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CALA Homes

## Stratford-upon-Avon Western Relief Road

Bridge Opportunities and Constraints Study



June 2015

Amec Foster Wheeler Environment  
& Infrastructure UK Limited



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## Document revisions

No.	Details	Date
1	Draft issue	01/06/2015
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## Executive summary

This report has been produced for the purpose of informing the feasibility and viability of providing a relief road to the south-west of Stratford-upon-Avon. Specifically the study has considered a solution for providing a bridging structure over the River Avon and Stratford Greenway.

The majority of the bridge structure lies within the River Avon flood plain. With this in mind the Environment Agency (EA) has been consulted to obtain an initial response and opinion from them on the proposed structure and embankments. Their response is recorded in minutes of a meeting, for which formal EA approval is has been received. In essence, they will not object to the road in this location, but the scheme will need to be modelled to understand the impact on flood events and the level of flood compensation required. It is recommended that the EA remain a key consultee as the scheme develops.

As part of the study, the impact on other environmental issues has also been considered, including ecology, noise, landscape visualisation, air quality and the historic environment. The key considerations for each of these issues have been captured and have not highlighted any impediment to the road and bridge structure being delivered.





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# 1. Introduction

CALA Homes is currently preparing a submission to Stratford-on-Avon District Council, regarding the promotion of Long Marston Airfield, for allocation as a new settlement of 3,500 dwellings within the Stratford Core Strategy.

In order to deliver the development, it has been determined that investment is required in the transport infrastructure around Stratford-upon-Avon to provide relief to the existing road network. A route to the south west of the town has been identified to connect the B439 Evesham Road in the west to the B3400 Shipston Road to the south. As part of this link road there will be a need to cross the River Avon and the Stratford Greenway, which at the point of crossing are within a short distance of each other.

Amec Foster Wheeler has been appointed to carry out a study into the feasibility of constructing a bridge in this location. The study identifies the opportunities and constraints affecting a new build bridge, and their influence on the form of structure and the approach embankments.

## 1.1 Key constraints

The proposed road passes over the River Avon and its floodplain. The Environment Agency is therefore a key consultee in the development of the scheme and preliminary discussions have been held with the EA to inform the design. Detailed flood modelling has not been carried out within the scope of this study. The EA have requested that no part of the structure will be within the watercourse or within the maintenance zone on each side of the river bank and this has been considered when positioning the bridge piers and abutments.

The proposed road also passes over the Stratford Greenway, which is a combined footpath and cycle path on the alignment of a disused railway. It is understood that any structure built over the Greenway will need to meet rail standards in terms of the construction. This will affect the clearances from the potential rail position to any part of the structure, both vertically and laterally, as well as requirements for parapets on the bridge above. The required clearance, known as the structure gauge, depends on the route and the types of vehicle. In developing the design, a worst-case scenario has been used, in terms of clearances of the Greenway, to prevent this becoming an issue as the design develops.

## 1.2 Data considerations

The design that has been developed is based on LiDAR data. This is obtained from aerial imagery and provides a level of detail that is sufficient for this stage of design.





## 2. Highway Design

The road alignment, in the region of the bridge, has been developed to a preliminary design level to inform the development of the scheme. The design is in accordance with standards set out in the Design Manual for Roads and Bridges (DMRB) with an anticipated design speed of 50mph. The section of road that has been considered is from the chainage where the road level has to start rising in order to provide sufficient clearance over the Stratford Greenway.

A drawing (37119-LEA-001) showing the plan, long section and cross sections is included in Appendix A.

### 2.1 Design criteria

The highway alignment is critical to the concept design of the bridge and developing the design is an iterative process as the key criteria and constraints are identified and agreed with different parties.

#### Design assumptions

The assumptions that have been used in the development of the vertical and horizontal road alignment, and the form of structure are as follows:

- ▶ The road is designed in accordance with the requirements set out in DMRB;
- ▶ The road has a design speed of 50mph (consistent with other roads within the area);
- ▶ The alignment will tie into existing ground level at the earliest opportunity (we have subsequently had confirmation from the EA that they would expect to see the road elevated above the flood plain, but this will not impact on the bridge structure);
- ▶ The road will be a single carriageway with 7.3m carriageway width and 1.0m verge on each side
- ▶ The road has a 2.0m wide footpath on one side and a 3.0m wide combined footpath and cycle path on the other.
- ▶ The structure over the Stratford Greenway will provide minimum clearance of 5.0m. This is based on historic data from the British Railway Board, which required minimum height of 4.78m above rail level for electrified lines. It has not been possible to ascertain the exact clearance that would be required for a potential future rail operator along this route, but 5.0m is considered to be a conservative limit for this stage, producing a robust design; and
- ▶ No part of the structure will be within 8m of the top of the riverbank. The exact alignment of the river bank is not known at this stage, but the centre of the piers are placed at least 10m from the indicative river edge.

#### Design considerations

There are a number of softer criteria that have led to the alignment shown in drawing 37119-LEA-001 (Appendix A).

- ▶ The structure will be straight for the full length to allow as much repetitive design and construction as possible, which will be more cost effective.
- ▶ Additional end spans have been included in the structure length to allow a more open construction, which is considered to be more conducive to the existing environment. This creates a 4 span structure, whereas a 2 span structure would suffice in terms of the physical requirement of crossing the River Avon and the Stratford Greenway. The end spans mean that the abutments can be located at the top of gentle slopes rather than requiring large retaining structures, which are visually intrusive.

## Design costings

Amec Foster Wheeler are currently undertaking further detailed work on costings for CALA Homes, but initial scoping does not indicate that costs would be fundamentally prohibitive to delivery.

## 2.2 Geotechnical considerations

The ground conditions are anticipated to be relatively soft, particularly for the north embankment where it crosses the flood plain with alluvial deposits.

It is anticipated that the embankment will require piled foundations, down to firm ground which could be between 10-20m depth. An indicative design is for driven concrete piles at approximately 1.5m centres, with a geogrid membrane placed over the top, to span between the piles with an engineered fill used to build up the embankment to the required height.

All of these issues are standard civil engineering practice when constructing a bridge adjacent to a river and are not considered to be significant issues.

It is recommended that geotechnical site investigation is carried out at the next stage to enable the design concept to be developed.

## 2.3 Variation in design speed

As noted in Section 2.1, the design speed for the design presented is 50mph. This dictates the allowable radius for the curves in the vertical and horizontal alignment for the road. This is considered to be a worst case design scenario and may well reduce through further dialog with the highway authority. The road needs to provide clearance over the Stratford Greenway, which is already on an embankment, these limits on curves have a significant impact on the length of the approach embankments.

For comparison:

- ▶ for a 50mph (used with this study) design speed, the total length of embankments and bridge is approximately 800m
- ▶ for a 40mph design speed, the total length of embankments and bridge is approximately 600m
- ▶ for a 30mph design speed, the total length of embankments and bridge is approximately 300m

This reduction in embankment length would have a significant impact on the cost and the effect on flood events. Consideration could be given to reducing the design speed for the road, in consultation with the highway authority. However for the purposes of this assessment the most onerous design speed has been considered.

## 3. Flood Risk and Drainage

### 3.1 Flood Risk

#### Background

As indicated in the Environment Agency's flood map, the route of the proposed relief road passes through the floodplains of the River Avon and the Shottery Brook, both of which are designated as Environment Agency Main Rivers. It is recognised that a Flood Risk Assessment (FRA) will be required as part of a planning application submission, however, as part of the assessment consideration of flood related issues have been included and liaison with the Environment Agency has been undertaken to identify any significant issues that would prevent the bridge from being constructed.

The planning application and FRA would be submitted to Stratford-on-Avon District Council as the Local Planning Authority. Statutory Consultees include the Environment Agency on matters relating to fluvial flood risk and Main Rivers, and Warwickshire County Council, not only with respect to highway matters, but also as the Lead Local Flood Authority (LLFA) to review the drainage elements of the proposals.

#### Environment Agency information and consultation

We consulted the Environment Agency for:

- ▶ Existing flood information, including flood map and modelled water levels (Appendix B);
- ▶ A preliminary opinion on the relief road along this alignment (only a red line route alignment was provided at this stage, no long or cross section details) (Appendix B); and
- ▶ Further advice on our preliminary alignment design long section and cross sections (draft minutes of the teleconference are included in Appendix B, which have been reviewed and accepted by the Environment Agency).

#### Flood Risk Vulnerability Classification

The National Planning Policy Framework (NPPF) contains no classification for highways. A classification has not yet been agreed with the Environment Agency, but it is anticipated that a classification of 'Essential Infrastructure' will be agreed, based upon numerous precedents. This classification is based on the limited risk to this type of development should it be subject to flooding, i.e. the lack of long term occupiers of the land and the lack of any additional associated infrastructure. The role of the bypass as an evacuation route would need to be discussed within the site specific FRA.

#### Constraints

Flood risk is likely to be a constraint with regard to the delivery of the new bridge. The preliminary opinion provided in Appendix B should be referred to in the first instance. The below constraints have been informed by the Environment Agency and have been considered as part of the design coming forward in these proposals:

- ▶ Any proposals must not increase flood risk elsewhere, either upstream or downstream;
- ▶ A route that included a section 'at grade' will not be acceptable. The floodplain by the racecourse floods frequently, approximately every other year. This frequency of flooding of a new relief road would not be acceptable.
- ▶ The Environment Agency would prefer a route that did not cross the floodplain at all (i.e. an alternative route elsewhere, although it is acknowledged that this is easier said than done);

- ▶ If this is not possible, the preference would be for a route that is raised above the 1% Annual Exceedance Probability (AEP) plus climate change water level, on raised abutments that minimised the footprint of the relief road in the floodplain, and thus the impact elsewhere;
- ▶ If this is not possible, the raised embankments could be possible, but this would need to be supported by detailed flood modelling to demonstrate no increase in risk elsewhere.
- ▶ In order to demonstrate no increase in flood risk elsewhere, it is anticipated that compensation for the volume of floodplain lost to the embankments would need to be provided. Level for level floodplain storage would need to be provided. The area of raised ground which the relief road ties into along its south-eastern section has been identified for this.
- ▶ In terms of the deck level of the road where it crosses the flood plain, the Environment Agency indicated that they may be able to incorporate some leniency with respect to its elevation. Flooding of the road to a depth of up to 300mm during the 1% AEP event may be acceptable (so as to reduce the construction costs), but this would need to be modelled in order to demonstrate an acceptable flood hazard, and to determine that the frequency that the road would be flooded would be acceptable.
- ▶ The Environment Agency indicated that they would be able to provide greater leniency in terms of the road deck level if it is possible to demonstrate an overall reduction in flood risk elsewhere, through over compensation of floodplain storage for example.
- ▶ A minimum 8m buffer (for maintenance access) from the banktop of any watercourse is required. No development (embankments or piers) should be proposed within this area. It is important therefore to capture the banktop on the topographic survey.

### Other Environment Agency advice

The Environment Agency also advised that:

- ▶ They have existing models for the River Avon, Shottery Brook and the River Stour;
- ▶ Further modelling of this system would be required to support an FRA, and licences to use their models could be purchased for this purpose;
- ▶ They do not anticipate that any new sections of model would need to be built – only amendment of the existing models to account for the proposed development would be required.
- ▶ The large area set aside for potential floodplain compensation looks reasonable, but will need to be incorporated into the model.
- ▶ Other road bridges in Stratford are liable to flooding, so it can't be assumed that users of the road could just find an alternative route if the proposed relief road was flooded.

### Consents

#### Flood defence consent

Under the terms of the Water Resources Act 1991, and the local land drainage by-laws, the prior written consent of the Environment Agency is required for any proposed works or structures, in, under, over or within 8 metres of the top of the bank/foreshore any watercourse designated a 'main river'.

Consent will be required in this instance, irrespective of the 8m buffer provided for maintenance, because the bridge will cross directly over the river, i.e. within 0m of the river centreline.

#### Land Drainage Consent

The proposed route also crosses a drainage ditch, which is likely classified as an 'Ordinary Watercourse'. Consent for works in the vicinity of this watercourse will be required from the LLFA.

### 3.2 Drainage considerations

The management of surface water drainage is also likely to be a constraint. In order to prevent an increase in flood risk downstream as a result of increased surface water run-off, SuDS will be required that provide attenuation storage to limit the additional run-off to greenfield rates. Crucially, SuDS that provide attenuation storage should not be located in the floodplain. A SuDS treatment train will also be required, prior to discharge.

The Environment Agency has advised that, ultimately, it will be for the LLFA to review the details of the drainage strategy. However, they advised that they would object if the SuDS attenuation storage device was located within the floodplain (the 1% AEP plus climate change flood extent). They did however advise that a coincident event would not need to be considered, i.e. that the drainage calculations would not need to assume that the Middle Avon was in flood at the time.

It is thought that storage could be provided in the road structure itself, for example in the form of oversized pipes. The raising of the road above the existing ground level to reduce the frequency that the road would be flooded during fluvial events would therefore help to provide the elevations required to provide drainage infrastructure too.



## 4. Environmental Considerations

### 4.1 Ecology

#### Overview

A desk based data gathering exercise has been undertaken in order to identify any potential ecological constraints that may affect the location or design of either the proposed bridge or the link road.

Detail botanical surveys have also been completed on the non-statutory site of nature conservation interest located along the northern section of the relief road in June 2015 and a Phase 1 Habitat assessment has been completed on land to the south of the River Avon.

#### Methodology

A data-gathering exercise was undertaken in May 2015 to obtain information on statutory and non-statutory biodiversity conservation sites, priority habitats and species, and legally-protected species (see Box 1) that are known to occur, or have previously been recorded, within the potential bridge location, wider link route and the surrounding area.

The following data was gathered from the MAGIC website<sup>1</sup> and Warwickshire Biological Records Centre (WBRC):

- ▶ internationally-designated, statutory sites within 10km of the proposed bridge location and link road route<sup>2</sup>;
- ▶ nationally-designated, statutory sites within 5km of the proposed bridge location and link road route<sup>2</sup>;
- ▶ non-statutory, designated sites within 1km of the proposed bridge location and link road route;
- ▶ records of legally-protected and otherwise notable species within 1km of the proposed bridge
- ▶ location only<sup>3</sup>; and
- ▶ ancient woodland and other national/local priority habitats within 1km of the proposed bridge location (where not already covered by a designated site, as listed above)<sup>4</sup>.

#### Box 1 Designated Wildlife Sites, and Priority Habitats and Species

##### Statutory Nature Conservation Sites

Internationally important sites: Special Areas of Conservation (SACs) and candidate SACs, Special Protection Areas (SPAs) and proposed SPAs, Sites of Community Importance, Ramsar sites and European offshore marine sites.

Nationally important sites: Sites of Special Scientific Interest (SSSIs) that are not subject to international designations and National Nature Reserves (NNRs). Local Nature Reserves (LNRs) are statutory sites that are of importance for recreation and education as well as nature conservation. Their level of importance is defined by their other statutory or any non-statutory designation (e.g. if an LNR is also an SSSI but is not an internationally important site, it will be of national importance). If an LNR has no other statutory or non-statutory designation it should be treated as being of district-level importance for biodiversity (although it may be of greater socio-economic value).

##### Non-statutory Nature Conservation Sites

These sites are designated alongside the statutorily protected areas, as they constitute the most important sites for wildlife in each county. In Warwickshire, the term Local Wildlife Site (LWS) is used.

##### Legal Protection

Many species of animal and plant receive some degree of legal protection. For the purposes of this study, legal protection refers to:

- Species included on Schedules 1, 5 and 8 of the *Wildlife and Countryside Act 1981* (as amended), excluding species that are only protected in relation to their sale (see Section 9[5] and 13[2]), reflecting the fact that the proposed development does not include any proposals relating to the sale of species;
- Species included on Schedules 2 and 5 of *The Conservation of Habitats and Species Regulations 2010* (as amended); and
- Badgers, which are protected under the *Protection of Badgers Act 1992*.

##### Priority Habitats and Species

In this report, the geographic level at which a species/habitat has been identified as a priority for biodiversity conservation is referred to as its level of 'species/habitat importance'. For example, habitats and species of principal importance for the conservation of biological diversity in

### Box 1 Designated Wildlife Sites, and Priority Habitats and Species

England (see the first bullet point below) are identified as of national species/habitat importance reflecting the fact that these species/habitats have been defined at a national level. The level of importance therefore pertains to the species/habitat as a whole rather than to individual areas of habitat or species populations, which cannot be objectively valued, other than for waterfowl, for which thresholds have been defined for national/international 'population importance'.

- National importance: Habitats and species of principal importance for the conservation of biological diversity in England. These National Priority species and habitats are listed on:

<http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx> These include those former UK Biodiversity Action Plan (UK BAP) priority habitats and species that occur in England;

- National importance: Species listed as being of conservation concern in the relevant UK Red Data Book (RDB) or the Birds of Conservation Concerns Red List;

- National importance: Nationally Scarce species, which are species recorded from 16-100 10x10km squares of the national grid;

- National importance: Ancient woodland (i.e. areas that have been under continuous woodland cover since at least 1600);

- County importance: Species listed in the Warwickshire BAP.

The initial phase 1 habitat survey of land to the south of the River Avon was undertaken by appropriately experienced and qualified ecologist in June 2015. Survey methods followed the extended Phase 1 Habitat Survey technique as recommended by Natural England<sup>1</sup>. This involved a systematic walk over of the site to classify the broad habitat types and to particularly identify any habitats of principal importance for the conservation of biodiversity as listed within Section 41 (S41) of the Natural Environment and Rural Communities (NERC) Act (2006). Full details of this assessment and the results of this assessment are presented at Appendix C.

Detailed botanical assessment of the Local Wildlife Site (LWS) and the potential Local Wildlife Site (pLWS) were completed in June 2015 by an experienced botanical surveyor from FPCR Environment & Design Ltd. These surveys included sampling of the vegetation in accordance with the standard National Vegetation Classification (NVC) survey methodology detailed in the NVC Users' handbook and methodologies used to assess grassland under the Natural England Farm Environment Plan. Further details of the methodologies used are presented at Appendix C.

Water bodies within 500m<sub>6</sub> of the proposed bridge location, not separated from the Site by barriers to great crested newt *Triturus cristatus* movement (e.g. major roads, rivers, etc.) were identified using a 1:25,000 Ordnance Survey map and aerial photography.

## Designated sites

### Internationally important designated sites

No designated sites of international importance were identified within 10km of the proposed link road.

### Nationally important designated sites

There are five nationally designated sites within 5km of the proposed link road, details of which are provided in Table 4.1.

Table 4.1 Statutory designated sites of national importance within 5km of the Site

Name of site	Designation	Grid reference	Size (ha)	Ecological Interest	Distance and direction from site
Racecourse Meadow	SSSI	SP185536	1.65ha	Herb-rich neutral grassland overlying alluvial clays with characteristic flood meadow community of meadow foxtail <i>Alopecurus pratensis</i> and great burnet <i>Sanguisorba officinalis</i> . Also present are pepper saxifrage	Adjacent to the east of the proposed link road and bridge location.

<sup>1</sup> JNCC, (2010), Handbook for Phase 1 habitat survey - a technique for environmental audit



				<i>Silaum silaus</i> and corn parsley <i>Petroselinum segetum</i> , both of which are uncommon in Warwickshire.	
<b>Welford Field</b>	SSSI	SP140529	2.13	Unimproved herb-rich neutral grassland in the floodplain of the River Avon.	4.4km W
<b>Ailstone Old Gravel Pit</b>	SSSI	SP211512	0.22	This site is designated for its geological interest.	2km S
<b>Copmill Hill</b>	SSSI	SP153579	11.51	Species-rich calcareous grassland supporting plants of local distribution in the county including yellow-wort <i>Blackstonia perfoliata</i> , woolly thistle <i>Cirsium eriophorum</i> , small scabious <i>Scabiosa columbaria</i> , carline thistle <i>Carlina vulgaris</i> and dyer's greenweed <i>Genista tinctoria</i> .  The site supports thirty species of butterfly including the nationally restricted white-letter hairstreak <i>Strymonidia w-album</i> and a small colony of marbled white <i>Melanargia galathea</i> . The moth fauna is exceptional and includes thirteen rare or nationally restricted species.	4.8km NW
<b>Welcombe Hills</b>	LNR	SP206568	59.62	The reserve is a mixture of grassland, woodland and scrub. It has numerous historical and ecological interests and is noted for its yellow meadow ant hills, its Shakespearian connections and its variety of bird life.	3km NE

### Non-statutory designated sites

The desk study identified twenty three non-statutory designated Ecosites, four Local Wildlife Sites and seven Potential Local Wildlife Sites within 1km of the application boundary. A summary of these sites, including their respective ecological interest (where provided) is provided in table 4.2 and table 4.3 below. The locations of these sites are shown on FPCR Figure 1: Appendix C.

Table 4.2 Ecosites Located within 1km of Link Road.

Ecosite ID	Ecosite Name	Primary Habitat	Brief Description
02/25B	Stratford on Avon to Fenny Compton (disused railway)		No description provided.
104/15	The Triangle Hedgerow	Woodland - Hedge, mixed	The site is of district value and is part of a pSINC. Mature hedge which has been laid in the past; but is now derelict. Although there is much common hawthorn; there are also wild privet; elder; crab apple; field maple; elm and dogwood.
106/15	Racecourse Brook - tributary of the River Avon	Stream	No description provided.
114/15	Shottery Brook Gardens	Farmland - Parkland	Selected as a potential Site of Importance for Nature Conservation (pSINC). The

Ecosite ID	Ecosite Name	Primary Habitat	Brief Description
			banks of the brook, which have been re-enforced, support the county rarity nettle-leaved bell-flower (record requires verification). Hogweed, nettle, dog rose and hawthorn are also found on site.
12/15W	River Avon	River	No description provided.
12/15R	River Avon	River	No description provided.
15/15	Old field and spinney at Shottery	Grasslands	Part of this site has been selected as a potential Local Wildlife Site (pLWS). The site includes the land adjacent to the Shottery brook (Ecosite 85/15). A large site with hay meadow, marshy grassland, woodland, orchard and pond.
21/25C	River Avon	Wetland - River	No description provided. But the Phase 1 Habitat survey undertaken describes the river at the proposed crossing point as: "Wide with a sluggish flow at this point. Marginal stands of common club-rush <i>Schoenoplectus lacustris</i> . Bankside vegetation typical of this type large lowland river, dominated by tall ruderal herbs with abundant common nettle <i>Urtica dioica</i> and cow parsley <i>Anthriscus sylvestris</i> . Fishing pegs/platforms. A few scattered willow <i>Salix sp.</i> , hawthorn and alder <i>Alnus glutinosa shrubs</i> . On south bank a more extensive area of large willows".
29/15	Seven Meadows & Avon Meadow SSSI, Stratford	Farmland - Arable, new grass, meadow	Large grassland site (Stratford upon Avon Steeplechase Course) part selected as pSINC and one meadow is an SSSI Racecourse Meadow Site of Special Scientific Interest Unimproved field, herb-rich neutral grassland with a characteristic flood meadow community.
29/25	Water Meadow, North of Clopton Bridge	Wetland - Pond, river, ditch, wet meadow	No description provided.
34/25B	Stratford and Moreton Railway (Disused)	Other - Disused railway	No description provided.
34/25C	Stratford and Moreton Railway (Disused)	Other - Disused railway	No description provided.
45/25	Pool, Orchard Hill Farm	Wetland - Pool	No description provided.

Ecosite ID	Ecosite Name	Primary Habitat	Brief Description
60/15W	Disused Railway - Broom Junction to Stratford upon Avon and Fenny Compton	Farmland - Old grass	Disused railway line with high wildlife value in some sections. Some sections selected as potential Sites of Importance for Nature Conservation. Tetrads B contains section of disused railway line now managed as a private nature reserve.
60/15X	Disused Railway - Broom Junction to Stratford upon Avon and Fenny Compton	Farmland - Old grass	Disused railway line with high wildlife value in some sections. Some sections selected as potential Sites of Importance for Nature Conservation. Tetrads B contains section of disused railway line now managed as a private nature reserve.
64/15	Bordon Hill - Old Rifle Range	Farmland - Old grass (calicolous)	County Nature Conservation Value & pSINCS species rich calcicolous grassland also of particular importance for its beetle fauna. Open area surrounded by dense scrub; becoming colonised by hawthorn; rose; wild privet; way-faring tree and ash.
83/25	Rush Brook, headwaters & tributaries	Wetland - Stream, tributaries	No description provided.
85/15	Shottery Brook, headwaters & tributaries. (tributary of River Avon)	Stream	The northern side of the brook is unmanaged and wooded. Heavily shaded resulting in an absence of ground flora. Eastern side of brook is mown & planted with trees. Heavy recreational use & situated next to Anne Hathaways Cottage.
93/15	Stratford-on-Avon Cemetery	Little information - wide range of flora	An interesting cemetery which supports a wide range of flora. We have little information on this site. However recorded species include yarrow, lady's smock, ox-eye daisy, bluebell, bird's-foot trefoil and dog violet.
98/15R	Disused Railway - Long Marston to Stratford 'The Greenway'		Site of county value and has been selected as a potential Site of Importance for Nature Conservation (pSINC). Wildlife corridor of high nature conservation value for much of its length. A nature reserve on the site of the old railway line used for recreational purposes.

Table 4.2 (continued) Ecosites Located within 1km of Link Road.

98/15W	Disused Railway - Long Marston to Stratford 'The Greenway'		Site of county value and has been selected as a potential Site of Importance for Nature Conservation (pSINC). Wildlife corridor of high nature conservation value for much of its length. A nature reserve on the site of the old railway line used for recreational purposes.
31/15	River Stour	River	Very good quality river in natural state with decent marginal vegetation. Pollarded willows line banks, with some alders. Aquatic vegetation is limited. Outlet from fish farm has more varied vegetation. Hedges of hawthorn with some willow & buckthorn.
147/15	Riparian Wood	Broadleaved semi-natural woodland	No description provided.

Table 4.3 Local Wildlife Sites and Potential Local Wildlife Sites Located within 1km of the Link Road

Local Wildlife Site (LWS) ID	Local Wildlife Site Name	Designation	Brief Description
SP15S1	Bordon Hill Old Rifle Range	LWS	Much of the former species-rich calcareous grassland area at Bordon Hill Old Rifle Range is now covered by Hawthorn scrub. However, the remaining grassland area, although small, supports a good range of calcareous plants.
SP25Li29c	Disused Railway	pLWS	No description provided
SP15X1	Pond and Wood	pLWS	No description provided
SP15W2	Riparian Wood	pLWS	No description provided
SP15Li8f	River Avon	LWS	This section of river retains many natural features, including several islands remnant channels and abundant diverse bankside vegetation. There are various habitats associated with the river, including woodland, meadows, scrub and ruderal areas.
SP23Li17n	River Stour	pLWS	No description provided
SP15W4	Seven Meadows and Stratford Steeplechase Meadow	pLWS	No description provided
SP15W1	Steeplechase Meadow	LWS	The site is particularly important in terms of its ecological position, being directly adjacent to Racecourse Meadow SSSI a site of national importance. The meadow borders the SSSI on two sides, and therefore provides a buffer zone to the latter.
SP15Li27q	The Greenway, Dismantled Railway	pLWS	No description provided
SP25C1	The Lench Meadows	LWS	The Lench Meadows occupy an underdeveloped area of Stratford on Avon adjacent to the River Avon. Together, with a nearby park, these sites form a useful green belt feature.
SP15S4	The Triangle Hedgerow	pLWS	No description provided

### Protected/Priority species

Within 1Km of the proposed link road records of protected and priority species were provided, the details of which are included at Table 4.4. In summary the protected species recorded within 1Km of the link road included: barn owl, great crested newts, grass snake, otter, water vole, slow worm, smooth newt and nine species of bat. The priority species identified comprised: brown Hare, common Frog, hedgehog, small heath, white admiral, white letter hairstreak. None of these records were from within the land affected by the proposed link road.

Table 4.4 Protected Species Located Within 1km of Link Road.

Species	Conservation Status	Location
Barn Owl ( <i>Tyto alba</i> )	NERC, LBAP	One record located 110m north of the site boundary
Brown hair ( <i>Lepus europaeus</i> )	NERC, WCA	One record located 670m north west of the site boundary
Brown long-eared Bat ( <i>Plecotus auritus</i> )	NERC, HR, WCA, LBAP	Two records located approximately 190m and 430m west of the site boundary
Common Frog ( <i>Rana temporaria</i> )	WCA	Three records were located to the north of the site, the closet of which was 770m from the site boundary
Common Pipistrelle ( <i>Pipistrellus pipistrellus</i> )	NERC, HR, WCA, LBAP	Six records were recorded within 1km of the site the closet of which was approximately 190m west of the site boundary
Daubenton's Bat ( <i>Myotis daubentonii</i> )	NERC, HR, WCA, LBAP	One record located 190m west of the site boundary
Grass Snake ( <i>Natrix natrix</i> )	NERC, WCA	Two records were located to the north east of the site boundary approximately 800m
Great Crested Newt ( <i>Triturus cristatus</i> )	NERC, HR, WCA	A single record was located approximately 850m north west of the site
Hedgehog ( <i>Erinaceus europaeus</i> )	NERC, WCA	Three records were located within 1km of the site boundary the closet of which was 180m of the site boundary
Leisler ( <i>Nyctalus leisleri</i> )	NERC, HR, WCA, LBAP	A single record located approximately 620m north east of the site boundary
Myotis Bat ( <i>Myotis sp.</i> )	NERC, HR, WCA, LBAP	A single record located approximately 620m north east of the site boundary
Natterer's bat ( <i>Myotis nattereri</i> )	NERC, HR, WCA, LBAP	Two records located within a 1km of the site boundary, approximately 190m west of the site and 620m north east of the site boundary
Noctule ( <i>Nyctalus noctula</i> )	NERC, HR, WCA, LBAP	Four records located within 1km of the site boundary
Otter ( <i>Lutra lutra</i> )	NERC, LBAP	all along the same watercourse
Pipistrelle ( <i>Pipistrellus sp.</i> )	NERC, HR, WCA, LBAP	One record located 430m north west of the site boundary
Slow-Worm ( <i>Anguis fragilis</i> )	NERC, WCA	A single record located approximately 1km south of the site

Table 4.4 (continued) Protected Species Located Within 1km of Link Road.

Species	Conservation Status	Location
Small Heath ( <i>Coenonympha pamphilus</i> )	NERC	A single record located approximately 360m north of the site
Smooth Newt ( <i>Lissotriton vulgaris</i> )	WCA	A single record located approximately 850m north west of the site
Soprano Bat ( <i>Pipistrellus pygmaeus</i> )	NERC, HR, WCA, LBAP	Three records were found within 1km of the site boundary, the closest of which was approximately 190m west of the site
Unidentified Bat ( <i>Chiroptera sp.</i> )	NERC, HR, WCA, LBAP	Five records were located within 1km of the site boundary, the closest of which was approximately 190m west of the site
Water Vole ( <i>Arvicola amphibius</i> )	NERC, LBAP	A single record located approximately 850m north west of the site
White Admiral ( <i>Limenitis camilla</i> )	NERC	Two records were located approximately 460m and 640m north of the site
White Letter Hairstreak ( <i>Satyrrium w-album</i> )	NERC	A single record located approximately 860m north of the site

**Key to Conservation Status:** WCA – Wildlife & Countryside Act 1981 (as amended), NERC – Species of Principal Importance under section 41 of the Natural Environment & Communities Act 2006, HR - The Conservation of Habitats and Species Regulations 2010, PBA - Protection of Badgers Act 1992, BoCC - Birds of Conservation Concern, LBAP - Local Biodiversity Action Plans species (County specific)

## Habitats

Habitats to the south of the River Avon were of low ecological value dominated by intensively managed rye grass leys and cereal crops. The field boundary hedgerows surrounding the intensively managed farmland south of the River Avon were generally species-poor and dominated by hawthorn. Whilst further detailed survey work is required to confirm the conservation value of the hedgerows, none of the hedgerows would be likely to meet the criteria to be classified as 'important' in accordance with the landscape and wildlife criteria of the Hedgerow Regulations 1997. However, as the canopies of the hedgerow comprise over 80% native species the hedgerows would be classified as habitat of principle importance as described in S41 of the NERC Act. Further details of this habitat assessment for this area of the site are provided at Appendix C.

At the crossing point the River Avon LWS is wide with a sluggish flow at this point. Marginal stands of common club-rush *Schoenoplectus lacustris*. Bankside vegetation typical of this type large lowland river, dominated by tall ruderal herbs with abundant common nettle *Urtica dioica* and cow parsley *Anthriscus sylvestris*. Fishing pegs/platforms. A few scattered willow *Salix sp.*, hawthorn and alder *Alnus glutinosa* shrubs. On south bank a more extensive area of large willows

Where the proposed link road crosses the Greenway Dismantle Railway (pLWS) the embankments of the former railway are wooded. The former track bed comprised a stoned surface with little vegetation cover.

To the north of the River the dominant habitat type is grassland. The grassland affected by the proposed link road includes the Seven Meadows pLWS and the Steeplechase Meadow LWS. The detailed botanical assessment completed on 4<sup>th</sup> June 2015 confirmed the grassland within the Seven Meadows pLWS was improved in nature and is unlikely to qualify as a LWS. The grassland within the Steeplechase Meadow LWS was identified as being species-rich neutral grassland of moderate quality but with one area supporting species-poor semi-improved neutral grassland. The assessment concluded that the site is likely to continue

to meet the LWS selection criteria given that the species assemblage had changed little since the site was last assessed against the criteria 11 years ago. The detailed survey work did however demonstrate that the diversity of the grassland to the west of the Steeplechase LWS was slightly lower than that to the east. Further details of the detailed botanical survey work are provided at Appendix C.

## Fauna

The habitats along the route of the proposed link road will provide suitable habitats for breeding / overwintering bird and are likely to be used by a proportion of the local bat population for the purpose of foraging / commuting. These habitats will also be suitable for other commonly encountered protected species including badger and grass snakes. At the detailed design stage further assessment for these groups will be required but given the potential area available adequate mitigation can be provided.

From review of the OS plans one water body was identified within 500m of the proposed bridge location. The pond is located 282m north west of the proposed bridge location, but is separated from the site by the Ludington Road, housing and a stream. Given the number of barriers to great crested newt movement this pond is not considered to require further investigation.

## Key considerations

Racecourse Meadow SSSI lies adjacent to the proposed bridge location and link road route. This SSSI is designated for its unimproved flood meadow grassland. Whilst the development will not result in a direct impact to the SSSI there is the potential for the loss of buffering habitats, for which adequate mitigation can be provided. Changes in hydrology in the immediate local area have the potential to have an indirect impact on the SSSI and these changes could be either negative or positive. At the detailed design stage the current hydrological regime will require further detailed consideration but with the application of appropriate measures the hydrological regime will be maintained and potentially enhanced for the botanical communities present within the SSSI. With the application of such mitigation the favourable condition of the SSSI should be maintained.

The other statutory designated sites are all sufficiently distant (over 2km) from the proposed route for it to be unlikely that they would be significantly affected by the proposed development.

In relation to non-statutory designated sites, the development of the link road is only likely to impact on five sites. These include: the River Avon (LWS), the Steeplechase Meadow (LWS), the Greenway Dismantled Railway (pLWS), the Seven Meadows (pLWS) and West Shottery Brook (Ecosite).

The proposed link road has been designed to bridge over the River Avon (LWS) and the Greenway Dismantled Railway (pLWS) consequently subject to further assessment work and appropriate mitigation it is unlikely to result in significant negative effects to these receptors. Furthermore, with the application of an appropriate construction management plan it is unlikely that the link road will not affect the conservation value of the Shottery Brook (Ecosite).

Construction of the link road will result in the loss of a small proportion of the Steeplechase Meadow (LWS). Whilst the detailed botanical assessment has concluded that the grassland is likely to still meet the LWS selection criteria, the area affected by the link road has a lower species diversity than the retained area. Therefore, as the position of the link road has avoided higher quality areas of the LWS in botanical terms, the location of the proposed link road is in accordance to the mitigation hierarchy as recommended at paragraph 118 of the NPPF. Furthermore, with the application of appropriate mitigation, which would include the creation of species-rich floodplain meadow grassland and appropriate management of this, along with the remaining area of the LWS, in the long term, the potential effect to the LWS is likely to be neutral – minor positive. Confirmation of effects to biodiversity will be demonstrated at the detailed application stage through biodiversity offsetting, whereby a Biodiversity Impact Assessment Calculator is used to calculate the residual biodiversity impact and the amount of any required off-site compensation required.

The completed survey work has confirmed that the botanical composition of the Seven Meadow (pLWS) is unlikely to meet the criteria to be considered as a LWS (Appendix C). Therefore, the loss of the habitats within this site will not result in potential impacts to a non-statutory designated site. With the implementation of appropriate enhancements such as the creation of floodplain meadow and the long term management of



such habitats, there is likely to be a net gain to biodiversity. Such provisions would also provide adequate mitigation for the minor losses to the Steeplechase Meadow (LWS).

Currently, with the exception of Racecourse Meadow SSSI there is no mechanism in place to ensure appropriate sympathetic management of either Steeplechase Meadow LWS or the adjacent potential LWS Seven Meadows. The suggested compensation measures include the creation of species-rich floodplain meadow and the enhancement of the retained area of the LWS and then, most importantly, securing long-term favourable management of this area of grassland which surrounds the SSSI. This will then ensure that this suite of grasslands can function in perpetuity as a coherent ecological network. These measures, if implemented, would deliver a significant biodiversity gain. Confirmation of such a positive gain to biodiversity will be demonstrated at the detailed application stage through biodiversity offsetting, whereby a Biodiversity Impact Assessment Calculator is used to calculate the residual biodiversity impact and the amount of any required off-site compensation required.

Habitats located to the south of the River Avon have been confirmed as being of low nature conservation value, being dominated by intensively managed agricultural land. Consequently, overall habitat losses south of the River Avon are unlikely to result in significant effects to biodiversity. The construction of the proposed link road will result in some loss of hedgerow but adequate mitigation for such loss can be provided through the creation of new hedgerows and the enhancement of retained hedges. Further, net gains for biodiversity can be provided on land surrounding the link road with the creation of species rich wet grassland within balancing facilities, species rich grassland on retained areas of open land / embankments of the road. These net gains to biodiversity will also be demonstrated at the detailed design stage through use of the biodiversity offsetting scheme.

Further detailed survey work at the detailed designed stage will be required for protected species including bats, badgers, breeding / winter birds and reptiles. However, the land available surrounding the proposed link road is adequate to provide the required mitigation for such species should this be required.

Such mitigation is likely to include the provision of:

- ▶ a sensitive lighting scheme and crossing points for bats,
- ▶ the creation of areas of species rich / managed areas of grassland which will provide suitable foraging area for the local population of bats and suitable area for breeding / wintering bird species, and
- ▶ the provision of appropriate crossing points within embankment sections of the link road for mammals and amphibians.

Where necessary the appropriate licenses from Natural England will be obtained should species protected under European or UK legislation be identified through the completion of further protected species work.

### **Recommended additional work**

At the detailed design stage further detailed survey work for protected species will be required but adequate mitigation and compensation for protected species identified can be achieved through sympathetic design.

## 4.2 Historic Environment

### Overview

Development such as the proposed link road and bridge can affect the historic environment either through direct disturbance of heritage assets or changes to aspects of their settings which contribute to heritage significance. Therefore, a high level desk-based assessment has been undertaken and this has involved the collection and review of readily available existing information.

### Methodology

Historic environment data was obtained from the following organisations:

- ▶ Historic England for designated heritage assets; and
- ▶ Warwickshire Historic Environment Record (WHER) for other recorded features/non-designated heritage assets.

The following sources were also consulted:

- ▶ Online historic mapping viewed at Old-maps.com.
- ▶ Online aerial photographs viewed at Google Earth; and
- ▶ Online detailed information on designated assets was viewed at the National Heritage List for England.

The assistance of these bodies and their staff is gratefully acknowledged.

The Warwickshire County Archaeological Service provides planning advice on historic environment matters in addition to maintaining the HER.

In order to place the site within its context and assist in identifying the potential for the presence of further remains of archaeological interest, data was collected for an area within 1km of the proposed road route (hereafter 'the study area').

### Designated assets

There are 43 designated heritage assets within the 1km study area (Figure 1, Appendix D).

The designated heritage assets comprise 39 listed buildings (one at Grade I, one at Grade II\* and 37 at Grade II), one Grade II registered park and garden and three conservation areas.

Table 4.5 Designated heritage assets within the 1km study area

List Entry	Name	Grade	Easting	Northing	Approx. Distance
1187857	SPRINGFIELD BRIDGE	II	420412	253071	32m
1187782	CLIFFORD FORGE HOUSE	II	419794	252727	468m
1205379	SHOTTERY CHURCH OF ENGLAND JUNIOR AND INFANT SCHOOL	II	418672	254620	523m
1298505	35, SHOTTERY	II	418676	254663	565m
1187789	4-18, COTTAGE LANE	II	418475	254703	579m

Table 4.5 (continued) Designated heritage assets within the 1km study area

List Entry	Name	Grade	Easting	Northing	Approx. Distance
1298551	ANNE HATHAWAY'S COTTAGE	I	41844 9	254745	622m
1025077	10 AND 12, SHOTTERY	II	41885 2	254687	661m
1187858	STRATFORD UPON AVON GRAMMAR SCHOOL FOR GIRLS	II*	41891 1	254663	674m
1025003	LAVENDER HOUSE	II	41868 5	254789	688m
1025088	OWL HOUSE	II	41882 9	254751	705m
1187861	THE GREEN	II	41879 9	254776	715m
1298507	THE THATCHED HOUSE	II	41870 3	254812	716m
1355153	DOVECOTE APPROXIMATELY 20 METRES NORTH OF STRATFORD UPON AVON GRAMMAR SCHOOL FOR GIRLS	II	41893 5	254702	720m
1187860	QUINEYS	II	41882 0	254774	722m
1355170	TAPESTRY COTTAGE	II	41880 6	254794	734m
1187790	BURMAN'S FARMHOUSE	II	41822 2	254835	762m
1298553	14-18 HATHAWAY HAMLET	II	41826 5	254926	835m
1187793	HATHAWAY HAMLET	II	41830 6	254943	841m
1204439	BROOKSIDE	II	41844 6	254966	843m
1187792	HATHAWAY HAMLET	II	41824 8	254932	845m
1298552	7-10 HATHAWAY HAMLET	II	41824 0	254952	867m
1204451	CHURCH OF ST ANDREW	II	41848 1	254994	869m
1187777	CHURCH COTTAGE	II	41843 2	254993	871m
1187791	1-6 HATHAWAY HAMLET	II	41825 9	254973	881m
1205897	SOLI HOUSE (CATHOLIC YOUTH HOSTEL)	II	42002 7	254169	893m
1382559	51	II	41963 1	252238	931m

Table 4.5 (continued) Designated heritage assets within the 1km study area

List Entry	Name	Grade	Easting	Northing	Approx. Distance
1382546	14-17	II	41969 5	252234	939m
1382558	49 AND 50	II	41963 0	252227	942m
1382547	AVON COTTAGE (NUMBER 18) AND CLIFFORD COTTAGE (NUMBER 19) AND FRONT GARDEN WALL	II	41971 4	252227	948m
1355191	4-7, TRINITY STREET	II	41998 8	254229	953m
1382557	PROSPECT HOUSE	II	41965 4	252214	956m
1382556	46 AND 47	II	41966 3	252204	967m
1382562	CLIFFORD LODGE AND ATTACHED WALL AND PIER	II	41974 0	252210	968m
1382555	45	II	41967 4	252200	972m
1382554	MAYTREES	II	41967 7	252196	976m
1382553	42 AND 43	II	41968 5	252190	982m
1206440	26 AND 27, RYLAND STREET	II	41993 3	254267	991m
1280430	HEARSE HOUSE APPROXIMATELY 23 METRES SOUTH OF CHURCH OF HOLY TRINITY	II	42008 7	254268	995m
1298499	28, RYLAND STREET (See details for further address information)	II	41992 7	254270	995m

The three conservation areas are:

- ▶ *Shottery* located c. 450m to the north,
- ▶ *Stratford-upon-Avon* c. 640m to the north; and
- ▶ *Clifford Chambers* c. 780m to the south.

The majority of listed buildings are situated within the conservation areas, though Springfield Bridge and Clifford Forge House are both in relatively isolated positions closest to the road route.

The Grade II registered park and garden at Anne Hathaway's Cottage (ListEntry 1001184) is also located within the Shottery conservation area.

### Other recorded features

There are 76 non-designated heritage assets in the 1km study area recorded in the Warwickshire HER (Figure 1, Appendix D). These assets have been used to inform this high level assessment of the potential for historic environment considerations.

The non-designated assets within the study area have been broadly grouped to gain an understanding of recorded patterns of land use.

Prehistoric assets include chance finds (MWA1008 and MWA4506), possible ring ditches (MWA6252 and MWA1413), Iron Age pits (MWA13402, MWA13402) and a possible round barrow (MWA918).

Romano-British assets include possible settlement sites (MWA1154 and MWA6251), possible fort site (MWA871) and chance finds (MWA919, MWA1617, MWA6259 and MWA4005).

Early-medieval assets include a settlement (MWA13319), ford (MWA1067), trackway (MWA8635) and cemetery (MWA1328).

Medieval assets include deserted settlements (MWA1047, MWA1049, MWA1045 and MWA10218), settlements (MWA892, MWA9043, MWA9081 and MWA9582), moat (MWA1021), churchyard (MWA8562), mills (MWA1035 and MWA1010), garden (MWA13045), farmhouse (MWA5896) and bridge (MWA5638).

Post-medieval assets include agricultural or horticultural features (MWA7553, MWA9315, MWA9320, MWA5897, MWA7666 and MWA8692), transport features (MWA4829, MWA7835, MWA4829, MWA4784, MWA7514, MWA4340, MWA5455, MWA9319 and MWA1020), extractive features (MWA9316 and MWA19186), water management features (MWA8868, MWA9318, MWA9317 and MWA4341) and industrial activity (MWA9321).

Within the proposed road route there are seven non-designated heritage assets recorded, which are given in the table below.

Table 4.6 Non-designated heritage assets within the proposed road route

WHER Ref.	Name/Description	Period	Monument type	Easting	Northing
MWA8635	Herepath along Clifford Chambers/ Milcote boundary - an Anglo-Saxon trackway known from documentary evidence	Early-medieval	Trackway	420169	253230
MWA4340	The Upper Avon Navigation	Post-medieval to Modern	River navigation	418603	253294
MWA7840	Midland Railway (Hatton, Stratford & Honeybourne)	Imperial	Railway	418676	253249
MWA4829	Turnpike road from Stratford to Andoversford	Imperial	Toll road	420169	253230
MWA4784	Turnpike road from Stratford to Long Compton Hill	Post-medieval	Toll road	420169	253230
MWA5455	Site of Milepost SW of Orchard Hill Cottage	Imperial	Milepost	420446	253149
MWA4920	Undated linear cropmark features identified on aerial photographs	Undated	Enclosure Linear feature Pit	418999	253179

There have been no previous archaeological investigations recorded within the site boundary. An archaeological watching brief 280m northwest of the road route recorded a group of Iron Age pits, linear features possibly Roman and a medieval field system.<sup>2</sup> Prior to this a geophysical survey had identified the

<sup>2</sup> Palmer, S.C., Evans, J., Mills, P., and Meredith, B. 2013. Iron Age Pit: a Watching Brief at Shipston Road, Stratford-upon-Avon, Warwickshire.

linear and pit features.<sup>3</sup> A watching brief to the east of the development at a similar distance identified no archaeological finds or features.<sup>4</sup> However, this was a small scale development.

Historic Ordnance Survey mapping indicates that the land within the road route was farmland in the 19<sup>th</sup> century within the River Avon valley rising up to Orchard Hill at the west. The land north of the River Avon was part of the Stratford-upon-Avon Race Course. There also appears to have been a sewage farm in the vicinity. The road route crosses the line of the former Branch line of the Hatton and Honeybourne Railway, former field boundaries and parish boundaries.

### Key considerations

The available evidence demonstrates the presence of archaeological remains within the valley of the River Avon, though do not indicate a clear constraint to development on the proposed bridge location or link road. The presence of the Grade II listed Springfield Bridge (List Entry 1187857) on the A3400 will have an influence on the location and design of the junction to the link road as the physical preservation and setting of this asset will need to be considered.

Nevertheless, the scale of the development and its location in a river valley mean that development would be likely to result in effects on archaeological remains. This is suggested in particular by the presence of cropmarks on the route (MWA4920) and records of finds of Iron Age to Medieval date at a site 280m northwest of the road route. Further assessment is considered necessary and it is recommended that early consultation with the Warwickshire County Archaeologist, Stratford District Council Conservation Officer and Historic England be initiated to help to define the scope of further surveys and assessment.

## 4.3 Noise

Using the proposed route (as shown in Appendix A) as a guideline, likely receptors can be determined. It is likely that potentially adverse changes in road traffic noise will be observed at dwellings along Luddington Road and Stannells Close, as well as individual farms including Milcote Hall Farm, Cross-o-the-Hill Farm and Clifford Bank Farm. Changes may also be observed on the main routes through Stratford-upon-Avon including Evesham Road. There is also the potential for construction noise impacts at these receptors. However, the proposed road may also provide positive effects, potentially reducing traffic and traffic noise along routes through Stratford-upon-Avon, particularly on the A4390 and the B439. The approximate locations of the potential receptors are indicated as yellow areas on Figure 4.1.

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<sup>3</sup> David, H. 2010. Land at Shipston Road, Stratford-upon-Avon, Warwickshire.

<sup>4</sup> Gethin, B. 2011. 5 Avonbank Drive, Luddington, Old Stratford and Draycote, Warwickshire: Archaeological Watching Brief.



Figure 4.1 Potential Receptors



Yellow areas indicate potential receptors.

A baseline noise measurement survey will be required at locations to be confirmed at a later date. The results of the survey would provide baseline noise levels for the assessment of the changes in road traffic noise and provide pre-construction ambient noise levels for the assessment of noise from construction activities.

All road traffic noise measurements would be carried out in accordance with the 'Calculation of Road Traffic Noise' (CRTN), 1988.

## 4.4 Air Quality

### Overview

The legislative framework for air quality consists of legally enforceable EU Limit Values that are transposed into UK legislation as Air Quality Standards (AQS) that must be at least as challenging as the EU Limit Values. Action in the UK is then driven by the UK's Air Quality Strategy that sets the Air Quality Objectives (AQOs) which give target dates to help the UK move towards achievement of the EU Limit Values. The AQOs are a statement of policy intentions or policy targets and as such, there is no legal requirement to meet these objectives except in as far as they mirror any equivalent legally binding Limit Values in EU legislation. The most recent UK Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published in July 2007.

The EU Limit Values are set by the European directive on air quality and cleaner air for Europe (2008/50/EC) and the European directive relating to arsenic, cadmium, mercury, nickel, and polycyclic aromatic hydrocarbons in ambient air (2004/107/EC) as the principal instruments governing outdoor ambient air

quality policy in the EU. The Limit Values are legally binding levels for concentrations of pollutants for outdoor air quality.

Since the publication of Part IV of the Environment Act 1995, local authorities have been required to review concentrations of the UK Air Quality Strategy pollutants within their areas and to identify areas where the AQOs may not be achieved by their relevant target dates. This process of Local Air Quality Management (LAQM) is an integral part of delivering the Government's AQOs detailed in the Strategy. When areas are identified where some or all of the AQOs might potentially be exceeded and where there is relevant public exposure, i.e. where members of the public would regularly be exposed over the appropriate averaging period, the local authority has a duty to declare an Air Quality Management Area (AQMA) and to implement an Air Quality Action Plan (AQAP) to reduce air pollution levels towards the AQOs. Latest guidance on the LAQM process is given in Defra's 2009 Local Air Quality Management Technical Guidance (LAQM TG (09)).

This assessment has modelled emissions of nitrogen oxides (NO<sub>x</sub>), PM<sub>10</sub> and PM<sub>2.5</sub>, in order to assess concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> as these are the pollutants of greatest health concern associated with road traffic. The NO<sub>x</sub> (NO and NO<sub>2</sub>) emitted from vehicle exhausts and other combustion sources undergoes photochemical oxidation in the atmosphere, with NO<sub>2</sub> being formed by oxidation of NO to NO<sub>2</sub> and, conversely, NO<sub>2</sub> undergoing photolysis (in the presence of sunlight) to create NO and ozone.

The UK Government and the Devolved Administrations have set national AQOs for particulate matter smaller than 2.5 µm in diameter (PM<sub>2.5</sub>). These objectives have not been incorporated into the LAQM Regime, and authorities have no statutory obligation to review and assess air quality against them. However, given that PM<sub>2.5</sub> is a pollutant of concern at the national and EU levels it has been included here.

Table 4.5 sets out the AQOs that are relevant to this assessment, and the dates by which they are to be achieved.

Emissions of other exhaust gases, such as carbon monoxide (CO), small quantities of sulphur dioxide (SO<sub>2</sub>) and non-methane volatile organic compounds (NMVOC) including 1,3-butadiene and benzene, will also occur from vehicles. National level measurement and modelling assessments carried out by Defra have shown that policy measures already in place should reduce levels of CO, 1,3-butadiene and benzene to ensure compliance with the respective standards and objectives, even at busy roadside locations.

For NO<sub>2</sub>, it is the annual mean objective that is the more stringent AQO; it is generally considered that the 1-hour mean NO<sub>2</sub> AQO will not be exceeded if the annual mean objective is not exceeded. For PM<sub>10</sub>, the 24-hour mean objective is more stringent than the annual mean.

**Table 4.7 Summary of relevant air quality standards and objectives**

Pollutant	Objective (UK)	Averaging Period	Date by which to be Achieved and Maintained thereafter (UK)
<b>Nitrogen dioxide - NO<sub>2</sub></b>	200 µgm <sup>-3</sup> not to be exceeded more than 18 times a year	1-hour mean	31 Dec 2005
	40 µgm <sup>-3</sup>	Annual mean	31 Dec 2005
<b>Particles - PM<sub>10</sub></b>	50 µgm <sup>-3</sup> not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
	40 µgm <sup>-3</sup>	Annual mean	31 Dec 2004
<b>Particles - PM<sub>2.5</sub></b>	25 µgm <sup>-3</sup>	Annual mean	2020
	Target of 15% reduction in concentration at urban background locations	3 year mean	Between 2010 and 2020



## Baseline Air Quality

### Local Air Quality Management Review and Assessment

In 2008, Stratford-on-Avon District Council declared the entire town of Stratford-on-Avon as an AQMA as a result of exceedances of the NO<sub>2</sub> annual mean AQO. The Proposed Link Road is located just outside this AQMA.

### Air Quality Monitoring

Stratford-on-Avon District Council monitored NO<sub>2</sub> concentrations using passive diffusion tubes at 20 locations in 2013, ten of which were in Stratford-on-Avon. The details of these passive monitoring sites are given in Table 4.6. The bias-adjusted concentrations monitored for the years 2010-2013 are shown in Table 4.7. Figure 4.2 shows the location of these passive monitors relative to the Site.

Table 4.8 Location details of NO<sub>2</sub> diffusion tube monitoring sites in Stratford-on-Avon

Site Name	Classification Type	X (m)	Y (m)	In AQMA?
Elizabeth House Garden, SuA	Urban Background	419931	254693	Y
Shipston Road, SuA	Roadside	420683	254421	Y
Brewery Street, SuA	Urban Background	419948	255342	Y
Guild Street, SuA	Roadside	420066	255172	Y
Tiddington Road, SuA	Kerbside	420710	254818	Y
Ely Street, SuA	Roadside	419972	254869	Y
Grove Road 1, SuA	Roadside	419759	254917	Y
Greenhill Street, SuA	Roadside	419768	255016	Y
Grove Road 2, SuA	Roadside	419758	254931	Y
Wood Street 2, SuA	Roadside	420127	254990	Y
Wood Street 1, SuA	Roadside	420059	254978	Y

Table 4.9 Diffusion tube annual average NO<sub>2</sub> concentration (µgm<sup>-3</sup>), 2010-2013

Site Name	2010	2011	2012	2013
Elizabeth House Garden, SuA	17.4	12.4	14.4	12.6
Shipston Road, SuA	24.1	21.8	20.9	20.2
Brewery Street, SuA	23.4	18.1	18.3	18.1
Guild Street, SuA	31.4	27.1	26.5	26.2
Tiddington Road, SuA	42.5	37.7	36.5	37.1
Ely Street, SuA	24.1	18.0	23.1	19.7
Grove Road 1, SuA	43.7	36.9	37.1	32.6
Greenhill Street, SuA	41.0	34.3	32.7	32.6
Grove Road 2, SuA	42.1	36.4	35.7	35.3
Wood Street 2, SuA	43.5	36.8	31.9	29.8
Wood Street 1, SuA	37.7	36.5	-	-

## Notes:

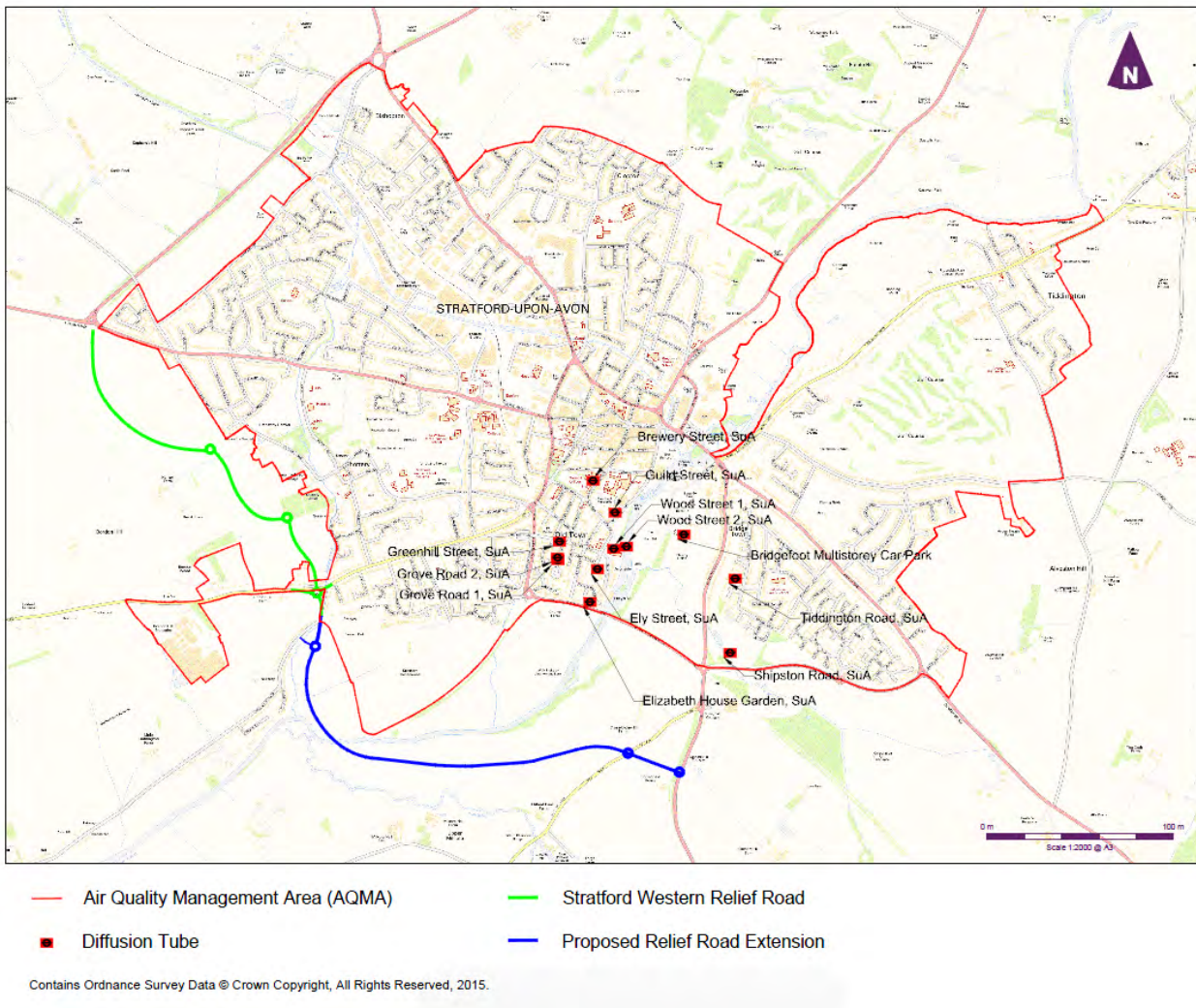
Exceedances of the NO<sub>2</sub> annual mean AQO are shown in **bold**

'-' Indicates no data available.

Bias adjustment factors: 2010 = 0.78; 2011 = 0.77; 2012 = 0.82; 2013 = 0.77

These results show that the annual mean AQO for NO<sub>2</sub> has not been exceeded in Stratford-on-Avon since 2010, possibly indicating that NO<sub>x</sub> emissions from road traffic in the town have reduced over the past few years. These monitoring results would give Stratford-on-Avon sufficient grounds to revoke the AQMA designation should it wish to do so.

Figure 4.2 Monitoring locations in Stratford-on-Avon



### Estimated Background Pollutant Concentrations

Defra has made estimates of background pollution concentrations on a 1 km<sup>2</sup> grid for the UK for seven of the main pollutants, including NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>, using data for a base year of 2011, making projections for years from 2011 to 2030 inclusive<sup>5</sup>. Table 4.8 shows the estimated values of the pollutants for 2015, the baseline year of the assessment, and for 2020, to show the predicted change in background pollutant concentrations over time, for a grid cell covering Stratford-on-Avon town centre (419500, 254500) and a grid square in which the Link Road will be located (418500, 253500).

<sup>5</sup> <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>

Table 4.10 Defra mapped background annual mean pollutant concentrations ( $\mu\text{g m}^{-3}$ )

Pollutant	419500, 254500		418500, 253500	
	2015	2020	2015	2020
Nitrogen Dioxide, NO <sub>2</sub>	13.3	11.0	9.3	7.6
Nitrogen Oxides, NO <sub>x</sub>	17.9	14.5	12.2	9.8
Particulate Matter, PM <sub>10</sub>	15.6	14.9	15.3	14.7
Particulate Matter, PM <sub>2.5</sub>	10.7	10.1	10.3	9.8

The forecasts show a downward trend in background pollutant concentrations, with predicted concentrations of all pollutants falling in 2020 compared to 2015 levels.

This decrease in ambient background concentrations has been estimated based on the knowledge that following the introduction of catalytic converters and European emission standards in 1992, emissions from cars and heavy-duty vehicles will decrease due to the penetration of new vehicles and trucks meeting each emerging emission standard. Future emissions (per vehicle) are therefore likely to be reduced as new vehicles, meeting the increasingly stringent emission regulations, replace older vehicles and form a greater part of the UK fleet. Market demand and future UK and European policies are likely to achieve further reductions in vehicle emissions, such as the introduction of Euro 6 emission standards in September 2015. The downward trend in pollutant concentrations in Stratford-on-Avon is therefore likely to continue.

### Key considerations

The proposed bridge crossing the River Avon and the Stratford Greenway under consideration here is required as part of the Proposed Link Road to the South of Stratford-on-Avon connecting the B439 Evesham Road in the west to the B3400 Shipston Road to the south. It is also part of wider improvements creating a link through to the A46. The Link Road would seek to benefit both existing user, by creating a bypass around Stratford Town centre and assist in providing sufficient capacity to support the development of 3,500 new homes to the south of Stratford-on-Avon. Traffic modelling has indicated that the capacity of the existing road network will be exceeded irrespective of the new development coming forward. If the capacity of the road network was exceeded, there would be congestion across the road network, with the associated congestion, stop-start traffic movements and queuing traffic. These are associated with increased emissions that would be likely to increase pollutant concentrations in the town, such that it would be possible that exceedances of the annual mean AQO for NO<sub>2</sub>, which have not been recorded since 2010, could occur again.

The Link Road, including the bridge under consideration, therefore presents the opportunity to improve the current road network conditions as well as support the delivery of the 3,500 new homes. This would reduce the congestion that could occur and help to alleviate congestion and minimise the increase in pollution caused by the additional traffic. The Link Road could also help to direct traffic away from the town centre, so that the improvements in air quality that have been recorded over recent years can continue.

The construction of the bridge and Link Road has the potential to generate fugitive dust emissions that could have a nuisance value for local residents, particularly those on Luddington Road. However, it is considered that these potential impacts can be reduced to a level that is not significant through employment of best practice mitigation measures.

## 4.5 Landscape and Visual Matters

The following provides a summary of key landscape and visual matters in relation to the proposed Stratford Western Relief Road.

## Site Context

The site lies within the Avon valley and comprises open fields in the north and west and arable farmland in the south and east. Stratford-upon-Avon racecourse is prominent immediately to the east, to which the urban fringe of Stratford provides a strong backdrop along its northern edge. Landform rises steadily eastwards across the farmland towards Clifford Lane. It is relatively well contained in its locality by the very nature of the topography together with field boundary vegetation. The River Avon meanders north-east to south-west through the site area which is also criss-crossed by several public rights of way including the distance routes; Monarch's Way, Shakespeare's Avon Way and Shakespeare's Way, as well as the Stratford Greenway which follows the former railway line. This route is elevated where it crosses the river, south of the racecourse.

## Planning Context

Both the 'Stratford-on-Avon District Local Plan Review', 2006 and the 'Intended Proposed Submission Core Strategy', July 2013 have been reviewed in relation to landscape policy. Whilst several policies are relevant to the site, it is important to note that the proposed road corridor and immediate context is not covered by any local or national landscape designations, nor do any other designations lie within close proximity. The Stratford Green Belt is located more than 2km to the north and the Cotswolds Area of Outstanding Natural Beauty (AONB) some 7km to the south. In terms of other designations, the Racecourse Meadow, a SSSI, lies immediately east of the northern section of the route (refer to Ecology section for further information).

The 'Green Infrastructure Study for the Stratford-on-Avon District', 2011 has also been reviewed, this includes recommendations and opportunities for the district; those particularly relevant to the site are:

- ▶ ST6: "Support and enhance biodiversity value of the River Avon corridor while recognising the importance of river meadows in flood management and increasing public access"; and
- ▶ ST7: "Improve linkages between key biodiversity sites and corridors, including the river, the racecourse in addition to supporting the aspirations of the BAP (Biodiversity Action Plan) priorities".

To ensure a robust Green Infrastructure (GI) network is delivered, a series of district wide strategic recommendations also form part of the study and act as overarching principles covering the areas between the larger settlements. Strategic recommendations of relevance are:

- ▶ SR3: Access and Recreational Network emphasises the need to enhance the existing network as well as create new links to improve overall connectivity between footpaths and cycleways across the district together with the development of a strong greenway framework which maximises biodiversity and recreational benefits.
- ▶ SR8: Tree Planting encourages native tree planting where appropriate to aid biodiversity and provide mitigation.

## Landscape Character

The site falls within the 'Severn and Avon Vales' National Character Area (NCA 106) and within both the 'Avon Valley' and 'Feldon' regional Landscape Character Areas. These character areas are further sub divided into Landscape Types; the proposed road corridor extends across the 'River Meadowlands' (Avon Valley) Landscape Type, described as "a narrow, meandering river corridors landscape, with flood meadows and steep, wooded river bluffs" and 'Feldon Parklands' (Feldon) Landscape Type, described as "a well wooded estate landscape with many large country houses set in mature parkland". The site also lies within the area identified as 'Enhancement Zone'.

The 'Landscape Sensitivity Assessment for Villages: Volume 2', prepared by White Consultants, 2012 assesses sensitivity of the landscape surrounding villages within the Stratford District to new residential and commercial development. While this study covers land immediately surrounding the village of Clifford Chambers to the south of the proposed road corridor, it does not extend far enough to the north to include the site or any part of it.

## Potential Visual Receptors

The majority of views are likely to be close range and the resultant Zone of Visual Influence (ZVI) relatively limited overall as indicated at FCPR Figures 1 and 2 in Appendix E. Potential receptors that have been identified include nearby properties; at the southern edge of Stratford, along Evesham Road, Limes Avenue, Luddington Road, Stannells Close and Avonbank Drive, as well as isolated farmsteads and houses; Milcote Farm, Clifford Bank Farm, Clifford Mill, Springfield House and Cross-o-the-Hill Farm.

Other receptors are likely to include public rights of way; footpaths SB29a (Shakespeare's Avon Way), SB32, SB34 (Shakespeare's Way), SB35, SB36, SB37, SB39, SB40 (Monarch's Way), SB41 together with the Stratford Greenway recreational route; local roads, including Clifford Lane (B4632) and Shipston Road (A3400); users of the River Avon itself, for example boaters and fishermen, and Stratford-on-Avon racecourse.

There is some potential for minimal, distant views of the proposed road, however these are likely to be limited owing to the flattish topographical nature of the landscape combined with intervening field boundary and roadside vegetation.





## 5. Conclusion

The opportunities and constraints study into a new bridge being constructed over the River Avon and Stratford Greenway has shown that it will be technically feasible.

The study has undertaken a high level study into the deliverability of the proposed bridge structure over both the River Avon and Greenway, which form part of the by-pass proposals. They have also undertaken a preliminary review of the environmental constraints for the provision of the new road. The purpose of the study was to see if a deliverable solution could be developed with regard to the provision of the bridge structure.

As part of the study, consultation has been undertaken with the EA as a key stakeholder in developing an appropriate and deliverable solution. Their feedback has been included in production of the final design proposals presented within the report.

In conclusion, to this preliminary study, the design process has not identified any significant issues with regard to provision of the bridge structure in any of the areas included within this study. It is considered that it would be possible to deliver an affordable scheme with the constraints identified within this report.

### 5.1 Recommendations for next steps

Following on from this study, it is recommended that a number of tasks should be carried out in order to develop the design further, thus reducing areas of risk and allowing a more robust cost estimate to be developed.

- ▶ The indicative design of the embankments should be costed to form a more robust cost estimate at this feasibility stage.
- ▶ Further consideration should be given to the design speed of the road, agreement should be sought from the Local Highway Authority as to whether it is possible to have a lower design speed below the 50mph used in this study. A reduction in design speed would reduce the length of embankment required, reducing the overall cost of the construction; reduced flood impact and reduced visual impact.
- ▶ The road elevation across the flood plain should be agreed with the highway authority and Environment Agency, taking into account the frequency and extent of flooding across the road that would be permitted.
- ▶ A full topographical survey of the route should be carried out, in particular capturing the tops of the riverbanks and the level of the Greenway. All critical clearance requirements should be verified.
- ▶ The preliminary design of the full route should be carried out including junctions and Shottery Brook crossing.
- ▶ Detailed flood modelling should be carried out in order to understand the impact on the construction of the proposed road on flood events, and to ascertain the level of flood compensation required.
- ▶ Geotechnical ground investigation should be carried out to verify foundation type for both the structure and the embankment.
- ▶ Structural preliminary design should be carried out to verify the sizes of structural members to give greater certainty in costing.
- ▶ An environmental scoping exercise should be carried out for the full route, to determine which specialist surveys are required.







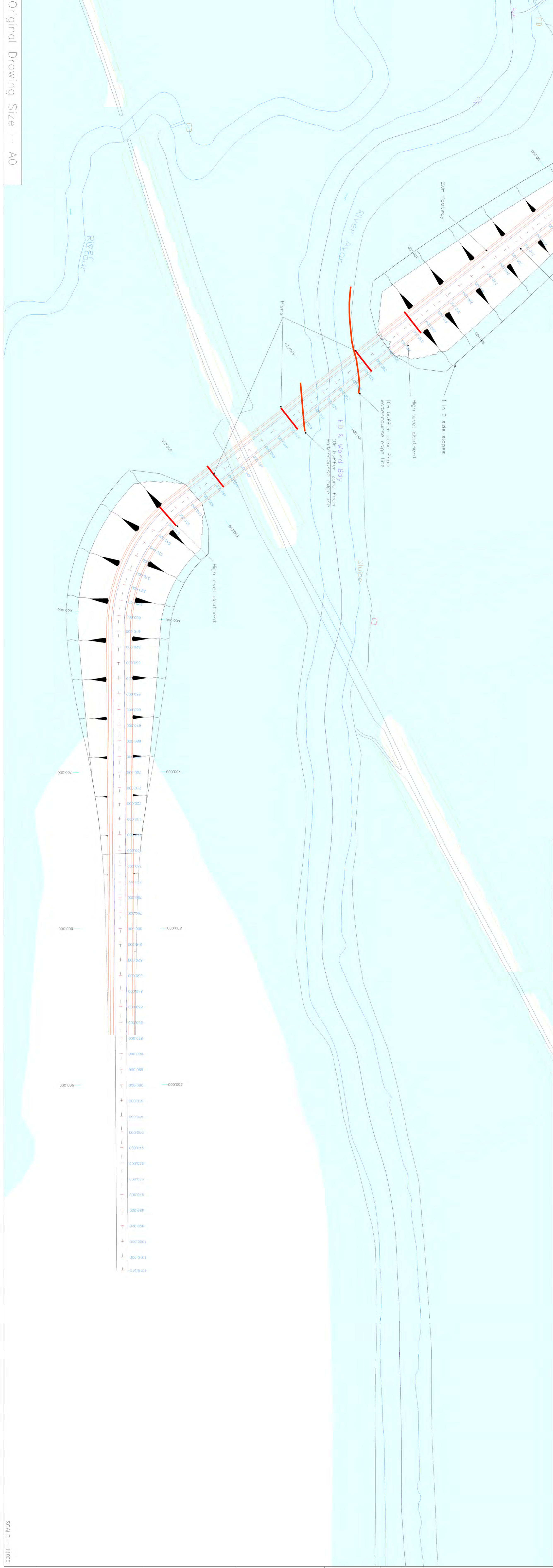
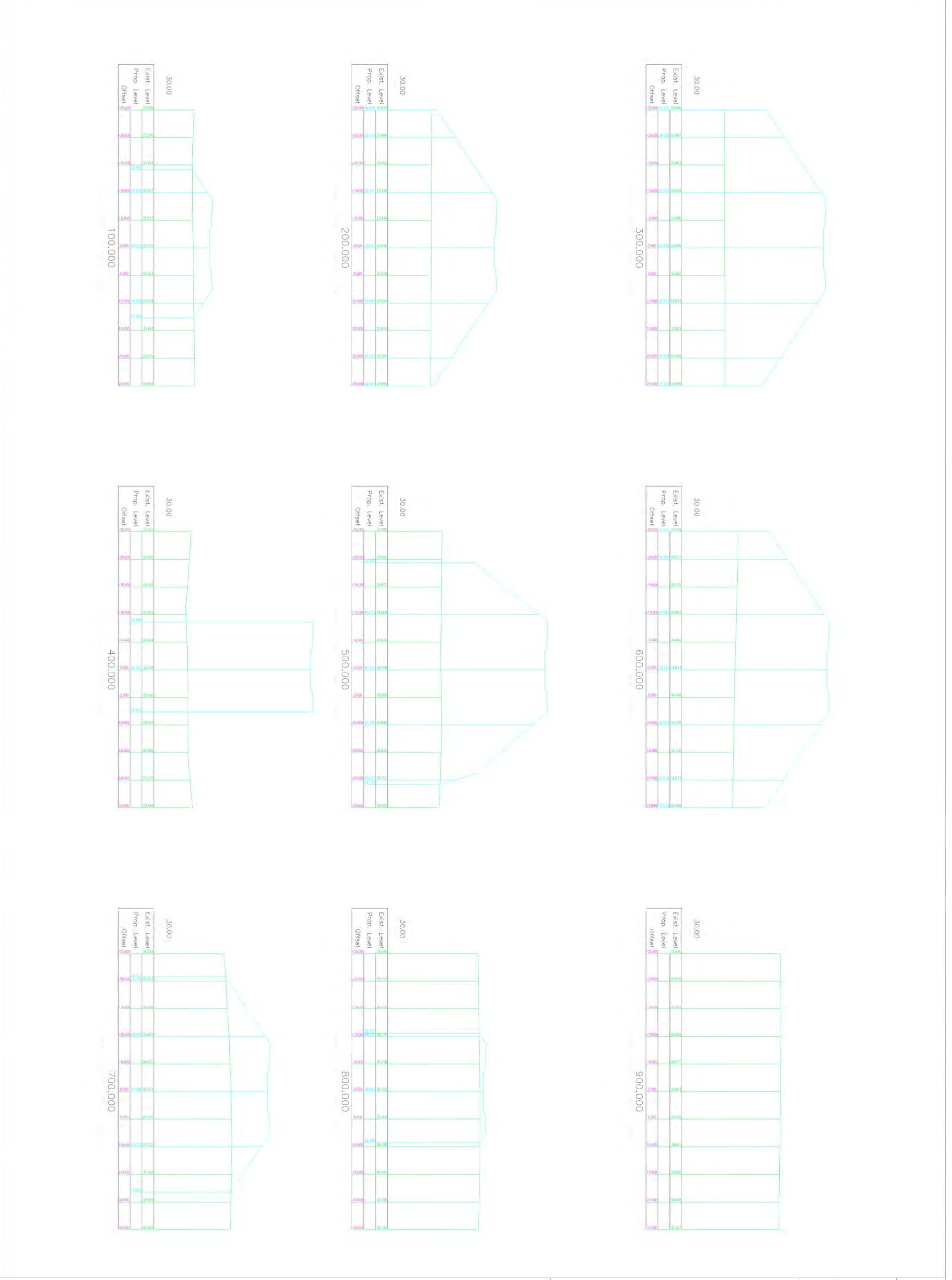
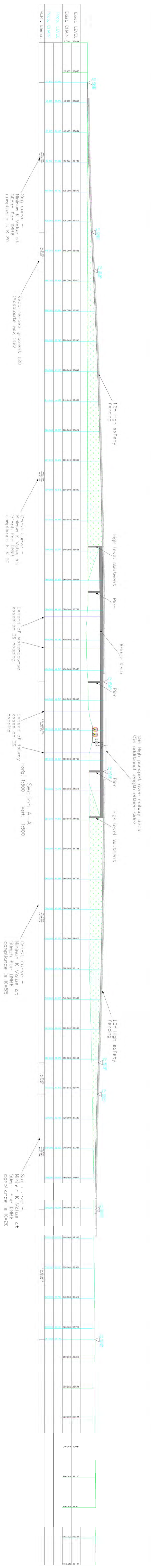
# Appendix A

## Drawing of proposed road

**Drawing Number:** 37119-LEA-001

**Drawing Title:** Stratford Bypass Alignment Design; Long Section and Cross Sections





Original Drawing Size - A0

DESCRIPTION		DMN	CHK	APP
REV	DATE			
-	MAY15			
INFORMATION ONLY				
REVISIONS				
REV	DATE	DMN	CHK	APP
A	MAY15			
FIRST ISSUE		STOOD	SNEEK	SNEEK

NOTES:

- SSSI Boundary
- 10m Buffer Zone from River Edge
- AREA SHOWN TO BE IN FLOOD ZONE B - BASED ON FLOOD MAP FOR PLANNING PURPOSES OF MAY 2015. REF: ENGLAND'S ENVIRONMENTAL AGENCY FLOOD LEVEL 08/2015-2030
- FURTHER INVESTIGATION OF FLOODING WOULD NEED TO BE CONDUCTED TO CONFIRM EXACT EXTENT OF THE CONNECTION POINTS.

CLIENT: CATALA

PROJECT TITLE: STRATFORD BYPASS

DRAWING TITLE: STRATFORD BYPASS ALIGNMENT DESIGN LONG SECTION AND CROSS SECTIONS

SCALE: AS SHOWN

SOALES: AS SHOWN

CLIENT: CATALA

amec foster wheeler

DRAWING No. 371119-LEA-001

SCALE - 1:1000





# Appendix B

## Flood Risk Information

Information arising from consultation with Environment Agency

- ▶ Existing flood information, including flood map and modelled water levels
- ▶ Preliminary opinion on the relief road
- ▶ Minutes of teleconference (26/05/2015)



Amec Foster Wheeler UK Limited  
60 London Wall  
London  
EC2M 5TQ  
richard.cartlidge@amecfw.com

**Our Ref:** SWWM-9918

**Your Ref:**

**Date:** 11 May 2015

Dear Mr Cartlidge

**Request for information:- Flood - Bypass Stratford upon Avon - CV37 9SE**

Thank you for your enquiry which was received on 22 April 2015 and subsequent payment received on 28 April 2015.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

**Flood Map**

According to our published Flood Map for Planning, which provides a general estimate of the likelihood of flooding across England & Wales, part of the site is shown to be within Flood Zone 3. This refers to land where the indicative probability of flooding from Rivers is 1% or more in any given year, disregarding the presence and effect of any defences. Please find enclosed a copy of the Flood Map for the area in the vicinity of the property.

**Modelled Levels**

The nearest main rivers are Shottery Brook, Middle Avon and River Stour. There are modelled levels enclosed for the nearest node points to the site (see the Node Point Location Map).

The models used are as follows;

River Avon SFRM 2010 – This model is a 1D2D ISIS Tuflow model.

River Stour SFRM 2010 – This model is a 1D2D Estry Tuflow model.

Shottery Brook SFRM 2008 – This model is a 1D2D ISIS model.

All these models can be purchased upon request.

## **Flood Defences**

There are no Environment Agency raised flood defences affecting this site. You may wish to contact the Local Authority to obtain further information regarding localised flooding from drains, culverts and small watercourses, and regarding existing or planned flood defence measures.

## **Record of Flooding**

Examination of our records of Historic Flooding (see explanation below) shows that the general area of the site was flooded in 1947, 1968, 1985, 1998 and 2007. Please note that these records show flooding to the land and do not necessarily indicate that properties within the historic flood extents were flooded internally. It is also possible that the pattern of flooding in this area has changed and that this area would now flood under different circumstances

You may also wish to contact your local authority or internal drainage board, to see if they have other relevant local flood information.

Our records of Historic Flooding show the extents of known flooding from rivers, the sea, and groundwater. It cannot show all the flooding that may ever have occurred – we can only show flooding where we have adequate records. As more data on historic flooding comes to light, and as flood incidents occur, then we will record this where we have adequate information to do so.

I have attached our Standard Notice or licence which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

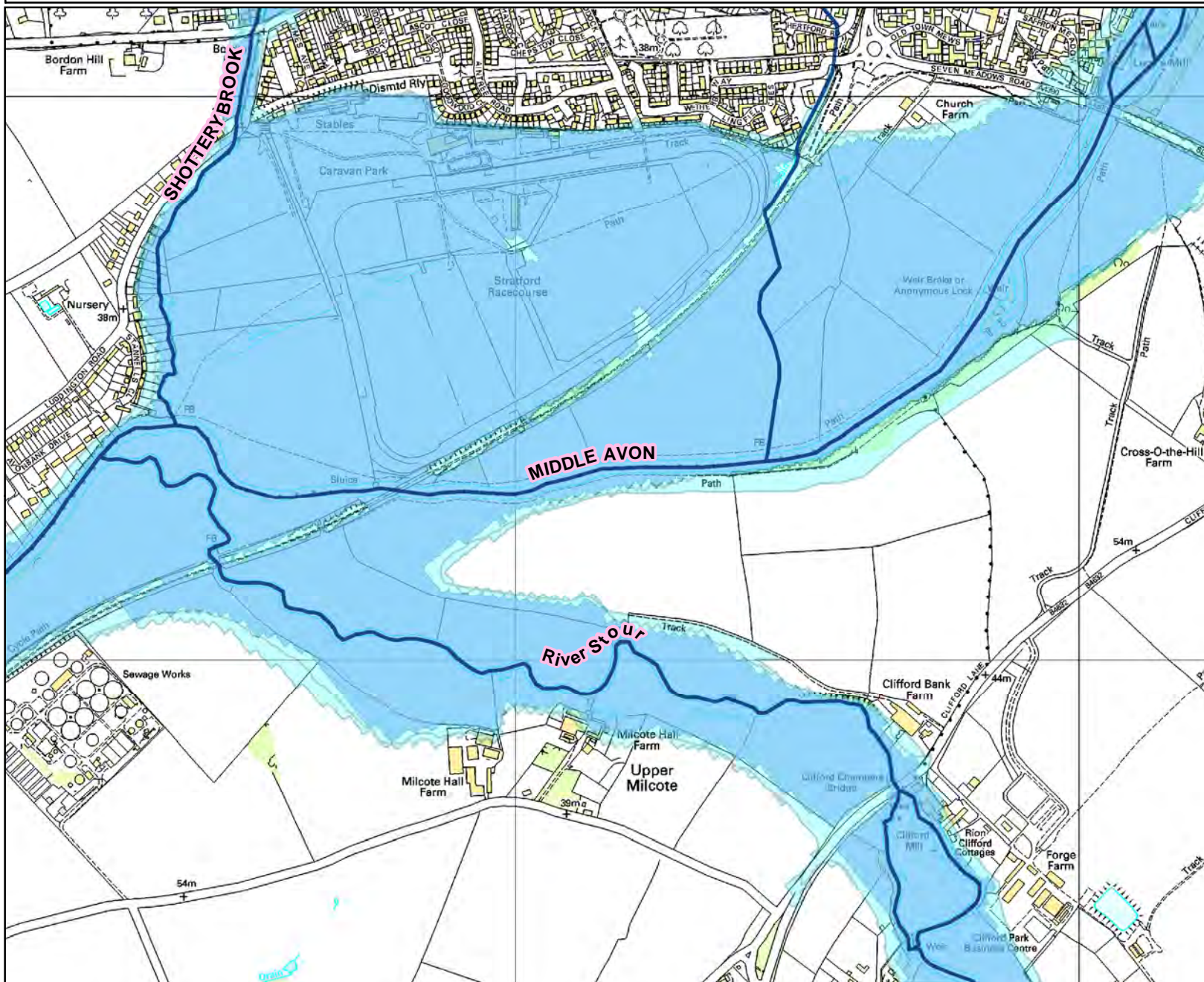
Yours sincerely

Yvonne Delaney  
Customers & Engagement Officer  
Staffordshire, Warwickshire & West Midlands




For further information please contact the Customers & Engagement team on  
01543 404959/4971/4814

Direct e-mail:- [SWWMcustomers@environment-agency.gov.uk](mailto:SWWMcustomers@environment-agency.gov.uk)

# Flood Map for Planning, Stratford, CV37 9SE. Prepared 07 May 2015. Ref. SWWM-9918



## Legend

-  Main Rivers
-  Flood Zone 2
-  Flood Zone 3

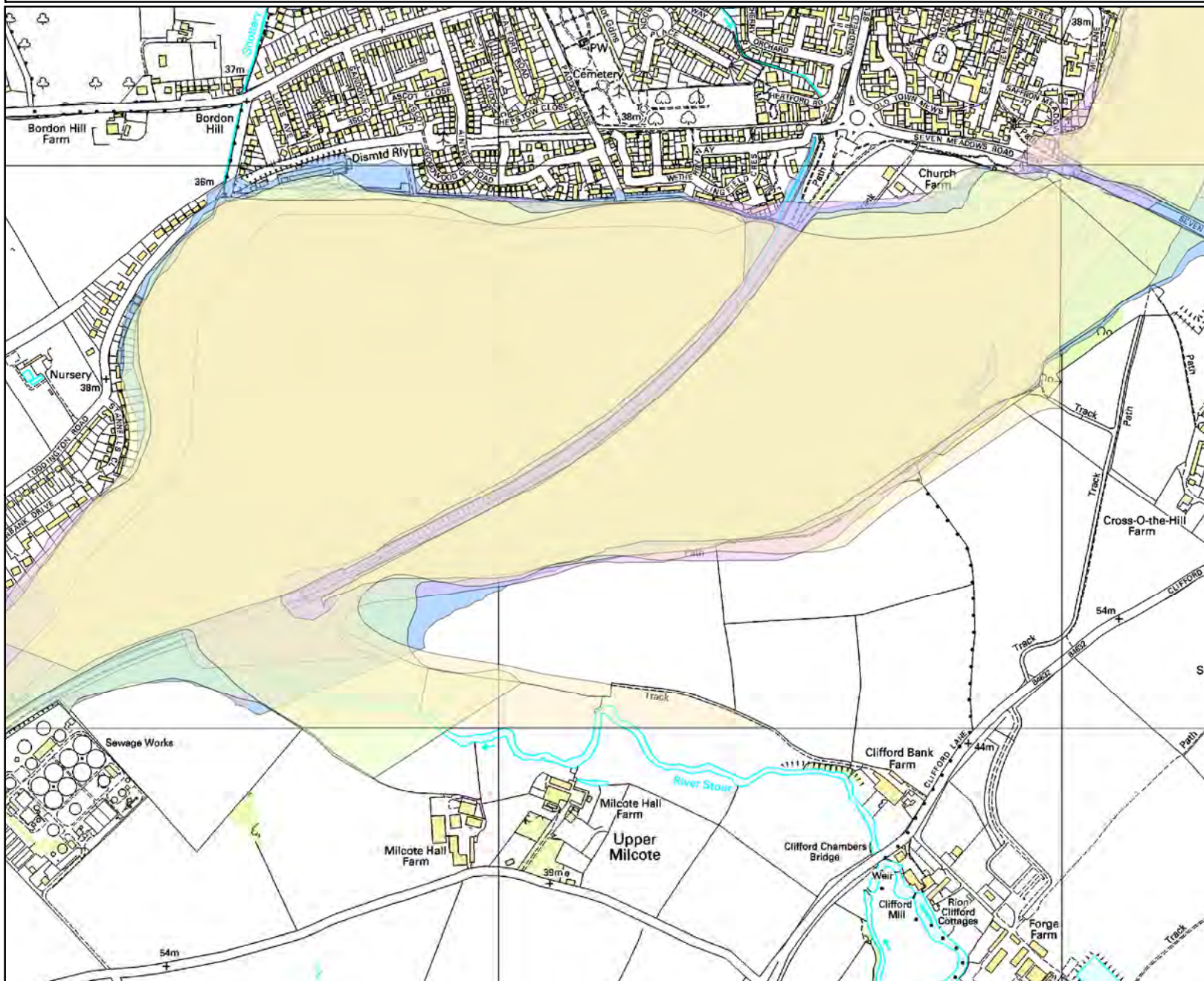
**Flood Map Areas (assuming no defences)**  
 Flood Zone 3 shows the area that could be affected by flooding from a river with a 1 in 100 (1%) or greater chance of happening each year.  
 Flood Zone 2 shows the extent of an extreme flood from rivers with up to a 1 in 1000 (0.1% - 1%) chance of occurring each year



Scale 1:10000



# Historic Flood Map, Stratford, CV37 9SE. Prepared 08 May 2015. Ref. SWWM-9918



## Legend

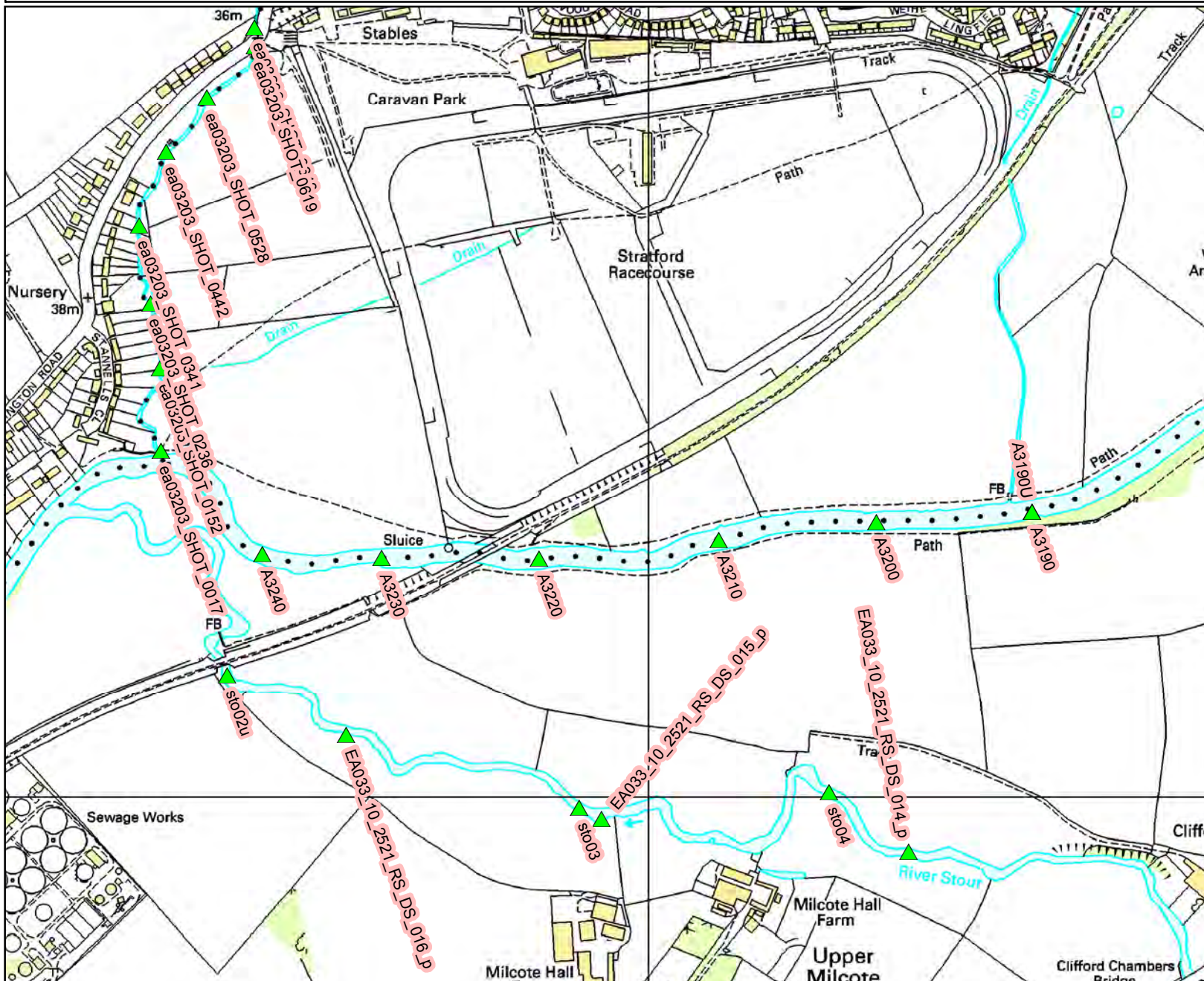
- March 1947
- July 1968
- April 1998
- January 1985
- July 2007



Scale 1:10000



**Node Point Location Map, Stratford, CV37 9SE. Prepared 07 May 2015. Ref. SWWM-9918**



**Legend**

- ▲ Selected Nodes



Scale 1:7000

# Modelled Levels

SWWM 9918	Model	Return Periods (yrs) Levels (mAOD)																Coordinates (m)		
		Undefended						Defended												
		UD_20	UD_50	UD_75	UD_100	UD_200	UD_1000	D_2	D_5	D_10	D_20	D_50	D_75	D_100	D_100cc	D_200	D_1000	East	North	
A3190	River Avon SFRM 2010				35.85		36.65	34.57	34.91	35.10	35.33	35.65	35.76	35.85	36.19	36.02	36.65	419476	253354	
A3190U					35.85		36.65	34.57	34.91	35.10	35.33	35.65	35.76	35.85	36.19	36.02	36.65	419476	253354	
A3200					35.81		36.61	34.52	34.87	35.05	35.28	35.60	35.72	35.80	36.14	35.98	36.61	419283	253342	
A3210					35.71		36.53	34.47	34.80	34.98	35.20	35.52	35.62	35.71	36.04	35.87	36.53	419087	253319	
A3220					35.52		36.31	34.42	34.72	34.89	35.08	35.36	35.44	35.52	35.81	35.65	36.31	418864	253296	
A3230					35.50		36.31	34.34	34.67	34.86	35.05	35.33	35.43	35.51	35.81	35.65	36.32	418668	253296	
A3240					35.47		36.26	34.31	34.66	34.84	35.03	35.31	35.40	35.47	35.76	35.60	36.26	418519	253302	
sto02u					35.46		36.26	34.14	34.60	34.81	35.01	35.30	35.38	35.46	35.75	35.59	36.26	418476	253151	
sto03					35.52		36.30	34.42	34.79	34.99	35.12	35.39	35.45	35.52	35.81	35.65	36.30	418913	252986	
sto04					35.61		36.33	34.69	35.02	35.15	35.25	35.54	35.58	35.61	35.88	35.77	36.34	419224	253006	
EA033_10_2521_RS_DS_014_p	River Stour SFRM 2010				36.31			35.59	35.65	35.73	35.83	36.06	36.14	36.31	36.47	36.47	37.11	419323	252931	
EA033_10_2521_RS_DS_015_p					36.16			35.41	35.46	35.53	35.60	35.87	35.94	36.16	36.31	36.31	36.98	418941	252972	
EA033_10_2521_RS_DS_016_p					36.10			35.37	35.41	35.46	35.52	35.80	35.87	36.10	36.25	36.25	36.92	418624	253077	
ea03203_SHOT_0017	Shottery Brook SFRM 2008	34.95	34.95	34.95	34.95	34.95	34.95											418393	253431	
ea03203_SHOT_0152		34.95	34.95	34.95	34.95	34.95	34.95												418392	253532
ea03203_SHOT_0236		34.95	34.95	34.95	34.95	34.95	34.96												418381	253614
ea03203_SHOT_0341		34.95	34.95	34.95	34.95	34.96	34.97												418366	253710
ea03203_SHOT_0442		35.00	35.01	35.02	35.03	35.04	35.14												418400	253802
ea03203_SHOT_0528		35.15	35.21	35.24	35.26	35.31	35.67												418450	253869
ea03203_SHOT_0619		35.35	35.42	35.45	35.47	35.53	35.92												418510	253932
ea03203_SHOT_0643		35.78	35.84	35.86	35.87	35.90	36.05												418510	253956

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AMEC Foster Wheeler  
60 London Wall  
London  
EC2M 5TQ

**Our ref:** UT/2015/114247/01-L01  
**Your ref:** 150422/JA08  
**Date:** 19 May 2015

Dear Sir,

## **ENQUIRY IN RELATION TO NEW BYPASS**

### **SOUTH WEST STRATFORD-UPON-AVON**

Thank you for your enquiry which we received on 1 May 2015.

The proposed bypass development alignment crosses the channel and spans the floodplain for the River Avon and the Shottery Brook, both designated as Main River.

#### **Modelling and FRA Requirements**

Detailed modelling should be undertaken to evaluate the different design options for the bypass, where it crosses both the channel and floodplain. This is a significant watercourse with a functional floodplain, and since a clear span option is not achievable, our preferred option for bypass design should be on raised pillars. Any structure that falls within functional floodplain must be avoided wherever practicably possible to ensure that there is no interfering with the river dynamics and flood flows.

A Flood Risk Assessment will need to identify the impact of any new abutments, embankments and/or stilts that are situated within the modelled floodplain upon the flood flow routes and floodplain extent as well as on peak flood levels. Approval of final bypass design will be subject to full hydraulic analysis demonstrating the flood risk impacts upstream and downstream of any new structure.

The following issues should be addressed within the modelling:

- Consideration of any existing or new structures (culverts, embankments, bridges etc) which may impede or alter the flow of water in the channel or floodplain
- Full sensitivity testing: Should any subsequent modelling demonstrate that a proposed structure results in an increased flood risk (either in frequency, severity

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Cont/d..

of flooding or a variation in the floodplain extent), the plans must be re-addressed and/or flood plain compensation provided accordingly.

### **Existing Modelling**

The Environment Agency Flood Map for Planning at this location consists of 1D/2D ISIS- TUFLOW modelling for the River Avon, completed as part of our River Avon 2010 SFRM Study, while the Shottery Brook outline is derived from broad scale national modelling techniques which are not considered detailed enough to inform site specific flood risk.

### **Flood Defence Consent**

Under the terms of the Water Resources Act 1991, and the local land drainage byelaws, the prior written consent of the Environment Agency is required for any proposed works or structures, in, under, over or within 8 metres of the top of the bank/foreshore any watercourse designated a 'main river'.

As part of the Pre Application consultation your designated officer will be Sarah Kirkman  
Contact Tel: 01543 404977 [sarah.kirkman@environment-agency.gov.uk](mailto:sarah.kirkman@environment-agency.gov.uk)

Yours faithfully

**Mr Martin Ross**  
**Planning Advisor**

Direct dial 01543 405047

Direct e-mail [martin.ross@environment-agency.gov.uk](mailto:martin.ross@environment-agency.gov.uk)



## DISCUSSION/TELEPHONE CONVERSATION RECORD

<b>Project No:</b>		<b>Doc Register No:</b>	37119-G003-M-i01
<b>Discussion between:</b>	Richard Cartlidge (RC)	<b>and</b>	Martin Ross (MR) - EA Planning Liaison; and Sarah Kirkman (SK) - Partnership and Strategic Overview Team
<b>Organisation:</b>	Environment Agency	<b>Incoming:</b>	<input checked="" type="checkbox"/> <b>Outgoing:</b> <input type="checkbox"/>
<b>Tel:</b>	01543 405047	<b>Fax:</b>	
<b>Address/e-mail:</b>	<a href="mailto:martin.ross@environment-agency.gov.uk">martin.ross@environment-agency.gov.uk</a>		
<b>Date:</b>	26-May-15	<b>Time:</b>	15:00 to 16:00

DETAILS:	Action
The purpose of the call was to obtain initial views from the Environment Agency (flood risk) on a proposed western bypass/relief road for Stratford, spanning from the Evesham Road (B439) in the north west to Clifford Lane in the south east.	
In advance of the meeting RC provided 2 x drawings for discussion, one showing the proposed bypass alignment (most recent draft), including long and cross sections, and another showing the route as a red line overlain onto LiDAR elevation data.	
RC introduced the scheme, summarised as follows: A proposed bypass, crossing the floodplain of the River Avon; This would include a bridge raised on 3 piers crossing both the River Avon and 'the greenway' (a footpath located on a disused railway embankment); To reach the bridge, the road would be on raised embankments on either side of the river; On the southern side of the river, the road would then tie into the higher elevation ground between the River Avon and the River Stour; On the northern side of the river, the embankment would slope down to ground level, with the northern section of the road 'at grade' through the remainder of the floodplain.	
SK and MR advised that any additional advice would be in addition to that provided in the written 'preliminary opinion', already provided based upon a simple red line of the proposed route.	
SK and MR advised that a route that included a section 'at grade' will not be acceptable. The floodplain by the racecourse floods frequently, approximately every other year. This frequency of flooding for a new relief road, (particularly in the Stratford area in which many of the local roads are at flood risk meaning that alternative routes would not be available), would not be acceptable.	
SK and MR advised that the Environment Agency would prefer a route that did not cross the floodplain at all, i.e. an alternative route elsewhere, (although it was acknowledged that this may not be possible).	
SK and MR advised that if this is not possible, the preference would be for a route that is raised above the 1% Annual Exceedance Probability (AEP) plus climate change water level, on raised abutments/piers that minimised the footprint of the relief road in the floodplain, and thus the impact elsewhere.	
RC advised that the use of piers across the whole floodplain may not be financially viable, hence the raised embankments. SK indicated that raised embankments could be allowed, but this would need to be supported by detailed flood modelling to demonstrate no increase in risk elsewhere.	



<p>SK advised that in order to demonstrate no increase in flood risk elsewhere, it is anticipated that compensation for the volume of floodplain lost to the embankments would need to be provided. Level for level floodplain storage would need to be provided, supported by modelling. RC advised that the area of raised ground into which the relief road ties into along its south eastern section has already been identified for floodplain compensation. MR questioned whether there are any ownership issues relating to this land. RC advised that, as far as he is aware, the client have advised that this entire area could be utilised for this purpose. SK advised that the floodplain compensation area looks promising, but may still be tricky to provide the level for level compensation required due to elevations and the scale of the embankments that will be required.</p>	
<p>In terms of the deck level of the road, SK and MR indicated that they may be able to incorporate some leniency with respect to its elevation. Flooding of the road to a depth of up to 300mm during the 1% AEP plus climate change event may be acceptable (so as to reduce the construction costs), but this would need to be modelled in order to demonstrate an acceptable flood hazard, and to determine that the frequency that the road would be flooded would be acceptable.</p>	
<p>In terms of the deck level of the road, Richard advised that a road deck at the desired elevation, of the 1% AEP plus climate change water level, may be financially unviable due to construction costs. Richard requested advice on the minimum deck elevation that the Environment Agency could allow. SK and MR advised that they may be able to incorporate some leniency (discussed further below) with respect to its elevation. Flooding of the road to a depth of up to 300mm during the 1% AEP plus climate change event may be acceptable (so as to reduce the construction costs), but this would need to be modelled in order to demonstrate an acceptable flood hazard, and to determine that the frequency that the road would be flooded would be acceptable. Richard questioned what level of hazard would be acceptable. Sarah and Martin indicated that depth was likely to be the greatest consideration, but that hazard would also need to be considered in the FRA.</p>	
<p>SK and MR advised that the Environment Agency would be able to provide greater leniency in terms of the road deck level (and depth of flooding) if it is possible to demonstrate an overall reduction in flood risk elsewhere, through over-compensation of floodplain storage for example.</p>	
<p>RC asked for any further advice re: easements and buffers from the watercourse - a minimum 8m buffer (for maintenance access) from the banktop of any watercourse has been considered so far. This has been reflected in the draft plans as a 10m easement from the OS river edge line. Sarah advised that as a minimum, no development (embankments or piers) should be proposed within this 8m easement (including in the river), but she advised that she would consult the consenting officer to confirm whether there would be any other requirements/stipulations.</p>	
<p>RC highlighted the potential problems re: where to locate SuDS devices. SK and MR advised that the Lead Local Flood Authority (LLFA) are now the statutory consultee on drainage, not the EA. RC requested advice on whether the Environment Agency would still comment on SuDS devices located in the fluvial floodplain of the River Avon. SK confirmed that, yes, they would object to any SuDS devices located in the floodplain. RC highlighted that due to the location of the relief road in the floodplain, it may be impossible to locate SuDS devices above the 1% AEP plus climate change water level. SK advised that for the drainage calculations, she would not expect us to assume that the Middle Avon River was in flood, i.e. the SuDS devices would not need to be above the 1% AEP plus climate change water level. The reasoning being that if the road were flooded, any rainfall would be falling directly into the flooded river in any case.</p>	
<p>In terms of the modelling, SK advised that the Environment Agency's flood map is based upon a detailed 1D/2D model of the River Avon, but only a J-Flow model of the Shottery Brook. Richard advised that the Environment Agency's Product 4 data (already supplied) indicated that detailed modelling of the Shottery Brook was also available. Sarah agreed to check this.</p> <p>Richard also advised that he had reasoned to Yvonne Delany (Customers &amp; Engagement Officer) on 12 May 2015 with respect to the data request, requesting clarification on some of the information and costs for purchasing the models. SK agreed to chase this as well.</p>	<p>SK to check what models are available.</p> <p>SK to chase Yvonne re: data request clarifications and model purchase costs.</p>

<p>Richard asked whether any new model build would likely be required. SK advised that she would not expect this to be necessary, and that purchase of the Environment Agency's existing models, and incorporation of the proposed relief road into these models would be sufficient to support an FRA for the relief road. SK advised the EA would expect modelling of the Shottery Brook and River Stour to include a 1% AEP event along those watercourses, combined with a 5% AEP event along the Middle Avon. Similarly, for the 1% AEP event along the River Avon, the 5% AEP events should be run through the Shottery Brook and River Stour.</p>		
<p>MR requested that Richard forward the details of the relevant contacts at the Council. RC advised that the Council are not our client, but are an interested party because of the impact on their Local Plan preparation. RC agreed to forward the details (already done so).</p>		<p>RC to forward to MR the contact details of the relevant officers at the Council.</p>
<p><b>Recorded by:</b></p>	<p>Richard Cartlidge</p>	<p><b>Update Contract Review and/or Quality Plan? No</b></p>
<p><b>Attachment/Continuation:</b></p>	<p>None</p>	

## Cartlidge, Richard A

---

**From:** Kirkman, Sarah L <sarah.kirkman@environment-agency.gov.uk>  
**Sent:** 05 June 2015 11:52  
**To:** Cartlidge, Richard A  
**Subject:** RE: Pre-application Chargeable Agreement for Bypass in South West Stratford - Minutes of our phone call

Hi Richard,

I can confirm that the minutes supplied herewith accurately reflect what was discussed during the teleconference on 26th May 2015.

Kind regards

Sarah

### Sarah Kirkman

Flood & Coastal Risk Management  
Staffordshire, Warwickshire and West Midlands Area  
Environment Agency

 01543 404977 (Internal 722 – 4977)

 [sarah.kirkman@environment-agency.gov.uk](mailto:sarah.kirkman@environment-agency.gov.uk)

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**From:** Cartlidge, Richard A [mailto:richard.cartlidge@amecfw.com]  
**Sent:** 05 June 2015 10:31  
**To:** Kirkman, Sarah L  
**Cc:** Ross, Martin  
**Subject:** Pre-application Chargeable Agreement for Bypass in South West Stratford - Minutes of our phone call

Hi Sarah

Thank you for yours and Martin's time last week to discuss potential flood risk issues relating to the potential Bypass in South West Stratford.

Please find attached the minutes/record of our discussion. Please confirm that you agree that this is an accurate record.

Thank you

**Richard Cartlidge**  
Senior Consultant, Water Management  
AMEC Foster Wheeler Environment & Infrastructure UK Limited

60 London Wall,  
London, United Kingdom EC2M 5TQ

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## Cartlidge, Richard A

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**From:** Kirkman, Sarah L <sarah.kirkman@environment-agency.gov.uk>  
**Sent:** 05 June 2015 09:11  
**To:** Cartlidge, Richard A  
**Cc:** Ross, Martin  
**Subject:** Stratford By Pass Proposal - Consenting Requirements

Hi Richard,

Please find attached our comments regarding the requirements for consideration of a Flood Defence Consent. We would expect an application for this work to be demonstrating the following:

- The soffit of the bridge must be designed and built above the 1 in 100 yr climate change fluvial level + an additional 600mm freeboard.
- 8m clear easement on both sides of the bridge from the watercourse with sufficient headroom for our machinery to drive through (minimum 4m headroom) if needed and an access into the watercourse would be beneficial.
- Evidence by way of hydraulic modeling to determine the effects of the works and provide level for level compensation for any embankments within flood zone 3.
- You may need to provide compensation to any land owners who they are intending to flood (not necessarily required for the consent but something you need to think about).
- The abutments need to be as few apart and far apart as possible.
- You will need a WFD assessment due to the scale of works and the proximity to a SSSI. If the SSSI is less than 0.5 miles away we will need to consult Natural England during the consenting process. It is usually best if the applicant approaches them with their plans and agrees a way forward prior to submitting a FDC.
- You will need to provide us with a method statement, ecology report and site compound location along with any detail of any bank protection you maybe using (If so preferably block-stone, no gabions).
- You are likely to be required to undertake mitigation for the works in the form of adding gravels or taking out any weirs locally which will be requested and suggested by biodiversity and geomorphology etc.

The Flood Defence Consent Application Form and Guidance Notes can be downloaded from our website [www.gov.uk](http://www.gov.uk)  
Please note that a Consent application can take up to 2 months to determine.

Kind regards

Sarah

### Sarah Kirkman

Flood & Coastal Risk Management  
Staffordshire, Warwickshire and West Midlands Area  
Environment Agency

 01543 404977 (Internal 722 – 4977)

 [sarah.kirkman@environment-agency.gov.uk](mailto:sarah.kirkman@environment-agency.gov.uk)

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# Appendix C

## Ecological Information

**Report:** FPCR Initial Habitat Assessment 2015





Cala Homes (Midlands) Ltd.

**Land South of Stratford upon Avon  
Stratford Western Relief Road**

**INITIAL HABITAT ASSESSMENT 2015**

June 2015

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**FPCR Environment and Design Ltd**

Registered Office: Lockington Hall, Lockington, Derby DE74 2RH

Company No. 07128076. [T] 01509 672772 [F] 01509 674565 [E] [mail@fpcr.co.uk](mailto:mail@fpcr.co.uk) [W] [www.fpcr.co.uk](http://www.fpcr.co.uk)

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2.0 METHODOLOGY ..... 6

3.0 RESULTS, EVALUATION OF HABITATS AND POTENTIAL IMPACTS..... 7

**FIGURES**

Figure 1: Consultation Results Plan

Figure 2: Habitats Plan

**APPENDICES**

Appendix A: Stratford Western Relief Road (Statutory & Non-Statutory Sites). Detailed Botanical Assessment

Appendix B: Target Notes

Appendix B: Hedgerow Notes

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## 1.0 INTRODUCTION

- 1.1 CALA Homes (Midlands) Ltd. commissioned FPCR Environment and Design Ltd. to undertake an initial ecological appraisal of an area of land located to the south of Stratford upon Avon, Warwickshire. This was associated with a proposal for a proposed new relief road required to support the proposed housing allocation at Long Marston Airfield. The indicative route for the road is shown on Figure 1
- 1.2 The appraisal involved an initial extended Phase 1 Habitat Survey in June 2015 to determine habitats and species present within the area of the indicative route for the proposed road and to make an initial assessment of their ecological value, and where appropriate, to identify the need for additional surveys.

## 2.0 METHODOLOGY

### Overview

- 2.1 The appraisal process has largely followed that recommended by the Chartered Institute of Ecology and Environmental Management (CIEEM)<sup>1</sup>. In summary, the key parts of that process have been:
  - a) Gathering baseline ecological information via a desktop study, an initial field survey and subsequent additional vegetation surveys;
  - b) Evaluation of the baseline information;
  - c) Discussion of the results and subsequent conclusions.

### Desk Study

- 2.2 Ecological information was requested from Warwickshire Biological Records Centre.
- 2.3 In addition, the following resources were interrogated for additional information and context:
  - Multi Agency Geographic Information for the Countryside (MAGIC) website<sup>2</sup>;
  - Colour 1:25,000 OS base maps<sup>3</sup>;
  - Aerial photographs from Google Earth<sup>4</sup>.

### Field Survey

- 2.1 The field survey method followed the extended Phase 1 Survey technique as recommended by Natural England<sup>5</sup>. This involved a systematic walk over of the site to classify the broad habitat types and identify any 'Habitats of Principal Importance' for the conservation of biodiversity as

---

<sup>1</sup> CIEEM. (2013). *Guidelines for Preliminary Ecological Appraisal*. [online]. Winchester:CIEEM. Available at: <http://www.cieem.net/guidance-on-preliminary-ecological-appraisal-gpea-> [Accessed 10/06/2015].

<sup>2</sup> [Online]. <http://magic.defra.gov.uk/>

<sup>3</sup> [Online]. [www.ordnancesurvey.co.uk](http://www.ordnancesurvey.co.uk)

<sup>4</sup> [Online]. [www.maps.google.co.uk](http://www.maps.google.co.uk)

<sup>5</sup> JNCC. (1990). *Handbook for Phase 1 habitat survey – a technique for environmental audit*. Peterborough: JNCC



listed within Section 41 (S41) of the Natural Environment and Rural Communities (NERC) Act 2006<sup>6</sup>.

- 2.2 The field survey was undertaken on 4<sup>th</sup> June 2015 by N Law. This included a detailed botanical survey of the grassland to the north of the River Avon. This additional survey work is reported in a separate grassland survey report which should be read in conjunction with this document (Appendix A).

### **3.0 RESULTS, EVALUATION OF HABITATS AND POTENTIAL IMPACTS**

This section should be read with reference to Figure 1 and Figure 2.

Additional information is provided in Appendix B Target Notes and Appendix C Hedgerow Notes.

Nomenclature follows Stace 2010<sup>7</sup>.

#### **Desk Study**

- 3.1 Consultation with Warwickshire Biological Records Centre (WBRC) identified the presence of statutory designated sites, a Site of Special Scientific Interest (SSSI), a non-statutory designated Local Wildlife Site, and a potential Local Wildlife Site within the potential impact zone of the proposed road. With the exception of the River Avon, and 'The Greenway, Dismantled Railway' (a multi-user trail) these designations, and potential designation, were based on the presence of grassland habitats. These designated sites are shown on Figure 1. The grassland sites are discussed in more detail in the grassland survey report which accompanies this report (Appendix A).

#### **Overview**

- 3.2 To the south of the River Avon the indicative route for the proposed road passes across a landscape of intensively farmed fields cultivated and sown with cereal crops and short-term rye-grass leys. North of the river, land use is less intensive and formed by smaller fields of grassland of varying quality, improved, semi-improved, species-rich and amenity grassland. Field boundaries are formed by hedgerows dominated by native species but often with a limited diversity of shrubs. South of the Avon hedgerow management is generally intensive with many of the hedges trimmed to a low height, whereas in contrast, those bounding the fields in the more pastoral landscape to the north of the river are generally tall and unmanaged. Mature trees within the hedgerows are not a feature.

#### **Broadleaved woodland**

- 3.3 Two small areas of broadleaved woodland are present on the line of the indicative route of the road. At the eastern extent (TN20) and where the road would pass over the Greenway (TN12).
- 3.4 The small area of broadleaved woodland bordering an existing road (TN20) is not ancient woodland and would be of local nature conservation value. There would need to be loss of some of this area to create the connecting junction for the road.

<sup>6</sup> *The Natural Environment and Rural Communities Act 2006*. [Online]. London:HMSO Available at: <http://www.legislation.gov.uk/ukpga/2006/16/contents> [Accessed 02/12/2014]

<sup>7</sup> Stace, C.A. (2010). *New Flora of the British Isles*. (3<sup>rd</sup> Ed.). Cambridge: Cambridge University Press

- 3.5 The proposed road would lift over the Greenway so impacts on the wooded area here, which will also be only of local value, would be minimised.

### **Grassland**

- 3.6 A range of grassland types of differing ecological value occur along the potential route.

#### **Short-term rye-grass leys.**

- 3.7 These are prominent feature south of the Avon. Largely dominated by perennial rye-grass *Lolium perenne* and with few other species present. These are sown to provide a crop of silage and are heavily fertilised. They are of negligible nature conservation value. Examples of those present are TN13 and TN14.
- 3.8 The loss of areas of this habitat type would have a negligible impact.

#### **Improved grassland**

- 3.9 The field bounded by Shottery Brook and the River Avon (TN11) supports a stand of improved grass of limited species diversity and with perennial rye-grass forming a significant proportion of the species composition. Immediately north of the Avon a second larger field (TN9) supports a similar type of grassland (see separate grassland survey report for more detail).
- 3.10 This grassland type has a low nature conservation value but in the case of TN9 the grassland survey has identified that this field has some function as buffering habitat to the adjacent SSSI.
- 3.11 The road would be elevated over TN11. The grassland survey has highlighted the possibility for the loss of areas of TN9 to be more than compensated for by the creation of species-rich floodplain grassland within the area of TN9 which is not lost to the road.

#### **Species-poor semi-improved neutral grassland**

- 3.12 A small area of this type of grassland (TN7) is present as part of Steeplechase Meadows LWS (see separate grassland survey report for more detail).
- 3.13 Although species abundance is lower in this part of the LWS the grassland survey report has highlighted the role that this area has as buffering habitat to the adjacent SSSI.
- 3.14 Most of this area is likely to be lost to the road. However, this loss could be compensated for by the creation of species-rich floodplain grassland within the large field to the south (TN9).

#### **Species-rich unimproved grassland**

- 3.15 Racecourse Meadow SSSI supports species-rich floodplain grassland and the adjacent Steeplechase Meadow LWS (TN6) also contains species-rich grassland of a similar type but of moderate quality (see separate grassland survey report for more detail).
- 3.16 There would be a loss of an area of species-rich grassland of moderate quality at the western end of Steeplechase Meadow LWS. This loss could however be compensated for by specific management to enhance species diversity and abundance within the area of the LWS which would remain unaffected by the proposals, the creation of species-rich floodplain grassland in TN9, and, most importantly, the subsequent long-term sympathetic management in perpetuity of the LWS, SSSI and newly created grassland as a coherent ecological unit.

### **Amenity grassland**

- 3.17 This is present in one location at the northern extent of the proposed road (TN5) where a field of predominantly perennial rye-grass grassland is mown regularly as the field is used for car boot sales.
- 3.18 This grassland is of negligible ecological value. Most of this area would be lost to the main junction at the northern extent of the road. This loss would be more than adequately compensated for by the compensation measures discussed in the preceding paragraphs.

### **Flowing water**

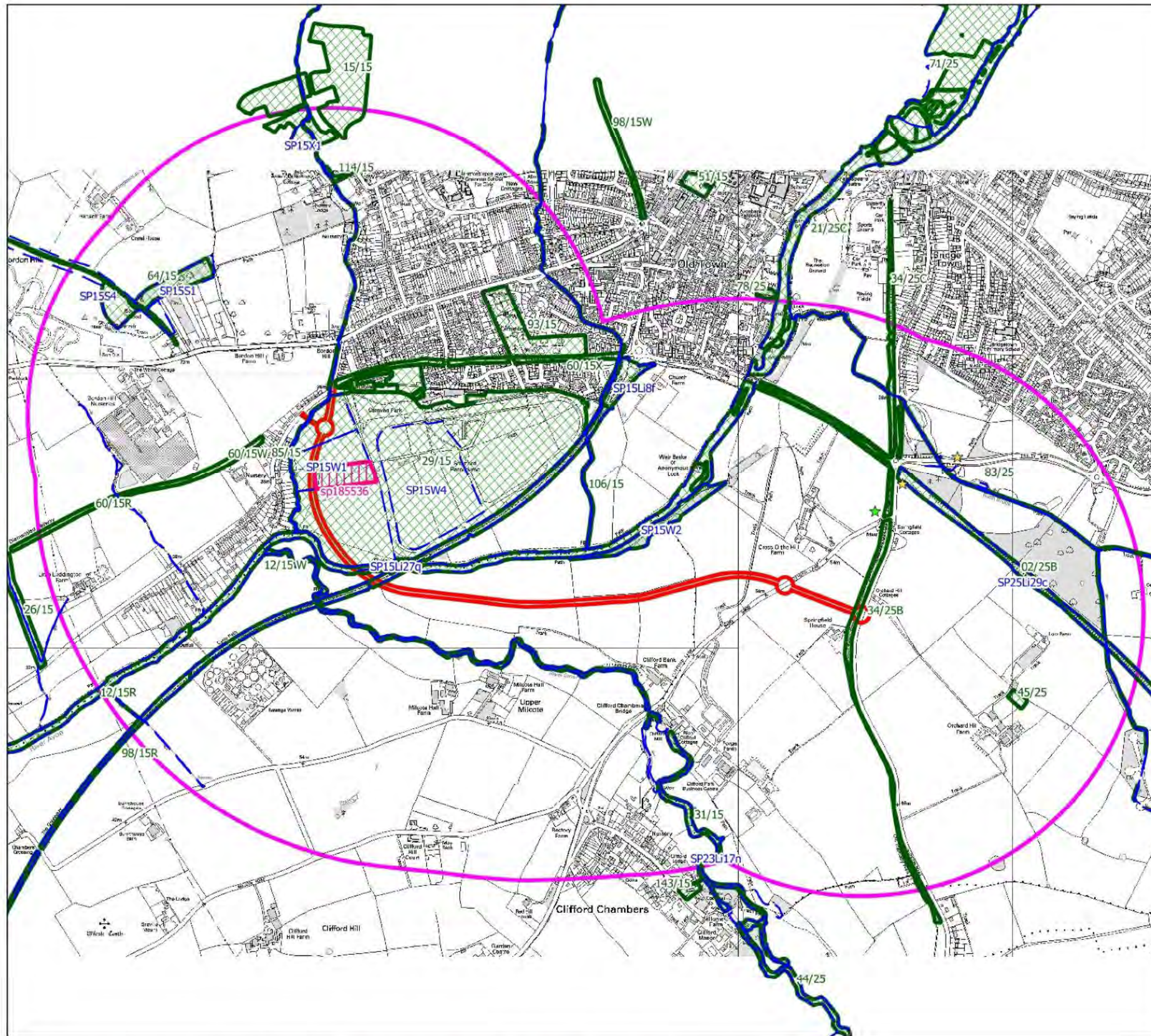
- 3.19 The road will have to cross the River Avon. In the general area of the crossing point (TN10) the river has a sluggish flow and has some tree cover (mainly willow *Salix sp.*) on the banks and some marginal emergent vegetation (mainly Common Club-rush *Schoenoplectus lacustris*). A minor road crossing would also involve going across Shottery Brook at the northern extent of the road (TN4) – close access to the brook channel at this point was not possible due to heavy bankside vegetation.
- 3.20 The proposed road would be elevated over the Avon and bridged over Shottery Brook so there should be no direct impact on these habitats.

### **Hedgerows**

- 3.21 Hedgerows form the boundaries of the fields along the line of the road. These are dominated by native species but often with a limited diversity of shrubs. Typical of the Midlands, hawthorn *Crataegus monogyna* is the main component of the hedges with blackthorn *Prunus spinosa* often locally abundant and suckering into the adjacent field. Elm features locally in the hedges south of the river. Other shrub species present include elder *Sambucus nigra*, field maple *Acer campestre* and dog-rose *Rosa canina agg.* The hedges north of the Avon bordering the grassland fields tend to be more species-rich than those to the south of the river.
- 3.22 South of the Avon hedgerow management is generally intensive with many of the hedges trimmed to a low height, whereas in contrast, those bounding the fields in the more pastoral landscape to the north of the river are generally tall and unmanaged.
- 3.23 Mature trees within the hedgerows are not a feature.

Some loss of hedgerow will be required along the route of the road. As hedgerows dominated by native species are representative of Hedgerow Habitat of Principal Importance as listed on Section 41 of the NERC Act this would represent a loss of habitat of national ecological value. However, this loss could be compensated for by planting replacement hedges and implementing sympathetic management of retained hedges. This would deliver significant benefits in the area south of the Avon where the current intensive management of the hedgerows greatly reduces their nature conservation value.





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- |                         |                         |
|-------------------------|-------------------------|
| Site Boundary           | Common Frog             |
| 1km Buffer              | Grass Snake             |
| SSSI                    | Great Crested Newt      |
| LWS & pLWS              | Slow-worm               |
| Ecosites                | Smooth Newt             |
| Barn Owl                | Small Heath             |
| Brown Long-eared Bat    | White Admiral           |
| Common Pipistrelle      | White-letter Hairstreak |
| Daubenton's Bat         | Brown Hare              |
| Lesser Noctule Bat      | Hedgehog                |
| Myotis Bat species      | Otter                   |
| Natterer's Bat          | Water Vole              |
| Noctule                 |                         |
| Pipistrelle Bat species |                         |
| Soprano Pipistrelle     |                         |
| Unidentified Bat        |                         |

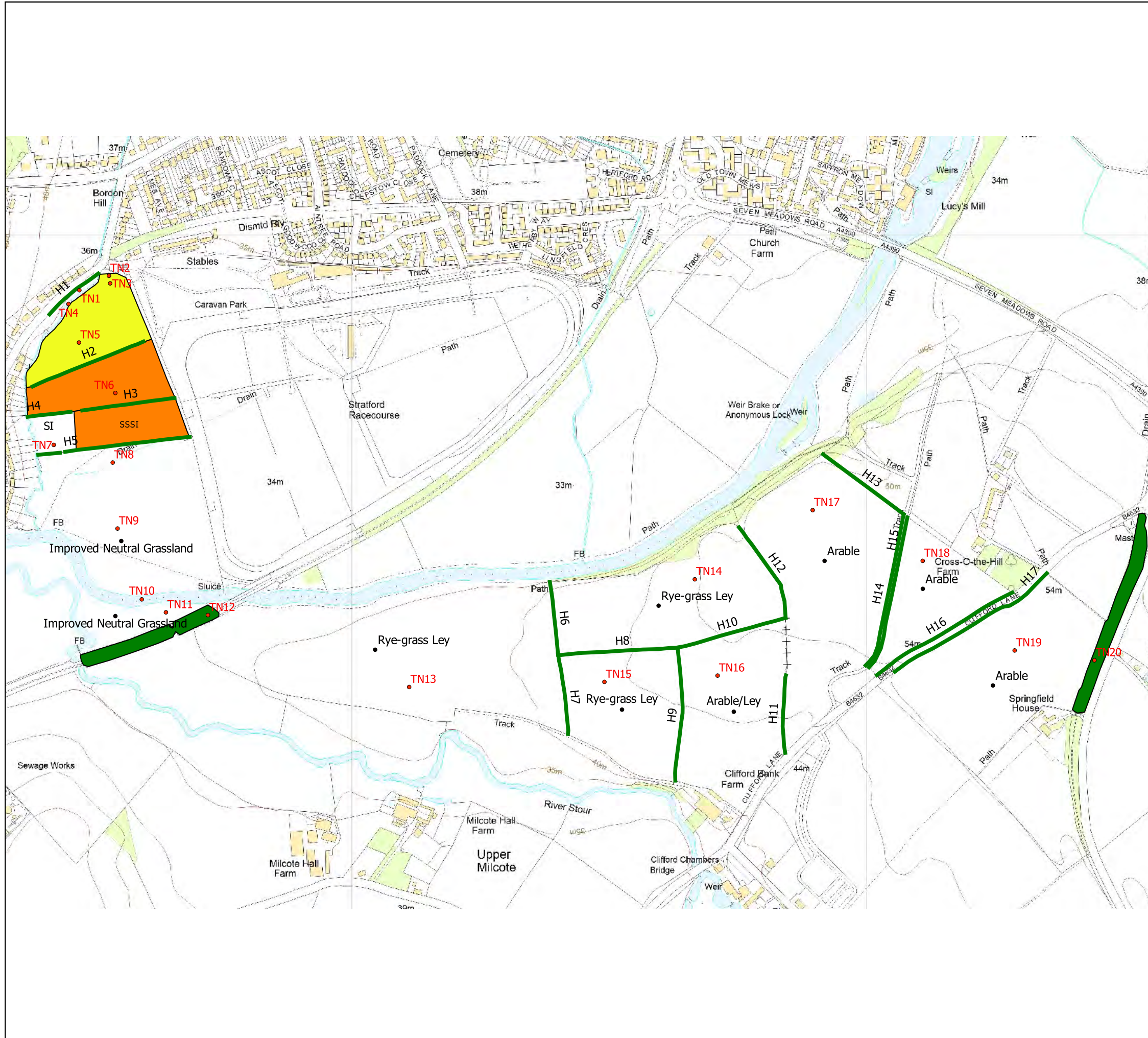
CALA Homes Ltd.  
Land south of Stratford upon Avon  
Warwickshire

AREA B CONSULTATION  
RESULTS PLAN

Scale: 1:14,500      10/06/2015

**Figure 1**      **6050-E- A**





**Legend**

- Broadleaved Woodland
- Unimproved Neutral Grassland
- Amenity grassland
- Hedgerows
- +++ Fence
- (TN) Target Notes
- SI - Species-poor Semi-improved Grassland

-	10.06.2015	First issue	NJL	KMG
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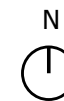
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CALA Homes Ltd.

Land south of Stratford upon Avon  
Warwickshire

PHASE 1 HABITAT PLAN

Scale @ A3: 1:7,500      10/6/2015      NJL / NJL



**Figure 2      6050-E-B**

**Appendix A**

**Stratford Western Relief Road  
(Statutory & Non-statutory Designated Site)  
Detail Botanical Assessment**

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Cala Homes (Midlands) Ltd.

**Stratford Western Relief Road  
(Statutory and Non-Statutory Designated Sites)**

**GRASSLAND SURVEY 2015**

June 2015

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**FPCR Environment and Design Ltd**

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**APPENDICES**

Appendix A:	2m x 2m quadrat locations & additional information
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**FIGURES**

Figure 1:	Grassland Survey Plan
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## 1.0 INTRODUCTION

- 1.1 CALA Homes (Midlands) Ltd. commissioned FPCR Environment and Design Ltd. to undertake an initial ecological appraisal of an area of land located to the south of Stratford upon Avon, Warwickshire. This was associated with a proposal for the proposed Western Relief Road which is required to support the proposed allocation at Long Marston Airfield.
- 1.2 The appraisal involved an initial extended Phase 1 Habitat Survey in June 2015 to determine habitats and species present within the area of the indicative route for the proposed road and to make an initial assessment of their ecological value, and where appropriate, to identify the need for additional surveys.
- 1.3 Consultation with Warwickshire Biological Records Centre (WBRC) identified the presence of statutory designated sites, a Site of Special Scientific Interest (SSSI), a non-statutory designated Local Wildlife Site, and a potential Local Wildlife Site within the potential impact zone of the proposed road. With the exception of the River Avon, and 'The Greenway, Dismantled Railway' these designations, and potential designation, were based on the presence of grassland habitats.
- 1.4 As the proposed road would result in a partial loss of the designated LWS (Steeplechase Meadow [Ref. SP15W1] and the potential LWS (Seven Meadows & Stratford Steeplechase Meadow) additional detailed survey work was undertaken as part of the initial assessment. This report provides the details of this additional survey work. Map references (e.g. Target Notes) follow those used within the wider assessment.

## 2.0 METHODOLOGY

### Introduction

- 2.1 An initial site visit was made on 6<sup>th</sup> May 2015 to assess the scope of the survey. This was then followed up by the field survey which was undertaken by N Law, a qualified and experienced botanist on 4<sup>th</sup> June 2015. In terms of undertaking an ecological evaluation of the grassland it was considered that assessment should consider whether the grassland met the criteria for the following:
  - Lowland Meadow – Habitat of Principal Importance (HPI)
  - Lowland Meadow – Warwickshire Biodiversity Action Plan Priority Habitat
  - Warwickshire Local Wildlife Site

### Lowland Meadow HPI

- 2.2 Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006) lists the 'Habitats and Species of Principal Importance'. In England these are all the habitats that were identified as requiring action in the UK Biodiversity Action Plan (UK BAP) and are referred to as Priority Species and Habitats in the subsequent 'Biodiversity 2020: A Strategy for England's wildlife and ecosystem services'<sup>1</sup> and the 'UK Post-2010 Biodiversity Framework'<sup>2</sup>. The

---

<sup>1</sup> DEFRA. (2012). *Biodiversity 2020: A Strategy for England's wildlife and ecosystem services*. [Online]. Available from [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69446/pb13583-biodiversity-strategy-2020-111111.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69446/pb13583-biodiversity-strategy-2020-111111.pdf) [Accessed 07/06/2015].



descriptions used for these priority habitats within the former UK BAP<sup>3</sup> remain valid for the corresponding Habitats of Principal Importance. As such, any reference to UK BAP habitats within this report should be considered to mean Habitats of Principal Importance.

2.3 The description for Lowland Meadow states:

*“A wide-ranging approach is adopted in this plan to lowland grasslands treated as lowland meadows. They are taken to include most forms of unimproved neutral grassland across the enclosed lowland landscapes of the UK. In terms of National Vegetation Classification plant communities, they primarily embrace each type of Cynosurus cristatus - Centaurea nigra grassland, Alopecurus pratensis - Sanguisorba officinalis floodplain meadow and Cynosurus cristatus - Caltha palustris flood-pasture”*

2.4 These National Vegetation Classification (NVC) plant communities are: MG5 Crested Dog's-tail – Common Knapweed; MG4 Meadow Foxtail – Great Burnet; and, MG8 Crested Dog's-tail – Marsh marigold. The NVC is a vegetation classification system based entirely on plant species composition and abundance which has been produced following detailed studies of the vascular plant, bryophyte (mosses and liverworts) and lichen species which occur within distinct vegetation types. The system covers nearly all natural, semi-natural and some major artificial vegetation communities.

2.5 For the grassland to be considered to be Lowland Meadow Habitat of Principal Importance it should support one of these NVC communities. Therefore, to make an assessment to determine whether the grassland would be considered to be Lowland Meadow HPI required a survey to be undertaken using the NVC survey methodology for grasslands.

### **Warwickshire Local Wildlife Site**

2.6 Within Warwickshire, sites with a non-statutory biodiversity designation are referred to as Local Wildlife Sites (LWS). These represent Local Sites as referred to within National Planning Policy Framework (NPPF)<sup>4</sup> and Government Circular 06/2005<sup>5</sup>.

2.7 In addition to designated Local Wildlife Sites, Warwickshire also has a series of sites considered to be of nature conservation importance which are termed ‘Ecosites’. Guidance from Warwickshire Biological Records Centre is that there is an on-going review of Local Wildlife Sites. As part of this review, it has identified sites which are considered to be potential Local Wildlife Sites (pLWS), but that many of these sites are as yet ungraded against the LWS system.

2.8 The guidelines for the selection of Local Wildlife Sites in Warwickshire<sup>6</sup> consider 3 categories of grassland:

<sup>2</sup> JNCC and Defra (on behalf of the Four Countries' Biodiversity Group). (2012). *UK Post-2010 Biodiversity Framework. July 2012*. [Online]. Available from: <http://jncc.defra.gov.uk/page-6189>. [Accessed 07/06/2015]

<sup>3</sup> BRIG. Maddock, A. [Ed.]. *UK Biodiversity Action Plan Priority Habitat Descriptions (Updated Dec 2011)*. [online]. Available at: [http://jncc.defra.gov.uk/PDF/UKBAP\\_PriorityHabitatDesc-Rev2011.pdf](http://jncc.defra.gov.uk/PDF/UKBAP_PriorityHabitatDesc-Rev2011.pdf) [Accessed 07/06/2015].

<sup>4</sup> Department for Communities and Local Government. (2012). *National Planning Policy Framework*. [Online]. London: Department for Communities and Local Government. Available from: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/6077/2116950.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf) [Accessed 07/06/2015]

<sup>5</sup> ODPM. (2005). *Government Circular: Biodiversity and Geological Conservation*. London: ODPM & DEFRA

<sup>6</sup> Warwickshire Wildlife Trust. (2013). *Habitat Biodiversity Audit (HBA) for Warwickshire: The Green Book revised ver. 12/13*. Coventry: Warwickshire County Council

- Unimproved grassland: Where agricultural improvement is absent or minimal. Considered to now be very rare in Warwickshire.
  - Semi-improved grassland: Where agricultural improvement has taken place but where species diversity and composition are...”*characteristic of their semi-natural grassland type*”.
  - Improved grassland: Semi-natural grassland that has been substantially altered by agricultural improvement so that species diversity is very low.
- 2.9 The guidelines indicate that unimproved and good examples of semi-improved grassland should be selected as Local Wildlife Sites but improved grassland “...*would not normally be selected on its own but may be included within the site if integral to another more species-rich habitat*”.
- 2.10 The selection guidelines for Local Wildlife Sites in Warwickshire take a similar approach to those used nationally for the selection of biological Sites of Special Scientific Interest (SSSI) in as much as a list of scientific characteristics form the key elements – these are more generally referred to as the ‘Ratcliffe Criteria’:
- Diversity;
  - Rarity;
  - Size;
  - Naturalness;
  - Fragility;
  - Typicalness;
  - Ecological Position;
  - Significant Populations; and,
  - Potential Value.
- 2.11 These scientific characteristics are then supplemented by a suite of ‘Cultural Characteristics’. Whilst these are important, the scientific characteristics are primary and sites are never selected solely on cultural characteristics.
- 2.12 The selection guidelines make it clear that it is considered unadvisable for third party ecological consultants to conduct a Local Wildlife Sites survey. There are several reasons for this but of particular note is the reason given that:
- “The Local Wildlife Site surveys for Warwickshire are specific to the sub-region requiring local knowledge of the natural, social and historical aspects of the area.”*
- 2.13 As a consequence, the survey has not been able to assess the grassland against the criteria but the survey methodology and results have allowed some discussion of this issue.

## Warwickshire, Coventry and Solihull Local Biodiversity Action Plan Priority Habitat<sup>7</sup>

- 2.14 Lowland Neutral Grassland is a Priority Habitat within the Warwickshire, Coventry and Solihull Local Biodiversity Action Plan. The habitat description<sup>8</sup> largely follows that for the Lowland Meadow HPI but introduces the term “semi-improved” grasslands and defines these as being grasslands which have “...had some improvement, but still retain a suite of old grassland species, a frequent situation in this area.”
- 2.15 Defining semi-improved grassland can be problematic. Descriptions are provided for surveyors within the ‘Handbook for Phase 1 Habitat Survey’<sup>9</sup> but these are open to wide interpretation. A more quantitative approach has been adopted by Natural England for identifying BAP habitats for the purpose of Environmental Stewardship agri-environment scheme agreements. This, or a very similar, approach is now utilised in some areas within their Local Wildlife Site selection guidelines.
- 2.16 The methodology used by Natural England was therefore considered to provide a mechanism to help with determining whether semi-improved grassland was present or not. Therefore, in addition to the NVC survey, additional survey work was undertaken using Natural England’s survey methodology as detailed in the Farm Environment Plan (FEP) Manual<sup>10</sup>.

### Survey Methodology

#### Limitations & Scope of Survey

- 2.17 Following an initial site visit on 6<sup>th</sup> May 2015 it was determined that the surveys should be undertaken no earlier than the first week in June to ensure that the work was within the optimal survey time and that sufficient growth was present to enable an accurate assessment. When the site was visited on June 4<sup>th</sup> the large field (TN9) had been mown and was subsequently baled and wrapped whilst the surveyor was on site. Consequently, the survey for this field has had to be reliant on the observations made during the May site walkover, and what could be gleaned from the cut material within the swath and small areas which had been missed by the mower. However, given the observations made on the 6<sup>th</sup> May it is considered that an accurate evaluation of the grassland within this field was possible despite this constraint.
- 2.18 The area occupied by TN1 is relatively small and it was considered that this could be adequately described from target notes and a species list.

<sup>7</sup> Warwickshire, Coventry and Solihull Local Biodiversity Action Plan (LBAP). [online]. Available from: <http://www.warwickshirewildlifetrust.org.uk/LBAP> [Accessed 07/06/2015]

<sup>8</sup> Irving, J.A.. (2002.). *Warwickshire, Coventry and Solihull Local Biodiversity Action Plan - Lowland Neutral Grassland*. [online]. Available at: <http://apps.warwickshire.gov.uk/api/documents/WCCC-863-165> [Accessed 07/06/2015]

<sup>9</sup> Nature Conservancy Council. (1990). *Handbook for Phase 1 habitat survey - a technique for environmental audit*. Peterborough: Joint Nature Conservation Committee

<sup>10</sup> Natural England. (2010). *Higher Level Stewardship – Farm Environment Plan (FEP) Manual. Third Edition – March 2010*. [online]. Available at <http://webarchive.nationalarchives.gov.uk/20150607000001/http://publications.naturalengland.org.uk/publication/32037> [Accessed 07/06/2015].

- 2.19 The proposed route of the road will not pass directly through Seven Meadows SSSI but through the area of land between the west boundary of the SSSI and Shottery Brook. Given that there would be no direct impact on the SSSI and the fact that the SSSI is monitored as part of Natural England's Condition Assessment monitoring scheme, it was considered that survey of the SSSI was not required for the purpose of this appraisal.
- 2.20 TN 5 is an intensively managed perennial rye-grass *Lolium perenne* ley, which is used regularly for car boot sales. Therefore, a detailed survey of this area was considered to be unnecessary for this appraisal.
- 2.21 Detailed survey work was therefore targeted at TN6 and TN7, e.g. the designated Steeplechase Meadows Local Wildlife Site.
- 2.22 The timing of the survey was early within the optimal survey period. This may have resulted in some grass species being overlooked whilst in the vegetative state, common bent *Agrostis capillaris* being a good example.

### NVC Grassland Survey

- 2.23 For the NVC survey sampling of the vegetation was guided by the methodology detailed in the NVC Users' handbook<sup>11</sup> and British Plant Communities Volume 3<sup>12</sup>. Initial visual assessment of these areas indicated that there may be some variation in species composition and abundance between the east and west sides of TN6 and also TN7. As the indicative route of the road would result in a loss of TN7 and the western end of TN6 it was decided that these should be sampled as separate areas.
- 2.24 The stand was surveyed by recording within a series of 2m x 2m quadrats which were placed within what were visually considered to be a stands of homogenous vegetation. A total of 5 quadrats were recorded in each of the three areas. These areas could then be analysed as individual stands or be combined to considered as a single stand if analysis subsequently showed them to be similar in their species composition. Each species recorded within the sample quadrats were then assigned a constancy score of I to V (e.g. 1 to 5 expressed as a Roman numeral) depending on the number of quadrats it occurred in; as shown in Table 1.

**Table 1: Assignment of Constancy Score**

% Occurrence in total number of quadrat samples	Constancy Score
81-100%	V
61-80%	IV
41-60%	III
21-40%	II
1-20%	I

<sup>11</sup> Rodwell, J. S. (2006). *National Vegetation Classification: Users' handbook*. [pdf.] Peterborough: JNCC. Available at: [http://jncc.defra.gov.uk/pdf/pub06\\_NVCusershandbook2006.pdf](http://jncc.defra.gov.uk/pdf/pub06_NVCusershandbook2006.pdf) [Accessed 07/06/2015].

<sup>12</sup> Rodwell, J.S. [Ed.]. (1992). *British Plant Communities Volume 3 – Grassland and Montane Communities*. Cambridge University Press: Cambridge.

- 2.25 Within each quadrat, all vascular and lower plant species were recorded (although in this instance, unusually, lower plants were absent) and given a quantitative measure of abundance using the DOMIN scale as shown in Table 2. This information was then used to construct a 'floristic table' which includes the frequency and abundance range for each species recorded within the sample quadrats.

**Table 2: DOMIN Scale of cover/abundance**

DOMIN SCALE	% COVER
10	91-100%
9	76-90%
8	51-75%
7	34-50%
6	26-33%
5	11-25%
4	4-10%
3	Several (10+) individuals
2	Many (4-10) individuals
1	Few (1-4) individuals

- 2.26 Additional information collected included;
- The position of each quadrat; determined using a hand held Global Positioning System (GPS) with an accuracy of within 3m.
  - The average and maximum sward height, and the species forming the maximum height
  - Photographic evidence of each survey quadrat

The location of each quadrat is shown on Figure 1.

### **Natural England Farm Environment Plan - Assessment of Grassland Features**

- 2.27 Given that the fifteen 2m x 2m quadrats undertaken for the NVC survey provided an extensive sampling area in relation to the size of TN6 & TN7 it was considered that the data derived from these could be used for this part of the assessment, even though the quadrats were larger than the 1m x 1m ones normally used for the Natural England methodology. In effect this might result in more species being recorded per m<sup>2</sup> and therefore a subsequent over-evaluation of the grassland.
- 2.28 Additional information recorded within each quadrat was an overall assessment of assessment of species cover of wildflowers (e.g. broadleaved herbs) and sedges excluding white clover *Trifolium repens*, creeping buttercup *Ranunculus repens* and injurious weeds.
- 2.29 In accordance with the NE FEP methodology each species was assigned an abundance value on the basis of how many of the quadrats it occurred in, as follows.

- Occurs in 1-2 quadrats out of 10 (e.g. 1-29%) = rare
- Occurs in 3-4 quadrats out of 10 (e.g. 30-49%) = occasional
- Occurs in 5 or more quadrats out of 10 (e.g. 50% or more) = frequent

### 3.0 RESULTS

#### Nomenclature & Abundances

3.1 Nomenclature follows Stace 2010<sup>13</sup>.

3.2 ABUNDANCES: D – dominant; A – abundant; F – frequent; O – occasional; R – rare; L - locally

#### Descriptions

##### TN1

3.3 The indicative route of the road would pass through this narrow strip of grassland which is neutral grassland with bramble *Rubus fruticosus agg.* scrub invading from the edges. A range of tall herbs (mainly ruderal species) are associated with the interface between the bramble scrub and the grassland. To the west, away from the potential line of the road, the area opens out into a small meadow. Species noted here included:

Taxon	Common Name	Abundance
<i>Rubus fruticosus agg.</i>	Bramble	Locally dominant
<i>Urtica dioica</i>	Common Nettle	Locally dominant
<i>Aegopodium podagraria</i>	Ground-elder	Locally abundant
<i>Cirsium arvense</i>	Creeping Thistle	Locally abundant
<i>Glechoma hederacea</i>	Ground Ivy	Locally abundant
<i>Festuca rubra</i>	Red Fescue	Abundant
<i>Poa trivialis</i>	Rough Meadow-grass	Abundant
<i>Galium aparine</i>	Cleavers	Frequent to locally abundant
<i>Alopecurus pratensis</i>	Meadow Foxtail	Frequent
<i>Dactylis glomerata</i>	Cock's-foot	Frequent
<i>Holcus lanatus</i>	Yorkshire-fog	Frequent
<i>Arrhenatherum elatius</i>	False Oat-grass	Locally frequent
<i>Geranium robertianum</i>	Herb Robert	Locally frequent
<i>Plantago lanceolata</i>	Ribwort Plantain	Locally frequent
<i>Torilis japonica</i>	Upright Hedge-parsley	Locally frequent
<i>Vicia sativa</i>	Common Vetch	Locally frequent
<i>Achillea millefolium</i>	Yarrow	Occasional

<sup>13</sup> Stace, C.A. (2010). *New Flora of the British Isles*. (3<sup>rd</sup> Ed.). Cambridge: Cambridge University Press

Taxon	Common Name	Abundance
<i>Bellis perennis</i>	Daisy	Occasional
<i>Centaurea nigra</i>	Common Knapweed	Occasional
<i>Cerastium fontanum</i>	Common Mouse-ear	Occasional
<i>Conium maculatum</i>	Hemlock	Occasional
<i>Ranunculus repens</i>	Creeping Buttercup	Occasional
<i>Rumex obtusifolius</i>	Broad-leaved Dock	Occasional
<i>Trifolium pratense</i>	Red Clover	Occasional
<i>Arctium minus</i>	Lesser Burdock	Rare
<i>Trifolium dubium</i>	Lesser Trefoil	Rare

**TN5**

- 3.4 This field is formed by intensively managed amenity grassland, dominated by perennial rye-grass which is mown regularly and used for car boot sales.

**TN6 (Steeplechase Meadow LWS)**

- 3.5 Although not particularly species-diverse with a total of 29 species recorded from within the field (12 grasses and 17 herbs), species composition is relatively uniform across the field, despite the initial assumption that it might vary between the east and west areas. The stand is characterised by an abundance of great burnet *Sanguisorba officinalis* and meadow buttercup *Ranunculus acris* along with abundant red fescue *Festuca rubra*. Alongside these, frequent lady's bedstraw *Galium verum*, creeping cinquefoil *Potentilla reptans* and the grasses Yorkshire-fog *Holcus lanatus*, rough meadow-grass *Poa trivialis* and meadow foxtail *Alopecurus pratensis* are the remainder of the constant species which form the majority of the vegetation. Other plants, like meadow barley *Hordeum secalinum* and meadow vetchling *Lathyrus pratensis* tend to be only occasional, and/or localised within the stand. Some plants occur only as odd individuals and as such are rare within the stand; these include red clover *Trifolium pratense* and common mouse-ear *Cerastium fontanum*.

**TN7 (Steeplechase Meadow LWS)**

- 3.6 The species composition of this area is similar to that of TN6 but here the overall percentage cover of the herbs is much lower; consequently the stand has a very grass dominated appearance. Locally there are small stands of Meadowsweet *Filipendula ulmaria* which was not noted within TN7. Locally, towards the stream, False Oat-grass *Arrhenatherum elatius* becomes frequent, possibly reflecting a difference in management between this area and TN6.

**TN9.**

- 3.7 This large field is formed by a stand of species-poor improved grassland. As discussed earlier, the field had been cut approximately two days before the survey on 4<sup>th</sup> June, reflecting the improved nature by the fact that there had been sufficient growth so early in the growing season to be able to take a crop of bagged silage. From the species present within the swath, un-cut areas and observations made on the 6<sup>th</sup> May, the following species list was compiled:



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<b>Taxon</b>	<b>Common Name</b>	<b>Abundance</b>
<i>Lolium perenne</i>	Perennial Rye-grass	Abundant
<i>Taraxacum officinale agg</i>	Dandelion	Abundant
<i>Alopecurus pratensis</i>	Meadow Foxtail	Frequent to abundant
<i>Dactylis glomerata</i>	Cock's-foot	Frequent
<i>Holcus lanatus</i>	Yorkshire-fog	Frequent
<i>Poa trivialis</i>	Rough Meadow-grass	Frequent
<i>Potentilla reptans</i>	Creeping Cinquefoil	Occasional to frequent
<i>Festuca rubra</i>	Red Fescue	Occasional
<i>Heracleum sphondylium</i>	Hogweed	Occasional
<i>Ranunculus acris</i>	Meadow Buttercup	Occasional
<i>Carex hirta</i>	Hairy Sedge	Rare

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## Results

Species in bold (e.g. *Ranunculus acris*) are wildflower indicator species within; Key 2, Table 1, GO2-Semi-improved grassland, within the FEP Manual

Species in bold and red (e.g. *Galium verum*) are wildflower indicator species within; Key 2, Table 4, GO6-Lowland Meadows-BAP Habitat, within the FEP Manual.

Species in bold and red with an asterisk (e.g. *Sanguisorba officinalis*\*) are flood plain meadow species.

The FEP methodology only provides 3 levels of frequency (rare, occasional, and frequent). In many instances certain species are clearly abundant or have local frequency (e.g. locally abundant). The FIELD column provides a subjective assessment of the species abundance to account for this.

Table 3: 2m x 2m Quadrats – (TN6)

Taxon	Common Name	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Frequency	DOMIN	DAFOR	FIELD
<i>Festuca rubra</i>	Red Fescue	7	5	7	6	7	4	5	5	6	7	V	(4-7)	F	A
<i>Holcus lanatus</i>	Yorkshire-fog	4	4	3	5	3	5	5	5	5	4	V	(3-5)	F	
<b><i>Sanguisorba officinalis</i>*</b>	<b>Great Burnet</b>	5	8	6	5	7	8	5	2	5	6	V	(2-8)	F	A
<b><i>Ranunculus acris</i></b>	<b>Meadow Buttercup</b>	4	2	3	5	3	2	5	4	2	2	V	(2-5)	F	A
<i>Poa trivialis</i>	Rough Meadow-grass	*	4	3	4	4	3	4	5	5	3	V	(3-5)	F	
<i>Alopecurus pratensis</i>	Meadow Foxtail	3	2	1	4	*	6	4	7	6	3	V	(1-7)	F	LA
<i>Potentilla reptans</i>	Creeping Cinquefoil	1	*	4	4	4	3	3	4	3	3	V	(1-4)	F	
<b><i>Galium verum</i></b>	<b>Lady's Bedstraw</b>	*	3	3	*	3	*	2	2	3	3	IV	(2-3)	F	LA
<i>Hordeum secalinum</i>	Meadow Barley	2	3	2	*	3	*	*	1	*	*	III	(1-3)	F	
<b><i>Lathyrus pratensis</i></b>	<b>Meadow Vetchling</b>	*	*	*	3	3	2	*	*	1	2	III	(1-3)	F	
<b><i>Rumex acetosa</i></b>	<b>Common Sorrel</b>	*	1	*	2	*	1	2	*	*	1	III	(1-2)	F	
<i>Lolium perenne</i>	Perennial Rye-grass	4	*	4	2	1	*	*	*	*	*	II	(1-4)	O	
<i>Dactylis glomerata</i>	Cock's-foot	*	*	*	3	*	*	*	2	*	2	II	(2-3)	O	
<i>Arrhenatherum elatius</i>	False Oat-grass	*	*	*	*	*	*	*	*	*	4	I	4	R	
<i>Ranunculus repens</i>	Creeping Buttercup	*	*	*	*	2	*	*	*	*	*	I	2	R	
<b><i>Cardamine pratensis</i></b>	<b>Cuckooflower</b>	*	1	*	*	*	*	*	*	*	*	I	1	R	
<i>Taraxacum officinale</i> agg.	Dandelion	*	*	1	*	*	*	*	*	*	*	I	1	R	

Taxon	Common Name	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Frequency	DOMIN	DAFOR	FIELD
<i>Cynosurus cristatus</i>	Crested Dog's-tail	*	*	1	*	*	*	*	*	*	*	I	1	R	
<i>Phleum pratense</i>	Timothy	*	*	1	*	*	*	*	*	*	*	I	1	R	
<b>ADDITIONAL SPECIES RECORDED WITHIN THE FIELD BUT NOT WITHIN THE SURVEY QUADRATS</b>															
<i>Alopecurus geniculatus</i>	Marsh Foxtail	*	*	*	*	*	*	*	*	*	*	0			R
<b><i>Plantago lanceolata</i></b>	<b>Ribwort Plantain</b>	*	*	*	*	*	*	*	*	*	*	0			R
<i>Plantago major</i>	Plantago major	*	*	*	*	*	*	*	*	*	*	0			R
<i>Poa pratensis</i>	Smooth Meadow-grass	*	*	*	*	*	*	*	*	*	*	0			R
<i>Rumex crispus</i>	Curled Dock	*	*	*	*	*	*	*	*	*	*	0			R
<i>Rumex obtusifolius</i>	Broad-leaved Dock	*	*	*	*	*	*	*	*	*	*	0			R
<b><i>Trifolium pratense</i></b>	<b>Red Clover</b>	*	*	*	*	*	*	*	*	*	*	0			R
<i>Trifolium repens</i>	White Clover	*	*	*	*	*	*	*	*	*	*	0			R
<i>Urtica dioica</i>	Common Nettle	*	*	*	*	*	*	*	*	*	*	0			R

Table 4: 2m x 2m Quadrats – (TN7)

Taxon	Common Name	B1	B2	B3	B4	B5	Frequency	DOMIN	DAFOR	FIELD
<i>Festuca rubra</i>	Red Fescue	8	6	8	4	6	V	(4-8)	F	A
<b><i>Sanguisorba officinalis</i>*</b>	<b>Great Burnet</b>	4	7	6	6	5	V	(4-7)	F	A
<i>Poa trivialis</i>	Rough Meadow-grass	4	4	3	4	4	V	(3-4)	F	
<i>Alopecurus pratensis</i>	Meadow Foxtail	3	4	4	3	3	V	(3-4)	F	
<i>Dactylis glomerata</i>	Cock's-foot	2	3	4	4	3	V	(2-4)	F	
<i>Holcus lanatus</i>	Yorkshire-fog	*	4	2	5	5	IV	(2-5)	F	
<i>Potentilla reptans</i>	Creeping Cinquefoil	3	2	3	3	*	IV	(2-3)	F	
<i>Arrhenatherum elatius</i>	False Oat-grass	4	1	*	7	7	IV	(1-7)	F	LA
<b><i>Ranunculus acris</i></b>	<b>Meadow Buttercup</b>	2	*	2	*	1	III	(1-2)	F	
<b><i>Galium verum</i></b>	<b>Lady's Bedstraw</b>	4	4	4	*	*	III	4	F	
<i>Hordeum secalinum</i>	Meadow Barley	4	3	*	*	*	II	(3-4)	O	
<i>Phleum pratense</i>	Timothy	*	*	1	*	1	II	1	O	
<i>Taraxacum officinale agg</i>	Dandelion	*	*	*	*	4	I	4	R	
<i>Lolium perenne</i>	Perennial Rye-grass	3	*	*	*	*	I	3	R	
<b><i>Lathyrus pratensis</i></b>	<b>Meadow Vetchling</b>	*	*	*	1	*	I	1	R	
<i>Deschampsia cespitosa</i>	Tufted Hair-grass	1	*	*	*	*	I	1	R	
<b><i>Filipendula ulmaria</i>*</b>	<b>Meadowsweet</b>	*	*	*	1	*	I	1	R	
<b>ADDITIONAL SPECIES RECORDED WITHIN THE FIELD BUT NOT WITHIN THE SURVEY QUADRATS</b>										
<i>Ranunculus repens</i>	Creeping Buttercup	*	*	*	*	*			R	
<i>Schedonorus arundinaceus</i>	Tall Fescue	*	*	*	*	*			R	

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## 4.0 ANALYSIS

### NVC Communities – Lowland Meadow HPI

- 4.1 The NVC is a vegetation classification system based on plant species composition and frequency within a sampled stand of vegetation. The system has been produced following detailed studies of the vascular plant, bryophyte (mosses and liverworts) and lichen species which occur within distinct vegetation types. The system covers nearly all natural, semi-natural and some major artificial vegetation communities and is documented over 5 volumes of *British Plant Communities* with Volume 3 covering grassland and montane communities.

#### Methodology

- 4.2 Analysis of NVC survey data involves four elements:
- Use of a vegetation key
  - Computer analysis
  - Comparison of floristic tables and community descriptions
  - Surveyor experience
- 4.3 British Plant Communities Vol. 3 provides a key (largely a dichotomous key) which enables the user to arrive at a conclusion by answering a series of questions based on the floristic composition of the sampled stand.
- 4.4 The quantitative species data for the NVC communities and their sub-communities are summarised in a standardised format in the form of floristic tables. Each floristic table includes the frequency and abundance range for each species within the main community and any sub-communities. Floristic tables (e.g. Tables 3 and 4 within this report) produced from the NVC survey were compared with the published NVC tables to look for any similarity between the two data sets which would then indicate the presence of a particular NVC community within the sampled areas.
- 4.5 The data gathered during this survey was analysed using the Modular Analysis of Vegetation Information System (MAVIS)<sup>14</sup> software package. For groups of plots entered into MAVIS as constancy tables or for groups created within the program, matching coefficients are computed between the published NVC synoptic floristic tables and the survey field data. The top 10 matching coefficients are displayed. Matching follows the same application of the Czekanowski coefficient as MATCH<sup>15</sup> with the same down-weighting to 0.1 of species not present in the input data but present at constancy I (1-20%) in the NVC tables. Though the “matching coefficient”, measured on a scale from 0 to 100 bears no absolute meaning, it is generally considered that coefficients below about 50 indicate poor matches, and those below 40 indicate very poor matches.

<sup>14</sup> CEH. (2014). *Modular Analysis of Vegetation Information System (MAVIS)*. [online]. Webpage. Available from: <http://www.ceh.ac.uk/products/software/cehsoftware-mavis.htm> [Accessed 14/11/2014]

<sup>15</sup> Malloch, A.J.C (1996). *Match Version 2.0: A computer program to aid assignment of vegetation data to the communities and sub-communities of the National Vegetation Classification*. Lancaster: Unit of Vegetation Science University

- 4.6 Each NVC community is given a full written description. These descriptions give context to the key and floristic tables and are of great value and importance as part of the analysis processes. Once a decision has been made on the basis of the result of the keying exercise, comparison of floristic tables and computer analysis, it is imperative that the description for the NVC community which it is assumed to be present is then read to ensure that this reflects the sampled stand.
- 4.7 Surveyors with good experience of NVC surveys are able call upon their experience of a wide range of different stands of vegetation to assist with the above analysis ensuring the best diagnosis is reached.

### Analysis

- 4.8 Tables 5 to 8 show the results of the MAVIS analysis of the quadrat data. From these it can be seen that the programme has not been able to make a good match with any particular NVC community within TN6. All the matching coefficients are below 50% and therefore a poor fit. This same result (poor fit) was achieved for the east part of TN6 (A1-A5), the west part of TN6 (A6-A10) and TN6 when considered as an overall stand (e.g. analysis of quadrats A1-A10 combined).

**Table 5: MAVIS Analysis of Quadrats TN6 A1-A10**

NVC COMMUNITY	MATCHING COEFFICIENT
MG7C	49.76
MG9	49.21
MG9b	47.58
MG3a	46.88
MG9a	46.76
MG7d	46.30
MG1c	45.03
MG10a	44.92
MG6a	44.82
MG6b	44.14

**Table 6: MAVIS Analysis of Quadrats TN6 A1-A5 (east side of field)**

NVC COMMUNITY	MATCHING COEFFICIENT
MG7c	48.86
MG9	47.93
MG10a	47.23
MG6a	46.96
MG7d	46.60
MG9b	46.19
MG9a	45.78
MG6	45.49
MG7	45.28
MG6b	44.57



Table 7: MAVIS Analysis of Quadrats TN6 A6-A10 (west side of field)

NVC COMMUNITY	MATCHING COEFFICIENT
MG7C	42.55
MG9	40.93
MG3a	40.02
MG7d	39.45
MG9b	38.78
MG9a	38.37
MG1c	37.90
MG3	37.10
MG6b	36.28
MG6a	35.71

- 4.9 Analysis of the data from TN7 has resulted in on matching coefficient of 50.88, but again this is very low. This was for the MG9b community, *Holcus lanatus-Deschampsia cespitosa* – *Arrhenatherum elatius* sub-community. However, although Yorkshire-fog is a constant species within M9b, its companion constant species, tufted Hair-grass *Deschampsia cespitosa* was rarely present here.

Table 8: MAVIS Analysis of Quadrats TN7 B1-B5

NVC COMMUNITY	MATCHING COEFFICIENT
MG9b	50.88
MG9	46.08
MG7d	43.68
MG1c	43.33
MG1a	41.82
MG3a	41.25
MG1b	41.18
MG7c	41.13
MG9a	40.39
MG7	40.16

- 4.1 Working the field data through the published NVC keys for mesotrophic grasslands indicated that the stands in both TN6 and TN7 would seem to have some resemblance towards the MG4 *Alopecurus pratensis* (Meadow Foxtail) – *Sanguisorba officinalis* (Great Burnet) grassland, despite the fact that this community did not feature within any of the MAVIS analysis results. This is a grassland type of seasonally-flooded land on alluvial soils which has been subjected to traditional hay meadow management over a long-period of time. Modern agricultural practices have led to widespread improvement of much of the former extent of this particular community, leaving few examples of good quality stands where species-richness has been maintained and the community is clearly defined. Where stands have been subjected to improvement it can difficult to define the community and depending on the degree of improvement, succession to other grassland types may occur.

- 4.2 The published description for MG4 lists sixteen species as being constant species only five of these were constant within TN6 and 4 within TN7. Therefore only 31% of the MG4 constant species are also constant in TN6 and 25% in TN7.

**Table 9: Comparison of constant species within MG4**

MG4 CONSTANT SPECIES	CONSTANT WITHIN TN6	CONSTANT WITHIN TN7
<i>Alopecurus pratensis</i>	<i>Alopecurus pratensis</i>	<i>Alopecurus pratensis</i>
<i>Cerastium fontanum</i>		
<i>Cynosurus cristatus</i>		
<i>Festuca rubra</i>	<i>Festuca rubra</i>	<i>Festuca rubra</i>
<i>Filipendula ulmaria</i>		
<i>Holcus lanatus</i>	<i>Holcus lanatus</i>	<i>Holcus lanatus</i>
<i>Lathyrus pratensis</i>		
<i>Lolium perenne</i>		
<i>Plantago lanceolata</i>		
<i>Ranunculus acris</i>	<i>Ranunculus acris</i>	
<i>Rumex acetosa</i>		
<i>Sanguisorba officinalis</i>	<i>Sanguisorba officinalis</i>	<i>Sanguisorba officinalis</i>
<i>Scorzoneroideis autumnalis</i>		
<i>Taraxacum officinale agg</i>		
<i>Trifolium pratense</i>		
<i>Trifolium repens</i>		

- 4.3 Although not surveyed, and therefore based on observations made from the public footpath passing through it, and information available from WBRC and Natural England, the adjacent Racecourse Meadow SSSI appears to support a similar community but here species abundance and richness appeared to be greater. This is most likely a reflection of different management; the SSSI has probably been managed extensively as traditional hay meadow and the LWS more intensively.
- 4.4 In summary, the vegetation within Steeplechase Meadow LWS doesn't correlate well with any specific NVC community but prior to improvement would most likely have been MG4 grassland. Whilst elements of this community remain, sufficient for its origins to be traced, it is now very poorly defined within what remains, with just a small number of the community constants that remain constant, and a generally much reduced overall species composition.

### **Warwickshire, Coventry and Solihull Local Biodiversity Action Plan (LBAP) Priority Habitat**

- 4.5 The LBAP description for Lowland Neutral Grassland Priority Habitat introduces the term semi-improved grassland:

*“This plan includes most forms of unimproved and neutral grassland across the enclosed lowland landscapes; also semi-improved grasslands i.e. those that have had some improvement, but still retain a suite of old grassland species (a frequent situation in our area). In terms of National Vegetation Classification plant communities, local examples comprise mainly crested dog’s-tail – common knapweed (MG5) grassland, meadow foxtail – greater burnet (MG4) floodplain meadow and crested dog’s-tail – marsh-marigold (MG8) flood pasture.”*

- 4.6 From this extract it can be seen that great emphasis is given to correlating unimproved Lowland Neutral Grassland habitat with these three NVC grassland communities which define Lowland Meadow HPI.

- 4.7 Elsewhere the LBAP Lowland Neutral Grassland description refers to good semi-improved neutral grassland:

*“4. CURRENT STATUS*

*The Habitat Biodiversity Audit Project suggests that about 185ha of unimproved/good semi-improved neutral grassland currently exists in Warwickshire, Coventry and Solihull. These meadows are usually small (1-3ha) and occur singly, or in small groups, where they may be separated by established hedgerows, in an otherwise intensively farmed landscape”.*

- 4.8 The LBAP description therefore clearly encompasses the more species rich examples of semi-improved neutral grassland as well as those grasslands which can be clearly defined as being representative of one of these three NVC grassland communities. Analysis of the NVC data has shown that although none of the grassland can be assigned to an NVC with any confidence it does appear to represent a heavily modified example of a community which formerly would have been more representative of MG4 grassland. Given that elements of the species composition of MG4 remain, it is likely that the stand would be considered to be representative of a more species-rich example of semi-improved neutral grassland. As such, it would meet the description for Warwickshire, Coventry and Solihull LBAP Lowland Neutral Grassland Priority Habitat. The presence of good quality semi-improved neutral grassland is discussed further in the following section which confirms this to be present within TN6 but not TN7.

**Natural England Farm Environment Plan - Assessment of Grassland Features**

- 4.9 The FEP Manual contains keys for the identification of species-rich grasslands. Using the data derived from the 2m x 2m quadrats for species composition, richness and abundance; and the percentage cover of key species; the vegetation for both TN6 & TN7 was processed through these keys as shown in Table 10 overleaf.
- 4.10 From Table 10 it can be seen that TN6 keys out to be considered as species-rich neutral grassland of moderate quality and TN7 to be species-poor semi-improved neutral grassland.
- 4.11 In terms of the FEP manual TN7 would be considered as being representative of Lowland Meadow Habitat of Principal Importance. But it is important to bear in mind that the methodology to reach this conclusion forms no part of either the published descriptions for Lowland Meadow HPI or for the Warwickshire, Coventry and Solihull LBAP Lowland Neutral Grassland Priority Habitat. The NVC analysis and subsequent discussion has demonstrated how the grassland does not meet the description for Lowland Meadow HPI. What the FEP analysis does however confirm, is that TN6 (e.g. the majority of Steeplechase Meadow LWS) is representative of the better quality semi-improved grasslands that are encompassed within the LBAP Lowland Neutral Grassland Priority Habitat and within the Local Wildlife Site selection guidelines.

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Table 8: Analysis of survey data using the FEP Manual Grassland Keys

SUMMARISED FEP KEY TO IDENTIFY BAP GRASSLAND FEATURES		
KEY	TN6	TN7
<b>Key 2a Stage 1:</b> Do at least two of the following apply? If YES = species-rich grassland and go to Key 2b; If NO got to next stage of key 2a		
i) Cover of rye-grasses and white clover <10%	Yes (1.3%)	Yes (0.2%)
ii) Sward is species-rich ; >15 species/m <sup>2</sup> – including grasses	No (10.3/m <sup>2</sup> )	No (10.4/m <sup>2</sup> )
iii) Cover of broadleaved herbs (wildflowers) and sedges is >30%, excluding white clover, creeping buttercup and injurious weeds.	Yes (42.0%)	No (28.0%)
<b>RESULT</b>	Species-rich grassland – got to Key 2b Stage 1	No, go to Key 2a Stage 2
<b>Key 2a Stage 2:</b> Do at least two of the following apply? If YES = semi-improved grassland & go to Key 2b; If NO go to Key 2a Stage 3		
i) Cover of rye-grasses and white clover <30%		Yes (0.2%)
ii) Sward is moderately species-rich, 9-15 species/m <sup>2</sup> – including grasses		Yes (10.4/m <sup>2</sup> )
iii) Cover of broadleaved herbs (wildflowers) and sedges is >10% or more; excluding white clover, creeping buttercup and injurious weeds.		Yes (28.0%)
<b>RESULT</b>		SI so go to K2b Stage 3
<b>Key 2a Stage 3:</b> Do at least two of the following apply? If YES = Species poor neutral grassland; If NO = non-grassland habitat		
i) Cover of rye-grasses and white clover >30%		
ii) Sward is species-poor, ≤8 species/m <sup>2</sup> – including grasses		
iii) Cover of broadleaved herbs (wildflowers) and sedges is <10%; excluding white clover, creeping buttercup and injurious weeds.		
<b>RESULT</b>		
<b>Key 2b Stage 1:</b> (from 2a as species-rich grassland – potential Lowland Meadow BAP Habitat): Are at least two Lowland Meadow BAP indicator species frequent and two occasional in the sward? (Or one bold indicator and three occasional for flood plain meadows) If YES = Good-quality species-rich grassland. If NO = continue to Key 2b Stage 2.		
	<b>No</b> <i>Sanguisorba officinalis</i> (F) <i>Galium verum</i> (F) <i>Lathyrus pratensis</i> (O)	
<b>RESULT</b>	<b>see below</b>	
<b>Key 2b Stage 2:</b> (from 2b Stage 1): Are 4 indicator species from a BAP habitat feature list present, but below the required threshold frequency for the grassland type, or are 3 indicator species at least occasional? If YES = Species-rich grassland of moderate quality. If NO = continue to Key 2b Stage 3 as semi-improved grassland.		
<b>RESULT</b>	<b>Yes</b> The 3 species listed above	
<b>Key 2b Stage 3:</b> (from 2a as semi-improved grassland or from 2b Stage 2 as insufficient indicators): Are four semi-improved grassland wildflower indicators and/or BAP grassland indicator species at least occasional in the sward? If YES – Good quality species-rich grassland. If NO = species-poor semi-improved grassland		
<b>RESULT</b>		<b>No</b> <i>Sanguisorba officinalis</i> (F) <i>Ranunculus acris</i> (F) <i>Galium verum</i> (F)
<b>GRASSLAND TYPE</b>	<b>Moderate quality species-rich neutral grassland</b>	<b>Species-poor semi-improved neutral grassland.</b>

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### Warwickshire Local Wildlife Site Selection Criteria

- 4.12 Although no evaluation of the grassland against the Local Wildlife Site Selection Criteria can be made, due to the guidance within the selection guidelines, some discussion is possible.
- 4.13 TN5 and TN9 are formed by improved grassland of low species-diversity and low ecological value. As such, they are unlikely to score highly against many of the Ratcliffe Criteria that underpin the Warwickshire Guidelines. However they do adjoin both Steeplechase Meadow LWS and Racecourse SSSI, and they would be considered as potentially forming buffering habitat. This buffering value is however probably unlikely to be sufficient for these fields to meet the LWS selection criteria given how species-poor they are.
- 4.14 Steeplechase Meadow was last formerly surveyed in 2004. In the intervening 11 years the sward composition seems to have changed little. The 2004 survey was undertaken on the 15<sup>th</sup> July 2004 and was constrained by the fact that the field had been cut for silage earlier in the year. However, this earlier survey recorded a few species not seen in the 2015 survey, including Pepper-saxifrage *Silaum silaus* and a single dropwort plant *Filipendula vulgaris* which is a rare plant within Warwickshire.
- 4.15 The 2015 survey has shown that although Steeplechase Meadow LWS does not support Lowland Meadow Habitat of Principal Importance the stand, with the exception of TN7, is representative of the better quality semi-improved grasslands encompassed by the Warwickshire LWS selection guidelines. This, coupled with the location of the LWS immediately adjacent to Racecourse Meadow SSSI, is such that the site is likely to score highly against many of the Ratcliffe Criteria. Consequently, the LWS designation would almost certainly continue to be justified were it to be re-assessed against the criteria some 11 years since this was last done.

## 5.0 DISCUSSION

- 5.1 The detailed botanical survey and analysis of the data has shown that the grassland to the north of Steeplechase Meadow LWS is formed by improved grassland of low botanical diversity and therefore of low ecological value. The grassland to the south of Racecourse Meadow SSSI is also formed by improved grassland and also of low botanical diversity and therefore low ecological value.
- 5.2 Steeplechase Meadow LWS continues to support a similar species assemblage to that recorded during 2004 when it was last assessed against the LWS selection guidelines. Consequently, the LWS designation is likely to remain justified. Although the current 2015 survey has looked in more detail than the 2004 survey and as a result has identified that part of the LWS, TN7, supports a less diverse sward, this part of the LWS adjoins the eastern boundary of the SSSI and plays an important role as buffering habitat.
- 5.3 The indicative route of the proposed road will result in a loss of some of the improved grassland, and part of the LWS (most of TN7 and some of the western end of TN6).
- 5.4 Whilst the loss of the areas of improved grassland are not likely to represent a significant ecological impact the loss of the areas of the LWS would be significant, with an impact at county level given the non-statutory designation the meadow is afforded.
- 5.5 The proposed development does however provide an opportunity to not only compensate for this loss but to also provide a significant gain in terms of species-rich floodplain grassland in

association with the SSSI and the portion of the LWS which would be unaffected by the proposals.

- 5.6 TN9 is a large field which currently supports improved grassland of low diversity and value. The area lost to the footprint of the proposed road is likely to be small in comparison with the remainder of the field. There will clearly be a need for compensatory flood storage capacity to offset that lost to the footprint of the road. This potentially would be achieved by remodelling this field to lower the land to create the required storage capacity. As part of this work the land could be sown with a specific seed mix to reflect traditional flood-plain meadows or strewn with green hay from a nearby suitable donor site, like Racecourse Meadow SSSI. In a similar vein, the species-richness of the LWS could be further enhanced by strewing green hay, ideally from the adjacent SSSI.
- 5.7 Following creation of the new floodplain meadow and enhancement of the area of retained LWS all of this land could then be managed as traditional floodplain hay meadow in tandem with the SSSI. Currently, within this suite of grasslands it is only the SSSI which can be assured appropriate sympathetic management. Therefore, whilst the proposed road will lead to a loss of area of grassland of county importance this loss can potentially be more than off-set by the creation of a significant area of compensatory habitat, the sympathetic management of which can then, most importantly, be secured in perpetuity. The use of such mitigation is likely to result in significant long term gains to biodiversity which will improve the quality of the statutory and non-statutory sites surrounding the proposed relief road.
- 5.8 The extent of the biodiversity gain that is expected with the proposal would subsequently be quantified via the Warwickshire Biodiversity Offsetting process once detailed development designs have been approved.

#### **Potential Indirect Impacts on Racecourse Meadow SSSI - Hydrology**

- 5.9 Whilst this appraisal has identified that there would not be a direct impact on the SSSI it has discussed the loss of potential buffering habitat. Changes in hydrology in the immediate local area have the potential to have an indirect impact on the SSSI, this could be either negative or positive. Whilst it is beyond the remit of this appraisal to consider hydrological issues it is worth discussing this matter in terms of the vegetation present.
- 5.10 MG4 *Alopecurus pratensis* (Meadow Foxtail) – *Sanguisorba officinalis* (Great Burnet) grassland is the vegetation type which most characteristically defines floodplain meadows. Whilst much of this type of grassland has long been lost to changes in agricultural practice, in many situations stands of vegetation within floodplains are clearly examples of former MG4 which have lost their distinctiveness due to the reduction in overall species diversity and composition. This type of vegetation occurs on alluvial soils subject to periodic flooding, as is the case with the land being considered by this appraisal. The depth of the free draining upper soil horizon, the depth and seasonal fluctuation of the damper lower soil horizons, and the frequency and duration of the seasonal flooding, will all influence both species diversity and composition of the overlaying grassland.
- 5.11 The proposed new road will have the potential to have an impact on local hydrology. Therefore the detail design will ensure that there is no reduction in the current hydrological regime within the SSSI and with careful design the scheme could improve the hydrological regime within the SSSI. Thus a change in the hydrological influences which increase potential water supplies on



the SSSI, and for that matter the other grasslands here, would not automatically be a negative impact. Potentially, changes which alter water levels to better suit this type of grassland may result in a positive impact.






## 6.0 CONCLUSIONS






- 6.1 The proposed new road would not have a direct impact on Racecourse Meadow SSSI as the indicative route passes to the west of the site. Changes in local hydrology could occur as a result of the proposed road. Any such change has the potential to be either a negative or positive impact on the plant assemblage for which Racecourse Meadow has been afforded this statutory designation. However, it is considered that improving the overall hydrological regime may result in improvements to the communities present in the SSSI and any hydrological change will be considered at the detailed design stage to ensure the potential effects of the relief road are minimised and positive effects achieved.
- 6.2 The road will result in the partial loss of Steeplechase Meadow, which has been afforded the non-statutory designation as a Local Wildlife Site. Although it has been 11 years since the meadow was formerly assessed against the LWS selection criteria, the vegetation which currently occupies the field is largely the same as that recorded in 2004 and as such it can be concluded that the meadow is still of LWS quality. The grassland is representative of Warwickshire, Coventry and Solihull LBAP Lowland Neutral Grassland Priority Habitat. Whilst part of the area which will be lost (TN7) is the least diverse part of the LWS this area forms buffering habitat on the western edge of the SSSI.
- 6.3 The field to the north of the LWS (TN5) is formed by improved grassland which, whilst of very low ecological value, has been included within the Seven Meadows and Stratford Steeplechase Meadows potential Local Wildlife Site; most likely as buffering habitat to the LWS. Most of this field would be lost to a new road junction (roundabout).
- 6.4 The large field to the south of the SSSI (TN9) is also formed by improved grassland of low ecological value. This has also been included within the pLWS, again, most likely as buffering habitat. Some loss of this field would occur to accommodate the road.
- 6.5 This loss of grassland of varying ecological value within TN7, TN5 and TN9 can be more than compensated for by the creation of an extensive area of species-rich floodplain grassland within the large southern field (TN9). Additional compensatory measures could include enhancement of the retained area of Steeplechase Meadow and sympathetic management of the SSSI, LWS and the newly created floodplain grassland in perpetuity. This compensation strategy can be expected to deliver a significant biodiversity gain, the extent of which will be quantifiable via the Warwickshire Biodiversity Offsetting Assessment process once final designs for the road have been approved.






## **7.0 APPENDICES**

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**Appendix A: 2m x 2m Quadrat Locations & Additional Information**

QUADRAT REF.	GRID REF.	AVERAGE SWARD HEIGHT (MM)	MAX. SWARD HEIGHT (MM)	PHOTOGRAPH
A1	SP 18164 53731	300	800	
A2	SP 18587 53712	300	860	
A3	SP 18557 53735	350	740	
A4	SP 18523 53744	400	900	
A5	SP 18509 53703	250	630	

QUADRAT REF.	GRID REF.	AVERAGE SWARD HEIGHT (MM)	MAX. SWARD HEIGHT (MM)	PHOTOGRAPH
A6	SP 18478 53721	300	970	
A7	SP 18450 53720	300	1040	
A8	SP 18441 53692	330	980	
A9	SP 18421 53706	250	1000	
A10	SP 18410 53687	350	980	

QUADRAT REF.	GRID REF.	AVERAGE SWARD HEIGHT (MM)	MAX. SWARD HEIGHT (MM)	PHOTOGRAPH
B1	SP 18460 53635	230	760	
B2	SP 18456 53615	350	950	
B3	SP 18433 53629	220	990	
B4	SP 18416 53632	350	1150	
B5	SP 18411 53607	200	1050	

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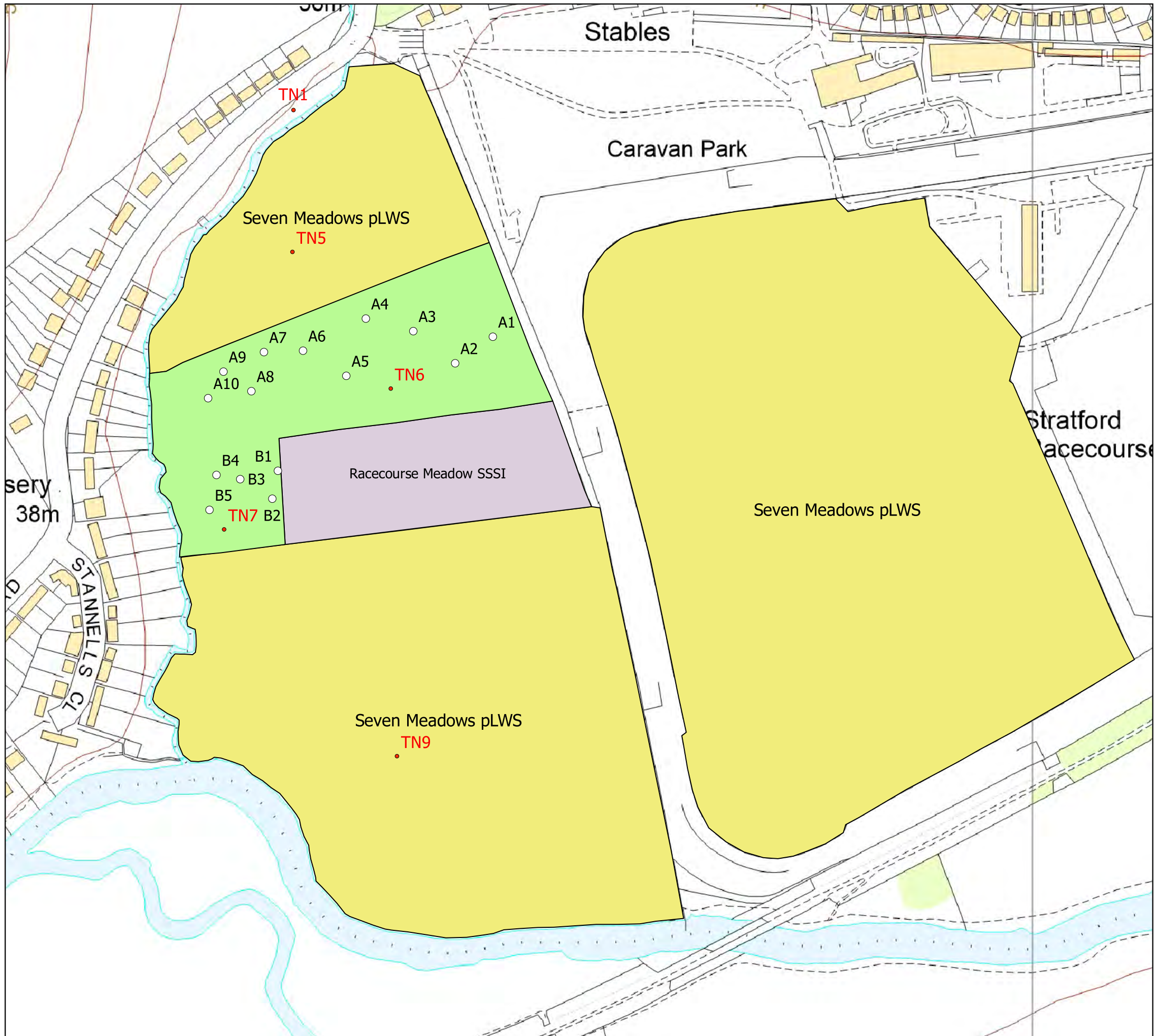
**APPENDIX B: 2M X 2M QUADRAT LOCATIONS, % COVERS & SPECIES/M<sup>2</sup>****Target Note 6**

Field Ref.	Quadrat Ref.	Grid Ref.	% Cover of Wildflowers & Sedges	% Cover Perennial Rye-grass	% Cover White Clover	% Cover Perennial Rye-grass White Clover	No. Species/ m <sup>2</sup>
TN6	A1	SP 18164 53731	25	5	0	5	8
	A2	SP 18587 53712	60	0	0	0	10
	A3	SP 18557 53735	50	5	0	5	13
	A4	SP 18523 53744	60	2	0	2	11
	A5	SP 18509 53703	45	1	0	1	12
	A6	SP 18478 53721	60	0	0	0	9
	A7	SP 18450 53720	50	0	0	0	9
	A8	SP 18441 53692	20	0	0	0	10
	A9	SP 18421 53706	20	0	0	0	9
	A10	SP 18410 53687	30	0	0	0	12
<b>AVERAGE</b>			<b>42</b>	<b>1.3</b>	<b>0</b>	<b>1.3</b>	<b>10.3</b>

**Field 2**

Field Ref.	Quadrat Ref.	Grid Ref.	% Cover of Wildflowers & Sedges	% Cover Perennial Rye-grass	% Cover White Clover	% Cover Perennial Rye-grass White Clover	No. Species/ m <sup>2</sup>
TN7	B1	SP 18460 53635	15	1	0	1	12
	B2	SP 18456 53615	40	0	0	0	10
	B3	SP 18433 53629	40	0	0	0	10
	B4	SP 18416 53632	30	0	0	0	10
	B5	SP 18411 53607	15	0	0	0	10
<b>AVERAGE</b>			<b>28</b>	<b>0.2</b>	<b>0</b>	<b>0.2</b>	<b>10.4</b>





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### Legend

- Racecourse Meadow SSSI
- Steeplechase Meadow LWS
- Potential Local Wildlife Site
- A1, B1 - 2mx 2m Survey Quadrats
- (TN1) Target Notes

rev	date	description	drm	chkd
-	10.06.2015	First issue	NJL	KMG



masterplanning  
 environmental assessment  
 landscape design  
 urban design  
 ecology  
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CALA Homes Ltd.

Land south of Stratford upon Avon  
Warwickshire

GRASSLAND SURVEY PLAN

Scale @ A3: 1:2,750      10/6/2015      NJL / NJL



**Figure 1      6050-E-C**



**Appendix B**

**Target Notes**

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## Appendix B : Target Notes

### TN1

A narrow strip of neutral grassland with bramble scrub invading from the edges. Tall ruderal herbs associated with the interface between the scrub and grassland. Opens out to the west into a small meadow.



### TN2

Small landscape plantation of mainly semi-mature horse-chestnut *Aesculus hippocastanum* and a single ash *Fraxinus excelsior*.

### TN3

Semi-mature ash.

### TN4

Scattered scrub and trees along Shottery Brook, with abundant bramble and tall ruderal herbs. Within this area there are a couple of mature ash; one to the east has some decay. Shrub component formed mainly by hawthorn *Crataegus monogyna*, elder *Sambucus nigra* and ash.



### TN5

Intensively managed amenity grassland. Regularly mown for car boot sales. Predominantly perennial rye-grass *Lolium perenne* with no forbs.



### TN6

Steeplechase Meadow LWS – moderate quality species-rich neutral grassland. Floodplain grassland, with an abundance of Great Burnet *Sanguisorba officinalis*, (See grassland survey report for more detail).



### TN7

Steeplechase Meadow LWS. Separate small area of the LWS – species-poor semi-improved neutral grassland. Visually appearing to be less species-diverse than the main area. Subsequent survey has shown this area to have a similar species-richness to the main area but with a lower abundance of individual species.



### TN8

Drainage ditch. Dry at time of survey but lack of vegetation within the channel indicated that usually retains water.

### TN9

Improved grassland (neutral). High percentage of perennial rye-grass and abundant dandelion *Taraxacum officinale* agg. (See grassland survey report for more detail).



### TN10

River Avon. Wide with a sluggish flow at this point. Marginal stands of common club-rush *Schoenoplectus lacustris*. Bankside vegetation typical of this type large lowland river, dominated by tall ruderal herbs with abundant common nettle *Urtica dioica* and cow parsley *Anthriscus sylvestris*. Fishing pegs/platforms. A few scattered willow *Salix* sp., hawthorn and alder *Alnus glutinosa* shrubs. On south bank a more extensive are of large willow.



### TN11

Improved neutral grassland (standing crop).

Taxon	Common Name	Abundance
<i>Lolium perenne</i>	Perennial Rye-grass	Abundant
<i>Poa trivialis</i>	Rough Meadow-grass	Frequent to abundant
<i>Dactylis glomerata</i>	Cock's-foot	Frequent
<i>Heracleum sphondylium</i>	Hogweed	Frequent
<i>Holcus lanatus</i>	Yorkshire-fog	Frequent

<b>Taxon</b>	<b>Common Name</b>	<b>Abundance</b>
<i>Bromus hordeaceus</i>	Soft-brome	Occasional
<i>Arrhenatherum elatius</i>	False Oat-grass	Rare
<i>Cerastium fontanum</i>	Common Mouse-ear	Rare
<i>Potentilla anserina</i>	Silverweed	Rare
<i>Ranunculus acris</i>	Meadow Buttercup	Rare
<i>Rumex crispus</i>	Curled Dock	Rare
<i>Trifolium repens</i>	White Clover	Rare
<i>Cirsium arvense</i>	Creeping Thistle	Rare (locally frequent)

#### **TN12**

Greenway (multi-user trail). Broadleaved woodland. At this point mainly formed by semi-mature ash and sycamore *Acer pseudoplatanus* with hazel *Corylus avellana* and elder shrubs. Extensive areas of common nettle on the embankments.

#### **TN13**

Intensively managed perennial rye-grass ley (standing crop)

#### **TN14**

Intensively managed perennial rye-grass ley with frequent soft-brome *Bromus hordeaceus*.

#### **TN15**

Intensively managed perennial rye-grass ley (standing crop)

#### **TN16**

Intensively managed perennial rye-grass ley or a cereal crop (not observed at close quarter)

#### **TN17**

Arable – barley crop.

#### **TN18**

Arable – barley crop.

#### **TN19**





Arable – wheat crop.




**Appendix C**  
**Hedgerow Notes**

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## Appendix C : Hedgerow Notes

Hedge Ref.	Comments	Photograph
H1	Fence line with remnant hedge formed by frequent hawthorn and some ash, elder and occasional dog-rose <i>Rosa canina</i> agg but with abundant bramble forming a significant component.	
H2	Tall unmanaged, with a strip of tall ruderal herbs on the north side. Extensive bramble margin on the south side. Hawthorn the main shrub species but also blackthorn <i>Prunus spinosa</i> which is locally abundant and small amounts of goat willow <i>Salix caprea</i> and dog-rose <i>Rosa canina</i> agg.	
H3	Tall, unmanaged. Abundant hawthorn, locally abundant blackthorn and frequent dog-rose.	
H4	A continuation of H3, Tall and unmanaged with tall ruderal herbs along the margin. Abundant hawthorn and blackthorn with occasional dog-rose.	
H5	Similar in structure and species composition to H2 to H4.	

Hedge Ref.	Comments	Photograph
H6	Low, and regularly trimmed. Predominantly hawthorn.	
H7	Tall, unmanaged. Fenced, but has been subjected to grazing by sheep in the past.	
H8	Predominantly hawthorn with some blackthorn and elm <i>Ulmus sp.</i> Species-poor and managed intensively.	
H9	Predominantly hawthorn.	
H10	Predominantly hawthorn with some blackthorn and elm <i>Ulmus sp.</i> Species-poor and managed intensively.	
H11	From a distance appears to be low-trimmed and likely to be of similar species composition to neighbouring hedges.	
H12	Tall, with sides trimmed. Very gappy in places. Abundant elm with occasional hawthorn and elder. Common nettle abundant in hedge bottom.	
H13	Tall, unmanaged.	
H14 & H15	Border track. Some hawthorn but mainly bramble which has grown over a wooden rail fence. In some places just the fence.	

Hedge Ref.	Comments	Photograph
H16 & H17	Trimmed, mixed species roadside hedges with hawthorn, field maple <i>Acer campestre</i> , elder and blackthorn.	



# Appendix D

## Historic Environment

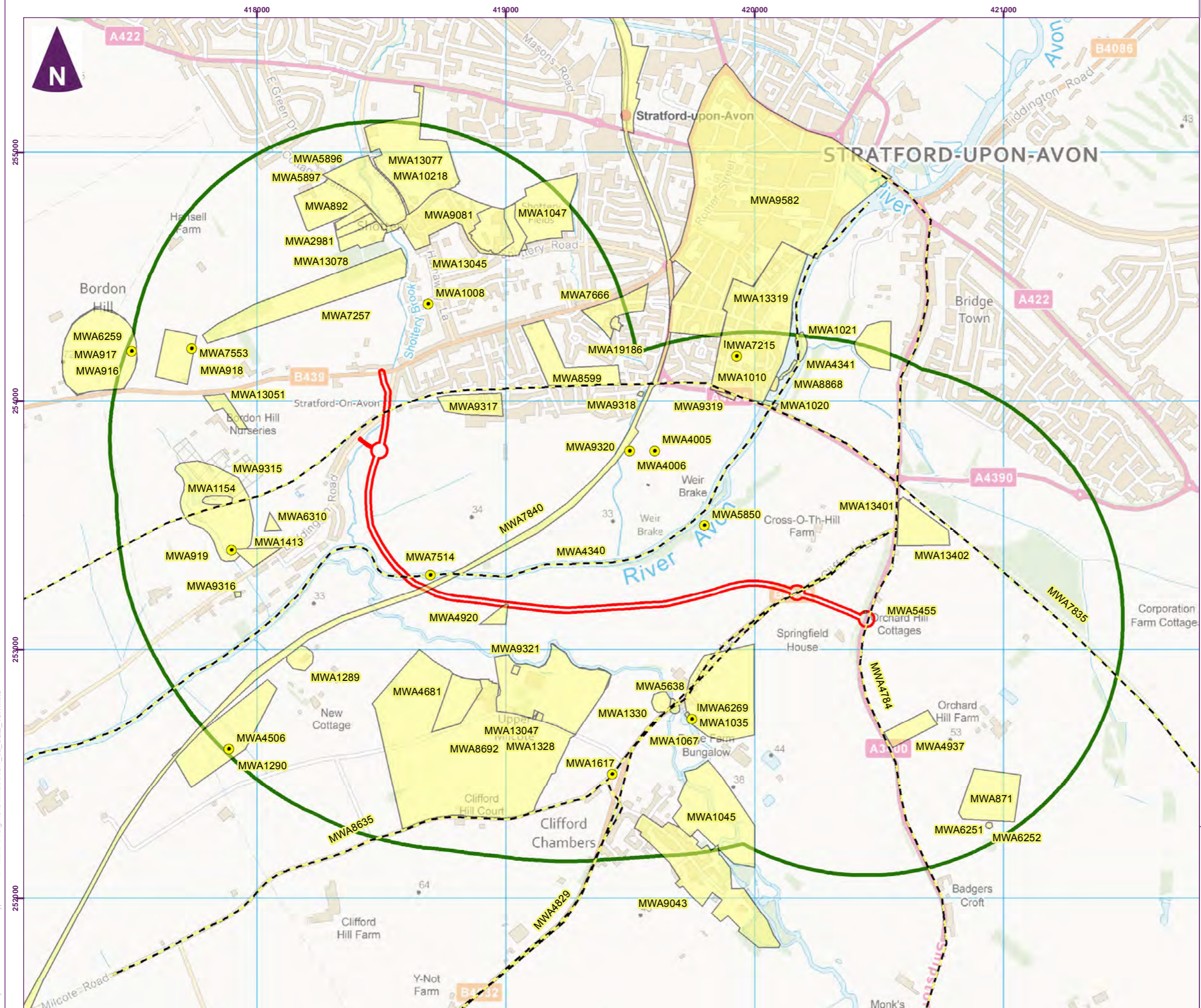
**Figure 1 Sheet 1:** Designated Heritage Assets within the 1km study area

**Figure 1 Sheet 2:** Other recorded features within the 1km study area







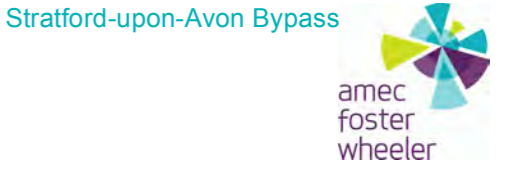
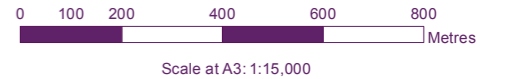


**Key**

- 1km study area
- Road route

**Other recorded features**

- WHER point entry
- WHER line entry
- WHER area entry



**Figure 1 - Sheet 2**  
Other recorded features within the 1km study area

file: R:\Projects\37119 - Stratford Bypass SUB FILE\16 Design\GIS\mxd\ARCH\_02\_Data\_10.1.mxd





# Appendix E

## Landscape and Visual Matters

**Figure 1:** Preliminary Visual Appraisal

**Figure 2:** Preliminary Visual Appraisal – Photo Viewpoints



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Aerial imagery © 2015 Microsoft Corporation



**Route Alignment (approximate)**

**Public Rights of Way / Routes potentially affected by the proposals**

**Potential Residential Receptors**

- 1 Southern edge of Stratford
- 2 Properties along Evesham Road / Limes Avenue
- 3 Properties along Luddington Road
- 4 Properties along Luddington Road / Stannells Close / Avonbank Drive
- 5 Milcote Hall Farm
- 6 Clifford Bank Farm
- 7 Clifford Mill
- 8 Springfield House
- 9 Cross-o-the-Hill Farm

**Potential Recreational Receptors**

- A Stratford-on-Avon Racecourse

**Photo Viewpoint Locations (including Viewing Positions)**

**Distance Radii**

**Zone of Visual Influence**

NOTE: the ZVI provides a representative boundary and representative area of visual influence.

Within the zone, existing landscape and/or physical features provide localised screening effects.

Further distant views may occur outside the zone boundary, although the significance of these views is considered to be negligible as a result of the distance and intervening screening effects.

client  
**CALA Homes (Midlands) Ltd**

project  
**Stratford Western Relief Road,  
Warwickshire**

drawing title  
**PRELIMINARY VISUAL APPRAISAL**

scale  
1:12,500 @ A3

drawn / checked  
MST / EAF

issue date  
01 June 2015

drawing / figure number  
rev

**Figure 1**

**A**



stratford-on-avon racecourse  
 stratford-on-avon urban edge  
 stratford-on-avon cemetery

stratford Greenway



PHOTO VIEWPOINT 1: View north from footpath s B40

milcote Hall Farm



PHOTO VIEWPOINT 2: View east from approximate centre line of proposed relief road

client  
 CALA Homes (Midlands) Ltd

project  
 Stratford Western Relief Road,  
 Warwickshire

drawing title  
 Preliminary Visual Appraisal:  
 PHOTO Viewpoints

scale  
 NTS @ A3

drawn / checked  
 MST / EAF

issue date  
 29 May 2015

drawing / figure number  
**Figure 2**

