replaced during the next survey. Given the large number and density of artificial refugia deployed at each survey area, the disturbance or loss of a small number of artificial refugia was not considered to have a negative impact on the results, which are considered to remain valid.

2.5.8 Low numbers of artificial refugia were not able to be found on a small number of occasions at survey areas R10 (visit nine and visit 11), R11 (visit seven), R13 (visit 10), R15 (visit eight), R16 (visit two), R17 (visit seven), R18 (visit 7), R21 (visit 9), R22 (visit seven and visit nine) and R25 (visit six). Given the densities at

which the artificial refugia were placed, a small number of artificial refugia not being checked during an individual survey is not considered to have a negative impact on the results, which are considered to remain valid.

2.5.9 During visit four to survey area R25, it was noted that approximately half of the artificial refugia had been moved or interfered with. This survey was consequently postponed until replacement artificial refugia were deployed, allowed to bed in, before the survey work recommenced. Only seven valid surveys were able to be completed to confirm presence and absence, however as this was not a sufficient number of visits to provide an assessment of the population size, a precautionary approach would therefore be taken to the assessment of impacts on this population.

2.5.10 Maintenance of the highways soft estate included the mowing of approximately 1.5 metres of the grass closest to the road edge to increase visibility at junctions. Due to the wide nature of the soft estate, it was possible to place the artificial refugia at the back of the verge away from the mown area, to allow refugia to remain undisturbed. This maintenance was not therefore considered a significant limitation to the validity of the survey results.

2.5.11 Table 2-4 below provides a summary of the surveys carried out at each of the 21 reptile survey areas.

Table 2-4 Reptile survey effort by site

Reptile survey area ID	Set up date	Date of first survey visit	Total number of surveys
R1	6 April 2021	21 April 2021	7
R2	6 April 2021	22 April 2021	7
R10	6 April 2021	22 April 2021	20
R11	7 April 2021	22 April 2021	20
R12	7 April 2021	22 April 2021	20
R13	7 April 2021	22 April 2021	20
R14	7 April 2021	22 April 2021	20
R15	7 April 2021	22 April 2021	20
R16	8 April 2021	23 April 2021	20
R17	8 April 2021	23 April 2021	15
R18	8 April 2021	23 April 2021	20
R19	8 April 2021	23 April 2021	20
R20	6 April 2021	22 April 2021	7
R21	6 April 2021	21 April 2021	20
R22	6 April 2021	21 April 2021	20
R23	6 April 2021	21 April 2021	7
R24	9 April 2021	26 April 2021	7
R25	9 April 2021	26 April 2021	7
R26	9 April 2021	26 April 2021	16
R27	12 April 2021	27 April 2021	7
R28	27 May 2021	10 June 2021	7

3 Results

3.1 Desk study

3.1.1 Data returned from SERC in 2021 indicated the presence of slow-worm, grass snake, adder and common lizard within the 2 kilometre study area. These are summarised in Appendix A *Desk study results* and shown in Appendix B *Reptile biological records plan*. The most recent record across all species is for three adult slow-worm, dated September 2018 and located to the east of the village of Broadway, approximately 900 metres west of the scheme. The adder records are more historical, with the most recent being dated July 2008 and located approximately 1.8 kilometres west of the scheme. Three reptile records are located within the footprint of the northern end of the scheme, in proximity to junction 25 of the M5 and are for slow-worm and grass snake.

3.2 Habitat assessment

3.2.1 The study area was set within a largely agricultural landscape on either side of the existing A358. The dominant habitat type was arable and improved grassland pasture, forming fields demarcated by species rich hedgerows, improved grassland verges along the A358, and areas of semi-natural broadleaved woodland and mixed plantation woodland. Field edge and woodland ponds were scattered throughout the study area and many of the agricultural fields were demarcated by drainage ditches. The study area also included small settlements and associated residential gardens.

3.2.2 All of the potential reptile sites identified during the desk-based scoping exercise were found, during field visits, to have habitats which could support common reptile populations and were taken forward for further survey. A total of 21 survey areas were identified, each of which are described below and their location shown in Appendix C *Reptile survey areas*.

Survey area R1

3.2.3 Survey area R1 is at the northern end of the existing A358, located at the Taunton Gateway Park and Ride, partially within the footprint of the scheme. The habitat was landscaped as part of the Park and Ride construction in 2010. The construction included log piles which created hibernacula for reptiles. The suitable reptile habitat was approximately 2.4 hectares and consisted of a mosaic of tall ruderal vegetation, scrub and rough grassland alongside two well-vegetated ponds and marginal wetland habitat. This survey area was well-connected to the surrounding agricultural landscape and offered high prey availability. Plentiful natural refugia provided good cover and foraging opportunities for reptiles. Figure 3-1 illustrates the type of habitat present at survey area R1.

Figure 3-1 R1 habitat example

Survey area R2

3.2.4 Survey area R2 is at the northern end of the scheme, located to the south-east of the Taunton Gateway Park and Ride, and partially within the footprint of the scheme. The suitable reptile habitat covered an area of approximately 0.8 hectare comprising a field situated between grazing and arable fields, along with three field margins with two adjacent improved grassland fields. All three field margins were adjacent to hedgerows, whilst two of them were also adjacent to the riparian corridor of the Black Brook. The hedgerows were dominated with English elm (*Ulmus procera)*, hawthorn (*Crataegus monogyna)* and field maple (*Acer campestre)*, whilst the watercourse was surrounded by willow sp. (*Salix spp.)*, with a common nettle (*Urtica dioica)* and bramble (*Rubus fruticosus agg.)* dominated ruderal habitat. A mixture of tall sward and short grass created a complex vegetation structure, providing good basking and foraging habitat for widespread reptile species. Figure 3-2 illustrates the type of habitat present at survey area R2.

Figure 3-2 R2 habitat example

Survey area R10

3.2.5 Survey area R10, partially located within the footprint of the scheme, comprised habitat located along the disused Chard Branch Lines railway in West Hatch, as well as a field of establishing, unmanaged grassland located 100 metres to the north-west. The suitable reptile habitat measured approximately 1.3 hectares. The habitat along the disused railway comprised a strip of land situated between two halves of an arable field, bordered with lines of trees. Scrub, grassland and broadleaved woodland were all present. The grassland field was dominated by Yorkshire fog (*Holcus lanatus)*, with patches of dog rose (*Rosa canina)* and

frequent teasel (*Dipsacus fullonum)* and thistle sp. *(Cirsium spp*.). There was a pond immediately adjacent to the southern boundary of the field, and two woodland edge boundaries also within the survey area. In combination, there was a diverse range of habitat opportunities for reptiles across survey area R10, with plentiful foraging habitat, basking opportunities, shelter and potential hibernation sites. This survey area was well connected to larger areas of suitable reptile habitat in the surrounding landscape. Figure 3-3 illustrates the type of habitat present at survey area R10.

Figure 3-3 R10 habitat example

Survey area R11

3.2.6 Survey area R11 is located on the verges of the existing A358 at the junction for Bickenhall Lane near Hatch Beauchamp, within the footprint of the scheme. The suitable reptile habitat comprised an approximately 0.4 hectare strip of grassland habitat adjacent to species-rich hedgerows with some ruderals. This survey area appeared to be subject to regular mowing as part of highways maintenance. Approximately 1.5 metres of the verge from the roadside appeared to be occasionally mown for safety, leaving the back section of the verge to develop a longer, denser grassland sward suitable for reptiles. An area of broadleaved plantation woodland and scrub bordered this survey area and was further connected to arable field margins along with an area of woodland and scrub planting to the north. This survey area provided good basking habitat, with good refuge opportunities in connected habitat. Figure 3-4 illustrates the type of habitat present at survey area R11.

Figure 3-4 R11 habitat example

Survey area R12

3.2.7 Survey area R12 is located on the verges of the existing A358, and adjacent field margins, at the junction for Capland Lane. The survey area was located within the footprint of the scheme. The suitable reptile habitat comprised an approximately 0.3 hectare strip of semi-improved grassland verge on a sloped bank, with scattered scrub also present. The northern part of survey area R12 was adjacent to a dense broadleaved woodland. The verge was managed due to its proximity to the A358 carriageway and comprised improved and rough grassland. Approximately 1.5 metres of the verge from the road appears to be occasionally mown for safety, leaving the back section of the verge with a longer and denser sward height suitable for reptiles. The southern part of the survey area fell within rough grassland margins at the base of hedgerows, at the boundary of an arable field parallel to the A358 where the verge was not safely accessible to survey. The native hedgerow provided connectivity to the wider environment, including a large pond located approximately 300 metres to the south and improved grassland fields to the north-east. Survey area R12 was connected via the hedgerow network to survey area R13 to the south. Survey area R12 provided good basking habitat, high prey availability, plentiful refuge opportunities and provided good cover and foraging opportunities for reptiles. Figure 3-5 illustrates the type of habitat present at survey area R12.

Figure 3-5 R12 habitat example

Survey area R13

3.2.8 Survey area R13 is located on a rough grassland arable field margin of varying width (0.5 metres to 2 metres) close to Capland and partially located within the footprint of the scheme. The suitable reptile habitat comprised approximately 0.7 hectares and ran alongside the riparian corridor of Fivehead River main channel 2, a native species-rich hedgerow, a line of mature trees and lowland mixed deciduous woodland with scrub. The area of woodland, located to the north-west of the survey area, led to a large pond and was connected to a broadleaved woodland strip and improved grassland fields to the north-east as well as to survey area R12 to the north. Survey area R13 provides high prey availability, plentiful refuge opportunities, foraging and egg laying opportunities for grass snake and excellent connectivity. Figure 3-6 illustrates the type of habitat present at survey area R13.

Figure 3-6 R13 habitat example

Survey area R14

3.2.9 Survey area R14 is located on the verges of the existing A358 at the junction for Stewley Lane and located within the footprint of the scheme. It comprised a 3 to 4 metre wide semi-improved grassland strip, with scattered scrub bordered by native species rich hedgerows. The suitable reptile habitat measured approximately 0.4 hectares and was subject to regular highways maintenance. Approximately 1.5 metres of the verge from the roadside appears to be occasionally mown for safety, leaving a longer and more dense grassland sward at the rear of the verge with suitability for reptiles. Early purple orchids were observed here. This survey area was connected to large areas of improved grassland to the north that were used to graze livestock. This survey area provided connectivity to large areas of suitable habitat in the surrounding landscape, including survey area R15, whilst the hedgerows provided refuge opportunities and potential prey availability. Figure 3-7 illustrates the type of habitat present at survey area R14.

Figure 3-7 R14 habitat example

Survey area R15

3.2.10 Survey area R15 runs along rough grassland field margins on either side of the riparian corridor of Venner's Water, with areas of scattered scrub. It is located partially within the footprint of the scheme, the suitable reptile habitat covered approximately 0.5 hectares. The southernmost field margin supported rough grassland with a long sward. Uneven ground created slopes and banks in places. The northernmost margin extended across three fields regularly supporting livestock. These margins supported rough grassland and scrub, although

livestock grazing and poaching into the watercourse had reduced the sward length in parts. A strip of broadleaved woodland and scrub ran along the watercourse and was connected to a large number of improved grassland fields, including a drainage field allowing access to a wetland habitat, as well as survey area R14 to the east. The habitats present provide good foraging, shelter and dispersal opportunities for common reptiles. Figure 3-8 illustrates the type of habitat present at survey area R15.

Figure 3-8 R15 habitat example

Survey area R16

3.2.11 Survey area R16 is located on the verges of the existing A358 at a staggered crossroad junction for Rapps and sits within the footprint of the scheme. The suitable reptile habitat comprised an approximately 0.8 hectare strip of managed grassland verge and arable field margin, comprising improved and rough grassland with encroaching scrub, whilst bare rock was present in some places. The verge components of this survey area were subject to regular highways maintenance. Approximately 1.5 metres of the verge from the roadside was occasionally mown for safety, leaving the back section of the verge a longer and more dense grassland sward of suitability for reptiles. The arable field margin supported semi-improved grassland of varying sward length, up to approximately 30 centimetres. A dense area of woodland was located to the south-west of the survey area which provided connectivity to large grassland areas to the south, as well as a pond. The combination of habitat types offered a range of good foraging and sheltering opportunities for reptiles, with connectivity into suitable habitats within the wider landscape. Figure 3-9 below illustrates the type of habitat present at survey area R16.

Figure 3-9 R16 habitat example

Survey area R17

3.2.12 Survey area R17 is located to the east of the existing A358 and comprises a grassland field and set-aside field margins located between two arable fields next to Cad Brook and is located partially within the footprint of the scheme. The suitable reptile habitat comprised rough grassland of approximately 0.8 hectares, with variable sward structure including a small quantity of scrub which created refuge opportunities. There were various tussocks and patches of dense grassland with a more complex species diversity and with a sward height up to a maximum of approximately 1 metre. Watercourse marginal habitat was available at the southern boundary of survey area R17, providing connectivity to the wider landscape and survey area R18. The watercourse margins provided the most suitable habitat for reptiles due to habitat connectivity, sward height and increased plant species richness along with the potential for increased prey abundance. Figure 3-10 illustrates the type of habitat present at survey area R17.

Figure 3-10 R17 habitat example

Survey area R18

3.2.13 Survey area R18 is located towards the southern end of the current A358, at the staggered junction with Cad Road, and lies within the footprint of the scheme. The suitable reptile habitat covered approximately 0.55 hectares and consisted of the verges of the A358 and adjacent field margins, comprising semi-improved grassland with scattered scrub. The survey area was bordered by native, species-rich hedgerows with scattered trees. The verges were subject to regular highways maintenance. Approximately 1.5 metres of the verge from the roadside was occasionally mown for safety, leaving a longer and denser sward at the rear with

suitability for reptiles. There was connectivity to wider habitats including links to survey area R17. Dense, tall ruderal vegetation and scrub habitat to the rear of the soft estate, alongside open areas, created a complex structure providing opportunities for basking and foraging reptiles. Figure 3-11 illustrates the type of habitat present at survey area R18.

Figure 3-11 R18 habitat example

Survey area R19

3.2.14 Survey area R19 is located at the southern end of the current A358, at the junction with the A303. It was located on the verge side of the Horton Cross services and was within the footprint of the scheme. The suitable reptile habitat comprised approximately 0.13 hectares on the soft estate of the A358 and comprised a dense grassland sward, ruderals and scattered scrub. It was connected to broadleaved woodland to the north, which in turn led to a field comprising improved grassland. The 1.5 metres of the verge from the roadside was regularly mown for safety, leaving the remainder of the wide verge in this section of the A358 suitable for reptiles. Patches of dense vegetation and scrub at the toe of the verge embankment provided potential cover for reptiles, whilst ruderal habitat alongside more open areas of the south facing bank created a complex structure providing opportunities for basking and foraging reptiles. Figure 3-12 illustrates the type of habitat present at survey area R19.

Figure 3-12 R19 habitat example

Survey area R20

3.2.15 Survey area R20 is located towards the northern end of the A358 and followed the riparian corridor of the Thornwater stream located between Thornfalcon and Henlade, with fields supporting arable crops and livestock on either side. The suitable reptile habitat covered an area of approximately 0.3 hectares and was

located within the footprint of the scheme. The watercourse corridor supported mature oak (*Quercus spp.)* and ash (*Fraxinus excelsior)*, with a dense understorey of bramble, hawthorn, elder (*Sambucus nigra)* and hazel (*Corylus avellana)*. Habitat connectivity was provided by the watercourse corridor, native hedgerows and treelines, with links to grassland fields and lowland mixed deciduous woodland to the south-west and south-east. Grazing of the grassland had resulted in a short sward being present which provides little potential cover for reptiles. Figure 3-13 illustrates the type of habitat present at survey area R20.

Figure 3-13 R20 habitat example

Survey area R21

3.2.16 Survey area R21 is located on the southern side of the existing A358 carriageway, at Mattock's Tree Hill and was immediately west of survey area R22. R21 is partially located within the footprint of the scheme, The suitable reptile habitat covered an area of approximately 0.8 hectares and comprised an overgrown arable field margin with cleavers (*Galium aparine)*, common nettle, Yorkshire fog, hogweed (*Heracleum sphondylium)* and tufted hairgrass (*Deschampsia cespitosa)* present. An arable field and an area of mixed scrub lie to the west, whilst a garden comprising amenity grassland with scattered trees was located to the south. Survey area R21 was bound by hedgerows which were largely species-rich, as well as conifer tree lines. The habitats provided refuge opportunities for reptiles and potential prey availability. There was connectivity via hedgerows between this survey area and an area of lowland mixed deciduous woodland to the north. Figure 3-14 illustrates the type of habitat present at survey area R21.

Figure 3-14 R21 habitat example

Survey area R22

3.2.17 Survey Area R22 is located on the southern side of the existing A358 carriageway, at Mattock's Tree Hill, and was immediately east of survey area R21. R22 is located within the scheme boundary. The suitable reptile habitat comprised an area of 0.6 hectares and comprises the margins of two arable fields. It was predominantly bound by native hedgerows which provided refuge opportunities and potential prey availability, whilst a line of trees separated the survey area from the verge of the A358 to the north. Connectivity to the wider landscape was via a network of hedgerows and lines of trees, with links to broadleaved plantation woodland, lowland mixed deciduous woodland, additional field margins and grassland. Figure 3-15 illustrates the type of habitat present at survey area R22.

Figure 3-15 R22 habitat example

Survey area R23

3.2.18 Survey area R23 is located on the northern side of the existing A358 carriageway, at Mattock's Tree Hill. It was located within the footprint of the scheme. The suitable reptile habitat covered approximately 0.2 hectares and comprised an arable field margin adjacent to the A358, with a hawthorn hedgerow separating the survey area from the carriageway. There were native species-rich hedgerows located at either end of survey area R23, with the hedgerows providing refuge opportunities and potential prey availability. A narrow strip of bare ground between the vegetated field margin and crop plants provided areas suitable for basking. The hedgerow at the southernmost end of the survey area provided connectivity to a pond and an area of mixed scrub which offered foraging and sheltering opportunities for reptiles. Figure 3-16 illustrates the type of habitat present at survey area R23.

Figure 3-16 R23 habitat example

Survey area R24

3.2.19 Survey area R24 is located along the riparian corridor of Fivehead River main channel 1 and spanned both sides of the existing A358. R24 was partially within the footprint of the scheme. The suitable reptile habitat covered an area of approximately 0.5 hectares comprising rough grassland margins of arable fields located on either side of the riparian corridor which was formed by lowland mixed deciduous woodland habitat with a canopy dominated by ash, although in some parts, the canopy had been opened up by recent tree removal, exposing bare earth and eroded riverbanks. The survey area is connected to the wider environment via the riparian corridor, native hedgerows and tree lines with more extensive oak woodland located approximately 250 metres to the north. Arable fields were present immediately beyond the watercourse corridor, with grassland fields located to the east and west in the wider environment. The habitats present within the survey area and immediate surrounds offer a range of foraging, sheltering and dispersal opportunities for common reptiles. Figure 3-17 illustrates the type of habitat present at survey area R24.

Figure 3-17 R24 habitat example

Survey area R25

3.2.20 Survey area R25 is located on the northern side of the existing A358 carriageway and located partially within the footprint of the scheme. The suitable reptile habitat covered an area of 0.4 hectares and comprised a small, semi-improved rough grassland field and the field margin of a field supporting livestock. The semi-improved grassland field was of a tussocky nature, whilst both fields were bordered by native hedgerows. The hedgerows provided connectivity to the wider environment, where several additional grassland fields were located to the north and east, along with a watercourse corridor, lowland mixed deciduous woodland, wet flush habitat, a pond, an area of mixed scrub and arable fields. The habitats present within the survey area offered excellent foraging and sheltering opportunities for reptiles, with good connectivity to suitable reptile habitats within the wider landscape. Figure 3-18 illustrates the type of habitat present at survey area R25.

Figure 3-18 R25 habitat example

Survey area R26

3.2.21 Survey area R26 is located within a rough grassland field margin of an arable field and was within the footprint of the scheme. The suitable reptile habitat measured approximately 0.3 hectares and comprised arable field margin bound by a native, species-rich hedgerow, ditches, lowland mixed deciduous woodland and broadleaved plantation woodland. Within the woodland was an area of bramble scrub and two ponds, one of which was dry at the time of the survey. There was connectivity into the wider landscape via a riparian corridor to the north of the survey area, which in turn provided links to further woodland, as well as grassland habitats. The survey area offered good foraging and shelter opportunities for reptiles with connectivity into suitable habitats within the wider landscape. Figure 3-19 illustrates the type of habitat present at survey area R26.

Figure 3-19 R26 habitat example

Survey area R27

3.2.22 Survey area R27 is located partially within the footprint of the scheme, in a neutral semi-improved grassland field which was bound by a line of trees and a native species-rich hedgerow. The suitable reptile habitat covered approximately 0.3 hectares. The field itself contained a number of natural refugia, including vegetated earth mounds, log piles and waste materials such as bricks. An area of tall ruderal vegetation was present within the survey area, with hemlock (*Conium maculatum)*, broad-leaved dock (*Rumex obtusifolius)* and common nettle dominating. Further grassland fields were present within the wider environment, along with the riparian corridor network associated with the River Ding. The survey area provided good foraging opportunities for reptiles and excellent shelter and dispersal opportunities. Figure 3-20 illustrates the type of habitat present at survey area R27.

Figure 3-20 R27 habitat example

Survey area R28

3.2.23 Survey area R28 is located directly adjacent to the footprint of the scheme, within the grounds of a school and was divided into two parts. The combined suitable reptile habitat covered a total area of approximately 1.65 hectares. The northern part was within the 'garden area' of the school, which supports a rough grassland sward and contained natural and artificial refugia, including dead plant matter, discarded roofing panels and wood piles at the edge of an area of overgrown grassland. The southern part of survey area R28 was located at the margins of an overgrown neutral grassland field, with areas of dense rough grassland and areas of bare earth. Discarded fencing panels provided artificial refugia. There was a strip of mixed scrub surrounding this field, which provided connectivity to additional grassland fields and lowland mixed deciduous woodland. The habitats present provided excellent foraging, sheltering and dispersal opportunities for reptiles. Figure 3-21 illustrates the type of habitat present at survey area R28.

Figure 3-21 R28 habitat example

3.3 Reptile presence/absence and population estimate survey

3.3.1 Surveys identified the presence of three species of common reptile (slow-worm, grass snake and adder) within 100 metres of the scheme. Slow-worm were recorded at 14 of the 21 survey areas (R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R21, R22, R26 and R28).

3.3.2 Of these 14 survey areas, seven supported grass snake in addition to slow-worm (R13, R14, R15, R16, R17, R18 and R22) and adder was found within one of the survey area (R22).

3.3.3 No reptiles were recorded at seven of the 21 survey areas (R1, R2, R20, R23, R24, R25 and R27).

3.3.4 The results from each survey area are discussed in detail below, including population size class and estimated population densities, with summaries of population size class and estimated population density provided in Table 3-5. Survey results are shown in Appendix D *Reptile survey results plans*, whilst full survey results can be found in Appendix E *Reptile survey results*.

Survey area R1

3.3.5 No reptiles were recorded at survey area R1.

Survey area R2

3.3.6 No reptiles were recorded at survey area R2.

Survey area R10

3.3.7 Only slow-worm were recorded at survey area R10. The peak count of nine was recorded twice, with both occasions occurring in June (4 June and 29 June). The second highest peak count (eight) was recorded on 13 September. No reptiles (including juveniles) were recorded during visits undertaken on 27 April and 24 September.

3.3.8 This survey area R10 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm at survey area R10 is 6.9 adults per hectare and therefore this survey area supports an estimated low population density.

Survey area R11

3.3.9 Only slow-worm were recorded at survey area R11. The peak count of six was recorded twice, with both occasions occurring in June (7 June and 10 June). The second highest peak count (four) was recorded on 29 June. No reptiles (including juveniles) were recorded during visits on 22 April and 4 May.

3.3.10 Survey area R11 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm at survey area R11 is 15 adults per hectare and therefore this survey area supports an estimated low population density.

Survey Area R12

3.3.11 Only slow-worm were recorded at survey area R12. The peak count of eight was recorded on 13 September. The second highest peak count (seven) was recorded on 30 June. No reptiles (including juveniles) were recorded during visits on 22 April, 6 May, 14 May, 17 May, 1 June and 15 June.

3.3.12 Survey area R12 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm at survey area R12 is 26.7 adults per hectare and therefore this survey area supports an estimated low population density.

Survey area R13

3.3.13 Survey area R13 recorded grass snake and slow-worm. A single record for one adult grass snake was recorded on 7 June. The peak count of two slow-worm was recorded on 21 June. No reptiles (including juveniles) were recorded during visits on 26 April, 4 May, 15 May, 1 June, 4 June, 12 June, 25 August, 27 August, 3 September, 6 September, 8 September, 10 September and 13 September.

3.3.14 Survey area R13 supports a ‘low’ population size class of grass snake. The estimated population density of grass snake is 1.4 adults per hectare and therefore survey area R13 supports an estimated low population density of this species.

3.3.15 Survey area R13 supports a ‘low’ population size class of slow-worm. The estimated population density of slow-worm is 2.9 adults per hectare and therefore survey area R13 supports an estimated low population density of this species.

Survey area R14

3.3.16 Survey area R14 recorded grass snake and slow-worm. The peak count of two grass snake was recorded twice, with both occasions occurring in June (7 June and 22 June). A single grass snake was recorded during seven further survey visits. The peak count of 13 slow-worm was recorded on 10 September. The second highest peak count (10) was recorded on 3 September. No reptiles (including juveniles) were recorded on 26 April and 13 September.

3.3.17 Survey area R14 supports a ‘low’ population size class of grass snake. The estimated population density of grass snake is 5 adults per hectare and therefore survey area R14 supports an estimated high population density of this species.

3.3.18 Survey area R14 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm is 32.5 adults per hectare and therefore survey area R14 supports an estimated low population density of this species.

Survey area R15

3.3.19 Survey area R15 recorded grass snake and slow-worm. A single record for one adult grass snake was recorded on 3 September. The peak count of 11 slow-worm was recorded on 22 June. The second highest peak count (10) of slow-worm was recorded on 7 June. No reptiles (including juveniles) were recorded during visits on 27 April, 4 May, 6 May and 29 June.

3.3.20 Survey area R15 supports a ‘low’ population size class of grass snake. The estimated population density of grass snake is 2 adults per hectare and therefore survey area R15 supports an estimated medium population density of this species.

3.3.21 Survey area R15 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm is 22 adults per hectare and therefore survey area R15 supports an estimated low population density of this species.

Survey area R16

3.3.22 Survey area R16 recorded grass snake and slow-worm. The peak count of two grass snake was recorded on 7 June. Grass snake was not recorded on any other survey visit to this site. The peak count of 36 slow-worm was recorded on 30 June. The second highest peak count (24) of slow-worm was recorded on 7 June. No reptiles (including juveniles) were recorded during visits on 2 May and 21 June.

3.3.23 Survey area R16 supports a ‘low’ population size class of grass snake. The estimated population density of grass snake is 2.5 adults per hectare and therefore survey area R16 supports an estimated medium population density of this species.

3.3.24 Survey area R16 supports an ’exceptional’ population size class of slow-worm. The estimated population density of slow-worm is 45 adults per hectare and therefore survey area R16 supports an estimated low population density of this species.

Survey area R17

3.3.25 Survey area R17 recorded grass snake and slow-worm. The peak count of one grass snake was recorded on three occasions: 1 June, 4 June and 21 June. The peak count of 10 slow-worm was recorded on 10 June. The second highest peak count (six) was recorded on three occasions (7 June, 15 June, 18 June). No reptiles (including juveniles) were recorded during visits on 22 April, 26 April and 5 May. As described in Section 2.5, access was restricted part-way through the survey season and therefore the following population estimates are based on data from 15 survey visits.

3.3.26 Survey area R17 supports a ‘low’ population size class of grass snake. The estimated population density of grass snake is 1.3 adults per hectare and therefore survey area R17 supports an estimated low population density of this species.

3.3.27 Survey area R17 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm is 12.5 adults per hectare and therefore survey area R17 supports an estimated low population density of this species.

Survey area R18

3.3.28 Survey area R18 recorded grass snake and slow-worm. The peak count of one grass snake was recorded on two occasions: 7 June and 18 June. Grass snake was not recorded on any other survey visit to this survey area. The peak count of 14 slow-worm was recorded on 25 June. The second highest peak count (eight) was recorded on 29 June. No reptiles (including juveniles) were recorded during visits on 26 April, 26 May, 1 June , 22 June, 20 September and 24 September.

3.3.29 Survey area R18 supports a ‘low’ population size class of grass snake. The estimated population density of grass snake is 1.8 adults per hectare and therefore survey area R18 supports an estimated low population density of this species.

3.3.30 Survey area R18 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm is 25.5 adults per hectare and therefore survey area R18 supports an estimated low population density of this species.

Survey area R19

3.3.31 Only slow-worm were recorded at survey area R19. The peak count of five was recorded on 10 June. The second highest peak count (four) was recorded on five occasions (26 April, 28 May, 7 June, 15 June and 25 June). No reptiles (including juveniles) were recorded during visits on 22 June, 3 September, 7 September, 13 September and 20 September.

3.3.32 Survey area R19 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm is 38.5 adults per hectare and therefore survey area R19 supports an estimated low population density of this species.

Survey area R20

3.3.33 No reptiles were recorded at survey area R20.

Survey area R21

3.3.34 Only slow-worm were recorded at survey area R21. The peak count of eight was recorded on two occasions: 5 May and 30 June. The second highest peak count (seven) was recorded on 13 September. No reptiles (including juveniles) were recorded on 10 September and 16 September.

3.3.35 Survey area R21 supports a ‘good’ population size class of slow-worm. The estimated population density of slow-worm is 10.0 adults per hectare and therefore this survey area supports an estimated low population density of this species.

Survey area R22

3.3.36 Adder, grass snake and slow-worm were recorded at survey area R22. A single, adult female adder was recorded during three survey visits (10 Jun, 22 June and 25 June). No other records for adder were identified at this survey area. The peak count of one adult female grass snake was recorded on 10 September. No other records for grass snake were made at this survey area. The peak count of 44 slow-worm was recorded on 25 June. The second highest peak count (39) was recorded on 2 June. Reptiles were recorded on all 20 survey visits.

3.3.37 Survey area R22 supports a ‘low’ population size class of adder. The estimated population density of adder is 1.7 adults per hectare and, therefore, survey area R22 supports an estimated low population density of this species.

3.3.38 Survey area R22 supports a ‘low’ population size class of grass snake. The estimated population density of grass snake is 1.7 adults per hectare and therefore survey area R22 supports an estimated low population density of this species.

3.3.39 Survey area R22 supports an ‘exceptional’ population size class of slow-worm. The estimated population density of slow-worm is 73.3 adults per hectare and therefore survey area R22 supports an estimated medium population density of this species.

Survey area R23

3.3.40 No reptiles were recorded at survey area R23.

Survey area R24

3.3.41 No reptiles were recorded at survey area R24.

Survey area R25

3.3.42 No reptiles were recorded at survey area R25.

Survey area R26

3.3.43 Only slow-worm were recorded at survey area R26. The peak count of three was recorded on two occasions: 10 June and 15 June. The second highest peak count (two) was recorded on two occasions (7 May and 14 May). No reptiles (including juveniles) were recorded during visits on 25 April, 19 May, 27 May and 2 June . As described in section 2.5, access was restricted part-way through the survey

season and therefore the following population estimates are based on data from 16 survey visits.

3.3.44 Survey area R26 supports a 'low' population size class of slow-worm. The estimated population density of slow-worm is 10.0 adults per hectare and therefore survey area R26 supports an estimated low population density of this species.

Survey area R27

3.3.45 No reptiles were recorded at survey area R27.

Survey area R28

3.3.46 Only slow-worm were recorded at survey area R28. The peak count of 52 was recorded on 10 June. The second highest peak count (46) was recorded on 25 June. Reptiles were recorded on all survey visits to this survey area, although as noted in section 2.5, only seven survey visits were conducted in total due to access restrictions.

3.3.47 Survey area R28 supports an 'exceptional' population size class of slow-worm. The estimated population density of slow-worm is 31.5 adults per hectare and therefore survey area R28 supports an estimated low population density of this species.

Reptile population summary

3.3.48 A summary of the number of reptiles recorded at each survey area is presented in Table 3-1 below, together with population categories and calculated reptile densities. A full list of results, including refugia densities, full weather conditions recorded during surveys and survey results are presented in Appendix D *Reptile survey results*.

Table 3-1 Reptile survey results by species and survey area, for survey areas supporting a reptile population.

Survey area and species	Total number adults recorded over 20* visits	Maximum number adults recorded during single visit (peak count)	Maximum number adults and juveniles recorded during single visit	Area of reptile habitat (Ha)	Population score (refer to Table 2-1)	Estimated Population density (refer to Table 2-2)
R10						
Slow-worm	59	9	13	1.3	Good	Low
R11						
Slow-worm	36	6	8	0.4	Good	Low
R12						
Slow-worm	41	8	10	0.3	Good	Low
R13						
Slow-worm	5	2	2	0.7	Low	Low
Grass snake	1	1	1	0.7	Low	Low
R14						
Slow-worm	68	13	13	0.4	Good	Low

Survey area and species	Total number adults recorded over 20* visits	Maximum number adults recorded during single visit (peak count)	Maximum number adults and juveniles recorded during single visit	Area of reptile habitat (Ha)	Population score (refer to Table 2-1)	Estimated Population density (refer to Table 2-2)
Grass snake	11	2	2	0.4	Low	High
R15						
Slow-worm	62	11	13	0.5	Good	Low
Grass snake	1	1	1	0.5	Low	Medium
R16						
Slow-worm	204	36	45	0.8	Exceptional	Low
Grass snake	2	2	2	0.8	Low	Medium
R17	*over 15 visits					
Slow-worm	38	10	11	0.8	Good	Low
Grass snake	3	1	1	0.8	Low	Low
R18						
Slow-worm	55	14	14	0.55	Good	Low
Grass snake	2	1	1	0.55	Low	Low
R19						
Slow-worm	38	5	16	0.13	Good	Low
R21						
Slow-worm	67	8	12	0.8	Good	Low
R22						
Slow-worm	326	44	52	0.6	Exceptional	Medium
Grass snake	1	1	1	0.6	Low	Low
Adder	3	1	1	0.6	Low	Low
R26	*over 16 visits					
Slow-worm	15	3	3	0.3	Low	Low
R28	*over 7 visits					
Slow-worm	163	52	66	1.65	Exceptional	Low

3.4 Assessment of importance

3.4.1 As per the criteria described in section 2.4.4, each survey area was assessed to evaluate its importance for reptiles. Survey areas R16, R22 and R28 were assessed as important reptile sites. Table 3-2 below provides full results for the assessment of each survey area with reptiles present, against every criterion.

Table 3-2 Assessment of importance of survey area where reptiles were present

Survey area	Three or more reptile species	Two snake species	Exceptional population of one species?	Assemblage of species scoring at least 4?	Significant regional importance	Important site?
R10	N/A	N/A	N/A	N/A	N/A	No
R11	N/A	N/A	N/A	N/A	N/A	No

Survey area	Three or more reptile species	Two snake species	Exceptional population of one species?	Assemblage of species scoring at least 4?	Significant regional importance	Important site?
R12	N/A	N/A	N/A	N/A	N/A	No
R13	N/A	N/A	N/A	N/A	N/A	No
R14	N/A	N/A	N/A	N/A	N/A	No
R15	N/A	N/A	N/A	N/A	N/A	No
R16	N/A	N/A	Yes	Yes	N/A	Yes
R17*	N/A	N/A	N/A	N/A	N/A	No
R18	N/A	N/A	N/A	N/A	N/A	No
R19	N/A	N/A	N/A	N/A	N/A	No
R21	N/A	N/A	N/A	N/A	N/A	No
R22	Yes	Yes	Yes	N/A	Yes	Yes
R26*	N/A	N/A	N/A	N/A	N/A	No
R28*	N/A	N/A	Yes	N/A	N/A	Yes

*The full 20 survey visits were not completed at each of these survey areas.

4 Conclusions

4.1.1 The study area supports three species of common reptile (slow-worm, grass snake and adder), with reptiles encountered at 14 of the 21 survey areas. Slow-worm and grass snake are considered widespread and locally common in Somerset, whereas adder is considered uncommon and localised. All three species are considered notable at a county level [6].

4.1.2 Slow-worm populations were found within 14 survey areas, with an ‘exceptional’ population recorded at three (R16, R22, R28), ‘good’ population size class being recorded at nine, and ‘low’ population size class recorded at the remaining two survey areas. Slow-worm population density was estimated to be medium within one survey area and low within the remaining 13.

4.1.3 Grass snake populations were found within seven survey areas, with a ‘low’ population size class at all of these. Grass snake population density was estimated to be high within one survey area and medium within a further two survey areas.

4.1.4 Adder were found within a single survey area, with a ‘low’ population size class being noted. Adder population density within this survey area was estimated to be low.

4.1.5 The presence of exceptional populations of slow-worm, makes survey areas R16 and R28 important sites for reptiles. The presence of adder, grass snake and slow-worm within survey area R22, including an exceptional population of slow-worm, makes R22 an important reptile site; therefore. Habitats within the vicinity of R16, R22 and R28 should be considered of high conservation value for reptiles.

Abbreviations List

Please refer to ES Report Chapter 17 Abbreviations

Glossary

Please refer to ES Report Chapter 18 Glossary

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Appendix A Desk study results from SERC

Scientific name	Common name	Location	Grid reference	Distance from scheme	Direction	Year
Natrix helvetica	Grass snake	Junction , M5 TA1 UA	ST2565424624	Within footprint	-	2017
Anguis fragilis	Slow-worm	Nr Junction 25 M5	ST255246	Within footprint	-	2015
Anguis fragilis	Slow-worm	Junction , M5 TA1 UA	ST2565424624	Within footprint	-	2017
Anguis fragilis	Slow-worm	Adjacent M5, nr Haydon	ST253243	200m	West	2015
Anguis fragilis	Slow-worm	Wood (hamlet), Ashill	ST312175	300m	West	1999
Natrix helvetica	Grass snake	Stewley, Ashill	ST315186	300m	East	2006
Natrix helvetica	Grass snake	Wood (hamlet)	ST312175	300m	West	1999
Anguis fragilis	Slow-worm	Stewley, Ashill	ST315186	300m	East	2006
Anguis fragilis	Slow-worm	Winterhay Lane	ST3511915029	700m	South-east	2018
Anguis fragilis	Slow-worm	Haydon	ST251238	600m	West	2015
Anguis fragilis	Slow-worm	Broadway	ST323153	1km	West	2016
Anguis fragilis	Slow-worm	Tanyard, Broadway	ST323153	1km	West	2017
Anguis fragilis	Slow-worm	Taunton	ST242251	1km	West	2003
Anguis fragilis	Slow-worm	Broadway	ST324153	900m	West	2018
Natrix helvetica	Grass snake	Bathpool, Bridgwater & Taunton Canal	ST254260	900m	North	2010
Natrix helvetica	Grass snake	Bridgwater and Taunton Canal / M5 bridge	ST263258	900m	North	1996
Natrix helvetica	Grass snake	Bathpool	ST255260	900m	North	2005
Natrix helvetica	Grass snake	Ilminster	ST358163	1.2km	East	2005
Natrix helvetica	Grass snake	Ilton	ST3484317340	1.3km	East	2017

Scientific name	Common name	Location	Grid reference	Distance from scheme	Direction	Year
Anguis fragilis	Slow-worm	Ilton	ST3484317340	1.3km	East	2017
Natrix helvetica	Grass snake	West Hatch	ST276207	1.3km	West	2008
Natrix helvetica	Grass snake	West Hatch	ST275207	1.3km	West	2007
Vipera berus	Adder	Thurlbear Wood & Quarrylands SSSI	ST273212	1.3km	West	1994
Zootoca vivipara	Common lizard	Holway, South Taunton	ST246234	1.3km	West	2017
Natrix helvetica	Grass snake	Land off Hyde Lane, Creech St Michael	ST268260	1.4km	North-east	2008
Anguis fragilis	Slow-worm	Thurlbear Wood Reserve	ST272210	1.5km	West	1991
Anguis fragilis	Slow-worm	The Vicarage, Creech St Michael	ST274253	1.4km	North-east	2010
Natrix helvetica	Grass snake	Thurlbear Quarrylands SSSI Butterfly Conservation Reserve	ST2725821021	1.5km	West	2016
Anguis fragilis	Slow-worm	Monkton Heathfield, Taunton	ST261266	1.5km	North-east	2010
Natrix helvetica	Grass snake	Monkton Heathfield, Taunton	ST261266	1.5km	North-east	2010
Vipera berus	Adder	Thurlbear Wood Reserve	ST272210	1.5km	West	1993

Scientific name	Common name	Location	Grid reference	Distance from scheme	Direction	Year
Anguis fragilis	Slow-worm	Wharf Lane, Ilminster	ST359145	1.6km	South-east	1998
Anguis fragilis	Slow-worm	Road up to 'Quarrylands' Butterfly Reserve.	ST272202	1.7km	West	2002
Anguis fragilis	Slow-worm	Slough Green	ST272202	1.7km	West	2003
Vipera berus	Adder	Thurlbear Reserve	ST270207	1.8km	West	2008
Anguis fragilis	Slow-worm	Stoke Court	ST266216	1.9km	West	1999
Zootoca vivipara	Common lizard	Bridgwater & Taunton Canal	ST281257	1.9km	North-east	2004
Natrix helvetica	Grass snake	Thurlbear	ST265211	1.9km	West	2005
Vipera berus	Adder	Thurlbear Wood Reserve	ST267208	2.0km	West	1991
Anguis fragilis	Slow-worm	Shudrick Lane, Ilminster	ST363144	2.1km	South-east	2007
Anguis fragilis	Slow-worm	Ilminster	ST363146	2.0km	South-east	2002

Appendix B Reptile Biological Records Plan

LEGEND

- ECOLOGY SURVEY ZONE
- 2KM DATA SEARCH AREA

SERC REPTILE RECORD

- ADDER
- COMMON LIZARD
- GRASS SNAKE
- SLOW-WORM

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

Drawing Title: SERC BIOLOGICAL RECORDS

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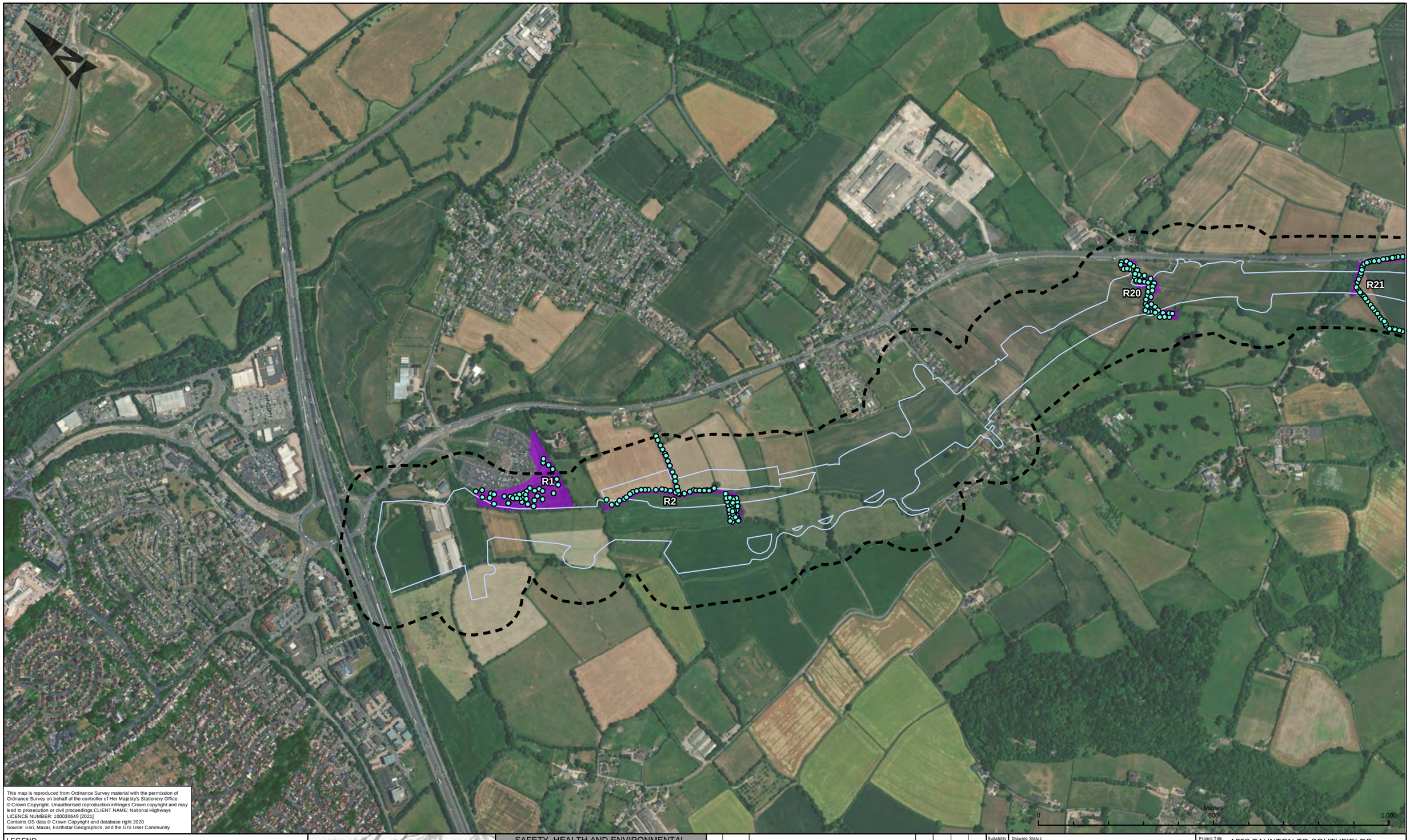
Location | Type | Role | Number — ZZ - DR - LE - 000199

Revision: P02

Appendix C Reptile survey areas



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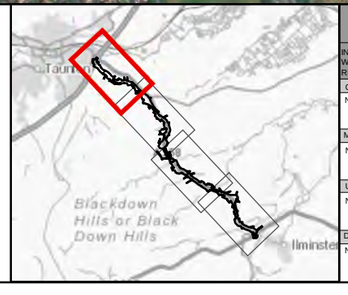
- REPTILE SURVEY AREA
- ARTIFICIAL REFUGIA



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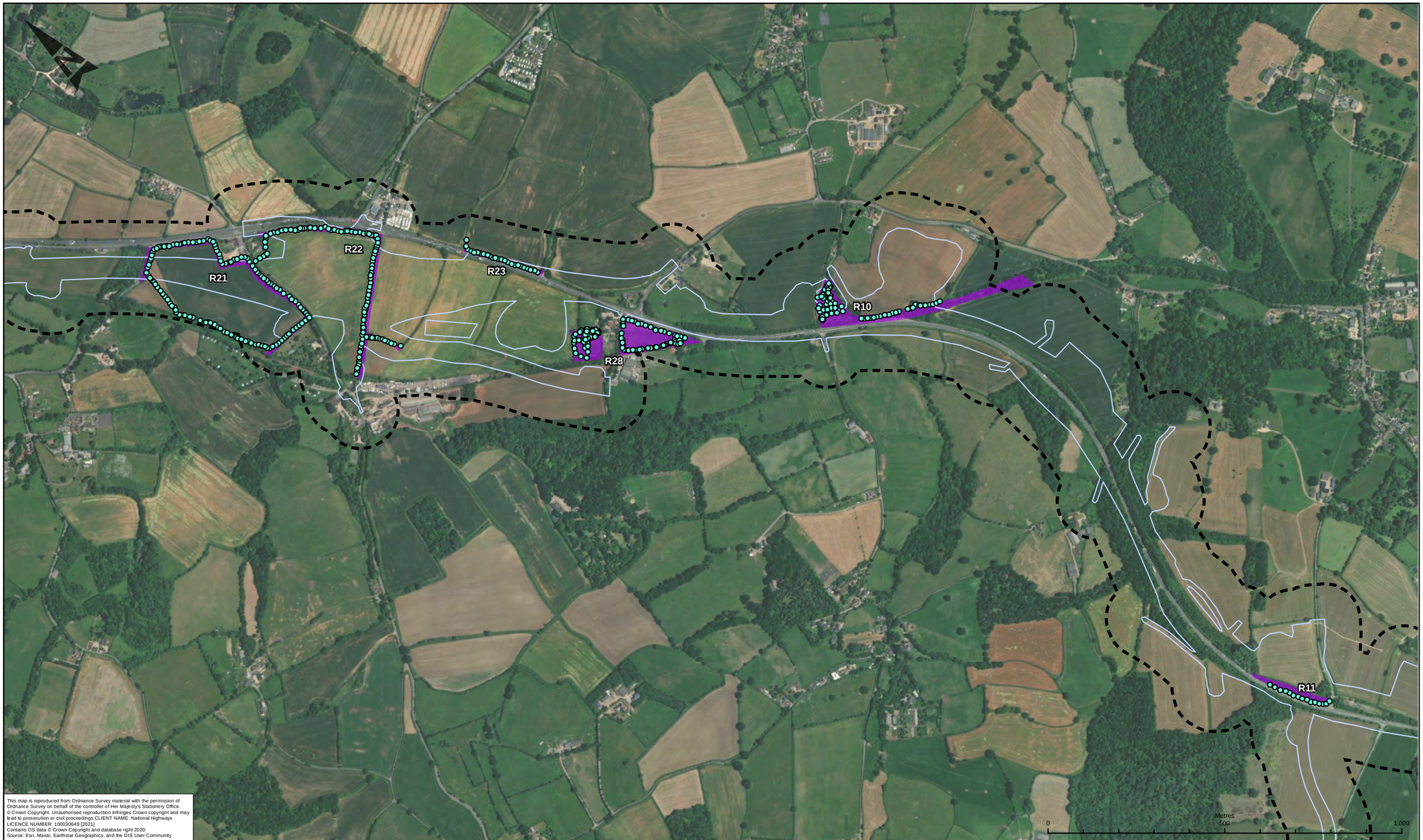

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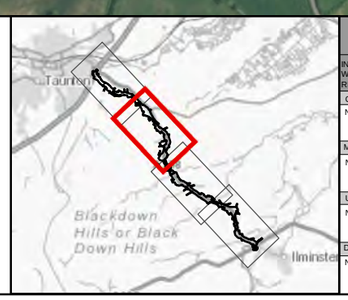

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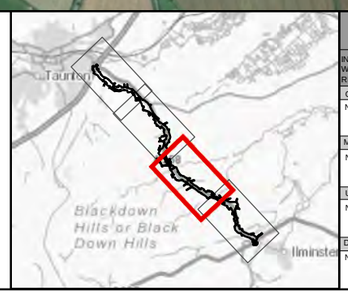
- REPTILE SURVEY AREA
- ARTIFICIAL REFUGIA



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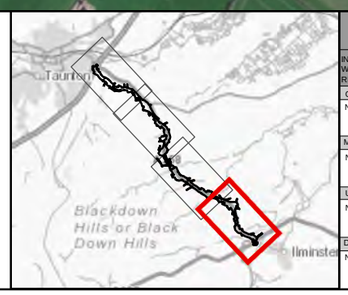

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Appendix D Reptile survey results plans

LEGEND

- ECOLOGY SURVEY ZONE
- ECOLOGY SURVEY ZONE 100M BUFFER
- REPTILE SURVEY AREA

SPECIES RECORDED

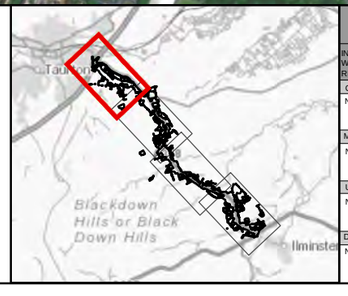
- GRASS SNAKE
- ADDER
- SLOW-WORM

SUMMARY TABLES

TOTAL ADULTS: Total number of adults recorded over 20* visits

MAX ADULTS: Maximum number of adults recorded during single visit (peak count)

MAX ADULTS AND JUVENILES: Maximum number of adults and juveniles recorded during single visit



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Drawing Title: REPTILE SURVEY RESULTS SHEET 1 OF 4

Client: national highways

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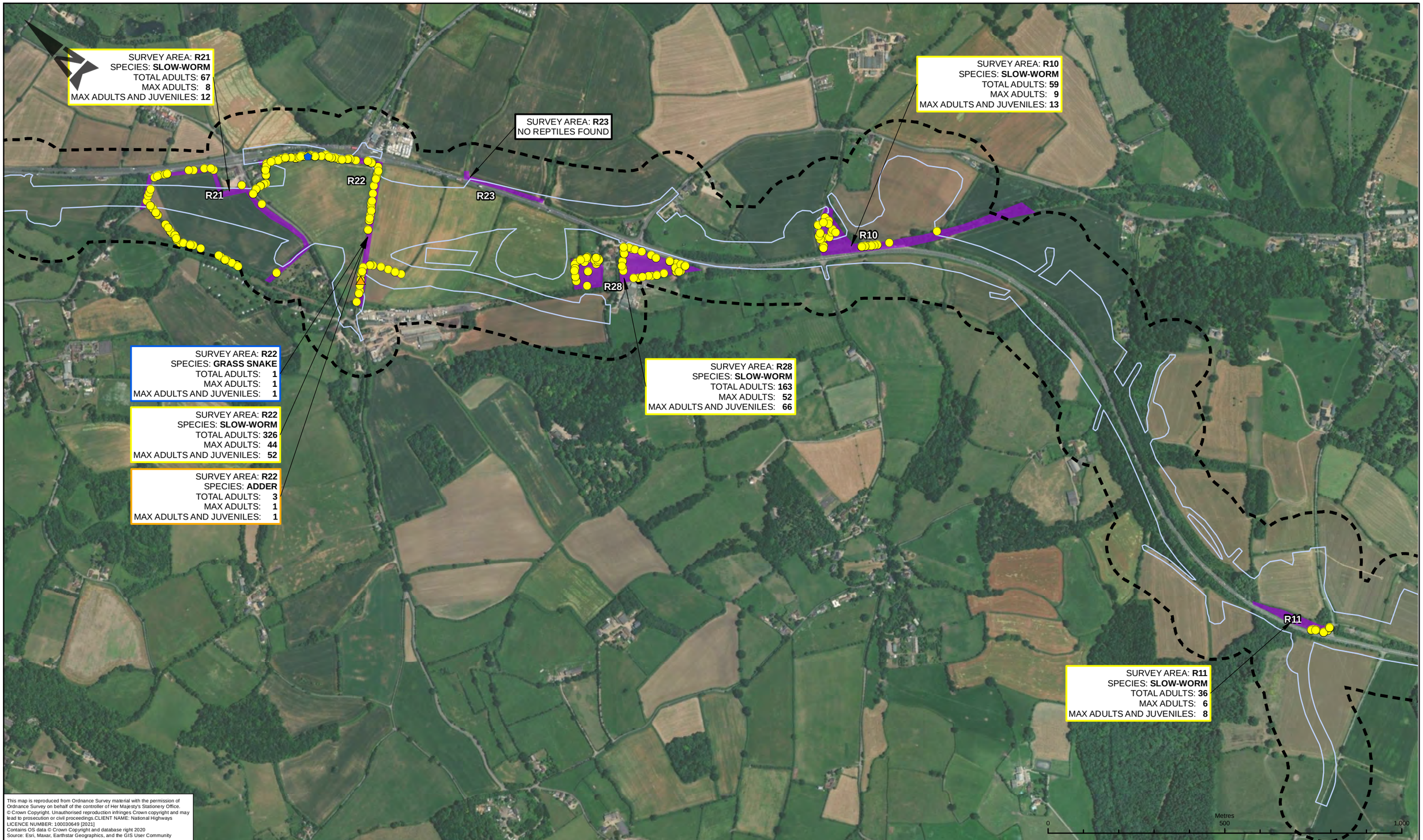

LEGEND

- ECOLOGY SURVEY ZONE
- ECOLOGY SURVEY ZONE 100M BUFFER
- REPTILE SURVEY AREA

SPECIES RECORDED

- GRASS SNAKE
- ADDER
- SLOW-WORM

SUMMARY TABLES

TOTAL ADULTS: Total number of adults recorded over 20* visits

MAX ADULTS: Maximum number of adults recorded during single visit (peak count)

MAX ADULTS AND JUVENILES: Maximum number of adults and juveniles recorded during single visit

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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CONSTRUCTION
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MAINTENANCE / CLEANING
NONE

USE
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DECOMMISSIONING / DEMOLITION
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Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

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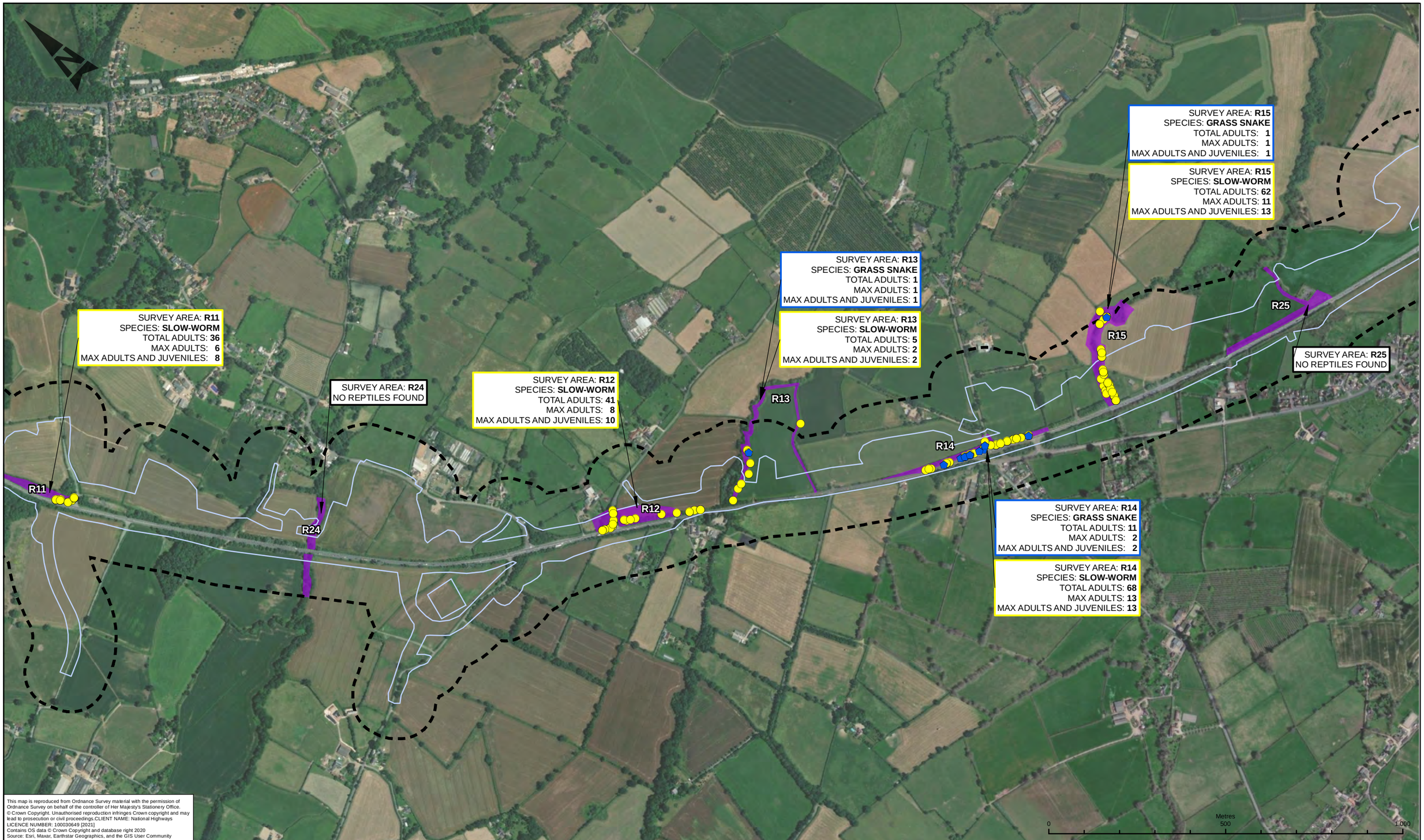


LEGEND

- ECOLOGY SURVEY ZONE
- ECOLOGY SURVEY ZONE 100M BUFFER
- REPTILE SURVEY AREA

SPECIES RECORDED

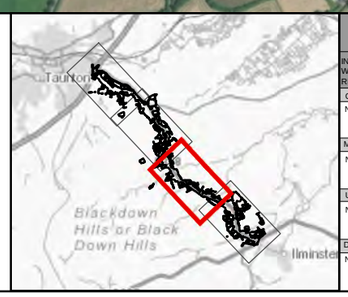
- GRASS SNAKE
- ADDER
- SLOW-WORM

SUMMARY TABLES

TOTAL ADULTS: Total number of adults recorded over 20* visits

MAX ADULTS: Maximum number of adults recorded during single visit (peak count)

MAX ADULTS AND JUVENILES: Maximum number of adults and juveniles recorded during single visit



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CONSTRUCTION
NONE

MAINTENANCE / CLEANING
NONE

USE
NONE

DECOMMISSIONING / DEMOLITION
NONE

Rev.	Date	Description	By	Chk'd	App'd	Auth'd
P02	11/05/22	ISSUE FOR INFORMATION	JE	MA	JS	SV

Suitability: S2 — SUITABLE FOR INFORMATION

Drawing Status

Client: national highways

Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

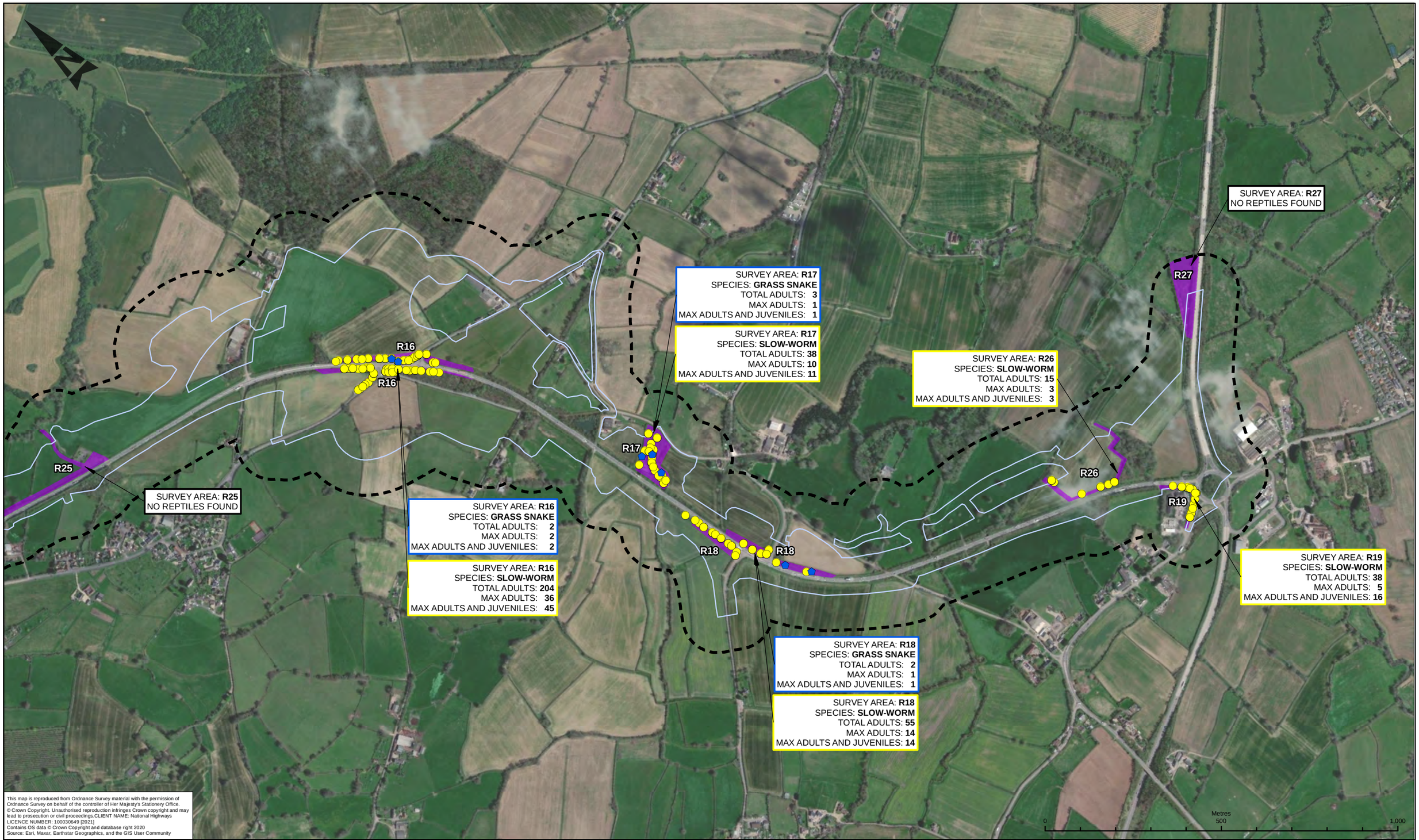
Drawing Title: REPTILE SURVEY RESULTS SHEET 3 OF 4

Scale	By	Checked	Approved	Authorised
1:10,000	JE	MA	JS	SV

Original Size	Date	Date	Date	Date
A3	11/05/22	11/05/22	11/05/22	11/05/22

Drawing Number: HE551508 - ZZ - ARP - DR - VES - LE - 000193
(HE PIN - Location | Originator | Volume - Type | Role | Number)

Revision: P02



LEGEND

- ECOLOGY SURVEY ZONE
- ECOLOGY SURVEY ZONE 100M BUFFER
- REPTILE SURVEY AREA

SPECIES RECORDED

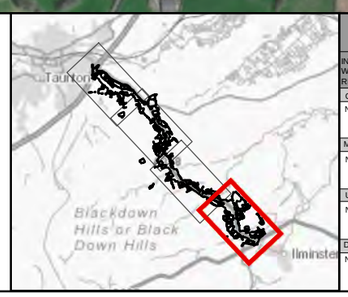
- GRASS SNAKE
- ADDER
- SLOW-WORM

SUMMARY TABLES

TOTAL ADULTS: Total number of adults recorded over 20* visits

MAX ADULTS: Maximum number of adults recorded during single visit (peak count)

MAX ADULTS AND JUVENILES: Maximum number of adults and juveniles recorded during single visit



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE IN THE DESIGN HAZARD LOG)

CONSTRUCTION
NONE

MAINTENANCE / CLEANING
NONE

USE
NONE

DECOMMISSIONING / DEMOLITION
NONE

Rev.	Date	Description	By	Chk'd	App'd	Auth'd
P02	11/05/22	ISSUE FOR INFORMATION	JE	MA	JS	SV

Suitability: S2 — Drawing Status: SUITABLE FOR INFORMATION

Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

Drawing Title: REPTILE SURVEY RESULTS SHEET 4 OF 4

Scale	By	Checked	Approved	Authorised
1:10,000	JE	MA	JS	SV

Original Size	Date	Date	Date	Date
A3	11/05/22	11/05/22	11/05/22	11/05/22

Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number
HE551508 - ZZ - ARP - VES - DR - LE - 000194

Revision: P02

Client: national highways

Appendix E Reptile survey results

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions				No. of slow-worm				Total SW per visit	No. of grass snake				Total GS per visit	No. of Adder				Total adder per visit
							Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv	
R1	06/04/2021	1.4	38	27	1	21/04/2021	12	Dry	1	1					0					0					0
					2	26/04/2021	12	Dry	1	2					0					0					0
					3	04/05/2021	13	Dry	3	2					0					0					0
					4	06/05/2021	15	Dry	3	3					0					0					0
					5	10/05/2021	15	Dry	3	4					0					0					0
					6	18/05/2021	14	Dry	1	4					0					0					0
					7	27/05/2021	14	Dry	2	2					0					0					0
						Total catch					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
R2	06/04/2021	0.34	73	215	1	22/04/2021	13	Dry	1	1					0					0					0
					2	26/04/2021	12	Dry	1	2					0					0					0
					3	04/05/2021	13	Dry	3	2					0					0					0
					4	06/05/2021	15	Dry	3	3					0					0					0
					5	10/05/2021	15	Dry / Intermittent showers	3	4					0					0					0
					6	18/05/2021	14	Intermittent showers	1	7					0					0					0
					7	03/09/2021	20	Dry	1	4					0					0					0
						Total catch					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
R10	06/04/2021	0.5	64	128	1	22/04/2021	13	Dry	1	1		1			1					0					0
					2	27/04/2021	15	Dry	1	2					0					0					0
					3	04/05/2021	13	Dry	3	2	1				1					0					0
					4	07/05/2021	14	Dry	2	2	1	2			3					0					0
					5	17/05/2021	15	Dry	1	5	1				1					0					0
					6	25/05/2021	14	Dry	3	5	1				1					0					0
					7	28/05/2021	14	Dry	1	3	1				1					0					0
					8	01/06/2021	17	Dry	1	2		1			1					0					0
					9	04/06/2021	14	Dry	1	1	3	5	1		9					0					0
					10	07/06/2021	14	Dry	1	6	1	4		8	13					0					0
					11	10/06/2021	17	Dry	1	6	1	3	1	3	8					0					0
					12	17/06/2021	15	Dry	1	6		4			4					0					0
					13	22/06/2021	12	Dry	1	6	1	1			2					0					0
					14	29/06/2021	14	Intermittent showers	1	6	1	7	1		9					0					0
					15	03/09/2021	20	Dry	1	4		3			3					0					0
					16	07/09/2021	20	Dry	1	4		2			2					0					0
					17	13/09/2021	17	Dry	1	4	2	6			8					0					0
					18	16/09/2021	16	Dry	1	1		1			1					0					0
					19	20/09/2021	16	Dry	1	1		2			2					0					0
					20	24/09/2021	18	Dry	1	1					0					0					0
						Total catch					**14**	**42**	**3**	**11**	**70**	**0**	**0**	**0**	**0**	**0**					**0**
R11	07/04/2021	0.15	15	100	1	22/04/2021	13	Dry	1	1					0					0					0

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions				No. of slow-worm				Total SW per visit	No. of grass snake				Total GS per visit	No. of Adder				Total adder per visit
							Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv	
					2	27/04/2021	15	Dry	1	2	1	2			3					0					0
					3	04/05/2021	13	Dry	3	2					0					0					0
					4	25/05/2021	14	Dry	3	5	1				1					0					0
					5	28/05/2021	14	Dry	1	3				2	2					0					0
					6	01/06/2021	17	Dry	1	1	1				1					0					0
					7	04/06/2021	13	Dry	1	1	1	1			2					0					0
					8	07/06/2021	17	Dry	1	6	3	3			6					0					0
					9	10/06/2021	17	Dry	1	5	4	2			6					0					0
					10	15/06/2021	16	Dry	1	2	1	1			2					0					0
					11	18/06/2021	14	Dry	2	6				3	3					0					0
					12	22/06/2021	12	Dry	1	4		2			2					0					0
					13	25/06/2021	17	Dry	1	4	2			6	8					0					0
					14	29/06/2021	14	Intermittent showers	1	6	1	3		2	6					0					0
					15	03/09/2021	20	Dry	1	4	1	2		1	4					0					0
					16	07/09/2021	18	Dry	1	4	1				1					0					0
					17	10/09/2021	18	Dry	1	5		1			1					0					0
					18	13/09/2021	17	Intermittent showers	1	4				4	4					0					0
					19	15/09/2021	18	Dry	1	1	1				1					0					0
					20	20/09/2021	17	Dry	2	1		1	0	1	2					0					0
						Total catch					**18**	**18**	**0**	**19**	**55**	**0**	**0**	**0**	**0**	**0**					**0**
R12	07/04/2021	0.15	35	233	1	22/04/2021	13	Dry	1	1					0					0					0
					2	27/04/2021	15	Dry	1	2	1	1			2					0					0
					3	04/05/2021	13	Dry	2	2		1			1					0					0
					4	06/05/2021	14	Dry	1	1					0					0					0
					5	14/05/2021	14	Dry	2	4					0					0					0
					6	17/05/2021	15	Dry	1	5					0					0					0
					7	26/05/2021	18	Dry	1	2		1			1					0					0
					8	01/06/2021	16	Dry	1	1					0					0					0
					9	04/06/2021	16	Dry	1	3		1		1	2					0					0
					10	07/06/2021	17	Dry	1	6	1	2			3					0					0
					11	10/06/2021	17	Dry	1	6	1	2			3					0					0
					12	15/06/2021	15	Dry	1	1					0					0					0
					13	22/06/2021	12	Dry	1	4	1				1					0					0
					14	30/06/2021	18	Dry	1	2	2	5		1	8					0					0
					15	03/09/2021	16	Dry	1	5		2		1	3					0					0
					16	07/09/2021	20	Dry	1	4	1				1					0					0
					17	10/09/2021	19	Dry	1	4	1	5			6					0					0
					18	13/09/2021	17	Dry	1	4	1	7		2	10					0					0
					19	16/09/2021	16	Dry	1	1		3			3					0					0
					20	22/09/2021	17	Dry	2	1	1	1			2					0					0
						Total catch					**10**	**31**	**0**	**5**	**46**	**0**	**0**	**0**	**0**	**0**					**0**

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions				No. of slow-worm				Total SW per visit	No. of grass snake				Total GS per visit	No. of Adder				Total adder per visit
							Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv	
R13	07/04/2021	0.31	66	213	1	22/04/2021	13	Dry	1	1				1	1					0					0
					2	27/04/2021	15	Dry	1	2					0					0					0
					3	04/05/2021	13	Dry	3	2					0					0					0
					4	06/05/2021	14	Dry	1	1	1				1					0					0
					5	14/05/2021	14	Dry	2	4					0					0					0
					6	17/05/2021	15	Dry	1	5				1	1					0					0
					7	26/05/2021	18	Dry	1	2		1			1					0					0
					8	01/06/2021	17	Dry	1	1					0					0					0
					9	04/06/2021	16	Dry	1	3					0					0					0
					10	07/06/2021	17	Dry	1	6					0			1		1					0
					11	10/06/2021	17	Dry	2	6		1		1	2					0					0
					12	15/06/2021	15	Dry	1	1					0					0					0
					13	21/06/2021	12	Dry	3	6	2				2					0					0
					14	25/08/2021	17	Dry	1	3					0					0					0
					15	27/08/2021	15	Dry	2	4					0					0					0
					16	03/09/2021	16	Dry	1	4					0					0					0
					17	06/09/2021	18	Dry	2	4					0					0					0
					18	08/09/2021	18	Dry	1	4					0					0					0
					19	10/09/2021	17	Dry	1	4					0					0					0
					20	13/09/2021	14	Intermittent showers	1	7					0					0					0
						Total catch					**3**	**2**	**0**	**3**	**8**	**0**	**0**	**1**	**0**	**1**					**0**
R14	07/04/2021	0.17	31	182	1	22/04/2021	13	Dry	1	1	1				1					0					0
					2	27/04/2021	15	Dry	1	2					0					0					0
					3	04/05/2021	14	Dry	4	5		1			1					0					0
					4	25/05/2021	14	Intermittent Showers	1	6	2				2					0					0
					5	28/05/2021	14	Dry	1	3		1		1	2	1				1					0
					6	01/06/2021	17	Dry	1	1		3			3			1		1					0
					7	04/06/2021	16	Dry	1	3	1				1			1		1					0
					8	07/06/2021	17	Dry	1	6		2			2			2		2					0
					9	10/06/2021	17	Dry	1	6	2	4			6			1		1					0
					10	15/06/2021	15	Dry	1	1	2		1	2	5					0					0
					11	18/06/2021	14	Dry	2	6	1	1			2			1		1					0
					12	22/06/2021	17	Dry	1	4	3	4	0		7			2		2					0
					13	25/06/2021	17	Dry	2	3	1	1		1	3			1		1					0
					14	29/06/2021	14	Intermittent Showers	2	6		2		1	3		1			1					0
					15	03/09/2021	16	Dry	1	4		10			10					0					0
					16	07/09/2021	18	Dry	1	4		1			1					0					0
					17	10/09/2021	19	Dry	1	4	3	10			13					0					0
					18	13/09/2021	18	Dry	2	5					0					0					0

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions: Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	No. of slow-worm: Adult M	Adult F	Adult Unk	Juv	Total SW per visit	No. of grass snake: Adult M	Adult F	Adult Unk	Juv	Total GS per visit	No. of Adder: Adult M	Adult F	Adult Unk	Juv	Total adder per visit
					19	16/09/2021	16	Dry	1	1		6			6					0					0
					20	20/09/2021	17	Dry	1	1	1	4		1	6					0					0
						Total catch					**17**	**50**	**1**	**6**	**74**	**1**	**1**	**9**	**0**	**11**					**0**
R15	07/04/2021	0.3	59	197	1	22/04/2021	13	Dry	1	1	1				1					0					0
					2	27/04/2021	15	Dry	1	2					0					0					0
					3	04/05/2021	13	Dry	3	2					0					0					0
					4	06/05/2021	14	Dry	1	6					0					0					0
					5	14/05/2021	14	Dry	1	6	2			1	3					0					0
					6	19/05/2021	12	Dry	3	3		1		1	2					0					0
					7	25/05/2021	15	Intermittent Showers	1	5		1			1					0					0
					8	02/06/2021	16	Dry	1	7	1	6		1	8					0					0
					9	07/06/2021	15	Dry	2	6	3	7	0	1	11					0					0
					10	10/06/2021	19	Dry	1	5	2	4		1	7					0					0
					11	17/06/2021	15	Dry	2	6	2	5	2	4	13					0					0
					12	22/06/2021	17	Dry	1	6	3	8			11					0					0
					13	25/06/2021	18	Dry	1	4	1	2		1	4					0					0
					14	29/06/2021	14	Intermittent showers	1	6					0					0					0
					15	27/08/2021	17	Dry	2	4		3		3	6					0					0
					16	03/09/2021	16	Dry	1	4		3		3	6			1		1					0
					17	07/09/2021	18	Dry	1	4	2	1	0	1	4					0					0
					18	10/09/2021	17	Dry	1	4				2	2					0					0
					19	13/09/2021	19	Dry	2	7				2	2					0					0
					20	16/09/2021	18	Dry	1	1		2			2					0					0
						Total catch					**17**	**43**	**2**	**21**	**83**	**0**	**0**	**1**	**0**	**1**					**0**
R16	08/04/2021	0.32	64	200	1	23/04/2021	15	Dry	3	1	1	4		2	7					0					0
					2	27/04/2021	15	1	1	2	8	2			10					0					0
					3	14/05/2021	14	Intermittent showers	2	6	2				2					0					0
					4	25/05/2021	13	Intermittent showers	1	6					0					0					0
					5	28/05/2021	18	Dry	1	6	4	8	2	2	16					0					0
					6	01/06/2021	17	Dry	1	1	4	4		1	9					0					0
					7	04/06/2021	14	Dry	1	3	8	4		1	13					0					0
					8	07/06/2021	15	Dry	2	6	15	9		2	26			2		2					0
					9	10/06/2021	17	Dry	1	6	9	5		2	16					0					0
					10	15/06/2021	17	Dry	2	1	8	5	2		15					0					0
					11	18/06/2021	16	Dry	2	6	8	4			12					0					0
					12	21/06/2021	12	Dry	3	6					0					0					0
					13	25/06/2021	17	Dry	2	3	4	8	2		14					0					0
					14	30/06/2021	18	Dry	1	2	19	17		9	45					0					0
					15	03/09/2021	15	Dry	1	6	1	5			6					0					0
					16	07/09/2021	18	Dry	1	1		3			3					0					0

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions				No. of slow-worm				Total SW per visit	No. of grass snake				Total GS per visit	No. of Adder				Total adder per visit
							Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv	
					17	13/09/2021	17	Dry	1	4	1	15			16					0					0
					18	16/09/2021	16	Dry	1	1	2	4		1	7					0					0
					19	20/09/2021	17	Dry	2	1		3			3					0					0
					20	24/09/2021	18	Dry	1	1	1	3			4					0					0
						Total catch					**95**	**103**	**6**	**20**	**224**	**0**	**0**	**2**	**0**	**2**					**0**
					1	23/04/2021	15	Dry	3	1					0					0					0
					2	27/04/2021	15	Dry	1	2					0					0					0
					3	05/05/2021	14	Intermittent showers	3	6					0					0					0
					4	14/05/2021	14	Intermittent showers	2	6	1			1	2					0					0
					5	17/05/2021	17	Dry	1	4	1			1	2					0					0
					6	26/05/2021	14	Dry	3	5	1				1					0					0
					7	01/06/2021	19	Dry	1	1	1				1			1		1					0
					8	04/06/2021	12	Dry	1	3	1	1		1	3		1			1					0
					9	07/06/2021	18	Dry	2	6	5	1		1	7				1	1					0
R17	08/04/2021	0.52	43	83	10	10/06/2021	17	Dry	1	6	8	2		1	11					0					0
					11	15/06/2021	17	Dry	2	1	5	1		1	7					0					0
					12	18/06/2021	15	Dry	2	6	2	4		3	9					0					0
					13	21/06/2021	12	Dry	3	6	2				2			1		1					0
					14	25/08/2021	15	Dry	2	4		1			1					0					0
					15	27/08/2021	16	Dry	2	3			1		1					0					0
					16	Access withdrawn																			
					17																				
					18																				
					19																				
					20																				
						Total catch					**27**	**10**	**1**	**9**	**47**	**0**	**1**	**2**	**1**	**4**					**0**
					1	23/04/2021	15	Dry	3	1		2			2					0					0
					2	27/04/2021	15	Dry	1	2					0					0					0
					3	26/05/2021	14	Dry	2	3					0					0					0
					4	01/06/2021	17	Dry	1	2					0					0					0
					5	04/06/2021	16	Dry	2	5	2				2					0					0
					6	07/06/2021	17	Dry	2	6	4	1			5		1			1					0
					7	10/06/2021	17	Dry	1	6	2	1			3					0					0
R18	08/04/2021	0.22	45	205	8	15/06/2021	15	Dry	2	1	2	1			3					0					0
					9	18/06/2021	15	Dry	1	6	1	1			2			1		1					0
					10	22/06/2021	12	Dry	3	6					0					0					0
					11	25/06/2021	17	Dry	2	5	5	8	1		14					0					0
					12	29/06/2021	15	Intermittent showers	2	6	3	5		2	10					0					0
					13	03/09/2021	16	Dry	1	6		4		1	5					0					0

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions				No. of slow-worm				Total SW per visit	No. of grass snake				Total GS per visit	No. of Adder				Total adder per visit
							Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv	
					14	06/09/2021	18	Dry	2	4		1			1					0					0
					15	08/09/2021	18	Dry	1	4		1			1					0					0
					16	10/09/2021	17	Dry	1	4	2	2			4					0					0
					17	13/09/2021	15	Dry	1	6	1	2			3					0					0
					18	16/09/2021	18	Dry	1	1	1	2			3					0					0
					19	20/09/2021	15	Dry	1	1					0					0					0
					20	24/09/2021	18	Dry	1	1					0					0					0
						Total catch					**23**	**31**	**1**	**3**	**58**	**0**	**1**	**1**	**0**	**2**					**0**
R19	08/04/2021	0.08	14	175	1	23/04/2021	15	Dry	3	1		1		1	2					0					0
					2	27/04/2021	15	Dry	1	2	3	1		3	7					0					0
					3	25/05/2021	11	Intermittent showers	2	6		1			1					0					0
					4	28/05/2021	18	Dry	1	6		4			4					0					0
					5	01/06/2021	18	Dry	1	1	1	2			3					0					0
					6	04/06/2021	16	Dry	2	5		2			2					0					0
					7	07/06/2021	17	Dry	1	6	1	2	1	4	8					0					0
					8	10/06/2021	18	Dry	1	5		5			5					0					0
					9	15/06/2021	17	Dry	1	1		3	1	2	6					0					0
					10	18/06/2021	15	Dry	2	6		2		5	7					0					0
					11	22/06/2021	13	Dry	1	6					0					0					0
					12	25/06/2021	18	Dry	1	4	1	3		12	16					0					0
					13	29/06/2021	15	Dry	2	6				3	3					0					0
					14	03/09/2021	20	Dry	1	4					0					0					0
					15	07/09/2021	18	Dry	1	1					0					0					0
					16	10/09/2021	18	Dry	1	5		2			2					0					0
					17	13/09/2021	15	Dry	1	6					0					0					0
					18	16/09/2021	18	Dry	1	1		1			1					0					0
					19	20/09/2021	15	Dry	1	1					0					0					0
					20	24/09/2021	18	Dry	1	1		1			1					0					0
						Total catch					**6**	**30**	**2**	**30**	**68**	**0**	**0**	**0**	**0**	**0**					**0**
R20	06/04/2021	0.19	45	237	1	22/04/2021	13	Dry	1	1					0					0					0
					2	26/04/2021	12	Dry	1	2					0					0					0
					3	04/05/2021	13	Dry	3	2					0					0					0
					4	06/05/2021	14	Dry	3	3					0					0					0
					5	10/05/2021	15	Dry	3	4					0					0					0
					6	17/05/2021	15	Dry	1	4					0					0					0
					7	27/05/2021	18	Dry	1	2					0					0					0
						Total catch					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
R21	06/04/2021	0.73	121	166	1	21/04/2021	12	Dry	1	1				3	3					0					0
					2	05/05/2021	12	Dry	2	2	4	4		1	9					0					0
					3	10/05/2021	12	Dry	2	2	2	1			3					0					0
					4	14/05/2021	14	Dry	2	4	2	3		3	8					0					0

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions				No. of slow-worm				Total SW per visit	No. of grass snake				Total GS per visit	No. of Adder				Total adder per visit
							Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv	
					5	18/05/2021	13	Dry	3	3	1			3	4					0					0
					6	25/05/2021	13	Dry	2	5	2	4			6					0					0
					7	28/05/2021	13	Dry	1	6	1	2			3					0					0
					8	02/06/2021	16	Dry	1	6	4	2			6					0					0
					9	07/06/2021	17	Dry	1	5		1			1					0					0
					10	10/06/2021	17	Dry	2	4	1	3		6	10					0					0
					11	17/06/2021	15	Dry	2	6		1			1					0					0
					12	22/06/2021	15	Dry	1	6		2		2	4					0					0
					13	25/06/2021	17	Dry	1	4	1	5		1	7					0					0
					14	30/06/2021	20	Dry	1	3	1	7		4	12					0					0
					15	03/09/2021	16	Dry	1	4	1	2			3					0					0
					16	06/09/2021	18	Dry	1	4		2		1	3					0					0
					17	08/09/2021	18	Dry	1	5		1			1					0					0
					18	10/09/2021	18	Dry	1	5					0					0					0
					19	13/09/2021	18	Dry	2	5	2	5		1	8					0					0
					20	16/09/2021	18	Dry	1	3					0					0					0
						Total catch					**22**	**45**	**0**	**25**	**92**	**0**	**0**	**0**	**0**	**0**					**0**
					1	21/04/2021	12	Dry	1	1	3	3		2	8					0					0
					2	04/05/2021	12	Dry	3	2	7	3		4	14					0					0
					3	10/05/2021	12	Dry	2	2	6	3	1	8	18					0					0
					4	14/05/2021	13	Dry	1	6	5	1		7	13					0					0
					5	18/05/2021	14	Dry	3	3	2	1		6	9					0					0
					6	25/05/2021	13	Dry	2	5	5	2		7	14					0					0
					7	28/05/2021	13	Dry	1	6	8	26		4	38					0					0
					8	02/06/2021	16	Dry	1	6	11	27	1	5	44					0					0
					9	07/06/2021	17	Dry	1	6	3	18		5	26					0					0
					10	10/06/2021	17	Dry	2	6	2	13		15	30					0		1			1
R22	06/04/2021	0.37	98	265	11	17/06/2021	15	Dry	2	6	5	4		1	10					0					0
					12	22/06/2021	16	Dry	1	4	6	10		6	22					0		1			1
					13	25/06/2021	17	Dry	1	4	2	42		8	52					0		1			1
					14	30/06/2021	20	Dry	1	3	5	20		16	41					0					0
					15	03/09/2021	16	Dry	1	4	3	22		12	37					0					0
					16	07/09/2021	18	Dry	1	4	0			2	2					0					0
					17	10/09/2021	18	Dry	1	5		12		4	16		1			1					0
					18	13/09/2021	18	Dry	2	5		17		10	27					0					0
					19	15/09/2021	17	Dry	1	3	6	16		5	27					0					0
					20	17/09/2021	16	Dry	1	4		5		2	7					0					0
						Total catch					**79**	**245**	**2**	**129**	**455**	**0**	**1**	**0**	**0**	**1**	**0**	**3**	**0**	**0**	**3**
					1	21/04/2021	12	Dry	1	1					0					0					0
					2	07/05/2021	14	Dry	2	2					0					0					0
R23	06/04/2021	0.1	25	250	3	18/05/2021	12	Dry	3	3					0					0					0
					4	25/05/2021	13	Dry	2	5					0					0					0

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions				No. of slow-worm				Total SW per visit	No. of grass snake				Total GS per visit	No. of Adder				Total adder per visit
							Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv		Adult M	Adult F	Adult Unk	Juv	
					5	28/05/2021	14	Dry	1	6					0					0					0
					6	02/06/2021	16	Dry	1	6					0					0					0
					7	07/06/2021	14	Dry	1	6					0					0					0
						Total catch					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
R24	09/04/2021	0.2	51	255	1	26/04/2021	12	Dry	1	2					0					0					0
					2	30/04/2021	11	Dry	1	4					0					0					0
					3	04/05/2021	13	Dry	3	2					0					0					0
					4	06/05/2021	15	Dry	1	3					0					0					0
					5	14/05/2021	14	Dry	2	4					0					0					0
					6	17/05/2021	15	Dry	1	4					0					0					0
					7	25/05/2021	14	Dry	3	5					0					0					0
						Total catch					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
R25	09/04/2021	0.2	54	270	1	26/04/2021	12	Dry	1	2					0					0					0
					2	30/04/2021	11	Dry	1	4					0					0					0
					3	25/05/2021	14	Intermittent Showers	1	6					0					0					0
					4	28/05/2021	13	Dry	1	6					0					0					0
					5	01/06/2021	19	Dry	1	1					0					0					0
					6	04/06/2021	12	Dry	1	1					0					0					0
					7	07/06/2021	17	Dry	1	8					0					0					0
						Total catch					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
R26	09/04/2021	0.2	34	170	1	26/04/2021	12	Dry	1	2					0					0					0
					2	30/04/2021	11	Dry	1	4		1			1					0					0
					3	05/05/2021	13	Dry	1	2		1			1					0					0
					4	07/05/2021	14	Dry	1	1	1	1			2					0					0
					5	14/05/2021	13	Intermittent showers	2	6		2			2					0					0
					6	19/05/2021	12	Dry	3	4					0					0					0
					7	27/05/2021	14	Dry	1	1					0					0					0
					8	02/06/2021	16	Dry	1	6					0					0					0
					9	07/06/2021	18	Dry	2	6					0					0					0
					10	10/06/2021	18	Dry	1	5	2	1			3					0					0
					11	15/06/2021	16	Dry	1	2	1	2			3					0					0
					12	18/06/2021	18	Dry	2	6				1	1					0					0
					13	22/06/2021	16	Dry	1	6					0					0					0
					14	29/06/2021	15	Intermittent showers	2	6		1			1					0					0
					15	25/08/2021	13	Dry	1	3		1			1					0					0
					16	27/08/2021	14	Dry	2	3		1			1					0					0
					17	Access withdrawn																			
					18																				
					19																				

Site	Site set up date	Site size (Ha)	Total no. refugia placed	Refugia density per Ha	Visit No.	Survey date	Weather conditions: Start Temp (°C)	Rain	Wind (0-8)	Cloud (0-8)	No. of slow-worm: Adult M	Adult F	Adult Unk	Juv	Total SW per visit	No. of grass snake: Adult M	Adult F	Adult Unk	Juv	Total GS per visit	No. of Adder: Adult M	Adult F	Adult Unk	Juv	Total adder per visit
					20																				
						Total catch					**4**	**11**	**0**	**1**	**16**	**0**	**0**	**0**	**0**	**0**					**0**
R27	12/04/2021	0.12	27	225	1	27/04/2021	15	Dry	1	2					0					0					0
					2	30/04/2021	11	Dry	1	4					0					0					0
					3	05/05/2021	14	Dry	1	1					0					0					0
					4	07/05/2021	12	Dry	1	2					0					0					0
					5	14/05/2021	14	Intermittent showers	2	6					0					0					0
					6	19/05/2021	16	Dry	3	4					0					0					0
					7	27/05/2021	17	Dry	1	1					0					0					0
						Total catch					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
R28	27/05/2021	0.63	51	81	1	10/06/2021	17	Dry	1	6	28	24		4	56					0					0
					2	17/06/2021	15	Dry	1	6	10	22		4	36					0					0
					3	25/06/2021	15	Dry	2	6	21	25		20	66					0					0
					4	03/09/2021	16	Dry	1	6	4	11		3	18					0					0
					5	06/09/2021	18	Dry	1	4		5		2	7					0					0
					6	13/09/2021	15	Dry	1	5		6			6					0					0
					7	16/09/2021	16	Dry	1	1		7			7					0					0
					8	Access withdrawn																			
					9																				
					10																				
					11																				
					12																				
					13																				
					14																				
					15																				
					16																				
					17																				
					18																				
					19																				
					20																				
						Total catch					**63**	**100**	**0**	**33**	**196**	**0**	**0**	**0**	**0**	**0**					

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