FIVE MILE LANE IMPROVEMENTS

COMMUTING AND FORAGING BATS MITIGATION STRATEGY

CONFIDENTIAL

AUGUST 2016

WSP | PARSONS BRINCKERHOFF

FIVE MILE LANE IMPROVEMENTS

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Vale of Glamorgan

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TABLE OF CONTENTS

APPENDICES

1 INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF THIS REPORT

The Vale of Glamorgan submitted a planning application for improvements at Five Mile Lane, Barry (Planning Ref 2016/00305/RG3). In response to this planning application, Natural Resources Wales (NRW) issued a letter dated 24th April 2016 outlining their concerns in relation to the proposed development, and requirements which would have to be met for the development.

This document has been prepared to satisfy Requirement 6: European Protected Species: A condition is secured to any permission granted to ensure a bat mitigation scheme is implemented.

2 SURVEY AND SITE ASSESSMENT

2.1 EXISTING INFORMATION ON BATS IN THE AREA

A desktop study was carried out to search for existing information on bats in the vicinity of the proposed works. The South East Wales Biodiversity Records Centre (SEWBReC) was contacted and protected species records obtained to identify any existing information on dormouse within the study area (a 5km radius of the works). Consultation was also carried out with the Vale of Glamorgan (VoG) County Ecologist and Natural Resources Wales (NRW).

The SEWBReC data search identified the following species within a 5km radius of the site:

- Common pipistrelle (Pipistrellus pipistrellus)
- Soprano pipistrelle (Pipistrellus pygmaeus)
- Unspecified Pipistrelle species ((Pipistrellus sp.)
- Noctule (Nyctalus noctula)
- Leisler's (Nyctalus leisleri)
- Brown long-eared (Plecotus auritus)
- Serotine (Eptesicus serotinus)
- Whiskered bat (Myotis mystacinus)
- Natterer's bat (Myotis nattereri)
- Daubenton's bat (Myotis daubentonii)
- Lesser horseshoe (Rhinolophus hipposideros)
- Greater horseshoe (Rhinolophus ferrumequinum)
- Unspecified bat

Further information on bat activity in the area was taken from the Interim Scheme Assessment Report prepared by Soltys Brewster Consulting in 2011.

2.2 SITE SURVEYS

The results of bat surveys conducted for the Scheme are summarised below. Full details of the methods used in these surveys are provided in the bat survey reports included as Appendix A to this report.

Five locations were surveyed during May, July and September 2014 (refer to Figure 1 in Appendix B). Four of the locations were surveyed by two personnel using Pettersson D240x time expansion bat detectors with Roland recording devices or AnaBat II frequency division detectors. Wherever possible, behaviour of bats observed was recorded in order to identify possible commuting routes. The remaining one location (Location 5) along the Waycock River was surveyed using static AnaBatat II frequency division detectors on the same three occasions in May, July and September 2014.

Ten species of bat were recorded in total across all the locations surveyed. Species most commonly recorded were common and soprano pipistrelles (Pipistrellus pipistrellus and P. pygmaeus). Bats were regularly observed foraging close to and commuting across the existing A4226 close to where the Scheme is to be on-line (Locations 1, 2 and 4).

A Lesser horseshoe bat was recorded at Location 1 on one occasion. This is a species of higher conservation concern and more vulnerable to traffic collisions.

At Location 3, mainly common and soprano pipistrelles along with a number of brown long-eared bats (Plecotus auritus) were observed commuting and foraging along a mature section of hedgerow. A roost of at least two brown long-eared bats (thought to be a day / feeding roost) was identified in a small agricultural shed at Location 3. Previous surveys (Soltys Brewster Consulting, 2011) also identified a roost (thought to be Pipistrellus spp.) within a bat box on the opposite (northern side) of the mature hedgerow at Location 3.

At Location 5 results indicate that the northern side of the River Waycock is used for foraging by Daubenton's bats (Myotis daubentonii) along with mainly Common and Soprano pipistrelles.

3 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT ON COMMUTING AND FORAGING BATS

3.1 CONSTRUCTION PHASE

The following potential impacts on bats have been identified for the Construction phase of the Scheme:

- Loss of foraging habitat due to site clearance works. The magnitude of this impact has been identified as *Low Adverse* and the significance of this impact has been identified as *Medium Adverse*.
- Disruption of commuting routes due to removal of linear vegetation features or construction site lighting. The magnitude of this impact has been identified as *Low Adverse* and the significance of this impact has been identified as *Medium Adverse*.
- No bat roosts were found in trees on the line of the Scheme, but two category 1 trees which potentially provide very good roost habitat would be lost. The bat roost identified in the shed adjacent to the Scheme would not be lost as a result of the Scheme. This impact has been classified as being *Low Adverse* in magnitude and *Slight Adverse* significance.

3.2 OPERATION PHASE

The following potential impacts have been identified for the Operation Phase of the Scheme:

- In locations where the Scheme is close to being on-line, it is considered that the dangers posed to bats by road traffic is unlikely to change significantly from the current situation. Tree felling either side of the carriageway may cause bats to fly lower between the hedges and possibly increase the risk from traffic collision. The magnitude of this impact is considered to be *Neutral* and the significance *Neutral*.
- Where the Scheme is further off-line, such as at Grovelands Farm where a brown long-eared bat roost has been identified (Location 3 on Figure 1), severance of known roosts from the network of hedgerows and woodland areas to the east may occur. Bats attempting to access roosting features and foraging habitat on the western side of the Scheme would be vulnerable to road traffic, particularly brown long-eared bats, which are low flying and more susceptible to traffic collision. The magnitude of this impact has been identified as *Low Adverse* and the significance of this impact has been identified as *Slight Adverse*.
- The River Waycock provided a safe road crossing opportunity for bats. As the Scheme is on line at this location it is unlikely to have any adverse effects on commuting and foraging bats. The magnitude of this impact is considered to be *Neutral* and the significance *Neutral*.
- Loss of commuting/foraging habitat (hedgerows and treelines). The magnitude of this impact has been identified as *Low Adverse* and the significance of this impact has been identified as *Slight Adverse*.

4 MITIGATION STRATEGY FOR COMMUTING AND FORAGING BATS

4.1 CONSTRUCTION PHASE MITIGATION

Although no bat roosts were found in the seven trees examined along the line of the Scheme, a bat-licensed ecologist will carry out an aerial re-inspection of Category 1 trees (medium potential to support roosting bats), and those trees that were inaccessible in the original surveys, prior to works commencing. Category 2 trees (low potential to support roosting bats) will be felled taking 'reasonable avoidance measures' such as climbing inspections by a bat licenced ecologist prior to felling or felled using soft felling techniques.

If following a thorough re-inspection of Category 1 trees no bats are found, exclusion devices will be fitted into potential roost features (PRF) to prevent bats accessing them prior to felling. If bats are discovered during the re-inspection, then a European Protected Species Licence will need to be obtained from NRW prior to felling.

Immediately prior to felling Category 1 trees will be checked from ground level by the bat licenced ecologist, to insure exclusion devices are still in place. If there are PRF where it was not possible to fit exclusion devices (e.g. not possible to inspect all of the feature or feature was too extensive) further climbing inspections may be carried out immediately prior to felling or soft felling techniques employed as appropriate. Soft felled trees should be left on the ground for 48 hours before being removed, giving any bats the opportunity to fly off under the cover of darkness. A toolbox talk regarding bats will be given to the tree work contractors by the ecologist. If bats are discovered during works, work will stop and the ecologist will inform NRW at the earliest opportunity. Work will not resume until advice has been sought from NRW and way to proceed has been agreed.

The bat licenced ecologist will have the necessary equipment to care for any discovered bat(s) and a method statement regarding tree felling and actions on discovering bats will be in place prior to works commencing. Bright lighting will not be directed to towards the trees identified as having potential of category 1 and 2.

4.2 OPERATION PHASE MITIGATION

The most appropriate method to mitigate the impact on the severed mature hedgerow (Survey location 3 on Figure 1), along which there is a known brown long-eared (*Plecotus auritus)* roost, would be to provide an underpass. However, this is not possible as the ground levels at this location do not allow it. Recent studies have suggested limited success of bat bridges / bat gantries in mitigating severance of flightlines by roads (Berthinussen & Altringham, 2012; Halcrow Group & Green, 2011). Therefore, this method is not considered appropriate.

Another method used to reduce bat mortality on road schemes is the use of 'hop overs': using planting or manipulation of existing features to encourage bats to fly at canopy height over the road. The effectiveness of this method has been shown to have some success in guiding bats to safe crossing points (Halcrow Group & Green, 2011), and may be most effective on smaller roads (Berthinussen & Altringham, 2012). In this situation a 'hop over' solution is considered to be the best option to mitigate the severance of this flightline, as other options are limited, and the existing boundary feature provides good opportunity for manipulation in this regard.

The existing treeline at this location has good structural diversity, with a canopy of mature trees (approximately 20m in height) and a dense understorey of shrubby vegetation. Therefore, no

extra planting will be required for the hop-over. Brown long eared bats are a species that fly low in clutter and so will follow vegetation, and so in order to guide brown long eared bats across the road at a safe height, a 4 to 5m high wooden / screen mesh will be installed within the vegetation on either side of the road, in order to force bats upwards (as suggested by Limpens *et al.*, 2005 reported in Halcrow and Green, 2011).The design of the bat hop-over will be developed at the detailed design stage, in consultation with NRW and the Vale of Glamorgan county ecologist.

In conjunction with the above, three Schwegler 2F bat boxes will be provided on the eastern side of the new carriageway, providing roosting opportunity for bats to the east of the carriageway without them having to cross the road. These will be located in existing mature trees along the hedgerow. This particular bat box design has been specified as they are marketed as being particularly successful for brown long-eared bats. These bat boxes will be installed at the earliest stage possible, to give the bats using the existing shed the opportunity to colonise them prior to the Scheme opening to traffic.

Woodland, scrub and hedgerow planting will mitigate the loss of foraging habitat lost to the Scheme. It is proposed to plant a total of 6.7ha of new woodland throughout the Scheme, including an area 2.8ha of new woodland between Middleton Plantation and Sutton Wood to compensate for the permanent loss of 0.431ha and the temporary loss of 0.469ha of woodland in the Barry Woodlands SSSI. Additionally, whilst 1,693 linear metres (lm) of existing hedgerow will be lost to the Scheme, it is proposed to plant 6,308lm of new hedgerow. Additionally, the landscaping proposals involve the creation of 4.7ha of wildflower meadow habitat, which would provide good bat foraging habitat.

Appendix A

BAT SURVEY REPORTS

APPENDIX A-1

BAT ACTIVITY SURVEY REPORT

60654

TACP

FIVE MILE LANE IMPROVEMENTS

BAT ACTIVITY SURVEY REPORT

PARSONS BRINCKERHOFF

OCTOBER 2015

FIVE MILE LANE IMPROVEMENTS – BAT ACTIVITY SURVEY REPORT

October 2015

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Project Number: **60654**

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CONTENTS

LIST OF ABBREVIATIONS

LBAP	Local Biodiversity Action Plan
NBMP	National Bat Monitoring Programme
NERC	Natural Environment and Rural Communities Act 2006:
NRW	Natural Resources Wales
SAC	Special Area of Conservation
SEWBReC	South East Wales Biological Records Centre
SSSI	Site of Special Scientific Interest
VoG	Vale of Glamorgan

EXECUTIVE SUMMARY

This report presents the findings of bat activity surveys undertaken as part of the Five Mile Lane Improvements, by TACP, on behalf of Parsons Brinkerhoff. The information will be used to inform the Environmental Impact Assessment (EIA) in relation to the Scheme.

The aim of the surveys was to identify commuting routes used by bats (regular flight paths usually along linear features within the landscape) which may be affected by the Scheme. Bats are vulnerable to being hit by moving traffic therefore new road developments, which sever bat commuting routes, have the potential to negatively affect these animals by causing injury and mortality.

Five locations were surveyed during May, July and September 2014. Four of the locations were surveyed by two personnel using Pettersson D240x time expansion bat detectors with Roland recording devices or AnaBat II frequency division detectors. Wherever possible, behaviour of bats observed was recorded in order to identify possible commuting routes. The remaining one location, (Location 5) along the Waycock River, was surveyed using static AnaBatat II frequency division detectors on the same three occasions in May, July and September.

Ten species of bat were recorded in total across all the locations surveyed. Species most commonly recorded were Common and Soprano pipistrelles (*Pipistrellus pipistrellus and P. pygmaeus*). Bats were regularly observed foraging close to and commuting across the existing A4226 close to where the Scheme is to be on-line (Locations 1, 2 and 4). In these locations it is considered that the dangers posed to bats by road traffic is unlikely to change significantly from the current situation. Although tree felling either side of the carriageway may cause bats to fly lower between the vegetation and possibly increase the risk of traffic collision.

A Lesser horseshoe bat was recorded at Location 1 on one occasion. This is a species of higher conservation concern and more vulnerable to traffic collisions. However, it is not considered that the Scheme will have a significant impact on the integrity of the wider population.

At Location 3 mainly Common and Soprano pipistrelles along with a number of Brown long-eared bats (*Plecotus auritus*) were observed commuting and foraging along a mature section of hedgerow. A roost of at least two Brown long-eared bats (thought to be a day / feeding roost) was identified in a small agricultural shed at Location 3. Previous surveys (Soltys Brewster Consulting, 2011) also identified a roost (thought to be *Pipistrellus spp*.) within a bat box on the opposite (northern side) of the mature hedgerow at Location 3.

The Scheme will sever the hedgerow to the east of the known roosts which would isolate these from the network of hedgerows and woodland areas to the east. Bats attempting to access roosting features and foraging habitat on the western side of the Scheme would be vulnerable to road traffic, particularly the Brown long-eared bats, which are low flying and more susceptible to traffic collision.

At Location 5 results indicate that the northern side of the River Waycock is used for foraging by Daubenton's bats *(Myotis daubentonii)* along with mainly Common and Soprano pipistrelles. This location also provides a safe road crossing opportunity for bats. As the Scheme is on line at this location it is unlikely to have any adverse effects on commuting and foraging bats.

1 INTRODUCTION

1.1.1 This report presents the findings of bat activity surveys undertaken as part of the Five Mile Lane Improvements, by TACP, on behalf of Parsons Brinkerhoff.

1.2 Location and purpose of the proposed scheme

1.2.1 The Scheme is located in the Vale of Glamorgan (VoG) and aims to upgrade a section of the A4226 known as Five Mile Lane between a point approximately 1.4km south of the Sycamore Cross Junction to the Waycock Cross Roundabout. Minor intersection upgrade works are also proposed at the Sycamore Cross Junction.

1.2.2 The route currently fails to meet appropriate highway standards and therefore a number of improvements are required to upgrade it, including the straightening and widening of bends, to create a safer route.

1.3 Aim of the survey

1.3.1 The aim of the survey was to identify commuting routes used by bats (regular flight paths usually along linear features within the landscape) which may be affected by the Scheme. Bats are vulnerable to being hit by moving traffic, therefore new road developments, which sever bat commuting routes, have the potential to negatively affect these animals by causing injury and mortality.

1.3.2 This report will inform the environmental impact assessment for the Scheme and will form part of the technical appendices of the Environmental Statement (ES) for the Scheme.

1.3.3 A separate survey for bat roosts within trees was undertaken for the Scheme and is reported in the Bat 'Survey of Trees' Report (AVA Ecology, 2014; Appendix 8.5).

1.4 Bat Ecology

1.4.1 Bats are the only mammals that use powered flight. They belong to the Order of mammals *(Chiroptera)*, which is the second largest Order following Rodents. The UK has 17 resident species of bat which belong to two families: *Rhinolophidae* (horseshoe bats) and *Vespertilionide* (vesper bats).

1.4.2 All UK species are nocturnal and use ultrasound to locate prey and find their way in their environment. They do this by emitting pulses of high frequency sound through their mouth, or noses (in the case of horseshoe bats), and listen for the returning sound which bounces back off objects in their surroundings. Bats use features within their environment to find their way around. These are often linear features, such as hedgerow, ditches and streams.

1.4.3 UK bats feed on a range of invertebrate, with different species preferring different prey items and using different techniques in order to hunt. For example, Pipistrelle species *(Pipistrellus* spp.*),* hunt small insects, such as midges by areal hawking (catching them in the air), whereas the Brown long-eared (*Plecotus auritus)* preys on larger insects such as moths and butterflies by gleaning (picking stationary insects off vegetation).

1.4.4 When they are not active, bats require a roost in which to shelter and rest. There are a number of different types of roost, including day roosts (where bats shelter during the day), maternity roosts (where bats give birth and raise their young), hibernation

roosts (where bats spend the winter in hibernation and torpor) and transitional roosts (where bats may stay between their summer and winter roosts).

1.4.5 Different species have different roosting requirements and prefer different locations in which to roost. For example, Noctules *(Nyctalus noctula)* roost almost exclusively in trees, whereas Horseshoe bats *(Rhinolophus* spp.*)* roost almost exclusively in buildings during the summer where they require a free space in which to hang and an entrance wide enough for them to fly through. During the winter all UK bats require a hibernation roost, which must have a stable temperature and a high humidity.

1.5 Bat Legislation and Policy

1.5.1 All UK bat species are protected by European legislation and are listed under Annex IV of the Habitats Directive (Council Directive 92/43/EEC), which is transposed into UK law by the Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations). Under regulation 41(1): '*a person who:*

- *Deliberately captures, injures or kills any wild animal of a European Protected Species,*
- *Deliberately disturbs wild animal of any such species,*
- *Deliberately takes or destroys the eggs of such an animal, or*
- *Damages, destroys a breeding site, or resting place of such an animal.*

1.5.2 *Is guilty of an offence'*

1.5.3 However, under Regulation 53 (1 & 2), *'the relevant licencing body may grant a licence for the purposes specified'* below:

- *Scientific or educational purposes;*
- *Ringing or marking, or examining any ring or mark on, wild animals;*
- *Conserving wild animals or wild plants or introducing them to particular areas;*
- *Protecting any zoological or botanical collection;*
- *Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment;*
- *Preventing the spread of disease; or*
- *Preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber or any other form of property to fisheries'.*

1.5.4 Under Regulation 53(9) *'the relevant licensing body must not grant a licence under this regulation unless they are satisfied:*

- *That there is no satisfactory alternative; and*
- *That the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.*

1.5.5 The following four UK bat species are also listed on Annex II of Council Directive 92/43/EEC, and are therefore species for which Special Areas of Conservation can be designated:

- Great horseshoe *(Rhinolophus ferrumequinum)*
- Lesser horseshoe *(Rhinolophus hipposideros)*
- Bechstein's bat *(Myotis bechsteinii)*
- Barbastelle *(Barbastella barbastellus)*

1.5.6 Bats are also protected under the Wildlife and Countryside Act 1981 (as amended). This legislation is less significant since the implementation of the Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations).

1.5.7 The Environmental Damage (Prevention and Remediation) Regulations 2009 (as amended) apply in relation to prevention and remediation of environmental damage to protected species, natural habitats, SSSIs, surface and ground water and land. In the case of damage to species and habitats the regulations have the power to make the operators of activities which have caused damage carry out:

- Primary remediation (clean up)
- Complementary remediation (cleaning up an alternative site if the damaged site cannot be fully restored), and
- Compensatory remediation (carry out other measures to provide alternative natural resources to compensate for the time during which the damaged site remains in its damaged state)

1.5.8 The following seven bats are listed as Species of Principal Importance for Nature Conservation under Section 42 of the Natural Environment and Rural Communities (NERC) Act 2006:

- Soprano pipistrelle *(Pipistrellus pygmaeus)*
- Great horseshoe *(Rhinolophus ferrumequinum)*
- Lesser horseshoe *(Rhinolophus hipposideros)*
- Bechstein's bat *(Myotis bechsteinii)*
- Barbastelle *(Barbastella barbastellus)*
- Noctule *(Nyctalus noctula)*
- Brown long-eared *(Plecotus auritus)*

1.5.9 The following eight bats are listed as species of nature conservation importance within the Vale of Glamorgan Local Biodiversity Action Plan (LBAP):

- Lesser horseshoe *(Rhinolophus hipposideros)*
- Noctule *(Nyctalus noctula)*
- Whiskered *(Myotis mystacinus)*
- Brandt's *(Myotis brandtii)*
- Natterer's *(Myotis nattereri)*
- Daubenton's *(Myotis daubentonii*)
- Pipistrelle *(Pipistrellus sp.)*
- Brown long-eared *(Plecotus auritus)*

2 METHODS

2.1 Desk Study

2.1.1 The South East Wales Biodiversity Records Centre (SEWBReC) was contacted and protected species records were obtained to identify any existing information on bats within a 5km buffer of the study area. There was also consultation with the Vale of Glamorgan (VoG) County Ecologist and Natural Resources Wales (NRW) on 30th April 2014 and 12th May, respectively.

2.1.2 Results from bat surveys undertaken in 2008 and 2009 to inform the A4226 Five Mile Lane Interim Scheme Assessment Report (Soltys Brewster Consulting, 2011) have also been reviewed.

2.2 Preliminary Walkover and Phase 1 Habitat Survey

2.2.1 General ecological walkover surveys were undertaken on 20th March and 22nd April 2014. These surveys comprised a walkover of the Scheme footprint and review of habitat conditions within 250 m of the proposed alignment. Additionally, an extended Phase 1 habitat survey was carried out on the 9th and 10th of June 2014. During these surveys, notes were made of any habitats suitable for bats within the study area.

2.3 Bat Activity Surveys

2.3.1 Surveys aimed to identify commuting routes of all species of bats across the Scheme. Features suitable to support bat commuting routes were identified through review of aerial photographs and the preliminary walk over surveys / Phase 1 habitat surveys. Five survey locations were selected along the Scheme which were considered to have good potential for use by commuting bats:

- Location 1 – Online section of the Scheme, between woodland block on western side of existing A4226 and a mature hedgerow on the eastern side.
- Location 2 – where the Scheme comes off line, between woodland block on the eastern side of the Scheme and a mature hedgerow on the western side connecting to a larger woodland block further west.
- Location 3 – Off-line section of the Scheme, along a mature hedgerow, next to a small agricultural shed
- Location 4 – Along a mature hedgerow, which links two woodland blocks either side of the existing A4226, near to where the Scheme comes back on-line.
- Location 5 – Online section of the Scheme, either side of the culverted River Waycock, which is a vegetated water course that links into further mature hedgerows and woodland blocks north and south of the existing A4226.

2.3.2 The selection of the survey locations was made in agreement with NRW and the VoG County Ecologist. Locations are shown on Figures 1a-1c.

2.3.3 Survey methods and timing drew on the best practice guidance given in Hunt (2012). All locations were surveyed on three occasions during the active period for bats in May, July and September 2014. Surveys took place on the following dates:

- 28th (Location 1 & 2) and 29th (Location 3, 4 & 5) May 2014

- 15th (Location 1, 2 & 5) and 16th (Location 3 & 4) July 2014
- 15th, 16th (Location 1 & 2) 17th & 18th (Location 3, 4 & 5) September 2014

2.3.4 Surveys commenced approximately 15 minutes before sunset and continued for 2 hours thereafter. In September an additional dusk survey was also carried out, which commenced approximately 2 hours before sunrise and ended approximately 15 minutes after sunrise. Weather conditions during the surveys are shown in the table below:

Survey date	Weather conditions at start of survey
28th May (dusk)	Cloud 100%, Temperature 14°C, wind 1-5mph, rain 0.
29th May (dusk)	Cloud 100%, Temperature 17°C start, 16°C , wind 0, rain – drizzle.
15th July (dusk)	Cloud 10%, Temperature 16°C, wind 0mph, rain 0.
16th July (dusk)	Cloud 100%, Temperature 17°C, wind 0-1mph, rain showers and drizzle during survey.
15th Sept (dusk)	Cloud 40%, Temperature 16°C, wind 0, rain 0
16th Sept (dawn)	Cloud 0%, Temperature 13°C, wind 0-1mph, rain 0
17th Sept (dusk)	Cloud 80%, Temperature 19°C, wind 5-10mph, rain 0
18th Sept (dawn)	Cloud 90%, Temperature 17°C, wind 5-10mph, rain 0

2.3.5 Locations 1 – 4 were surveyed by two personnel using Pettersson D240x time expansion bat detectors with Roland recording devices or AnaBat II frequency division detectors. Wherever possible, behaviour of bats observed was recorded in order to identify possible commuting routes. Bat calls recorded in the field were later analysed using Bat Sound or AnalookW software and species identification made with reference to Russ (2012).

2.3.6 Due to health and safety issues (steep embankments close to running water), Location 5 was surveyed using two automated AnaBat II frequency division detectors. These were placed at either end of the culvert on three occasions during May, July and September. The detectors were placed out just prior to and retrieved just after the other dusk activity surveys finished in May and July (approximately 3 hours on each occasion). The detectors were placed out just prior to the dusk surveys and retrieved at the end of the dawn surveys during September (i.e. out over the entire night – approximately 11.5 hours). The data recorded was analysed using AnalookW software and species identification made with reference to Russ (2012).

2.4 Personnel used

2.4.1 Surveys were undertaken by:

- Steve Wadley (ACIEEM, NRW Bat Licence No. 42680:OTH:CSAB:2012)
- Joanna Wadley (Trainee bat worker)
- Rhianna Bill (MSc)
- Fearn Simms BSc, MLA, ACIEEM, CMLI
- James Bilham BSc (Hons), MSc, ACIEEM
- Dr Tim Rich BSc, PhD
- Jean Hamilton BSc, MSc, MCIEEM
- Marta Gaworek-Michalczenia BSc, MSc, GCIEEM
- Kiri Jones BSc, MSc, GCIEEM

2.5 Constraints, limitations and assumptions

2.5.1 There was some drizzle and rain showers during some of the surveys (29th May & 16th July). As temperatures were warm and good numbers of bats were recorded during these surveys, it is not considered this was a significant constraint.

2.5.2 It was not always possible to observe all bat's behaviour in the field due to poor light conditions. Therefore it was not possible to say whether all bats recorded were foraging or commuting to a feeding area.

2.5.3 As automated detectors were used at Location 5, there is no observed bat behaviour information at this location. However it does provide data on bat species present and the level of activity.

2.5.4 Time expansion detectors need to stop and play back the time expanded call in order to be recorded. During this short space of time when the call is being recorded other bats may be missed, which is a minor constraint.

2.5.5 Surveys which rely on species identification from interpretation of bat calls have a number of limitations. Species with quiet calls, such a Brown long-eared *(Plecotus auritus)* are often underrepresented as their calls are not always picked up by bat detectors. Conversely, bats with louder calls, such as Noctules (*Nyctalus noctula*) can be detected at a much longer distance, so may be over-represented.

2.5.6 There are also often difficulties in identifying bats to species level from interpretation of their calls using sound analysis software; this is particularly true of the *'Myotis'* genus. Identification to species level has been made through examination of call parameters with reference to Russ (2012) and using professional judgement and experience. In many cases it has not been possible to identify to species level with reasonable surety and in these cases, just the genus has been recorded.

2.5.7 *Plecotus* species recorded and observed during the surveys were presumed to be *Plecotus auritus* (the Brown long-eared bat) as the very rare Grey long-eared *(Plecotus austriacus)* is not known in the area.

3 RESULTS

3.1 Desk Study

3.1.1 The SEWBReC data search identified the following species:

- Common pipistrelle *(Pipistrellus pipistrellus)*
- Soprano pipistrelle *(Pipistrellus pygmaeus)*
- Unspecified Pipistrelle species ((*Pipistrellus sp.)*
- Noctule *(Nyctalus noctula)*
- Leisler's *(Nyctalus leisleri)*
- Brown long-eared *(Plecotus auritus)*
- Serotine *(Eptesicus serotinus)*
- Whiskered bat *(Myotis mystacinus)*
- Natterer's bat *(Myotis nattereri)*
- Daubenton's bat *(Myotis daubentonii)*
- Lesser horseshoe *(Rhinolophus hipposideros)*
- Greater horseshoe *(Rhinolophus ferrumequinum)*
- Unspecified bat

3.1.2 The data search and consultation with the Vale of Glamorgan species officer also identified the following significant roost sites:

- Maternity roost of Serotine within a church located approximately 3km to the north of the Scheme. The pre-parturition size of the roost is approximately 50 individuals, with the roost being monitored annually as part of the National Bat Monitoring Programme (NBMP). Other roosting bats recorded at the site include Common pipistrelle, Soprano pipistrelle, Brown long-eared and Natterer's bat.
- Maternity roost of Lesser horseshoe bats within a 13th Century Castle approximately 4.5km to the south-west of the Scheme. The pre-parturition size of the roost is approximately 100 individuals. Also identified as a maternity roost for Natterer's (approximately 30). Records of low numbers of Brown long-eared, Common pipistrelle, Soprano pipistrelle, Daubenton's and Serotine also roosting at this location.
- Maternity roost of Lesser horseshoe bats within a barn approximately 5.5km from the Scheme. The pre-parturition size of the roost is approximately 30 individuals
- Maternity roost of Lesser horseshoe bats within a Castle approximately 6.8km to the west of the Scheme. The pre-parturition size of the roost is approximately 20 individuals. Records also of a single roosting Greater horseshoe.

3.1.3 There were several other roost sites of small numbers and individual bats that were unidentified or of common species (mainly pipistrelle spp. or Brown long-eared).

3.1.4 The following species of bats were identified in the surveys undertaken in 2008 and 2009 (Soltys Brewster Consulting, 2011):

- Common pipistrelle *(Pipistrellus pipistrellus)*

- Soprano pipistrelle *(Pipistrellus pygmaeus)*
- Noctule *(Nyctalus noctula)*
- *Myotis* species – highly likely, but unconfirmed Whiskered / Brandt's (*Myotis mystacinus / M. Brandtii)* and Natterer's *(M. Nattereri).*
- *Plecotus* species

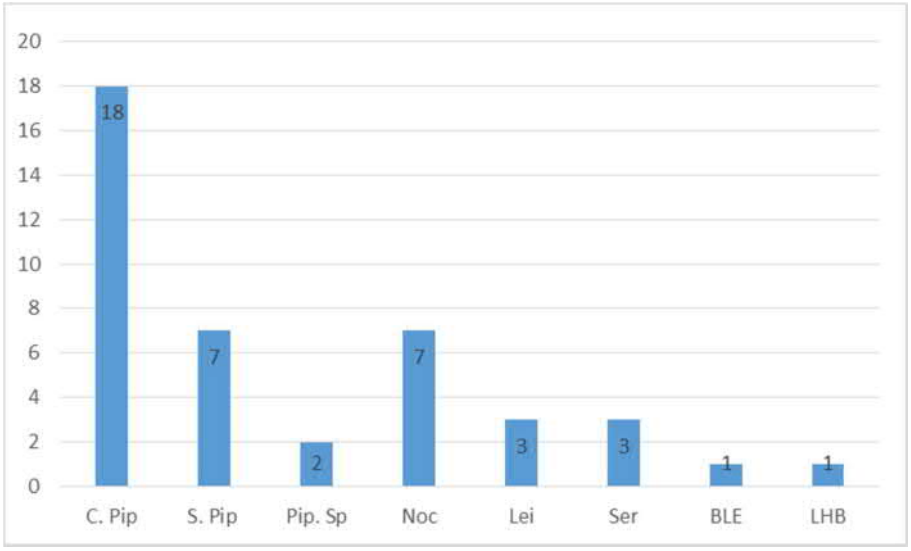
3.1.5 The majority of activity-type observations and recordings were made by both commuting and foraging bats. Bats were also observed crossing the A4226 in a number of places, including: Grovelands Farm / Northcliff Cottage, Sutton Wood and the River Waycock in a west to east direction.

3.1.6 The surveys also revealed the presence of roosting bats in a purposefully installed bat box on a stable block to the south of Northcliff Cottage (Grid ref: ST07959 70512). The type of box observed, coupled with the presence and type of droppings was indicative of use by *Pipistrellus* species.

3.1.7 During 2009, dusk emergence / dawn re-entry surveys were carried out on a group of mature Oak and Ash trees within the southern part of the study corridor. No bats were observed emerging or returning to the trees surveyed. However, the results did indicate that a roost of Soprano pipistrelles *(Pipistrellus pygmaeus)* was located nearby in close proximity to Sutton Wood.

3.2 Bat Activity Surveys – Location 1

3.2.1 The graph below shows the species and frequency of records at Location 1 during May, July and September. Seven species were recorded along with two unidentified *Pipistrellus* species.



***Key to species abbreviations:** C.Pip = Common pipistrelle (*Pipistrellus pipistrellus)*, S.Pip = Soprano pipistrelle *(Pipistrellus pygmaeus)*, Pip Sp = unidentified *Pipistrellus* species, Noc = Noctule *(Nyctalus noctula)*, Leisler's *(Nyctalus leisleri),* Ser = Serotine (*Eptesicus serotinus*), BLE = Brown long-eared *(Plecotus auritus)*, LHB = Lesser horseshoe *(Rhinolophus hipposideros)*

3.2.2 The majority of bats recorded at Location 1 were not seen, due to poor light levels. A number of observations were made of Noctule bats foraging high over-head

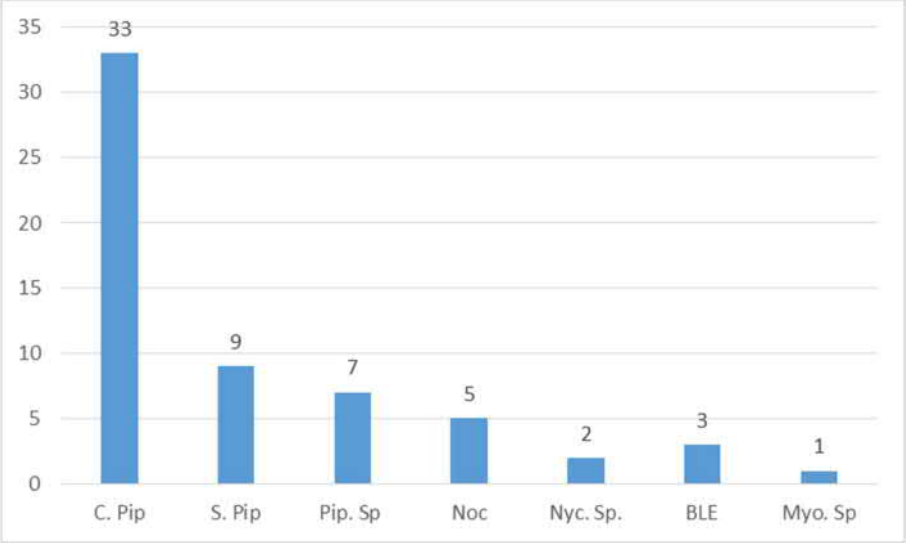
(approximately 25–30m), and over trees to the west of the existing road. Noctules were also commuting from the west towards the north.

3.2.3 There were observations made of Common pipistrelles crossing the existing A4226 in a west to east direction and foraging along the road and then heading south. A Serotine was also observed foraging back and forth (west, east and east, west) along the hedgerow on the western side of the road.

3.2.4 One Lesser horseshoe bat was recorded during the dawn survey in September on the western side of the road, but no observations were made.

3.3 Bat Activity Surveys – Location 2

3.3.1 The Graph below shows the species and frequency of records at Location 2 during May, July and September. Five species were recorded (including an unidentified *Myotis* species) along with seven unidentified *Pipistrellus* species and two unidentified *Nyctalus* species.

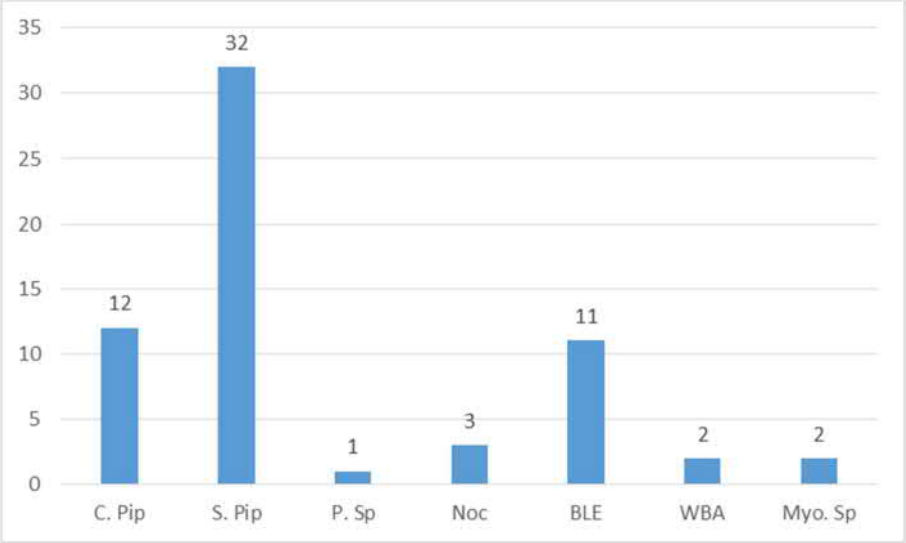


***Key to species abbreviations:** C.Pip = Common pipistrelle (*Pipistrellus pipistrellus)*, S.Pip = Soprano pipistrelle *(Pipistrellus pygmaeus)*, Pip Sp = unidentified *Pipistrellus* species, Noc = Noctule *(Nyctalus noctula)*, Nyc. Sp = unidentified *Nyctalus* species, BLE = Brown long-eared *(Plecotus auritus)*, Myo. Sp = unidentified *Myotis* species.

3.3.2 The majority of bats observed at this location (mainly Common pipistrelle) appeared to be foraging above or alongside the existing A4226, flying in a north to south / south to north direction at heights of between 8 – 30m. There was also good levels of foraging activity recorded within the trees on the western side of the road with bats crossing over the road from east to west after spending time foraging alongside the road.

3.4 Bat Activity Surveys – Location 3

3.4.1 The Graph below shows the species and frequency of records at Location 3 during May, July and September: Five species were recorded along with one unidentified *Pipistrellus* and two unidentified *Myotis* species.



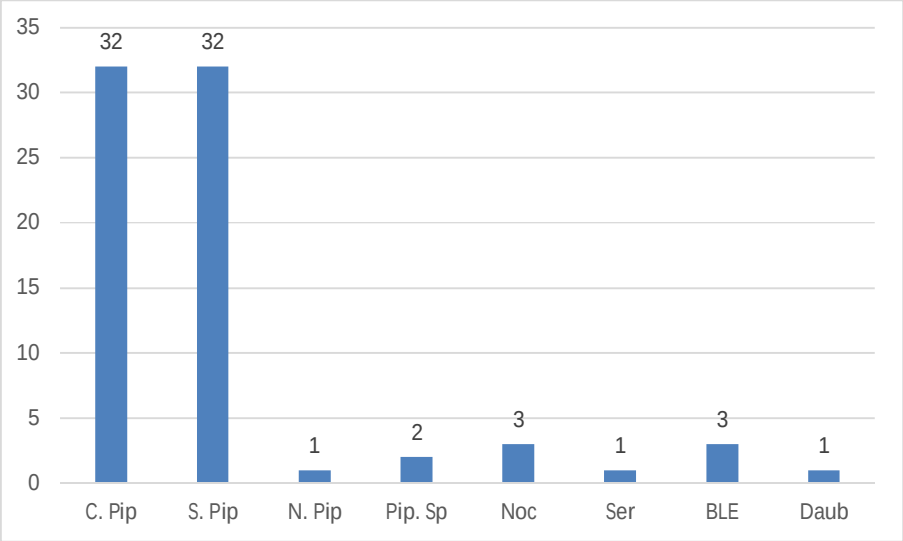
***Key to species abbreviations:** C.Pip = Common pipistrelle (*Pipistrellus pipistrellus)*, S.Pip = Soprano pipistrelle *(Pipistrellus pygmaeus)*, Pip Sp = unidentified *Pipistrellus* species, Noc = Noctule *(Nyctalus noctula)*, BLE = Brown long-eared *(Plecotus auritus)*, WBA = Whiskered, Brandt's or Alcathoe *(Myotis mystacinus, M. brandtii, M. alcathoe),* Myo. Sp = unidentified *Myotis* species.

3.4.2 Not all bats recorded were observed due to poor light levels. The majority of bats observed at this location appeared to be foraging back and forth along the hedgerow. There were records of Soprano pipistrelles also foraging around an Ash tree within the hedge. A Soprano pipistrelle seems to have emerged from the Ash tree at the start of the survey in May. During the July survey, a Soprano pipistrelle was also observed flying to up to a hole on an east facing branch of the tree, but not entering. No evidence of roosting bats was recorded at this tree during the bat tree roost inspection survey (AVA Ecology, 2014). It was however, given a 'category 1*' valuation (the highest valuation) for roosting bats in accordance with the 'protocol for visual inspection of trees due to be affected by arboricultural works, as described in Hunt (2012).

3.4.3 Up to two Brown long-eared bats were observed using the small agricultural shed located along the hedgerow. During the May survey, a Brown long-eared was observed within the shed at the southern end above a ridge beam, prior to foraging activity being recorded outside. In July a Brown long-eared was observed emerging from the shed at 22:06 and then flying east. Later (22:25) two animals were again observed within the shed along with some feeding remains (moth wings). No Brown long-eared bats were observed or recorded during the September survey.

3.5 Bat Activity Surveys – Location 4

3.5.1 The graph below shows the species and frequency of records at Location 4 during May, July and September; seven species were recorded along with two unidentified *Pipistrellus* species.



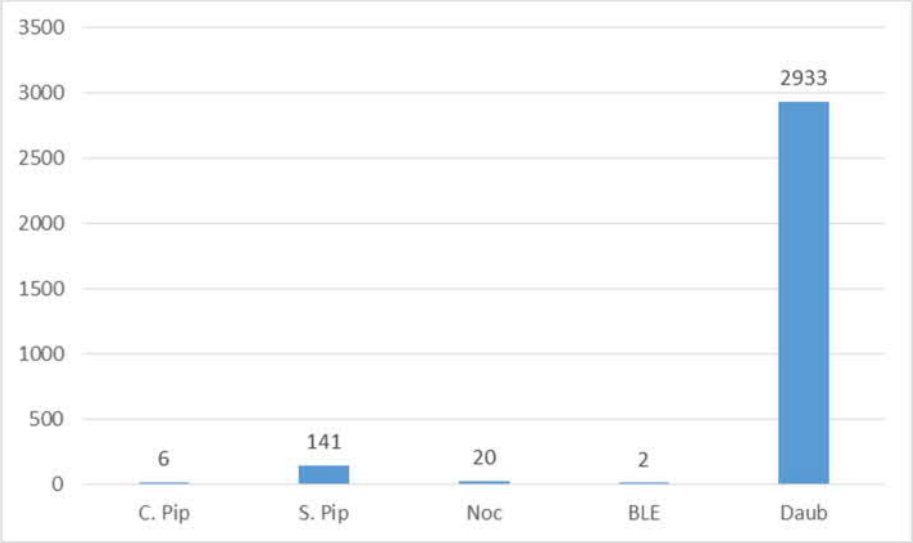
***Key to species abbreviations:** C.Pip = Common pipistrelle (*Pipistrellus pipistrellus)*, S.Pip = Soprano pipistrelle *(Pipistrellus pygmaeus)*, N.Pip = Nathusius pipistrelle *(Pipistrellus nathusii)*, Pip Sp = unidentified *Pipistrellus* species, Noc = Noctule *(Nyctalus noctula)*, Ser = Serotine (*Eptesicus serotinus*), BLE = Brown long-eared *(Plecotus auritus)*, Daub = Daubenton's *(Myotis Daubentonii),*

3.5.2 Not all bats recorded were observed due to poor light levels.

3.5.3 Eight records were made of Common and Soprano pipistrelles flying across the road at this location at heights of between 2 and 20m, but typically at heights of 3-4m. Good levels of foraging activity were recorded over the hedgerows and trees on the north-eastern side of the road and also on the south-western side. A Noctule was also recorded flying in a southerly direction, from the woodland block in the north-east.

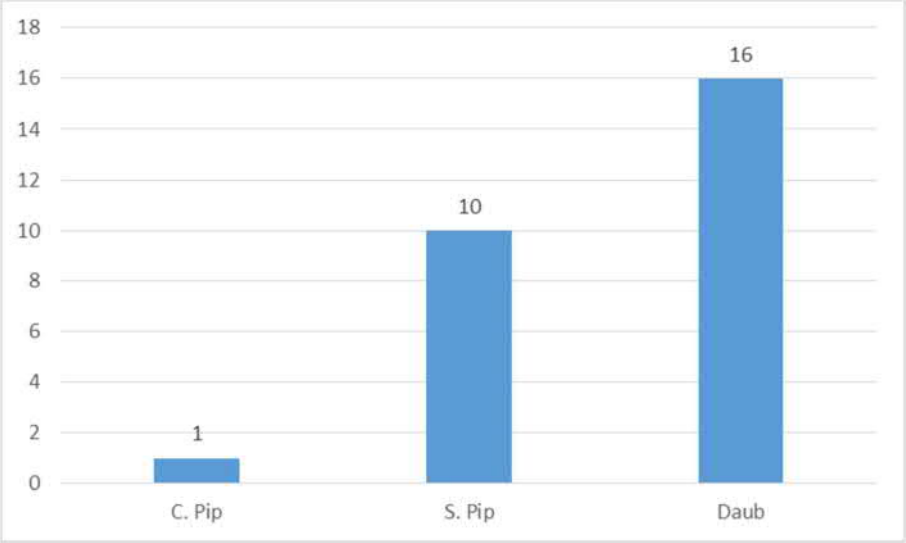
3.6 AnaBat Survey – Location 5

3.6.1 The Graph below shows the species and frequency of records at Location 5 recorded on the ANABAT on the northern side of the road, facing south, during May, July and September. Note that the frequencies given in the graphs represent the number of times the detector is triggered, rather than numbers of bats present. Five species of bats were recorded.



***Key to species abbreviations:** C.Pip = Common pipistrelle (*Pipistrellus pipistrellus)*, S.Pip = Soprano pipistrelle *(Pipistrellus pygmaeus)*, Noc = Noctule *(Nyctalus noctula)*, BLE = Brown long-eared *(Plecotus auritus)*, Daub = Daubenton's *(Myotis Daubentonii),*

3.6.2 The Graph below shows the species and frequency of records at Location 5 recorded on the ANABAT on the southern side of the road, facing north, during May, July and September. Three species of bat were recorded.



***Key to species abbreviations:** C.Pip = Common pipistrelle (*Pipistrellus pipistrellus)*, S.Pip = Soprano pipistrelle *(Pipistrellus pygmaeus)*, Daub = Daubenton's *(Myotis Daubentonii),*

3.6.3 No observations of behaviour were available as surveys were undertaken with automated detectors. By far the highest levels of activity were recorded on the ANABAT on the northern side of the road, facing south, on the River Waycock. The vast majority of calls recorded on this detector were that of a *Myotis* species. Give the location (next to water) and examination of the sonograms it is consider that the

species was Daubenton's bat *(Myotis Daubentonii).* The majority of the recordings were made during the September survey, where there was near constant records throughout the entire night. This probably represents a high level of foraging activity over the river, close to the detector. It is unknown how many bats were responsible for the recordings and may only be a few individuals.

4 ASSESSMENT AND CONCLUSIONS

4.1 Species identified and commuting routes

4.1.1 A total of 10 species of bats were identified during the surveys. By far the most abundant were Common and Soprano pipistrelles, which are species generally considered to be at low to medium risk of collisions with road traffic due to the height at which they fly. There were far fewer species recorded that are considered to be of high-risk of traffic collisions; these tend to be species that hunt in cluttered environments, and fly close to the ground, such as Lesser horseshoes, Brown long-eared and *Myotis* species.

4.1.2 Common and Soprano pipistrelles and Noctule bats were observed foraging alongside and crossing the existing road at Locations 1 and 2. A Lesser horseshoe bat was also recorded at Location 1, which is a species of higher conservation concern and more vulnerable to traffic collisions. The Scheme is mainly on line at these locations (coming off line near Location 2) and so the dangers posed by road traffic is unlikely to change significantly from the current situation. However if the scheme requires tree felling either side of the carriageway it would produce a wider gap between vegetation that bats would have to cross. This may cause bats to fly lower between the vegetation and possibly increase the risk from traffic collision.

4.1.3 Extensive foraging activity was recorded along the hedgerow at Location 3, mainly of Common and Soprano pipistrelles. There were also several records of Brown long-eared bats and at least two were found to be roosting within a small agricultural shed (see below). A roost is also known within a bat box at a larger stable on the opposite (north) side of the hedgerow (Soltys Brewster Consulting, 2011). The hedgerow is therefore not only used by bats for foraging but also a commuting route to gain access to and from roosting sites. The Scheme will sever the hedgerow to the east of the stable and shed which would isolate these roost sites from the network of hedgerows and woodland areas to the east. Bats attempting to access roosting features and foraging habitat on the western side of the scheme would be vulnerable to road traffic, particularly the Brown long-eared bats, which are low flying and more susceptible to traffic collision.

4.1.4 High levels of Common and Soprano pipistrelle activity was recorded at Location 4, close to where the Scheme comes back on line. Bats were observed foraging along the hedgerows leading up to the existing A4226 on the eastern side and within trees on the western side of the road. Bats were also observed crossing the road at this location and also foraging above the existing road. As the scheme is coming back online, the dangers posed by road traffic is unlikely to change significantly from the current situation, for bats foraging and commuting across the road. Although if tree felling is required either side of the road, it may increase the gap between vegetation that bats would have to cross, possibly causing them to fly lower and being at increased risk from road traffic.

4.1.5 At Location 5 results indicate that the northern side of the River Waycock is used for foraging by Daubenton's bats along with mainly Common and Soprano pipistrelles. This location also provided a safe road crossing opportunity for bats. As the Scheme

is on line at this location it is unlikely to have any adverse effects on commuting and foraging bats at this location.

4.1.6 It is considered unlikely that the Scheme would have a significant impact on the local Lesser horseshoe bat population. The surveys did not indicate that there were any significant commuting routes for this species affected by the Scheme. One Lesser horseshoe was recorded at one location on one occasion and the closest known maternity roost from the data search records is approximately 4.5km to the southwest.

4.2 Bat roost identified

4.2.1 Brown long-eared bats were observed emerging and entering the small agricultural shed during two of the three surveys undertaken at Location 3.

4.2.2 Survey observations suggest this structure is used as a day roost and a night / feeding roost for at least two Brown long-eared bats. This is based on a Brown long-eared observed emerging at 22:08 during the July survey, feeding remains on the shed floor and bats observed within the shed later in the evening in May and July after Brown long-eared bats being recorded outside.

4.2.3 A bat roost was also identified during the 2009 surveys within a bat box at a stable on the north side of the hedgerow at Location 3. The roost was considered to be that of a *Pipistrellus* species (Soltys Brewster Consulting, 2011). A further inspection of the bat boxes was undertaken outside the bat active period, in November 2014, which found no evidence of roosting bats (AVA Ecology[2], 2014). Internal and external inspections were also carried out within the main barn. No evidence of roosting bats was observed and the structure was considered to have low potential to support roosting bats, principally because of air flow, light ingress and suitable roosting features (AVA Ecology[2], 2014).

4.2.4 These roosts are protected under regulation 41(1) of the Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations) – refer to Section 2.2. The Scheme will not directly affect them, but as indicated in Section 5.1, the bats which occupy them (particularly the Brown long-eared bats) are vulnerable to being hit by road traffic along the scheme.

5 REFERENCES

AVA Ecology (2014). Bat Survey of Trees at 5 Mile Lane, St. Athan, Cardiff.

AVA Ecology[2] (2014). Bat Surveys of Stables at Grovelands Farm, Five Mile Lane, Moulton (see Appendix A)

Hundt, l. (2012) *Bat Surveys: Good Practice Guidelines.* 2nd Edition, Bat Conservation Trust.

Russ, J. (2012) *British Bat Calls – A Guide to Species Identification*. Pelagic Publishing.

Soltys Brewster Consulting (2011). A4226 Five Mile Lane Proposed Road Safety Improvement Scheme – Interim Scheme Assessment Report (Doc. Ref.: 0937801 R01). Vale of Glamorgan Council (see Appendix B).

6 FIGURES

6.1 Figure 1.0 A-C Bat Activity Survey Crossing Points

Legend

- Transect Locations
- Proposed Scheme

N

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NOTES

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10 Park Grove, Cardiff CF10 3BN
Tel: 029 2022 8966
admin@tacp.co.uk

Vale of Glamorgan
A4226 Five Mile Lane Improvements
Bat Activity Surveys

○ DRAWN JB	○ CHECKED TR	○ OFFICE : CARDIFF
○ NOT TO SCALE	○ DATE OCTOBER 2015	

FIGURE / DRAWING NO.	REV
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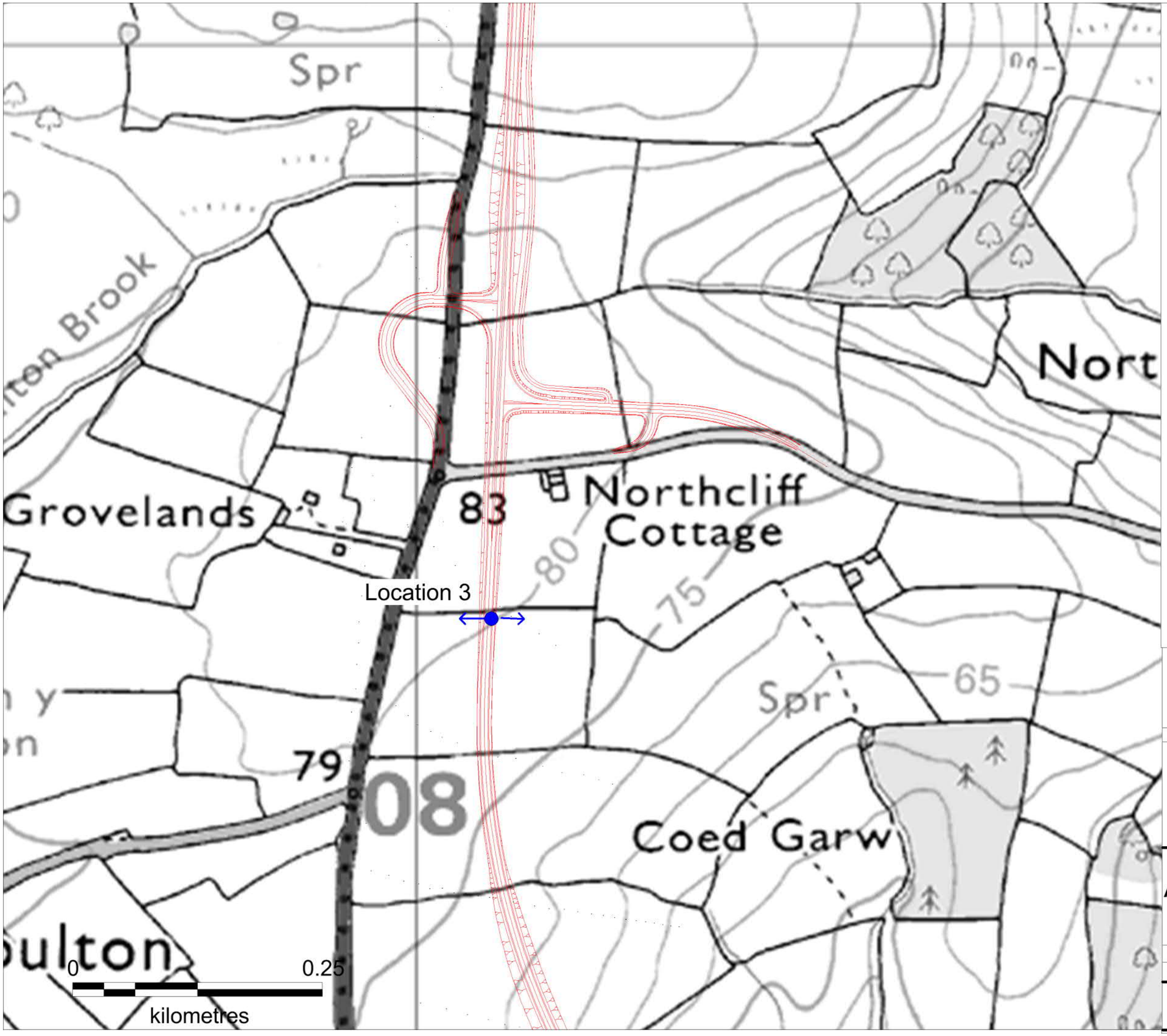

Legend

- Transect Locations
- Proposed Scheme

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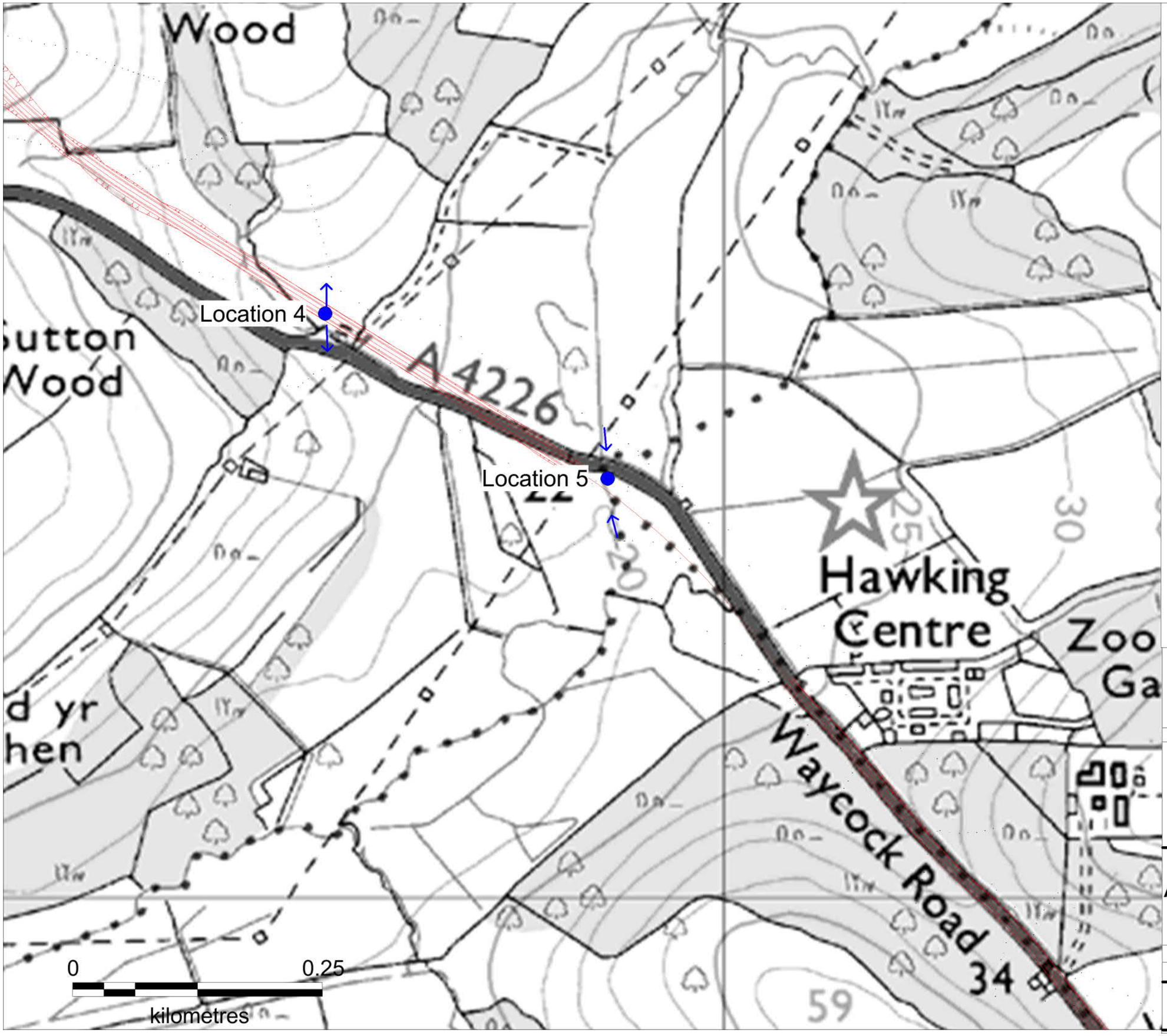

Legend

- Transect Locations
- Proposed Scheme

N

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A4226 Five Mile Lane Improvements
Bat Activity Surveys

○ DRAWN JB	○ CHECKED TR	○ OFFICE : CARDIFF
○ NOT TO SCALE	○ DATE OCTOBER 2015	

FIGURE / DRAWING NO.	REV
60654_BA01c	0

7 APPENDICES

Appendix A: Bat Surveys of Stables at Grovelands Farm, Five Mile Lane, Moulton (AVA Ecology 2014).

Appendix B: A4226 Five Mile Lane. Proposed road safety improvement scheme. Interim scheme assessment report (Soltys Brewster Consulting, January 2011).

Ecology Arboriculture Contracting

Bat Surveys of Stables
At
Grovelands Farm
Five Mile lane
Moulton

Date: 01/12/2014

AVA Ecology Ltd, 6 Hook Close, Osbaston, Monmouth. NP25 3BD Tel. 01600 772294
Reg.no.8644091

Ecology Arboriculture Contracting

Client	TACP Ltd
Site / job	Grovelands stables 5 mile lane bat box checks
Report title	Bat survey of stables at Grovelands
report ref	ava/tacp/grovelands/5 mile lane
Local Authority	Vale of Glamorgan

version	status	changes	author	position	Date
1	draft		S Wadley	Director	01/12/2014
2	1st Final	amendments	S Wadley	Director	09/12/2014
3					

Name	Position	Date

Reviewed by	J Wadley	Secretary	
Approved for issue	S Wadley	Director	
Issued by	S Wadley	Director	09/12/2014

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Contents

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Author

This survey and report was carried out by Mr Steve Wadley of AVA Ecology Ltd. Mr Wadley has 3 years experience of bat conservation and survey work. He holds a Natural England (NE) class 2 bat survey license (Number 20123667) and VBRV licence as well as a NRW bat licence (number CCW42680:OTH:CSAB:2012). Mr Wadley specialises in woodlands and tree dwelling bats and is a qualifying member of the Chartered Institute of Ecology and Environmental Management (CIEEM), and committee member of Gloucestershire bat group.

Executive summary

This bat survey and report was commissioned by TACP Ltd and concerns stables located 150m east of Grovelands farm, five mile lane (A4226). The stables and small shed are within 75m of the proposed new route for the A4226 road enhancement scheme.
Bat activity surveys during summer 2014 at potential crossing points were carried out which identified a long eared bat day roost (2 bats) within a small shed near the stables and a potential Pipistrelle bat roost (single bat) located in a Ash tree on the east side of the shed. The shed is located around 70m to the east of the current A4226.
A previous survey report carried out by Soltys Brewster in January 2011 identified bat droppings (consistent with Pipistrelle bats) discovered beneath a bat box located on the stables opposite the small wooden shed. (See appended report).

This bat scoping survey by AVA ecology Ltd was carried out on 26th November 2014 outside the bat activity season so the results are not conclusive but are merely to provide a likelihood or potential of use of the boxes and stables by bat species.
The daytime survey identified 2 x bat boxes, one on the east elevation apex and one on the north elevation apex. The boxes are of wooden construction and do not have an inspection hatch, however inspection is possible from ground level using a strong torch and endoscope. The box at the east elevation was full of spider's webs and a dead bird skeleton which would suggest the box has not been used by animals for at least 12 months, the box at the north elevation appeared to be clear of spider's webs and looked clean and potentially may have been used by bats during the summer of 2014
No evidence of bat activity was discovered at either bat box but this may have been affected by recent heavy rainfall although no bat droppings were discovered inside the boxes.

An external daytime inspection of the rest of stables was carried out which identified a low potential for bats due to gaps between the roofing panels, open stable doors and windows. The stables is connected to woodlands to the south east (Coed garw,Ffynon y Coed and Lidmore wood) via hedgerows, further extending south east to the River Waycock, Coed Bach and Coed y Caple. These features make the surrounding habitat of good potential for bats.

The internal daytime inspection identified a low potential for bats due to darker areas above roof beams and between roofing panels.
However, the stables are open and as such have a high level of air flow and light ingress making it unlikely that bats would use the building as anything other than a transitional day roost or feeding perch.

A further survey of the small wooden shed identified a few insect wing remains inside the south end of the shed but no other evidence of bat activity internally or externally. The construction of the shed and associated high air flow and light levels suggest the shed is not likely to be suitable for bats other than a transitional roost or feeding perch.

In the absence of mitigation the impact of the road scheme on the bat roost in the small shed would be low but the severance of the hedgerow to the east of the stables to accommodate the new road construction may have a medium impact on foraging or commuting bats
Any works to the small shed will require a European protected Species licence from NRW.
Further survey is required on the bat boxes at the stables during the bat activity period May – September to assess the potential level of use of the bat boxes and transect survey of the hedgerow should be carried out to assess usage by foraging or commuting bats

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1: Introduction

1.1 Site description

The site is located at grid reference ST: 080704 and comprises a wooden stables and small shed set in improved pasture and arable fields some 70m east of the hedge lined A4226 at Grovelands farm.
The "L shaped" stables are north facing and have traditional stable door entrances. A concrete platform is located at the front of the stables with a tall hedgerow running behind the stables in an east to west direction. This hedgerow has some semi mature trees one of which, an Ash tree, has potential for roosting bats. (See Tree Report by AVA Ecology Ltd 2014)

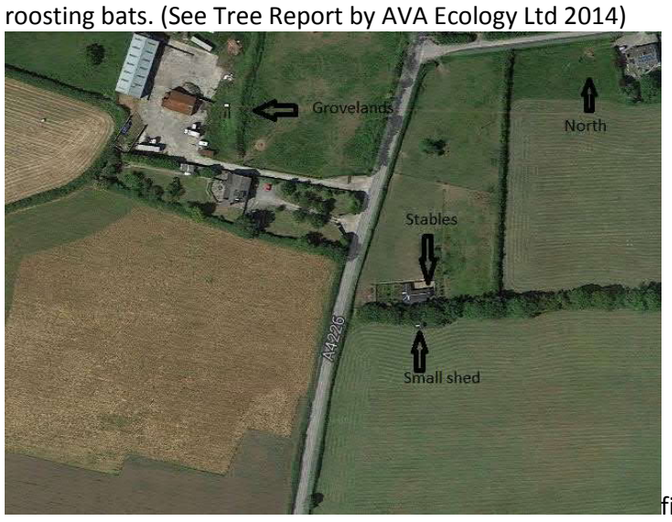

fig 1.

1.2 Proposed development

It is proposed to enhance the current route of the A4226 which will include re-locating the road some 150m to the east of its current position at Grovelands farm. (See fig 3). This will involve dissecting the tall hedgerow at grid reference ST: 081704 and could potentially cause disturbance to any bat roosts present as well as sever foraging or commuting routes.

1.3 Aims of study

The objective of this study is to identify evidence of any use of the stables (and bat boxes) by bat species. The report aims to assess the level of usage, classification of roost present, and requirement for development license. It will also provide mitigation proposals to be carried out prior to, during and after the works.

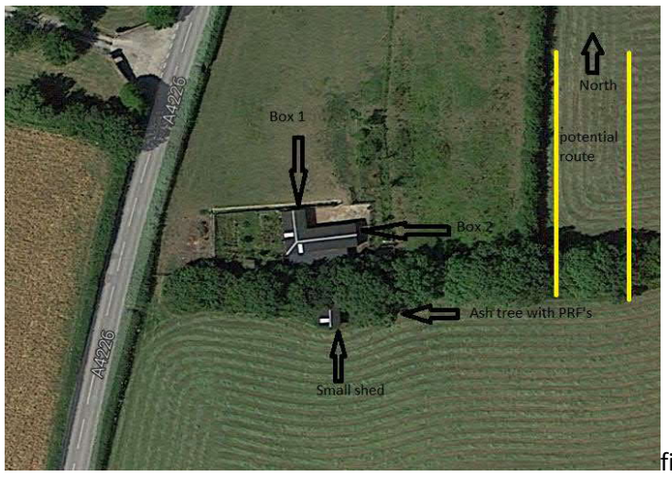

fig 2.

2: Methodology

2.1 Desk study

A desk study was not carried out specifically for this survey but was carried out as part of the ongoing crossing point surveys (see main survey).

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2.2 Field surveys

The methods used were appropriate to achieve the aims of the survey following *Bat Surveys - Good Practice Guidelines* (2nd Ed; Bat Conservation Trust 2012) and BS 42020:2013 Biodiversity. (Code of practice for planning and development).

Date	26th November 2014	Notes
Weather	Light Rain	
Cloud cover	100%	
Temperature	10°C	
Wind speed	5mph	
Name	**Bat Licence**	**Experience**
Steve Wadley	CCW42680:OTH:CSAB:2012	Experienced and licensed bat specialist.

The stables and bat boxes were inspected externally and internally using binoculars, endoscope and a high powered torch. Photographs of any evidence of bat activity and potential exit or entry points identified in the stables were taken and noted for the report.

3: Results

3.1 Field survey

3.1.1 Habitat description

The habitat surrounding the site at Grovelands stables is mostly arable and improved pasture fields with small woodlands to the north east and south east connected by hedgerows and tree lines. There are some minor roads which are also tree lined leading further to woodlands and farm buildings dotted around the area (see fig 3). The small River Waycock runs generally North east to South West and is around 1.5km to the south east.

fig 3.

3.1.2 External survey

The external survey identified a modern, north facing wooden built stables with composite material roofing panels. There is a tall mixed species hedgerow immediately south of the building running from east to west which contains several semi mature Ash and Oak trees. The stables have traditional doors allowing air and light into the building therefore producing high levels of air flow and natural light. There are a few areas of low potential for bats throughout the building including gaps between the rafters and roofing panels at the eaves and gaps at overlapping panels. There are also gaps beneath the barge boards at the gables. No evidence of bat activity was discovered externally and the potential for bat roosting was considered to be low.

3.1.3 Internal Survey

The internal survey identified several areas of low potential including gaps between exposed rafters and roofing materials, and gaps at woodwork unions (internal corners of the roof). Two of the stable doors were locked and inaccessible making inspection impossible and horses occupied two of the stables making inspection difficult. No evidence of bat activity was discovered and it was noted during the

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inspection that it was very unlikely that bats would use the stables for roosting other than as a transitional roost or feeding perch due to high air flow and natural light levels.

4: Assessment

4.1 Survey constraints (Inc. equipment)

The presence of horses in the stables made internal inspection difficult and evidence may have been missed due to safety issues.
Two of the stables were locked and inaccessible making inspection of those internal areas impossible.

4.2 Potential impacts

4.2.1 Bat roosts

In the absence of mitigation the proposed development would have a low potential impact on the bat roost in the small shed and a potentially low impact on any bats using the bat boxes attached to the stables. This impact would be caused by factors such as increased noise, security lighting, vibration and dust from construction traffic during the road improvement works.
The severance of the hedgerow to the east of the stables may have a potential impact on the bat roost in the small shed through loss of foraging or commuting habitat.

4.2.2 Bat foraging and commuting habitat

In the absence of mitigation the proposed development would have potential medium impact on bat foraging and commuting routes. This is due to the potential severance of a flight path (hedgerow) to accommodate the new road route to the east of the stables.
(2 brown long eared bats and a Pipistrelle bat were observed during surveys using the hedgerow for foraging during bat activity surveys).

5: Legislation and policy guidance

This legislation must be considered at all stages of development.
All bat species occurring in the UK are fully protected by European and UK law.

Under The Conservation (Natural Habitats &c) Regulations 2010 (and 2011/2012 amendment regulations) Regulation 41, (1) A person who—
(a) Deliberately captures, injures or kills any wild animal of a European protected species,
(b) Deliberately disturbs wild animals of any such species,
(c) Deliberately takes or destroys the eggs of such an animal, or
(d) Damages or destroys a breeding site or resting place of such an animal, is guilty of an offence.

Under the Wildlife and Countryside Act 1981 (as amended) it is an offence to:

- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used by bats for shelter or protection.
- Intentionally or recklessly disturb bats whilst in their place of rest or shelter
- Sell or advertise for sale or transport bats (including their derivatives)

The Countryside and Rights of Way Act 2000 (CroW)

The Act places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

Schedule 9 of the Act amends SSSI provisions of the Wildlife and Countryside Act 1981, including provisions to change SSSIs and providing increased powers for their protection and management. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increases penalties on conviction where the provisions are breached; and introduce a new offence whereby third parties can be convicted for damaging SSSIs. To ensure compliance with the Human Rights Act 1998, appeal processes are introduced with regards to the notification, management and protection of SSSIs.

Schedule 12 of the Act amends the species provisions of the Wildlife and Countryside Act 1981,

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Reg.no.8644091

strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable', create a new offence of reckless disturbance, confer greater powers to police and wildlife inspectors for entering premises and obtaining wildlife tissue samples for DNA analysis, and enable heavier penalties on conviction of wildlife offences.

Planning Policy Advice

Planning Policy Wales Chapter 5 "Conserving and Improving Natural Heritage and the Coast"
The Welsh Government's objectives for the conservation and improvement of the natural heritage are to:
• promote the conservation of landscape and biodiversity, in particular the conservation of native wildlife and habitats;
• ensure that action in Wales contributes to meeting international responsibilities and obligations for the natural environment;
• ensure that statutorily designated sites are properly protected and managed;
• safeguard protected species, and to
• promote the functions and benefits of soils, and in particular their function as a carbon store.

The UK Biodiversity Action Plan (UKBAP) includes objectives to conserve, and, where practicable, enhance:
• The quality and range of wildlife habitats and ecosystems;
• The overall populations and natural ranges of native species;
• Internationally important and threatened species, habitats and ecosystems;
• Species, habitats and natural and managed ecosystems characteristic of local areas
• Biodiversity of natural and semi-natural habitats where this has been diminished over recent decades.

The Welsh Government is committed to promoting Habitat and Species Action Plans relevant to Wales prepared under the UKBAP in fulfilment of its obligations under the Countryside and Rights of Way Act.

Protected species
The presence of a species protected under European or UK legislation is a material consideration when a local planning authority is considering a development proposal which, if carried out, would be likely to result in disturbance or harm to the species or its habitat. Local planning authorities should advise anyone submitting a planning application that they must conform to any statutory species protection provisions affecting the site concerned, and should consult Natural Resources Wales before granting permission. An ecological survey to confirm whether a protected species is present and an assessment of the likely impact of the development on a protected species may be required in order to inform the planning decision.

Developments are always subject to the legislation covering European protected species regardless of whether or not they are within a designated site. New developments for which development works would contravene the protection afforded to European protected species require derogations from the provisions of the Habitats Directive.

Derogations may only be authorised if there is no satisfactory alternative and if the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in its natural range. The development works to be authorised must be for the purposes of preserving 'public health or safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment.

Derogations are granted by a licence issued by the Welsh Government Local planning authorities are under a duty to have regard to the requirements of the Habitats Directive in exercising their functions. To avoid developments with planning permission subsequently not being granted derogations in relation to European protected species, planning authorities should take the above three requirements for derogation into account when considering development proposals where a European protected species is present.

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Reg.no.8644091

6: Recommendations and Mitigation Measures

6.1 Mitigation proposals

The mitigation proposals for the development are as follows:

a) No works to the stables or small shed including alterations or removal will take place as part of the road enhancement scheme. If works to the stables or shed is planned then further survey should take place beforehand including bat activity surveys and bat box checks during the summer months May - September 2015 to assess usage of the bat boxes.
c) Any severance of the hedgerows to accommodate the new road route must be mitigated by planting mixed species hedgerows each side of the road to minimise the risk of bat impact with vehicles.
d) The newly planted hedgerows must connect with other existing hedgerows to the west of the new route.
e) Any removal of the hedgerow must be done between September and April to avoid the bat activity season.

6.2 Further survey

The stables have a low potential for roosting bats but as the stables will not be directly impacted by the road scheme further survey of the buildings was not deemed necessary. However, transect surveys of the nearby hedgerows should be carried out to assess flight paths and foraging routes to inform an assessment of the potential impacts of the new road route and hedgerow severance.

6.3 Requirement for licence.

The stables and small shed will not be altered or removed as part of the road scheme and will not be directly impacted. Mitigation can be put into place which will reduce the impacts to a negligible level therefore a European protected species licence was not deemed necessary as the proposed development would not result in an offence being committed under the Conservation of Habitats and Species Regulations 2010 (as amended).

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Reg.no.8644091

7: Conclusion

It is possible that one of the bat boxes attached to the stables is being used by bat species. Although no physical evidence such as droppings or urine staining was discovered, the bat box at the north gable was free of the spider's webs and debris which was evident in the bat box on the east gable. This may of course be due to birds using the north box but as brown long eared bats and a pipistrelle bat have been observed foraging near the stables there is a possibility that they may be using the box. The previous report by soltys Brewster confirms pipistrelle droppings beneath a bat box at the stables.
As droppings can be washed away with rain and are eaten by ants and other insects, only inspection of the box during the summer months May – September would confirm presence or absence. Bats are also known to use bat boxes for hibernation so it may be beneficial to regularly inspect the boxes over the winter period September to May.

The severance of the hedgerow to accommodate the new road route may have an impact on the foraging or commuting routes of the bats using the small shed so transect surveys must be carried out to assess the usage of the hedgerows.

An EPS licence is not deemed necessary but the mitigation must be followed to ensure bats are not impacted by the proposed development.

8: Photographs


1 South elevation


2 East elevation bat box

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Reg.no.8644091


3 North elevation bat box


4 North elevations

10: References

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Mitchell-Jones, A.J. & McLeish, A.P. (2004)

Bat mitigation guidelines. English Nature. Mitchell-Jones, A.J. (2004)

Bats and lighting. A.Fure (London naturalist No. 85 2006)

South East Wales Biological Records Centre (SEWBReC) (bat records)

The Conservation of Habitats and Species Regulations 2010 (as amended)

The Wildlife and Countryside Act 1981 (as amended)

Tan 5 Planning Policy in Wales

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A4226 FIVE MILE LANE

PROPOSED ROAD SAFETY IMPROVEMENT SCHEME

INTERIM SCHEME ASSESSMENT REPORT

January 2011

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PROPOSED ROAD SAFETY IMPROVEMENT SCHEME

A4226 FIVE MILE LANE

VALE OF GLAMORGAN

INTERIM SCHEME ASSESSMENT REPORT

January 2011

Document Ref: 0937801 R01 Final Report

Approved by:	Gary Soltys
Position:	Director
Date:	January 2011

Contents

Volume 1 – Interim Scheme Assessment Report

1 Introduction

1.1.1 Soltys Brewster Consulting were commissioned by the Engineering Design and Procurement Section of the Vale of Glamorgan Council to coordinate the Environmental Assessment for the proposed highways improvements to a section of the A4226, between Sycamore Cross and Waycock Cross, locally known as Five Mile Lane.

1.1.2 The A4226 (Five Mile Lane) route currently fails to meet modern highway standards; The Welsh Assembly Government has awarded a principal road transport grant to the Vale of Glamorgan Council for safety improvements to Five Mile Lane. The Interim Scheme Assessment report (ISAR) follows on from a Stage 1 Environmental Impact Assessment, May 2008. The assessment concluded that the route corridor under appraisal and shown in Figure 1.1, is preferred to take forward for further refinement and route option appraisal.

1.2 Studies Completed to Date

1.2.1 Between 1997 and 2005 wider studies examined the possibilities of improving safety and access to Cardiff International Airport (now simply known as Cardiff Airport). Phase One proposals published in 1998 looked at construction of a new road for traffic using the A4050 corridor to link the A4232 at Culverhouse Cross with the Barry Docks Link Road, south of Wenvoe. This route corridor was safeguarded in the Vale of Glamorgan Unitary Development Plan (UDP), but has since been shelved. Environmental Statements produced in support of these earlier proposals included:

- *Full Scheme Environmental Statement - Airport Access Road Phase 1* (June 1998) Chris Blandford Associates
- *Interchange Environmental Statement - Airport Access Road Phase 1* (June 1998) Chris Blandford Associates

1.2.2 A later study in 2005 looked to establish the scope of environmental assessment needed to promote an alternative route further to the west, broadly following the alignment of the A4226 between the A48 and the A4050 to the west of Barry, locally known as Five Mile Lane. A scoping report was produced in 2005 in collaboration with the Statutory Consultees:-

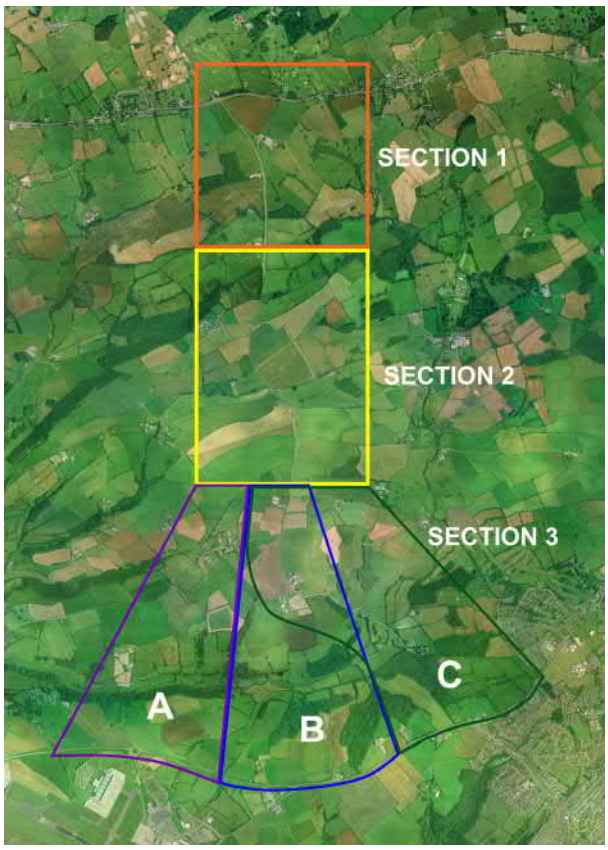
- *Cardiff Airport Access Road, Environmental Assessment Scoping Report* (August 2005) Soltys Brewster Consulting.

1.2.3 Subsequently, further scoping and Stage 1 Assessment was undertaken for a scheme to specifically upgrade the A4226 (Five Mile Lane) between the A48 and the northwestern edge of Barry at Waycock Cross to address its current poor safety record and improve links into the southern Vale including Barry, Cardiff Airport and settlements further west along the B4265. Supporting documents produced included:-

- *A4226 Five Mile Lane Improvements, Environmental Assessment Scoping Report (January 2008)* Soltys Brewster Consulting.
- *Five Mile Lane Stage 1 Environmental Assessment (May 2008)* Soltys Brewster Consulting.

Stage One Environmental Assessment

1.2.4 The Stage 1 assessment considered the main opportunities and constraints within a wider study area and broad route corridors for new route corridors to take forward to the ISAR stage of the process.



1.2.5 Section 3 A and B were discounted as feasible broad corridor options as they did not satisfy the planning objective of improving the safety of Five Mile Lane, and adverse environmental impacts were considered to be greater than for Section 3 C.

Scheme Engineering Design

1.2.6 Studies leading to the proposed alignments have considered a range of improvements to the existing road including:

- measures confined to the existing alignment (on-line improvements);
- improvements separate from the existing alignment (off-line improvements); and
- a combination of the two.

1.2.7 The selection of the appropriate proposed standards and route alignments is a iterative process. Wide ranging options have been studied and several rejected in the early stages of the study – predominately because the options did not satisfy the main ethos of safety improvements. Rejected options include:

- dual carriageway;
- "wide single two carriageway plus one" standard; and
- alignments that involve much severance, land take, earthworks and potentially high construction costs.

1.2.8 At start of the scheme preparation process the Vale of Glamorgan Council designers had the benefit of some previous feasibility work undertaken by Cardiff Council acting as Trunk Road Agents for the Welsh Assembly Government. These were initially referred to as Options 1, 2, 5, 7, 8, 9 and the Link Road. Only Options 7, 8 and 9 have been retained for present consideration. Options 1, 2 and 5 were not taken forward because the required quantity of earthworks was considered excessive for the appropriate standard of highway.

1.2.9 The routes presented herein are still in the early stages of development for broadly comparative studies. Recommendations are provided towards adoption of the best route option in this iterative process.

1.3 Purpose of the Interim Scheme Assessment Report

1.3.1 The Interim Scheme Assessment Report lies between the Stage 1 environmental assessment, as guided by Volume 11 of the Design Manual for Roads and Bridges (DMRB), and Stage 2 assessment. During the intervening period new guidelines for transport schemes and strategies specific to Wales have emerged; The Welsh Assembly Government Transport Appraisal Guidance (WelTAG)[1].

1.3.2 The ISAR is a vehicle to collate all studies and surveys, analysis and appraisal collected and compiled during and since the Stage 1 EIA and align the results with reporting requirements set out in WelTAG. The approach aims to streamline progress in selecting an appropriate route between Sycamore Cross (the junction with the A48 in the north) and Waycock Cross (the junction with the A4226 to the south).

1.3.3 WelTAG's guidelines promote appraisal requirements that are of a scale that is appropriate to the value to the scheme, that focus on areas of most concern and on impacts that differentiate options.[2] Appraisal against Transport Planning Objectives aims to achieve a "fit for purpose" resulting scheme, and the required outcomes and strategic priorities of the Wales Transport Strategy, such as the National Transport Plan and its component plans.

1.3.4 Appraisal is the process of assessing the worth of a course of action and provides decision-makers with all the information they require to make a reasoned and auditable decision. The ISAR presents environmental baseline information and knowledge gathered to date in considering potential route options. It provides a concise assessment document with which to consult with Statutory Environmental Bodies and encouraging debate and discussion on feasible, acceptable, objective focused and environmentally acceptable options that will form the basis of Stage 2 assessment, Public Consultation and ultimately the selection of a preferred scheme for detailed Stage 3 assessment.

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1 WelTAG v7.1 2008 The Welsh Assembly Government Transport Appraisal Guidance

2 WelTAG v7.1 2008:1.4 Purpose of WelTAG

1.3.5 The ISAR will be circulated to the following statutory consultees in February 2009 followed by a discussion workshop in March 2009:

- **Cadw**
- **Countryside Council for Wales (CCW)**
- **Environment Agency Wales**
- **Glamorgan Gwent Archaeological Trust (GGAT)**
- **Vale of Glamorgan Council,** Countryside and Environmental Projects
- **Vale of Glamorgan Council,** Development Control
- **Vale of Glamorgan Council,** Rights of Way Officer
- **Vale of Glamorgan Council**, Environmental Health

1.3.6 Following the workshop a consultation responses and recommendations report will be compiled in liaison with the SEB's which, along with the ISAR and Risk Register, will inform the following stages of the scheme design and assessment.

1.4 Approach and Methodology

1.4.1 The ISAR appraises the route alignment options against Traffic Planning Objectives (TPO's) and Welsh Impact Areas thus ensuring deliverable, implementable and feasible (technical and operational) options are taken forward. The scheme is subject to The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999[3].

1.4.2 Within WelTAG there is a formal and standardised two stage appraisal process. Undertaking appraisal in two stages enables best use of appraisal resources, as the first stage narrows the list

[3] Schedule 2 and The Highways (Assessment of Environmental Effects) Regulations 1999. A 'Screening Opinion' was requested from the Planning Department of the Vale of Glamorgan Council, and on September 13th 2007 a reply confirmed that, *"An Environmental Statement as defined by the Town & Country Planning (Environmental Impact Assessment) (England & Wales) Regulations 1999, is required to support a planning application for the Five Mile Lane road improvement, as described in the documents and plans received on 20th August 2007."*

of proposals down to the leading options - or option - with only the best options then being subjected to a full and detailed appraisal.

1.4.3 The assessment is in accordance with WelTAG and DMRB, between Stage 1 and 2:

- Stage 1 - The qualitative and sometimes quantitative approach for the appraisal against each criterion.
- Stage 2 - The (ordinarily more detailed) qualitative and quantitative approach for the appraisal against each criterion.

1.4.4 Please see individual topic chapters for detailed methodologies.

Impact Distribution

1.4.5 Where appropriate to the criterion being appraised the geographic and social distribution of effects is considered; does the scheme affect a particular group of society such as those that are mobility impaired, elderly, on low incomes or unemployed, women or deprived groups? Distribution impacts are explicitly stated and quantified wherever feasible to ensure that the proposal promotes social inclusion and that certain groups are not disproportionately adversely affected.

Impact Significance

1.4.6 Qualitative and quantitative measures for each appraisal criterion are assessed on their own merits. The results of the assessment of the impact significance will be summarised using a seven-point scale, like for other UK guidance, as follows:

Large beneficial	+ + +
Moderate beneficial	+ +
Slight beneficial	+
Neutral	0
Slight adverse	-
Moderate adverse	- -
Severe adverse	- - -

1.4.7 Assessment of significance aims to differentiate the impact levels across options and is not considered in isolation from the overall appraisal results.

Mitigation

1.4.8 Avoidance represents the first stage in the mitigation hierarchy. Measures which avoid impacts are considered 'certain' and so considered in advance of measures designed simply to minimise impacts due to their inherent residual level of uncertainty with regard to implementation and success[4].

1.4.9 Iterative design and assessment of the proposed routes aims to overcome the following effects:

- intrusion of the road into undisturbed, high-quality landscapes
- large earthworks which intrude into views from nearby property and public places
- intrusive embankments crossing valleys and low-lying land
- cuttings which create notches on the skyline or scars on hillsides and sidelong ground
- unsympathetic junctions between new and existing landscapes
- landtake required for large earthworks affecting heritage and nature conservation sites
- changes to drainage regimes.

1.4.10 Mitigation principles are put forward for consideration by the overseeing organisation and Statutory Environmental Bodies; mitigation measures have not been iteratively prioritised against other assessment topics. The conclusions and recommendations report will recommend specific mitigation measures which are to be agreed with the overseeing organisation during Stage 2.

1.4.11 Mitigation measures assume ideal geotechnical conditions of grading out embankments and returning to agriculture and in sections where steep cuttings are preferred, that bedrock is suitable.

4 DMRB Volume 11 Section 4 Part 1 HD 44/09 3.14

Double counting

1.4.12 There is scope for double counting and overlap between criteria, which may lead to a distortion of the importance of certain elements in the appraisal process. While as far as possible this has been netted out within the appraisal, it is recognised that this can be taken only so far - transport by its nature has direct and indirect consequences which feed through in different ways to a range of economic, environmental and social impacts. In order to minimise double-counting, impacts have been assessed in the chapters according to where the impacts experienced are considered most relevant.

1.5 Assessment Structure

1.5.1 Whilst assessing effects of the scheme in accordance with WelTAG only becomes necessary at the next formal stage it is important to begin to consider aspects at this stage against broader option alignments and the baseline information collated thus far.

1.5.2 The ISAR begins to align the scheme assessment to the guidelines in WelTAG required for forthcoming EIA stages. Over and above undertaking an initial evaluation of performance of the scheme against the Transport Planning Objectives aiming to address local problems effectively, the contextually appropriate derivation of wider transport strategies.

Social Impacts

1.5.3 Social impacts have been progressed towards WelTAG's criterion of "Transport Safety, Personal Security, Permeability, Physical Fitness and Social Inclusion" from DMRB's "Pedestrians, Cyclists and Community Effects"

Geology, Soils, Land Use and Agriculture

1.5.4 Because land use within the study area is primarily agriculture which is inherently linked with geology and soils these four topics have been combined under one heading of Land Use. Soils and geology will be fully assessed in forthcoming stages with the benefit of detailed baseline and scheme design information.

Vehicle Travellers included in association with Landscape Effects

1.5.5 Assessment of effects on vehicle travellers has been combined with the landscape assessment:

- both topics are assessed against the same baseline landscape character
- to avoid double counting
- when considering potential mitigation measures the effect of views from and along the road have been taken into account alongside effects on visual amenity in views towards the road as well as effects on landscape character due to the scheme.

1.5.6 The ISAR report assesses the effects of the proposed route alignment on environmental and social effects within the following criterion:

3.0 **TRAFFIC NOISE AND VIBRATION** – noise and vibration effects on local community caused by traffic.

4.0 **LOCAL AIR QUALITY** - local air quality and greenhouse gasses effects on the local community.

5.0 **LANDSCAPE AND VEHICLE TRAVELLERS** – effects on landscape character and quality, visual amenity (from dwellings, footpaths and places of work and leisure) and vehicle travellers (views from the road and driver stress). Includes assessment of effects on landscape designations, settings to heritage features and road lighting.

6.0 **BIODIVERSITY** – effects on nature conservation and biodiversity resource (SSSI's, loss, disturbance and fragmentation of habitat, resting place, breeding site or feeding/foraging area), severance of traditional dispersal routes and effects on protected species (reptiles, birds, bats, aquatic invertebrates and the riverine habitats of the River Waycock) and incidence of wildlife/vehicle collision.

7.0 **LAND USE** – effects on land use, soil quality and landholdings (loss of resource and severance) and effects on geology and contaminate land.

8.0 **HERITAGE** – effects on cultural heritage assets including archaeological remains, historic buildings and historic landscapes.

9.0 **WATER ENVIRONMENT** – risk of pollution, effects on surface water quality, hydrological effects, and physical changes to watercourses, loss of floodplain storage, accidental spillage, reduction in and derogation of groundwater recharge and effects on abstraction.

10.0 SOCIAL IMPACTS – impacts on pedestrians/public footpaths users, cyclists, bridleways and riding routes and on the use of community facilities.

11.0 DISRUPTION DUE TO CONSTRUCTION - potential construction effects.

12.0 POLICIES AND PLANS – assessment of local, regional and national policy that may be affected by the broad route corridor.

1.5.7 The reporting for each criterion covers the methodology used, the baseline conditions against which the assessment is undertaken, and the assessment of effects and potential mitigation measures. Comparative assessments between route options are detailed in Volume 3 - Option Appraisal Tables, summarised within the main report and tabulated in summary within the Appraisal Summary Tables allowing comparison of alignments in the context of appraisal criterion.

Receptor Numbering and Cross Referencing

1.5.8 Receptors have been assigned unique reference numbers that can be cross referenced between tables, maps and report text, in the following format:

Topic abbreviation - sector number – receptor number

For example LC–5–7 is referencing Landscape Character Topic– Sector 5 – Receptor number 7.

2 Baseline

2.1 Geographical Context

2.1.1 Figure 1.1 Context of the Proposal can be found in Volume 2. The Five Mile Lane section of the A4226 is primarily oriented in a north-south direction. Sycamore Cross junction forms the northern point which may be accessed from the east via the A48, A4232 (Ely Link) and the M4 (Junction 33) and from the west via the A48 from Cowbridge, Bridgend and Swansea. The Waycock Cross roundabout is located at the southern point of the route which is accessed from the east via the A4050 running along the northern edge of Barry and from the west via continuation of the A4226 from the direction of Cardiff Airport.

2.2 Historical Context

2.2.1 Map based and field surveys reveal an historic alignment of Five Mile Lane. in the old road can be noted in a few places along its length as 'dog-legs' and local accesses whose sharp bends have been realigned resulting in the existing road. There are two significant lengths where this has occurred. The first is at the crossing of the Waycock River where the road was realigned and a new river bridge was constructed in 1969. The other is the 1200 metre length south of Sycamore Cross which was realigned in the 1970's.

2.3 Planning Context

Transport Planning Objectives (TPO's)

2.3.1 Assessment against TPO's aims to address local problems effectively. Five Mile Lane has been a notorious location for road accidents over the years in a fairly even distribution along its length. There have been 65 accidents between the years 1994 to 2007, of which 11 were fatal. In the same period there have been 16 accidents at the Sycamore Cross junction and three slight accidents at Waycock Cross.

2.3.2 During the last seven years the Vale of Glamorgan Council has endeavoured to improve safety on the road through the introduction of speed limits, which the Safety Camera Partnership enforce with a static camera, re-surfacing, improved signage, lighting, and solar powered LED cats eyes. However the road still contains a number of sharp bends, has substandard forward visibility and is too narrow in places for two large vehicles such as farm traffic, lorries or buses to pass. Along most of its length the speed limit is 40 miles per hour and overtaking is not allowed.

2.3.3 Pedestrians, cyclists and equestrians are not catered for in the main. Those who do use the route are effectively doing so at considerable risk to themselves and others.

2.3.4 The Transport Planning Objective is therefore to reduce accidents through minimal improvements to the horizontal and vertical alignment of the existing road. The proposals aim to improve safety for vehicular, cyclists and pedestrian users. A secondary aim is to improve access to the airport and to the north and west of Barry.

2.4 Baseline Traffic Forecast

2.4.1 For the following traffic forecasts developments taken into consideration for high growth conditions (with a projected increase in the region of 12-16%) are the major developments of St Athan and Wales International Business Park.

2.4.2 Recent studies show that the current traffic flow of 7,000 vehicles per day (VPD) would increase by approximately 9-13% by the baseline year of 2014 under central growth conditions.

2.4.3 For the assessment year fifteen (2029) projected increase in traffic along Five Mile Lane for the Do-Minimum scenario may be in region of 21-26%. Improvements to Five Mile Lane may increase this to 38-48% on the baseline year.

2.5 Do Minimum Scenario

2.5.1 Assessment against a 'Do-Minimum' scenario has been undertaken to represent the most realistic view of transport conditions without improvements to the A4226. Comparisons can then be drawn between the Do-Something scenarios described below and a baseline scenario.

2.5.2 Assessment against the 15 year Do Something has been undertaken to appraise the likely effects of the preferred option, constructed and in use, 15 years after the scheme has opened.

2.6 Scheme Options Descriptions

2.6.1 Figure 1.1 Route Alignment Options and Figure 2.1 Longitudinal Sections can be found in Volume 2.

2.6.2 For the purposes of assessment the routes have been divided into seven sectors. This strategy allows comparisons to be drawn between each alignment within each sector with the potential to explore 'joining' up different coloured sectors, to avoid the most significant effects as explored in the forthcoming results and recommendations report.

2.6.3 All elevation references are approximate, being derived from a five metre vertical interval topographical survey and are expressed in metres above ordnance datum (AOD).

Route Alignment Comparison

2.6.4 The primary differences and similarities between the route options are:

- All alignments would commence and end with modifications to the existing junctions at Sycamore Cross, A48 and Waycross Cross, A4226;
- None of the alignments are considering improvement works to a 1200 metre section between Blackland Farm and southern reaches Sycamore Cross proposed junction;
- Two options are designed to a 80km/h standard due to the minimum curvature and numerous junctions and accesses along the highway; the Purple and the Red, mainly on-line, alignment with new T-junctions (or improved vision splays as a minimum requirement) and a roundabout onto the existing carriageway;

- The other three options are designed to a 100km/h standard utilising roundabouts to access the existing road / proposed local collector road and in the case of the Blue an overbridge in place of the Orange and Green roundabout in the vicinity of Grovelands/Northcliff Cottages;
- Road Cross Sections are comprised of a 7.3 metre carriageway with 1 metre hardstanding and a 2.5-3 metre soft verge with climbing lanes through the steeper parts of the Waycock Valley.
- All alignments, other from the Purple option, include climbing lanes through the relatively steep section of the Waycock Valley.
- The Red and Purple options would inevitably lead to major service diversions and delays to the travelling public during the construction phase. Further, any provision for pedestrians and cyclists would have to be included adjacent to the carriageway.
- The Orange, Green and Blue allow for the improvements to be constructed in separate phases but would still lead to major delays to the travelling public during the construction phase. Once constructed pedestrians and cyclists would be better provided for than the Red option, with access along the existing road and potentially with provisions made for them adjacent to the carriageway where the proposed and existing routes are co-incident.
- The Green alignment offers the potential for a reduction in the area of potential fragmented farmland when compared with the Orange Route with a reduction in earthwork quantities and hence a cost saving.
- The Blue option has been designed with the benefit of the feasibility work already undertaken on the Red, Orange and Green routes maximising offline potential to afford better access to adjacent properties and fields, to afford use in relative safety for the enjoyment of walkers, cyclists and equestrians and to ease technical issues and interference to the travelling public during the construction phase. The Blue option proposes an overbridge at the Northcliff/Moulton junction in place of the roundabouts proposed along other alignments. The alignment also proposes a new bridge crossing across the River Waycock.
- In order to consider the river crossing within this assessment, prior to design progression, some broad assumptions have been made; all bridges would be designed with similar clearances (with a soffit level at least one metre above the 1:100 storm flood level (taking into account climate change impact)) and spans; the Blue option requires a brand new

bridge downstream from the existing; Red and Purple routes would require widening the existing bridge; Orange and Green would require widening of both the bridge and culvert for the side roads.

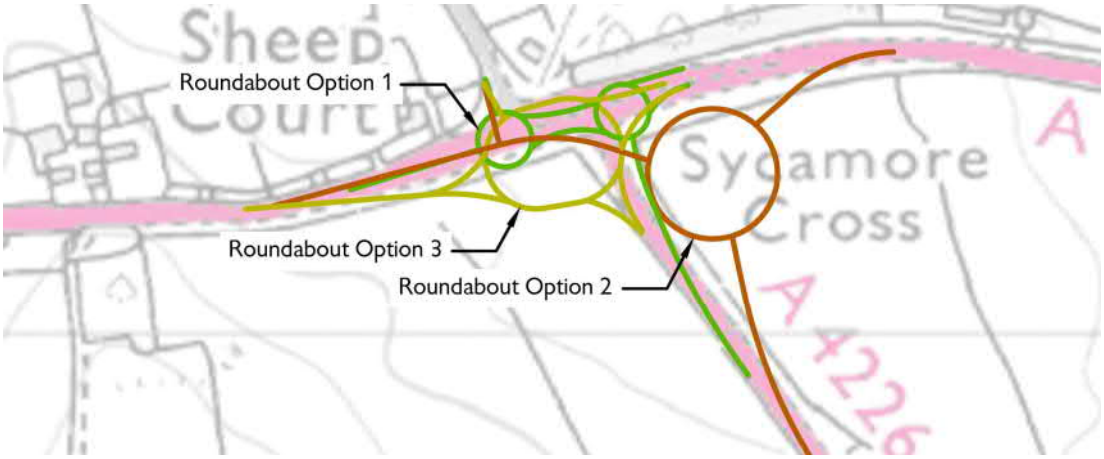
- The Purple route is a feasibility design produced by Arup under a separate commission from the Welsh Assembly Government and totally independently from other studies progressed by Cardiff County and the Vale of Glamorgan Council. In connection with access to Cardiff Airport the Purple route assessed within the ISAR is the "On-line", minimum cost upgrading of the existing road. The discarded "Off-line" route was a "Wide Single 2 + 1" standard of carriageway cross section and derived mainly as part of a solution for a road link crossing the Waycock Valley to the west of the A4226 directly to the existing Welford Roundabout thereby avoiding the Waycock Cross Roundabout.

Approximate lengths of 'on and off line' sections for each alignment are:

	Red (Cardiff Option 7)	**Orange** (Cardiff Option 8)	**Green** (Cardiff Option 9)	**Blue** (VoGC Option)	**Purple** (Arup Online Option)
Close to & Online (metres)	3550	1750	2250	140	2450
Offline (metres)	1200	2900	2450	4480	2300

Sector One

2.6.5 This section of the proposed routes encompasses the Sycamore Cross junction at the north end of the Five Mile Lane. Once modelled and assessed preferred junction option will be selected at the next EIA stage.



2.6.6 Sector one is exposed to the south on the Limestone Ridge (approximately 105 metres), that gives the landscape character area its name, The Ridgeline. The A48 Roman Road travels east-west along the ridge supporting Bonvilston and St Nicholas settlements approximately 440 metres and 700 metres to the west and east respectively from the extents of the junction. To the north of the A48 junction are a number of dwellings and farmsteads and a belt of woodland that effectively screens much of the junction to the north. Settlement and farmsteads are softened by mature standard trees and shelterbelts. To the south, the pastoral farmland is defined by trimmed hedgerows that permit wide views both to and from this character area.

2.6.7 The existing staggered dedicated right turn junctions are proposed to be replaced by roundabout/s. The first option proposes two roundabouts which involves the least landtake. A second option utilises one roundabout to the south east of the existing Five Mile Lane/A48 junction, requiring a T junction between the Pendoylan road and the A48. The third option proposes a large roundabout that provides access to all roads.

2.6.8 The junction would require earthworks to grade into controlling levels on the A48 and grade out embankments to the south. All options require removal of lengths of hedgerow with the small double roundabout (option 1) removing the least (approximately 260 metres), and the large roundabout serving all roads requiring removal of approximately 400 metres (option 2) while the large roundabout that accommodates Five Mile Lane and the A48 requiring removal of 470 metres (option 3).

Sector Two

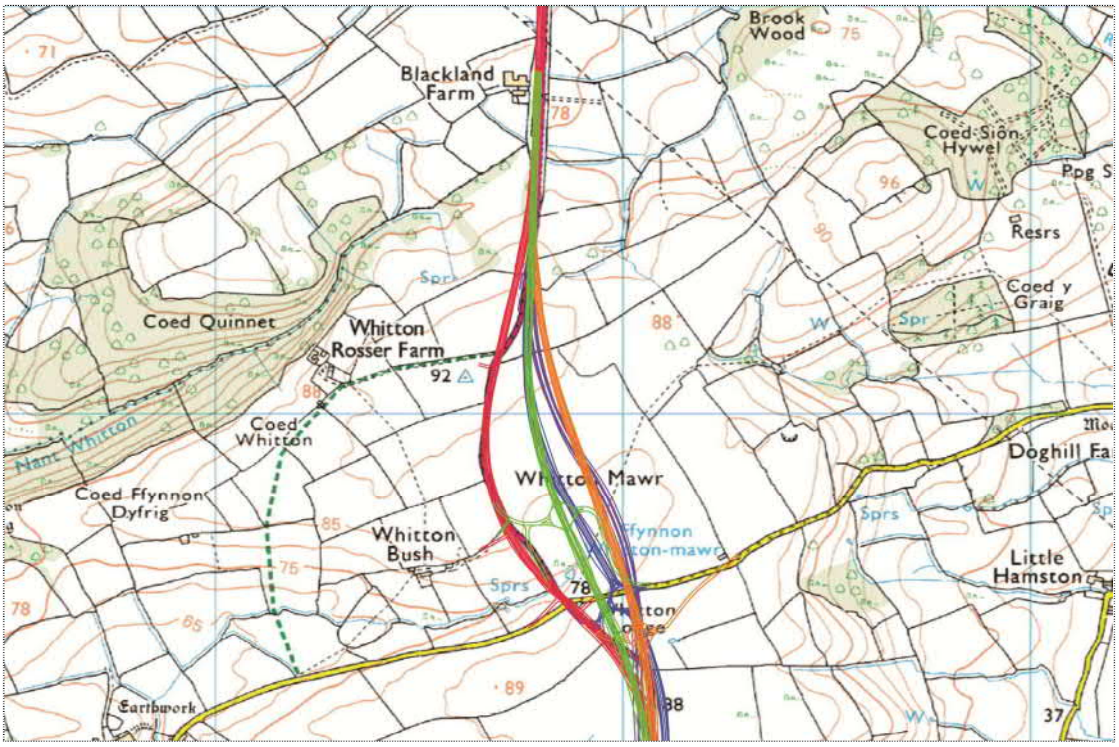
2.6.9 From Sycamore Cross Five Mile Lane travels south along a stretch which has been improved through widening and horizontal realignment. There are no works proposed to this section and tying in should be permissible with the existing fenceline.

2.6.10 The topography begins to drop from the high point with the junction at Sycamore Cross down to low point of 78 metres at the southern point of this sector. Redlands Farmstead and adjacent dwellings straddle the pre-1970's alignment to the east of the current road and a new dwelling has been erected to the west. South of Redlands Farm the landscape character changes to The Rolling Ridge Slopes where woodland blocks, including a proportion of ancient woodland, are introduced as a landscape element. The road passes a large barn, then Oaklands Farm and finishes just to the north of Blackland Farm.

Sector Three

2.6.11 To the south of Blackland Farm the potential routes begin to diverge, gradually diverging between the improved online option to the west and the mainly offline routes running a more direct route to the east of Five Mile Lane. The sector gently rises from 78 metres to a high point of 92 metres at the junction with Whitton Rosser Farm where the landscape is characterised by The Plateau character type. All offline options travel through a large arable field dropping towards the Ffynnon Whitton-mawr spring at 78 metres and rises again to a high

point where all routes broadly realign to the southeast of Whitton Lodge, the southern end of sector 3.



Red Alignment

2.6.12 The Red, mainly online alignment cuts through woodland (approximately 2500 square metres) and grassland on Amelia Trust land, in cutting of approximately three quarters of a metre. This option would require the removal of either or both of the roadside hedgerows depending on refined horizontal and vertical alignment. It is approximated that half of the Five Mile Lane roadside hedgerow would be lost in this sector. The route broadly follows the vertical alignment of the existing road until the topography drops away to the south of Amelia Trust junction where it is in cutting of up to 2 metres. The road is then on an embankment of 2 metres across the Ffynnon Whitton-mawr spring and a 2-3 metre cutting once again as it ascends towards the high point at the south of the sector.

Green, Blue, Orange and Purple Alignments

2.6.13 These route option alignments take a more direct route towards the end of the sector but are similarly on embankment as they travel south towards the Ffynnon Whitton-mawr spring and in

cutting through the high point plateau towards the end of the sector. The westerly of these, the Green alignment, is approximately 140 metres to the east of the existing route at the greatest point. The most easterly of the routes, the Orange and Purple, are approximately 240 metre east of the existing road. The routes would cause less loss to the woodland than the Red with the Green Option requiring the least removal (990 square metres) followed by the Blue and Purple routes (1100 square metres), and the Orange requiring in excess of 1800 square metres to be removed.

2.6.14 The Green route is on embankment (up to 1.5 metres) as it descends towards a roundabout that forms the junction to the Walterston/Dyffryn minor roads. The embankment reforms to a maximum height of 3.5 metres over the Ffynnon Whitton-mawr spring. The vertical alignment remains similar as it travels south from the spring, cutting through the high point of the open plateau by over 4 metres.

2.6.15 The Blue route is on similar height embankments similar to the Green as it descends and ascends to cross the Ffynnon Whitton-mawr spring. The roundabout forming the junction between the improved Five Mile Lane and the Walterston/Dyffryn roads is located between an Oak copse and Whitton Lodge on the Dyffryn road. The road in cutting through the plateau high point at the end of the sector is however much shallower at less than a metre.

2.6.16 Similarly the Orange route is on embankment across the Ffynnon Whitton-mawr spring field, on average between 1 and 1.5 metres above ground level to cross the Walterston/Dyffryn road at grade. The roundabout junction to join this road is however approximately 70 metres to the south of the current road crossing.

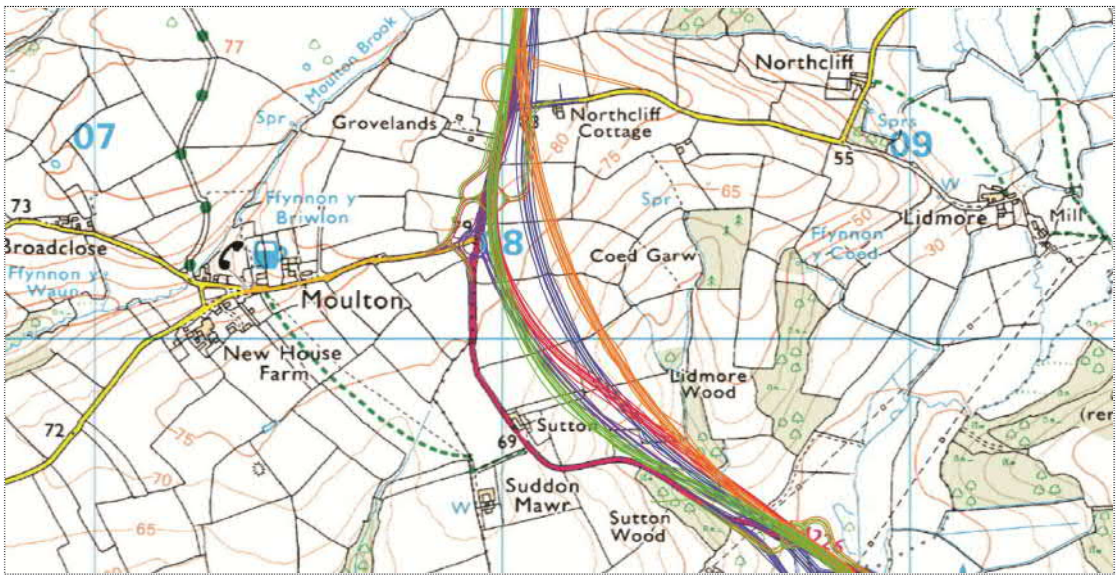
2.6.17 The Purple route option appears to follow the existing ground level more closely than the other options with an approximate maximum embankment through the Ffynnon Whitton-mawr spring field of 1.6 metres. Improved sight lines would likely be proposed at the junction with the Walterston/Dyffryn road. The cutting through the plateau high point is approximately 1.3 metres deep.

Sector Four

2.6.18 Sector four is a relatively short section between two high points of 88 metres and 83 metres in the vicinity of Grovelands, Grovelands Farm and Northcliff Cottage. The topography dips between these two high points at the head of Moulton Brook (approximately 78 metres). All proposed route options follow similar alignments within this section with an approximate maximum distance of 100 metres apart. All alignments are in cutting on the higher ground and on embankment on the lower ground adjacent to Moulton Brook. The most dramatic earthworks would be required for the Green, Orange and Red routes that travel on an embankment and then cutting, 3.7 metres and 4.3 metres, 3.8 metres and 3.8 metres, and 4.8 metres and 2.4 metres respectively. The Blue and Purple routes follow the topography more closely being on embankment at 1.8 metres and cutting 1.4 metres and 1.1 metres and 1.7 metres respectively.

2.6.19 The Purple route could require the removal of one of the existing roadside hedges along most of this sector whereas the Red, Green and Orange routes could require the removal of the majority of existing roadside hedge as they are online. The Blue route runs in parallel with the existing road requiring minimal removal of existing roadside hedgerow.

Sector Five

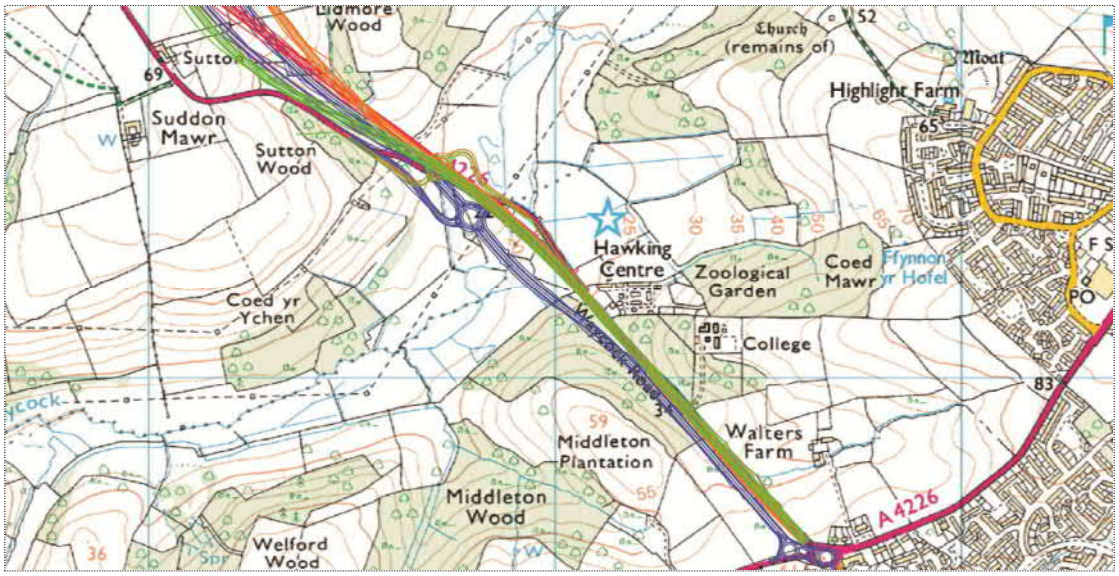


2.6.20 This sector encompasses the route sections from the open Plateau (83 metres AOD) down the Wooded Valley Sides (32 metres AOD) towards the existing River Waycock crossing on the Valley Floor. It begins near Grovelands, Grovelands Farm and Northcliff Cottage where the routes are in cutting and the Blue passes under an overbridge serving Northcliff Farm and beyond to Lidmore and Lidmore Mill. The other options are sevred by roundabouts. From a horse paddock and stables between the dwellings, the routes diverge, turning south east offline cutting into the south east facing valley side through pastoral fields and Sutton Farm. The Red option becomes offline at this point due to the restriction of the existing sharp curves and to tie in with the existing culvert at the River Waycock. The routes are in cutting down the valley side flattening out to embankments across the valley floor. Maximum cuttings and embankments are approximately Blue – 5.5 and 8 metres, Purple – 6 and 5 metres, Red – 5 and 6 metres, Orange – 5 and 7.5 metres and Green – 6 and 5 metres respectively.

2.6.21 The proposed road options begin to converge again between two woodland groups where the vertical alignments emerge onto embankments. These woodlands would be potential screening for receptors on Barry's residential edge, which being on high ground reduces visible depth from the road corridor. The Orange and Red routes cut through between approximately 15-20 metres of the south eastern boundary of the woodland to the north, through an

approximate 6 metre cutting. The Blue route, in tying into the existing route cuts through the north east edge of Sutton Wood. The valley and valley slope supports a number of important trees in the form of standard Oaks and those growing along a field drain connecting the two woodland blocks.

Sector Six



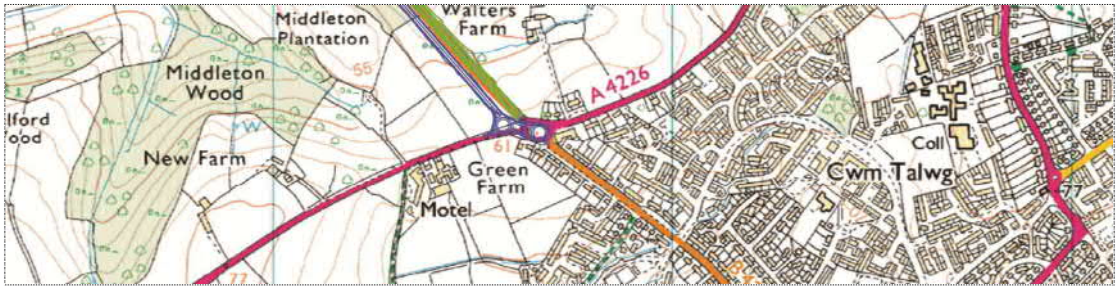
2.6.22 On the valley floor (23 metres) and up the southern side of Waycock Valley the routes follow similar horizontal alignments. The Blue option, being offline, permits road users from The Welsh Hawking Centre, adjacent residents, and the Barry College Buildings to access the new alignment via the existing road and the proposed roundabout. All other options along this stretch are online, requiring a short parallel collector road between these buildings and the old road dog-leg that currently serves the sewage works and used as a layby. Access to the Barry College buildings is not defined for any except the Blue option.

2.6.23 All the alignments are on embankments across the valley floor and all but the Blue Route tend to follow the existing horizontal road alignment. The Blue option runs further west avoiding the online corridor. Roundabouts and minor access roads are proposed to connect the new alignments and Five Mile Lane (on the valley floor between two powerline runs) for the Green, Orange and Blue Routes. The Purple and Red options propose T-junctions.

2.6.24 Every option involves partial removal of woodland for the road landtake required to satisfy standard horizontal and vertical alignments up the steep north west facing valley.

2.6.25 Parallel to Five Mile Lane a culverted stream runs down the majority of the north facing Waycock Valley until it joins the Waycock River. In all but the Blue options, refined alignment would involve consideration of impacts between the stream and the woodland.

Sector Seven



2.6.26 The Blue route and existing road are roughly parallel approaching the junction with the A4226 and require a double roundabout to serve all three routes. All other options are online as they approach the junction and are not proposing a collector road for Barry college buildings, so a single roundabout is proposed in the existing location.

Assessment of Effects

3 Traffic Noise and Vibration

3.1 Introduction / Impact Description

3.1.1 The World Health Organisation defines noise annoyance as the "feeling of displeasure evoked by noise" (WelTAG p105). WelTAG guidance states: "Noise nuisance from transport sources can adversely affect the quality of living of local communities. Vibration is a similar effect, but instead of being transmitted by air, it is transmitted by the earth. Noise is normally considered as an approximate indicator for both noise and vibration, since its effects are normally felt more strongly" (WelTAG p105-6). This chapter aims to draws conclusions on which of the five proposed new routes for the A4226 Five Mile Lane would cause the least noise annoyance for the local community.

3.1.2 The existing traffic noise and vibration varies and will depend on a number of factors including: vehicle operation (i.e. average speed, variation in speed and road geometry), vehicle type (i.e. car, lorry or motorbike).

3.2 Appraisal Methodology

3.2.1 The methodology used to assess the Traffic Noise and Vibration impacts (TNV) of the proposed road scheme on the A4226 Five Mile Lane follows current 'best practice' WelTAG and DMRB guidance published by the Welsh Assembly Government and the Highway Agency respectively.

3.2.2 The process adopts the standard approach using baseline desktop studies to identify potential sensitive receptors likely to be significantly affected by the proposed scheme and the potential effects brought about by the proposed development. The chapter will then judge the magnitude of effects and undertake a qualitative assessment of their significance following implementation with a quantitative assessment being undertaken at Stage 2. Impacts have been assessed against the baseline (Year 1 Do Minimum), Year 15 Do Minimum (worst case scenario) and Year 15

Do Something for each receptor and road alignment option. A description of the practicable mitigation techniques available will also be provided.

Double Counting

3.2.3 In order to avoid double-counting of impacts, where possible, receptors have been assessed in the chapters according to where the impacts experienced would be most significant. Receptors such as SSSIs or SPAs, for example, would be more sensitive to ecological than TNV effects.

Cumulative Effects

3.2.4 At this stage, there haven't been any potential cumulative TNV effects predicted or assessed as a result of completing this scheme.

3.3 Study Area / Sensitivity of Receptors

3.3.1 The study area for this chapter was "restricted to within a 300m buffer of each of the five potential routes, since significant impacts are not likely to occur beyond that" (WelTAG p107). Please see figures 3.1-3.5.

3.3.2 All potential receptors within the 300m zones were mapped and their building function recorded. Private dwellings and business premises have been identified as highly sensitive TNV receptors. Only residents whose dwellings create the frontage to the proposed route are considered to be high sensitivity receptors, potential receptors beyond the buildings fronting directly onto the existing road have not been assessed at this stage as they are unlikely to experience a change in TNV. Domestic dwellings within the 300m zone that were considered unlikely to experience a noticeable change in TNV levels were discounted from further assessment at this point in the process. Preliminary receptors with low noise sensitivity such as barns, silos and storage facilities were also discounted from further assessment, as they are unlikely to experience significant effects in TNV levels. Buildings of similar location, aspect, function and sensitivity were grouped and appraised in unison as the potential impacts would be similar at each address.

3.3.3 The main focus of the study has been placed on TNV sensitive receptors, which could potentially experience significant levels of effect as a result of the implementation of the scheme.

3.3.4 The TNV sensitive receptors that have been assessed are: private dwellings and business premises which are located with 300m study area. Any receptors outside of this study area boundary have not been assessed, as it is assumed that they are unlikely to be significantly affected by the proposals in terms of TNV.

Discounted Dwellings and Premises

Redlands Cottage, Redlands House and Ash Tree Cottage

3.3.5 There would not be any construction works in the direct vicinity of Redlands Cottage, Redlands House and Ash Tree Cottage and the domestic dwelling on the opposite side of the carriageway, any temporary nuisance caused by passing works traffic would not be significant. On completion the TNV levels at the properties would be comparable to baseline.

Welsh Hawking Centre

3.3.6 The Welsh Hawking Centre is not considered to be a sensitive TNV receptor despite being located off the existing road within the 300m potential impact zone created by each of the five route options as the likely impacts created by the alternative alignments would be comparable to that created by the existing Five Mile Lane.

3.3.7 Opting for the Blue alignment would potentially create a slight positive effect as the main carriageway carrying the bulk of the fast moving traffic would be moved further from the Centre beyond a screen of mature deciduous trees. This impact may be beneficial but it would not be significant.

3.3.8 The alternative options would involve improving the existing road, potentially increasing traffic speed and volume and therefore TNV level but not to such an extent as to be significant.

Barry College of Further Education

3.3.9 Barry College of Further Education is also not considered to be a sensitive TNV receptor. The site is set back approximately 120m from the existing A4226 and is separated from the road by dense deciduous woodland. None of the route alignments would move the carriageway closer to the buildings or significantly remove any of the mature vegetation used as screening.

3.4 Baseline Conditions

3.4.1 The current traffic noise and vibration level experienced on the existing road network varies depending on time of time of day and year and it is likely the trends found in national traffic data would be relevant and applicable on these sections of roads.

3.4.2 Generally, it is predicted the national increase in motorist numbers would increase TNV levels on existing A4226 with or without a scheme implementation. This increase would have the greatest effect at the northern Sycamore Cross junction and at the southern Waycock Cross roundabout as motorists not intending to use Five Mile Lane will use the improved junctions.

3.4.3 The following paragraphs outline the existing road, features and sensitive receptor types that are located for each sector along the existing A4226 – Five Mile Lane carriageway.

Sector 1 Baseline:

3.4.4 Sector 1 features an east-west aligned section of the existing A48 and Sycamore Cross junction. The road runs adjacent to farmland, private gardens, and Cottrell Park Golf Club. It is a busy section of road used be a wide spectrum of motorists including commuters, haulage operators and holiday travellers.

3.4.5 The road surface is in good condition and the carriageway itself is relatively straight and has good visibility; the road widens at Sycamore Cross junction integrating dedicated turning lanes. Combined, these factors allow motorists to easily achieve the designated 40mph speed limit, creating high levels of TNV.

3.4.6 Receptors are distributed evenly along the road, positioned at the same topographical level as the road and are generally to the north of the carriageway. Domestic dwellings are the main sensitive receptors within the Sector.

Sector 2 Baseline:

3.4.7 The existing A4226 runs in a general north-south alignment within Sector 2, it lies adjacent to farms, domestic dwellings and farmland and in the vicinity of Redland Wood.

3.4.8 In Sector 2 there is one sweeping bend and overtaking is permitted in both directions, as a result traffic is able to move freely and quickly therefore TNV levels are likely to be at average or above average levels. However, there are a number of farm tracks and field accesses along the carriageway which may also help to reduce TNV levels as drivers may reduce speed in anticipation of emerging farm traffic.

3.4.9 There are no planned works or TNV sensitive receptors within Sector 2.

Sector 3 Baseline:

3.4.10 Blackland Farm (TNV-3-1) is situated to the north of Sector 3, where the road remains wide and overtaking is allowed. Approximately 200m south of Blackland Farm, the road narrows and overtaking is prohibited, the bends within this section of the sector are often tight and visibility is poor. Traffic speeds and therefore TNV are often reduced as appropriate to the conditions. Infrequent field accesses may also help to reduce traffic speed and noise as drivers may reduce speed in anticipation of emerging farm traffic. However if traffic is forced to slow rapidly and unexpectedly as a result of this emerging farm traffic brief yet large increases in TNV could be caused. Tall hedges and hedgebanks along the road verges may help attenuate against actual and perceived traffic noise.

3.4.11 Whitton Lodge (TNV-3-2) is situated on Five Mile Lane at a cross roads leading to Llancarfan in the west and Dyffryn in the east. Traffic along these routes would create high baseline TNV levels.

Sector 4 Baseline:

3.4.12 Sector 4 is a relatively narrow and straight section of the road running north-south with tall hedges on the adjacent verges.

3.4.13 There are no TNV sensitive receptors within this Sector.

Sector 5 Baseline:

3.4.14 In the northern section of Sector5, the carriageway slightly widens and overtaking is permitted. Traffic speeds are likely to be high as they pass the sensitive receptors (TNV-5-1 and TNV-5-2). TNV levels are likely to be average given that cars can travel at a steady speed, however the acceleration from overtaking vehicles may result in an increase in levels. The road then narrows slighty within into the southern section; where overtaking is prohibited past the entrance tracks to Sutton Fach Farm (TNV-5-3) and through a complex of tight blind bends where forward visibility is poor, as a result traffic speeds and TNV levels are reduced. Tall hedges on the road verges may help attenuate against actual and perceived traffic noise.

Sector 6 Baseline:

3.4.15 The existing Five Mile Lane is predominately positioned in a north-west to south-east alignment within Sector 6. The road passes through a section of Barry Woodlands, where the tree conopies that enclose the carriageway result in reduced light levels and potentially visibility problems. However, the road is generally straight and wide which could allow for high speed traffic and therefore high TNV levels.

3.4.16 Adjacent to the road are blocks of deciduous dense woodland and fields with generally tall hedge boundaries, these may help to attenuate the traffic noise and reduce the perceived noise.

3.4.17 There are no TNV sensitive receptors within Sector 6.

Sector 7 Baseline:

3.4.18 Traffic will have to slow and may become stationary when approaching the existing junction where Five Mile Lane meets the Waycock Cross roundabout with Port Road, Port Road West and Pontypridd Road, this may result in lower than average TNV level within this locality.

3.4.19 The road has similar characteristics to the Sycamore Cross Junction at the northern extent of Five Mile Lane and is used by a wide range of motorists using the route.

3.4.20 The buildings front directly onto the existing A4226 Waycock Road, Waycock Cross roundabout, Port Road West, Port Road and Pontypridd Road creating highly sensitive receptors.

3.5 Potential mitigation principles

3.5.1 The permanent mitigation techniques as noted in the DMRB (Volume 11 Section 3, Part 7, HA 213/08, Chapter 5/1) suitable for use on this scheme include:

3.5.2 **Environmental barriers** – These can be in the form of earth mounding or acoustic fencing of various types or a combination of the two. Conventional environmental barriers are not effective in reducing ground borne vibration and may be only partially effective against airborne vibration. The use of reflective and absorptive barriers could also be considered.

3.5.3 **Low-noise surfaces** – The principal benefit of low-noise surfaces is the reduction in mid and higher frequencies of noise generated by tyres. They are less effective in addressing low frequency noise generated by heavy vehicles that may be perceived as airborne vibration. These also create a relatively smooth running surface that in some cases can help to reduce ground borne vibration.

3.5.4 **Speed restrictions** – The effect of the speed of vehicles on noise level is one of the most fundamental in the noise prediction process. Above 40 km/h, noise level increases with the

speed of the vehicle and a reduction in speed would normally cause a reduction in noise level. In a similar way, the volume of traffic has a direct influence on the noise level.

3.5.5 TNV attenuation may also be achieved by adjusting the horizontal and vertical alignments of the proposed roads. Moving the road away from sensitive receptors or placing the road within a cutting would reduce potential TNV impacts. The proposed routes utilizing these techniques would generally create lower significance impacts.

3.5.6 During the construction phase temporary mitigation techniques should include controlling working hours and noise levels from sites with contractual restraints; erecting temporary environmental barriers around the construction site where land is available should also be considered. Compensating homeowners for the disruption and annoyance cause may also be necessary. Temporary re-housing whilst the works are completed and installing additional insulation and glazing should also be considered.

3.5.7 The merits of any mitigation technique intended to attenuate TNV should be assessed against any conflicts it may cause; for example an environmental "barrier may introduce an unacceptable visual intrusion or safety implication" (DMRB Volume 11 Section 3, Part 7, HA 213/08, Chapter 5/2) or it may be uneconomically viable to construct or compensate against.

3.6 Construction Impacts

3.6.1 The impacts caused during the construction phase could include constant above average noise and vibration from the works heavy plant and frequent sharp increases in levels caused by sudden impacts such as piling. Construction impacts are temporary and generally more localised than other impacts.

Construction Impact Mitigation

3.6.2 In order to mitigate against the temporary construction related impacts, a number of techniques should be considered, these include: proposing contract conditions to limit noise levels from the construction site and to restrict working hours. Erecting temporary measures such as

environmental barriers around the construction site where land is available installing additional insulation and glazing and temporary re-housing could also be considered.

3.7 Significance

3.7.1 Generally, as the road geometry, horizontal and vertical alignment and junction pattern is similar for all of the route options, the results of the assessment do not vary greatly. Overall, each route will have a neutral or a beneficial effect on the sensitive receptors and it is unlikely any route will cause a greater annoyance to the local community than what is already experienced. Please see Volume 3 for full appraisal Tables.

Table 3.1 : SUMMARY OF RESIDUAL EFFECTS

	ROUTE ALIGNMENT									
RECEPTORS	**BLUE**		**PURPLE**		**RED**		**ORANGE**		**GREEN**	
Sector 1	Yr 1 D.M	Yr15 D.S	Yr 1 D.M	Yr15 D.S	Yr 1 D.M	Yr15 D.S	Yr 1 D.M	Yr15 D.S	Yr 1 D.M	Yr15 D.S
TNV-1-1	-	+	-	+	-	+	-	+	-	+
Sector 2	**No Works Proposed**									
Sector 3										
TNV-3-1	-	-	-	-	-	-	-	-	-	-
TNV-3-2	-	0	-	0	-	0	-	0	-	-
			Preferred Option							
Sector 4	**No Sensitive Receptors**									
Sector 5										
TNV-5-1	-	+	-	-	-	-	-	+	-	-
TNV-5-2	-	-	-	0	-	0	-	-	-	0
TNV-5-3	-	++	-	+	-	++	-	+++	-	+
TNV-5-4	**N/A**		**N/A**		**N/A**		**N/A**		-	+++
							Preferred Option			
Sector 6	**No Sensitive Receptors**									
Sector 7										
TNV-7-1	-	-	-	0	-	0	-	0	-	0
			Preferred Options							

Sector 1 Preferred Route:

3.7.2 Each potential route requires the same scope of junction improvements; each of the five routes would ultimately create a beneficial, but not significant effect on the sensitive TNV receptors. In Sector 1 there is not a preferred route option.

Sector 2 Preferred Route:

3.7.3 There are no planned works in Sector 2. The construction noise emitted from works in Sectors 1 and 3 would not cause any significant impacts to dwellings within Sector 2.

Sector 3 Preferred Route:

3.7.4 All of the routes follow similar online horizontal alignments when passing Receptor TNV-3-1 (Blackland Farm and Tynant) and would all create the same permanent adverse, but not significant effect. At this point one route cannot be distinguished from the others.

3.7.5 The Red Route would require the demolition of the domestic dwelling Whitton Lodge (TNV-3-2); therefore the proposed route would not cause any TNV impacts on the receptor. However, the other factors involved in relocating the residents such as the economic and social would have significant impacts. Opting for the Red route and relocating the residents would not be a preferred option.

3.7.6 The Purple Route may result in slight beneficial impact to Whitton Lodge (TNV-3-2) as the proposed carriageway would be constructed approximately 140m east of the existing carriageway, to which the property currently abuts. Other routes (ie. Blue, Orange and Green) may also have slight beneficial impacts on other the receptors but not to the same extent as the Purple Route. In Sector 3 the Purple Route is the preferred route option.

Sector 4 Preferred Route:

3.7.7 There are no TNV sensitive receptors within Sector 4; therefore the alignment of the route would cause no effects. In Sector 4 there is not a preferred route option.

Sector 5 Preferred Route:

3.7.8 The impacts created by each route vary quite dramatically where the route horizontal alignments are at their most different. Following the implementation of mitigation measures, the Blue and Orange Route may have a beneficial impact on Grovelands Farm (TNV-5-1) and as the route will be further away from the existing carriageway. The other routes may cause adverse impacts as additional junctions in close proximity to the dwellings and improved carriageway designs may increase levels of TNV. Beneficial impacts at Grovelands Farm as a result of the Routes Blue and Orange will be offset by the adverse impacts caused at Northcliff Cottage (TNV-5-2) as the carriageway is moved closer to the dwelling. All routes, but in particular the Orange Route, provide beneficial effects for TNV-5-3 (Sutton Fach Farm).

3.7.9 The Green Route will provide a significant benefit for the residents of Sutton Mawr (TNV-5-4) as the main carriageway would be relocated approximately 300m away from their dwelling. This receptor has not been assessed for the Blue, Purple, Red and Orange Routes as the buildings are beyond the 300m study area.

3.7.10 Overall the Orange Route is the preferred option in Sector 5 as it creates greater significant beneficial impacts than the other routes.

Sector 6 Preferred Route:

3.7.11 There are no TNV sensitive receptors within Sector 6; therefore the route realignments would not cause any effects. In Sector 6 there is not a preferred route option.

Sector 7 Preferred Route:

3.7.12 Traffic will have to slow on the approach to a junction regardless whether it is a single or a double arrangement, this should therefore reduce local TNV levels. The double roundabout incorporated into the Blue Route may have a higher traffic capacity than the single roundabout options present in the other routes; this higher capacity may result in increased amounts of queuing and stationary traffic adjacent to the sensitive dwellings. This may cause an increase in TNV annoyance compared to the single roundabout options. Therefore the Purple, Red, Orange or Green Route is the preferred route option in Sector 7.

3.8 Overall Significance

3.8.1 Overall, the Orange Route is the preferred route option when assessed under Traffic Noise and Vibration impact criteria. Following the installation of appropriate mitigation the route could offer a significant positive benefit on one occasion and it does not produce a significant adverse effect to receptors along its whole length. The Orange Route would cause the least noise annoyance to the local community.

3.9 Limitations, Assumptions and Further Work

3.9.1 It has been assumed that junctions and roundabouts on the constructed roads would slow traffic and reduce TNV levels at that point, whereas wide, straight sections of the road would allow fast moving traffic and therefore the highest levels of TNV.

3.9.2 Other assumptions include: the predicted increase in traffic volume (from 7000 VPD up 9-13% by the baseline year under central growth conditions or up 12-16% under high growth conditions. For assessment year 15 (2029) the Do-Minimum increase may be 21-26%. Improvements to Five Mile Lane may increase this to 38-48% on the baseline year causing an increase in the baseline TNV level. The assessment assumes that within the next fifteen years significant steps will not be made to only use hybrid or electric cars which emit an extremely low level of noise and vibration.

3.9.3 Generalised TNV criteria have been established for the purposes of this assessment - traffic moving at a constant high speed would emit more noise and vibration than traffic decelerating on the approach to a junction or roundabout than accelerating on completing the manoeuvre.

3.9.4 The main limitation of this study was the sole use of desk-based assessment as without the use of complex measuring and data modelling equipment the actual impacts cannot be measured.

3.9.5 Further work should involve completing the Stage 2 WelTAG and the DMRB methodology of assessment as described in the documents.

4 Local Air Quality

4.1 Introduction / Impact Description

4.1.1 The WelTAG guidance states "Exhaust emissions from transport sources disperse in the air, affecting its quality. A deterioration in local air quality can cause damage to human health while certain pollutants can affect the world's climate (contributing to global warming through greenhouse gas emissions)." The two main local pollutants that affect local air quality are particles (PM^{10}) and nitrogen dioxide (NO^2). This chapter aims to draw conclusions on which of the five proposed new routes for the A4226 Five Mile Lane would cause least impacts with regards to local air quality and greenhouse gasses for the local community.

4.1.2 The existing air quality varies and will depend on a number of factors including: vehicle operation (i.e. average speed, variation in speed, road geometry and engine temperature), vehicle type and fuel type (i.e. petrol or diesel).

4.2 Appraisal Methodology

4.2.1 The methodology used to assess the impacts on Local Air Quality and Greenhouse Gas Emissions as a result of the proposed road scheme on the A4226 Five Mile Lane follows current 'best practice' WelTAG and DMRB guidance published by the Welsh Assembly Government and the Highway Agency respectively.

4.2.2 The process adopts the standard approach using baseline desktop studies to identify potential sensitive receptors likely to be significantly affected by the proposed scheme and the potential effects brought about by the proposed development. The chapter will then judge the magnitude of effects and undertake a qualitative assessment of their significance following implementation with a quantitative assessment being undertaken at Stage 2. Impacts have been assessed against the baseline (Do Minimum), 1st Year Do Something (worst case scenario) and 15 Year Do

Something for each receptor and road alignment option. A description of the practical mitigation techniques available is also provided.

Double Counting

4.2.3 In order to avoid double-counting of impacts, where possible, receptors have been assessed in the chapters according to where the impacts experienced will be most significant.

Cumulative Effects

4.2.4 At this stage, there haven't been any potential cumulative air quality effects predicted or assessed as a result of completing this scheme.

4.3 Study Area / Sensitivity of Receptors

4.3.1 The investigation was restricted to within a 200m buffer of each of the five potential routes, since "local air quality impacts are likely to be highly localised in the vicinity of the polluting sources" (WelTAG p112). Please refer to figures 4.1-4.5.

4.3.2 All potential receptors within the 200m zones were mapped and their building function recorded.

4.3.3 Residents whose dwellings create the frontage to the proposed route were considered to be high sensitivity receptors. Domestic dwellings within the 200m zone that were considered unlikely to experience a noticeable change in air quality levels were discounted form further assessment at this point in the process. Preliminary receptors with low sensitivity such as barns, silos and storage facilities were also discounted from further assessment. Buildings of similar location, aspect, function and sensitivity were grouped and appraised in unison, as the potential impacts would be equal at each address.

4.3.4 The main focus of the study has been placed on air quality sensitive receptors, which could potentially experience significant levels of effect as a result of the implementation of the scheme.

4.3.5 The air quality sensitive receptors that have been assessed are: private dwellings and business premises and all designated sites (SAC's, SPAs and SSSIs), which are located with 200m study area. Any receptors outside of this study area boundary have not been assessed, as it is assumed that they are unlikely to be significantly affected by the proposals in terms of air quality.

Discounted Dwellings and Premises

Redlands Cottage, Redlands House and Ash Tree Cottage

4.3.6 There will not be any construction works in the immediate vicinity of Redlands Cottage, Redlands House and Ash Tree Cottage and the domestic dwelling on the opposite side of the carriageway, any temporary nuisance caused by passing works traffic would not be significant, once mitigation measures have been put in place. On completion the air quality levels at the properties will be comparable to baseline.

Welsh Hawking Centre

4.3.7 The Welsh Hawking Centre is not considered to be a sensitive AQ receptor despite being located off the existing road within the 200m potential impact zone created by each of the five route options as the likely impacts on air quality arising from the alternative route alignments would be comparable to those arising from traffic using the existing Five Mile Lane.

4.3.8 The Blue Route alignment would potentially create a slight positive effect, as the main carriageway carrying the bulk of the fast moving traffic would be moved further from the Hawking Centre beyond a screen of mature deciduous trees. This impact may be beneficial but it would not be significant.

4.3.9 The alternative options would involve improving the existing road, following the same alignment. However it is predicted that existing mature vegetation would be capable of ameliorating though confinement any rises in air pollution, therefore levels would remain comparable to those of the baseline.

Barry College of Further Education

4.3.10 Barry College of Further Education is currently not in use as an educational facility and therefore not considered to be a sensitive receptor. The site is also set back approximately 120m from the existing A4226 and is separated from the road by dense deciduous woodland, which is likely to mitigate any deterioration in air quality levels. None of the five route alignments would move the carriageway closer to the buildings and therefore no deterioration in air quality would occur.

4.4 Baseline Conditions

4.4.1 The following paragraphs outline the existing road, features and sensitive receptor types that are located for each sector along the existing A4226 – Five Mile Lane carriageway.

Sector 1 Baseline:

4.4.2 Sector 1 features an east-west aligned section of the existing A48 and Sycamore Cross junction. The road runs adjacent to farmland, private gardens, and Cottrell Park Golf Club. It is a busy section of road used by a wide spectrum of motorists including commuters, local residents, haulage operators and visitors.

4.4.3 The road surface is in good condition and the carriageway itself is relatively straight and has good visibility; the road widens at Sycamore Cross junction integrating dedicating turning lanes. The slow moving or stationary traffic at the junction may locally cause higher than average levels of pollutants within the air.

4.4.4 Domestic dwellings are the main sensitive receptors within the sector and are predominately located to the northwest of the existing carriageway.

Sector 2 Baseline:

4.4.5 The existing A4226 runs in a general north-south alignment within Sector 2, it lies adjacent to farms, domestic dwellings and farmland and in the vicinity of Redland Wood.

4.4.6 Within the sector, three sensitive domestic dwelling receptors have been identified. These receptors are distributed to the sector northern and southern extents at the same approximate topographical level at the road.

4.4.7 In Sector 2 there is one sweeping bend and overtaking is permitted in both directions, as a result traffic is able to move freely and quickly therefore air quality is likely to be at average or above average levels. However, there are a number of farm tracks, field access and other informal junctions along the section of road, which could cause traffic to slow rapidly and unexpectedly. This may cause deterioration in local air quality levels.

Sector 3 Baseline:

4.4.8 Blackland Farm (TNV-3-1) is situated to the north of Sector 3, where the road remains wide and overtaking is allowed. Approximately 200m south of Blackland Farm, the road narrows and overtaking is prohibited, the bends within this section of the sector are often tight and visibility is poor. Traffic speeds and therefore reduced as appropriate to the conditions, resulting in slower moving traffic within this area. Infrequent field access and informal junctions may also help to reduce traffic speed. As a result local air quality within this Sector may be lower than average.

4.4.9 There are two sensitive receptors within Sector 3, Blackland Farm (Receptor AQ-3-1) and Whitton Lodge (Receptor AQ-3-2). The former is situated to the northern boundary of the Sector, while Whitton Lodge is situated on Five Mile Lane at a cross roads leading to Llancarfan in the west and Duffryn in the east. Traffic within this sector generally moves freely, therefore air quality levels would be expected to be typical for the volume of traffic that passes along it. However levels may deteriorate close to the crossroads near Whitton Lodge.

Sector 4 Baseline:

4.4.10 Sector 4 is a relatively narrow and straight section of the road running north-south with tall hedges on the adjacent verges.

4.4.11 There are no sensitive receptors within this sector.

Sector 5 Baseline:

4.4.12 In the northern section Five Mile Lane is relatively wide and overtaking is permitted and traffic speeds are likely to be high at they pass the sensitive receptors. Air quality is likely to be average given that cars can travel at a steady speed, however the acceleration from overtaking vehicles may result in deterioration in air quality. The road then narrows into the southern section, where overtaking is prohibited past the entrance tracks to Sutton Fach Farm and Sutton Mawr through a complex of tight blind bends, as a result traffic speeds are reduced, therefore local air quality may be lower than expected within this section of the Sector.

Sector 6 Baseline:

4.4.13 The existing Five Mile Lane is predominately positioned in a north-west to south-east alignment within Sector 6. The road is generally straight and wide which could allow for traffic to travel at steady speeds.

4.4.14 Adjacent to either side of the road are blocks of deciduous dense woodland and fields with hedge boundaries. The woodland forms part of the larger Barry Woodlands SSSI and is considered to be a sensitive receptor.

Sector 7 Baseline:

4.4.15 Traffic will have to slow and may become stationary when approaching the existing junction where Five Mile Lane meets the Waycock Cross roundabout with Port Road, Port Road West and Pontypridd Road, this may result in lower than average air quality within this locality.

4.4.16 The road at Waycock Cross has similar characteristics to the Sycamore Cross Junction at the northern extent of Five Mile Lane and is used by a wide range of motorists using the route.

4.4.17 The buildings front directly onto the existing A4226 Waycock Road, Waycock Cross roundabout, Port Road West, Port Road and Pontypridd Road creating highly sensitive receptors.

4.5 Construction Impacts

4.5.1 During the construction phase of the works air quality is likely to temporarily reduce for receptors within close proximity of the works, due to associated traffic and construction dust. Mitigation measures such as wheel and body washing, sheeting of lorries prior to leaving site, spraying of roads, and provision of visual barriers, would be carried out to minimise the effects of dust during the construction period.

4.6 Potential mitigation principles

4.6.1 The permanent mitigation techniques as noted in the DMRB (Volume 11 Section 3, Part 1, HA 207/07, Chapter 3/6) suitable for use on this scheme include:

- Increasing the distance between the road and the sensitive location. Realignment by only a few tens of metres may provide significant benefits.
- Orientation of the road relative to locally prevailing winds. If a route can be chosen so that a sensitive location tends to be upwind of the road, average concentrations at that location will be lower than if the sensitive locations tend to be downwind.
- Junctions and intersections would be sited to minimize the impact on air quality at sensitive locations. Slow traffic negotiating intersections generally produces greater amounts of pollution than freely flowing traffic.
- Placing the road in a cutting or on an embankment can increase the distance between a roadside receptor and the vehicles thus allowing more time for dispersion and reducing concentrations at the receptor.

4.7 Overall Significance

Table 4.1: SUMMARY OF RESIDUAL EFFECTS

	ROUTE ALIGNMENT									
RECEPTORS	**BLUE ROUTE**		**PURPLE ROUTE**		**RED ROUTE**		**ORANGE ROUTE**		**GREEN ROUTE**	
Sector 1	WC	RE	WC	RE	WC	RE	WC	RE	WC	RE
AQ-1-1	- -	++	- -	++	- -	++	- -	++	- -	++
Sector 2	**No Works Proposed**									
Sector 3										
AQ-3-1	-	++	-	++	-	++	-	++	-	++
AQ-3-2	- -	+	-	++	0	0	-	+	-	+
			Preferred Option							
Sector 4	**No Sensitive Receptors**									
Sector 5										
AQ-5-1	-	++	- -	-	- - -	-	- -	-	- - -	-
AQ-5-2	- - -	-	0	0	- - -	- -	- - -	- -	- - -	- -
AQ-5-3	N/A		-	++	-	+ +	N/A		-	+ +
	Preferred Option									
Sector 6										
AQ-6-1	0	0	0	0	0	0	0	0	0	0
	Preferred Options									
Sector 7										
AQ-7-1	- - -	-	- -	0	- -	0	- -	0	- -	0

Note

WC = Worst Case (i.e. 1st Year Do Something)
RE = Residual (i.e. After mitigation measures have been put in place)

Sector 1 Preferred Route:

4.7.1 Each potential route requires the same scope of junction improvements; each of the five routes will ultimately create a beneficial, effect on the sensitive air quality receptors.

1 there is not a preferred Do Something option.

Sector 2 Preferred Route:

4.7.2 There are no planned works in Sector 2.

Sector 3 Preferred Route:

4.7.3 All of the routes follow the same online position when passing Receptor AQ-3-1 (Blackland Farm and Tynant) and would all create, once mitigation measures have been put in place, significant beneficial effects. At this point one route cannot be distinguished from the others.

4.7.4 The Purple Route may result in significant beneficial impacts to Whitton Lodge (AQ-3-2) as the proposed carriageway would be constructed approximately 140m east of the existing carriageway, to which the property currently abuts. Other routes (ie. Blue, Orange and Green) may also have beneficial impacts on other receptors within the sector, as the proposed road would be constructed at a greater distance than the existing road, however these impacts are unlikely to be significant.

4.7.5 The Red Route would require the demolition of the domestic dwelling Whitton Lodge; therefore the proposed route would not cause any air quality impacts on the receptor. However, the other factors involved in relocating the residents such as the economic and social would have significant impacts. Opting for the Red route and relocating the residents would not be a preferred option.

In Sector 3 the Purple Route is the preferred Do Something option

Sector 4 Preferred Route:

4.7.6 There are no air quality sensitive receptors within Sector 4; therefore the alignment of the route would cause no effects.

In Sector 4 there is not a preferred Do Something option.

Sector 5 Preferred Route:

4.7.7 The Blue Route may have some beneficial impacts, on Grovelands Farm (AQ-5-1) once mitigation measures have been put in place, as the route will be further away from the existing carriageway. For other routes, impacts are likely to be adverse due to the effects of the adjacent roundabout, as the accelerating/decelerating traffic causes deterioration in air quality

within this locality. Impacts from all routes on receptor AQ-5-2 (Northcliff Cottage) are likely to be neutral to adverse. Adverse impacts are likely to be greatest if the Red, Orange or Green Route is selected as the feeder road for the roundabout passes within a few metres of the property.

4.7.8 The Purple, Red and Green Routes may result in benefits to receptor AQ-5-3 (Sutton Farm), as the proposed route will be at a greater distance from the farm than the existing carriageway. The Blue and Orange Routes do not impact on the receptor and as they are outside of the 200m-study area, they have not been assessed.

In Sector 5 the Blue Route is the preferred Do Something option.

Sector 6 Preferred Route:

4.7.9 All of the routes follow the same online position when passing Receptor AQ-6-1 (Barry Woodland SSSI) and are unlikely to impact on air quality, as the existing woodland may potentially absorb any changes in air quality. At this point one route cannot be distinguished from the others.

In Sector 6 there is not a preferred Do Something option.

Sector 7 Preferred Route:

4.7.10 The Blue Route, which will incorporate a double roundabout, may result in slower moving traffic for a longer period of time compared to a single roundabout, especially at peak hours. Therefore it may result in greater effects on air quality than the other routes. Routes 2-5 will incorporate the existing roundabout, therefore depending on the volume of traffic, vehicles may be able to move away from the sensitive receptors more quickly, resulting in less pollutants being emitted into the atmosphere.

In Sector 7 the Purple, Red, Orange or Green Route is the preferred Do Something options.

4.8 Overall Result

4.8.1 Overall, the Purple Route is the preferred Do Something option when assessed in terms of Air Quality impact criteria alone.

4.9 Limitations, Assumptions and Further Work

4.9.1 It has been assumed that junctions and roundabouts on the constructed roads will slow traffic and therefore reduce existing air quality levels at that point, whereas straight sections of the road will allow for traffic to move at a steady speed and therefore emissions may be lower.

4.9.2 Other assumptions include: vehicle emission standards will be tightened approximately every five years, resulting in a decrease in emissions of particles and nitrogen oxide. It is also assumed that the predicted national increase in traffic volume (amount) will happen causing an increase in the emissions of potentially harmful pollutants.

4.9.3 The main limitation of this study was the sole use of desk-based assessment as without the use of complex measuring and data modelling equipment the actual impacts cannot be measured.

4.9.4 Further work would involve completing the Stage 2 WelTAG and the DMRB methodology of assessment as described in the documents.

5 Landscape and Vehicle Travellers Effects

5.1 Introduction

5.1.1 This chapter describes the potential effects of the scheme on the landscape of the area surrounding the proposed road alignments. It assesses three specific sub-topics: landscape character, visual amenity and vehicle travellers.

5.1.2 This chapter provides a summary of the baseline conditions established by the desk-based studies and field surveys, and assesses the likely effects of the scheme on landscape resources during construction and in the short term as a worst-case scenario. Mitigation measures to integrate the scheme into the landscape and minimise adverse effects are considered and the residual effect on the landscape resource assessed. In conclusion recommendations are put forward to further minimise adverse effects towards adoption of best route option.

5.1.3 Field surveys and desk-based studies conducted since the completion of the Stage 1 Assessment report (SBC 2008) include landscape features surveys, appraisal of landscape character, landscape quality, visual envelope and receptor mapping, and review of CCW's LANDMAP data.

5.2 Landscape Effects Appraisal Methodology

5.2.1 The assessment has been undertaken in accordance with the guidance set out under the appraisal of impacts on landscape as set within the WelTAG framework; in turn referring to the guidance set out in detail in DMRB as well as by the Landscape Institute and Institute of Environmental Management and Assessment guidelines:

- "WelTAG" v7.1 June 2008
- "DMRB volume 11, section 3, part 5 Landscape Effects" August 2008
- "Guidelines for Landscape and Visual Impact Assessment" Landscape Institute/ Institute of Environmental Management & Assessment 2002
- Countryside Council for Wales LANDMAP methodology

5.2.2 The function of this section of the ISAR is to collate baseline surveys completed following the Stage 1 Assessment report (SBC 2008) and assess the potential effects of progressed route alignment options, focusing on significant effects as well as those that differentiate between route alignment options. LANDMAP data supplemented the analysis and categorisation of landscape character, visual amenity and light levels at night.

Assessment of Significance on Landscape Character

5.2.3 Landscape effects would be derived from physical changes to the landscape that may cause changes in character and how the landscape is experienced and valued. The landscape classification and evaluation is the baseline against which the effect of the proposed scheme is assessed.

5.2.4 Assessment of the significance of effects on landscape character is the result of a combination of magnitude of change and the capacity of the landscape to accommodate or accept the change that is predicted to occur.

5.2.5 In applying the criteria, the potential beneficial as well as adverse effects of the scheme have been taken into account. Assessment of magnitude is based on factors including geographical extent, prominence, degree of alteration/intrusion and perceived change, reversibility, duration and potential mitigation. In assessing how the alignments would affect the existing landscape the following factors are considered:

- The extent to which the road would be visible in the landscape;
- The character of the landscape and its capacity to accept changes of the type and scale proposed;
- The extent to which effects can be mitigated and the road can be integrated into the landscape.

5.2.6 The following criteria have been used to define magnitude:

- **High Magnitude**: The scheme or specific effect will result in substantial loss or major alteration to key elements of the landscape resource to the extent that there is a fundamental change to landscape character.

- **Medium Magnitude**: The scheme or specific effect will result in loss or alteration to key elements of the landscape resource to the extent that there is a partial change to landscape character.
- **Low Magnitude**: The scheme or specific effect will result in minor loss or alteration to key elements of the landscape resource to the extent that there may be some slight perception of change to landscape character.
- **Negligible Magnitude**: The scheme or specific effect will result in very minor loss or alteration to key elements of the landscape resource and there would be no fundamental change to landscape character.

5.2.7 Landscape capacity refers to the degree to which a particular landscape character area (LCA) or type is able to accommodate change of a specific type without significant effects in its character, or overall change of landscape character type.

5.2.8 Consequently, capacity is based on the type of development proposed, a consideration of sensitivity, landscape value (quality, situation and rarity) attached to the landscape and visibility from within the LCA. For the purposes of this landscape character assessment the following criteria have been adopted for assessing capacity.

- **Low Capacity**: A landscape of high value, sensitive to this form of development, or where views of the road scheme may be visible from a large proportion of the character area. As a consequence significant effects on landscape character or quality are likely.
- **Moderate Capacity**: A landscape that has medium sensitivity to the type and form of development proposed and any change caused by the proposed development would be unlikely to have a significant effect on landscape character or quality that could not be mitigated against.
- **High Capacity**: A landscape of low value, not sensitive to this type of development, unlikely to be within a designated landscape and contain few other constraints imposed by landscape character elements. Or where dominant views from within the LCA of the proposed road scheme are unlikely. As a result development of the type proposed is very unlikely to have a significant effect on landscape character or quality.

5.2.9 As stated above, the relationship and combinations of magnitude and capacity determine the significance of landscape effects. Significance increases in line with the capacity of the landscape character area (LCA) and the magnitude of effect. Differentiation is made between the sensitivity of particular receptors based upon their value within the landscape. A greater landscape capacity or a smaller magnitude of landscape effect moderates and/or lessens the significance of effect. The table below sets out the derivation of significance for effects on landscape character.

Table 5.1 Significance of Effect on Landscape Character

Magnitude of Effect on Landscape Character	Landscape Capacity		
	Low	**Moderate**	**High**
High	Substantial*	High-Moderate*	Moderate
Medium	High-Moderate*	Moderate	Slight
Low	Moderate	Slight	Slight-Neutral
Negligible	Slight	Slight-Neutral	Slight-Neutral

Note: *Substantial and High-Moderate is considered significant in terms of the EIA Regulations and as such has been asterisked.*

Assessment of Significance on Visual Amenity

5.2.10 Effects on visual amenity relate to changes in the composition of views and people's responses to these changes which have been assessed at locations frequented by members of the public such as dwellings and public rights of way. Relevant considerations for the visual effect analysis included:

- The magnitude of the change to the visual quality that would be caused by the proposed road alignments including length of road visible, the roads potential prominence, the distance between road and receptor, and the context of the view;
- The receptor location, number of people within each potential receptor group and the nature of these receptor groups and their sensitivities (e.g. will people view the site during work or leisure activities, whilst in transit, etc.); and
- The existing visual character and quality of the view (including whether it is subject to landscape designations, the presence of positive or negative visual detractors, etc.).

5.2.11 The level of significance of effect upon visual amenity is determined by correlating the magnitude of effect with the sensitivity of receptors. When considering the potential visibility of the scheme, the following features are taken into account:

- the level of the road relative to the existing ground level (including mounds, bunds, cuttings, false cuttings);
- the main carriageway, side roads, junctions, lighting and structures;
- traffic on the road (screened traffic is by a barrier (for example a cutting or woodland) of over 4 metre deep/tall, whereas 'not fully screened' refers to the fact that larger vehicles would be visible but smaller cars are not); and
- loss of landscape elements.

5.2.12 The magnitude of effect on visual amenity is based upon the following criteria:

- **High Magnitude**: Where the scheme will result in a significant or dominant and immediately apparent feature of the view that affects and changes the overall character of the view and to which other features become subordinate.
- **Medium Magnitude**: Where the scheme forms a visible and recognisable new element within the overall view and is readily noticed by the viewer without changing the overall nature of the view.
- **Low Magnitude**: The scheme will constitute a minor component of the wider view, which might be missed by the casual observer. Awareness of the development will not have a marked effect on the overall quality of the view.
- **Negligible Magnitude**: The presence of the proposed road scheme has no effect on the perception of the landscape**.**

5.2.13 Receptor type is a key factor in determining sensitivity, although other factors listed can influence the sensitivity of the given receptor to visual change.

- **High Sensitivity**: Residents with views towards the route alignments or people undertaking recreation where the landscape within which the road is seen is the primary reason for attraction (e.g. walkers, hikers, riders, scenic route users). Receptors are more likely to be within a recognised designated landscape and could be attracted to visit more frequently, or stay for longer by virtue of the view.

- **Medium Sensitivity**: Outdoor workers (farm workers etc.) and people undertaking recreational pursuits where the landscape within which the scheme is seen is not the primary reason for attraction (e.g. golfers, water based activities, theme and adventure parks, historic sites, parks and gardens, minor road users). This category normally includes residents with indirect views towards the development but for the purposes of this study the worst-case scenario is recorded i.e. all residents are high sensitivity. Receptors are less likely to be within a recognised designated landscape and could be attracted to visit more frequently, or stay for longer by virtue of the facilities and features of the particular attraction.
- **Low Sensitivity**: People travelling through the landscape (by car, train, bus etc.). Users of indoor workplaces and indoor community facilities. Receptors are unlikely to be within a recognised designated landscape and are most likely to be present at a given viewpoint by virtue of some other need or necessity unrelated to the landscape.

5.2.14 For brevity of reporting receptor groups have been established where the effects on a group of adjacent receptors would be similar. Where these groups include both residents and outdoor workers, the effect on residents' visual amenity has been recorded as the worst-case scenario.

5.2.15 Receptors assessed in detail are those that are both likely to be significantly affected by the road scheme and fall within the Visual Envelope as shown on the Visual Envelope Map.

Visual Envelope Map (VEM)

5.2.16 The maximum potential extent of the proposed road's visibility has been determined using computer generated data to create a Visual Envelope Map (figure 5.2 VEM). The computer visibility analysis does have a number of limitations. VEMs prepared solely on the basis of the digital terrain model do not take into account the screening effects of surface features such as woodland, hedges and hedgebanks, walls, buildings and other local landscape features and local topographic variations. The VEM was generated to where vehicles 4 metres tall and less would be visible but only from 11 points along the roads length. Consequently, the VEM diagram should be considered as the worst-case and be used as a tool in determining general theoretical visibility rather than absolute visibility prior to being verified in the field which was done at seven points along the existing road and across the alignment corridor.

5.2.17 Private dwellings, public buildings and public footpaths that fall within the field verified Visual Envelope or any that fall out with it due to the location in comparison to the verification point are included within the visual impact assessment.

5.2.18 The table below, based on Landscape Institute Guidelines, sets out the derivation of significance for effects on visual amenity:

Table 5.2 Significance of Effect on Visual Amenity

Magnitude of Visual Effect	Sensitivity of Receptor		
	High	**Medium**	**Low**
High	Substantial*	High-Moderate*	Moderate
Medium	High-Moderate*	Moderate	Slight
Low	Moderate	Slight	Slight-Neutral
Negligible	Slight	Slight-Neutral	Slight-Neutral

Note: *Substantial and High-Moderate is considered significant in terms of the EIA Regulations and as such has been asterisked.*

5.2.19 The above derivations of significance can be translated into WelTAG's seven point scale used in the comparison between options and environmental assessment topics:

Table 5.3 Definition of the '7-Point Scale' For Use in Appraisals

Significance Category	WelTAG Scale	Symbol	SEA Definition	Example (Landscape effects)
Substantial	Large Positive Benefit	+ + +	Significant beneficial effect	Very few proposals will merit this score.
High-Moderate Moderate	Moderate Positive Benefit	+ +	Significant beneficial effect	Proposals enhance landscape because they: • fit in very well; • have potential to restore characteristic features; • enable a sense of place and scale; • enable a sense of quality; and • further government objectives.
Slight	Slight Positive Benefit	+	Beneficial effect, but not significant	The proposals: • fit in well; • incorporate mitigation; • enable a sense of place and scale maintain or enhance existing character outside protected areas; and • avoid conflict with government policies.

Slight-Neutral	No effect or neutral effect	**0**	No effect	The proposals: • complement the landscape; • incorporate mitigation; • avoid being visually intrusive and don't affect tranquility; • maintain existing landscape character outside protected areas; and • avoid conflict with Government policies.
Slight	Slight Adverse Effect	**-**	Adverse effect, but not significant	The proposals: • do not quite fit the landscape/ townscape; • impact on certain views; • cannot be completely mitigated; • affect an area of recognised landscape quality; and • conflict with local authority policies.
Moderate	Moderate Adverse Effect	**- -**	Significant Adverse effect	The proposals: • are out of scale with the landscape/ townscape; • are visually intrusive; • cannot be fully mitigated; • will have an adverse impact on a landscape/townscape of recognised quality; and • conflict with local and national policies.
High-Moderate				
Substantial	Severe Adverse Effect	**- - -**	Significant adverse effect	Proposals are: • at complete variance with the landscape; • highly visual and intrusive; • damaging to characteristic features; • elements of change in very high quality or highly vulnerable landscapes; • not capable of being mitigated for; and • not reconcilable with Government policy.

Source: WelTAG appendices pg E.9

Assessment of Road Lighting and Signage

5.2.20 The assessment does not consider the effects of signage or gantries. This would be undertaken at the next stage of the EIA process once signage design has been progressed.

5.2.21 The effects of lighting have been included within the visual amenity assessment but with consideration also for landscape character. At this stage the assessment uses LANDMAP's night time pollution analysis as the baseline against which to assess the unmitigated effects of proposed road lighting proposed around junctions.

Vehicle Travellers Effects Appraisal Methodology

5.2.22 The appraisal of effects on Vehicle Travellers follows methodology set out in DMRB; there is no equivalent under WelTAG. The objective is to undertake sufficient assessment to identify the

factors and effects concerning vehicle travellers to be taken into account by the Design Organisation in developing and refining route options in agreement with the Overseeing Department's Project Manager.

5.2.23 The DMRB Volume 11, Section 3, Part 9 was used to provide guidance on the assessment. The effects on vehicle travellers of the proposed scheme were assessed using the following criteria:

- View from the road; and
- Driver Stress.

5.2.24 Assessment of effects on vehicle travellers has been combined with the landscape assessment:

- as both topics are assessed against the same baseline landscape character;
- to avoid double counting; and
- when considering potential mitigation measures the effect of views from and along the road have been taken into account alongside effects on visual amenity in views towards the road as well as effects on landscape character due to the scheme.

View from the Road

5.2.25 This criterion determines whether the new alignments provide opportunities for views to the landscape for road users and the quality of those views. Views from the road are assessed taking into account wide differences between route options, landscape character and quality, extent of exposure to scenery and any especially good or bad potential views along the route.

5.2.26 Four categories are used in assessing travellers' ability to see the surrounding landscape:

- **No view**: road in deep cutting or contained by earth bunds, environmental barriers or adjacent structures.
- **Restricted view**: frequent cuttings or structures blocking the view.
- **Intermittent view**: road generally at ground level but with shallow cuttings or existing barriers at intervals (such as hedgerows).
- **Open view**: appropriating DMRB's guidelines to the study area an open view has been defined for this study as a view extending to the landscape – i.e. are on embankment or level with landform.

5.2.27 Hedgerows have not been considered as screening elements within the assessment of views from the road for two primary reasons:

- As an important landscape element hedgerows would be a likely mitigation measure to minimise adverse effects on landscape character and visual amenity, but mitigation principles are yet to be agreed; and
- Views from the road are a secondary consideration with consideration first for integrating the road in the landscape, and other potential significant effects, so the potential views described would be sought along lengths where not prohibited by mitigation measures.

Driver Stress

5.2.28 Driver stress is defined for the purposes of environmental assessment as the adverse mental and physiological effects experienced by a driver traversing a road network. The aim of reducing driver stress is to maintain driving standards, reduce risk taking, reduce chances of driver fatigue and maintain concentration.

5.2.29 Driver stress has three main components: frustration, fear of potential accidents, and uncertainty relating to the route being followed. An initial evaluation of these factors is qualitatively described in comparison to the do minimum baseline.

Double Counting

5.2.30 Where applicable overlap between criteria and double counting has been identified and then assessed under one criterion as far as practicable at this stage to avoid distortion of the importance of certain elements in the appraisal process:

- Heritage – includes assessment of historical landscapes, Scheduled Ancient Monuments and registered parks and gardens as applicable
- Biodiversity – includes assessment of effects on biodiversity due to changes to the vegetative resource and assessment of lighting effects on bats
- Social Impacts – includes assessment of pedestrian routes, cycle routes, bridleways and community facilities.

- Land Use – includes assessment impacts of Red option of Whitton Lodge which is not included under visual amenity here as it would be demolished if the Red option was taken forward in its current form.

Cumulative Effects

5.2.31 Cumulative landscape effects will be assessed during upcoming stages if applicable.

5.3 Baseline Conditions

Wider Landscape Context

5.3.1 The Vale of Glamorgan is an attractive and productive lowland landscape on the north coast of the Severn estuary and Bristol Channel. The county is bordered by the large urban centres of Cardiff to the east, Bridgend to the west and by the M4 to the north and coast to the south. It covers an area of approximately 335 square kilometres of which about 70% is agricultural land[5].

5.3.2 There are three broad character types within the Vale in visual terms. The Rural Vale, The South East Developed Vale and The Coast; The Rural Vale is further divided into the North Rural Vale and the South Rural Vale divided by the A48 Roman Road.

5.3.3 Five Mile Lane forms a broad boundary between two variations of the South Rural Vale connecting to Barry within The South East Developed Vale. The underlying Carboniferous and Liassic Limestone is the basis to the characteristics of fertile well drained soils and hence cultivation and settlement since Roman times. Lowland plateaux with a gently undulating surface dips into shallow or steep wooded valleys; the landscape is dissected by picturesque valleys to the west and a more complex hill and basin system to the east of Five Mile Lane. Barry (the Vale's largest settlement) and large-scale detractors influence rural perception within the managed farmland from high ground.

5 White Consultants 1999 ' Landscapes Working for the Vale of Glamorgan'

5.3.4 Prevalent in the South Rural Vale is a Norman nucleated settlement pattern based on manor and church. Today the South East Vale is the most developed with Barry at its heart. The modern settlement of Barry is effectively a conurbation of a number of villages that have built up since the 19th century as a result of industrial activity at Barry docks. The western edge of the study area touches on the Llancarfan Historic Landscape as listed on the Register of Landscapes of Outstanding Historic Importance in Wales[6]. For further details see chapter 8 Heritage.

Study Area

5.3.5 Progressing from Stage One the study area has become focused on the existing road and proposed route option corridors, stretching from the limestone ridge and associated Roman A48 Road in the north down a broad southerly extending ridge finger, a remnant of limestone plateau and the watershed between the Waycock and Llancarfan valleys. The high ground gives way to the Lower Waycock Valley before rising again through woodland to meet the coastal plateau between Cardiff Airport in the West and Barry in the East.

Landscape Evaluation

5.3.7 Please refer to Figure 5.3 depicting results of landscape features surveys and Landscape Character Areas. Although the landscape has been classified into broadly homogenous units, or LCA's, the landscape displays common characteristics across the study area:

- Land cover and landscape pattern are closely related to elevation and topography.
- Main land use is pastoral agriculture.
- Landscape trends relate to changing agricultural practices (removal of hedgerows to create larger fields or to replace with fences) and small scale infilling (new dwellings around existing farmsteads).

6 *"Part 2.1 Register of Landscapes of Outstanding Historic Interest in Wales",* Cadw; Welsh Historic Monuments Cardiff 1998

5.3.8 The classification and evaluation of the baseline landscape is derived from LANDMAP (bracketed and numbered LCA's), but refined during the course of the study to align the wider analysis to the local study area. The current and proposed alignments travel through the six following character areas:

The Ridgeline and Ridgeline Slopes

5.3.9 Along the northern reaches of the Llancarfan and Waycock catchments a limestone ridge runs east-west, along which linear historic settlements and an historic Roman Road run. The landscape character is evidently susceptible to change. Mature trees along the road and around settlements filter and screen expansive views in parts. Redlands Farm and neighbouring houses, including new builds, along northern reaches of Five Mile Lane are exposed to view.

5.3.10 Running south from the Ridgeline is a southerly extending ridge finger or remnant limestone plateau and the watershed between the Waycock and Llancarfan Valleys. In the north the landscape is characteristic of rolling ridge slopes and to the south is a plateau landscape.

The Plateau

5.3.11 At the south end of ridge finger this landscape type is characterised by exposed high ground (88 metres AOD) and expansive views. Field sizes are larger with a greater proportion of arable farming, bound often by short trimmed hedgerows. Farmsteads are often found within this character type.

The Rolling Ridge Slopes

5.3.12 The north section of the ridge finger is influenced by The Wooded Valley Sides character type which clothes the broad south facing lower slopes of the valleys. Farmsteads are often found within this character type.

The Wooded Valley Sides

5.3.13 At lower AOD's the valley sides are steeper and clothed in woodland on the less productive steeper topography. The majority of hamlets in the area are found within this character type.

The Valley Floor

5.3.14 Traced by trees the River Waycock meanders through smaller pastoral fields bound by ditches and outgrown hedgerows reducing the scale of this relatively flat LCA. Generally attractive views tend to more intimate but can be detracted by overhead power lines and areas of lower quality landscape.

Barry

5.3.15 The north western edge of Barry, on the Rhoose plateau, falls within the Study Area. The urban situation is in contrast with other LCA's. Value is poorer than for other character areas and capacity is higher.

5.3.16 In the landscape evaluation summary table below Quality is categorised according to DMRB's five point scale of highest quality, very attractive, good landscape, ordinary landscape, and poor landscape.

Table 5.4: Landscape Evaluation Summary Table

Landscape Character	Landscape Value	Landscape Capacity
1 - RIDGELINE AND RIDGE SLOPES ***(ST NICHOLAS AND BONVILSTON RIDGE CREST - VLFGLVS271)***		
Moderate Prominent broad backed limestone ridge crest (extensive views both to and from) forming the rough boundary between the South Vale and the North Vale. Small to medium sized irregular field pattern of improved pastoral farmland defined by trimmed hedgerows over a gently rolling/undulating topography. Linear settlements of St Nicholas and Bonvilston address the A48 Roman Road. Adjacent character types exert an influence as the landform dips away on the boundary of this LCA; hedgerows are less frequently managed or	**High Value** **Very Attractive quality** **High Rarity** **Declining Condition** Falls within an SLA and encompasses an historical route. High intrinsic value Long views are unusual in other aspect areas in the Vale - high rarity. Moderate integrity. The A48 can be heard through much of the area. Inappropriate suburban detailing and development along A48, and Cottrell golf course modifies the landscape character. Generally well managed farmland enhancing views. Detractive features in the area include two TV	**Moderate** Although Bonvilston and St Nicholas are conserved positive elements, the rural and settlement character is eroded by roadside development, quarrying, masts, signage and other urban detailing. Visibility of character area reduces capacity to absorb development. Mature trees along the A48 largely screen views to golf course. Moderate night time

Landscape Character	Landscape Value	Landscape Capacity
outgrown especially along watercourses; field sizes become smaller; woodland becomes more frequent.	masts at St Lythans Down and Pantylladron, power lines and the quarry at Pant y Ffynnon.	pollution.
2 –THE ROLLING RIDGE SLOPES ***(CENTRAL VALE RIDGES AND SLOPES - VLFGLVS146)***		
Moderate Rolling lowland of similar landcover to the ridge; small to medium sized field pattern of pastoral farmland defined by trimmed hedgerows. Woodland blocks introduced - an influence of Wooded Valley Sides LCA. Of medium scale. Farmsteads and new build house are potential receptors within the LCA.	**Moderate Value** **Very Attractive/Good Landscape Quality** **Fair/declining condition** Common landscape within Vale. Pleasant views within the character area. Tranquil away from the road.	**Moderate** The landform, tall hedgerows and woodland blocks reduce visibility. Farmsteads common within this character type. Night time pollution is slight (sparsely settled)
3 - THE PLATEAU ***(CENTRAL VALE RIDGES AND SLOPES - VLFGLVS146)***		
Weak – Moderate Further south along the ridge finger from LCA 2. Larger field sizes bound by trimmed hedgerows, a greater proportion of arable (constraint to slope treatment). Whilst the area does not have a strong intrinsic character being typical of well-maintained Vale plateau, it is enhanced by long views to the sea/Bristol Channel, (and BAA hanger) and its open exposed qualities. Farmsteads are often found within this character type. Tall vegetation clustered around buildings.	**Moderate Value** **Moderate/Good Landscape Quality** **Fair Condition/declining trend** Integrity affected by loss of hedgerows Not rare landscape Tranquillity and attractive views affected by the airport and Aberthaw Power Station and Five Mile Lane. Hedges being substituted by fences.	**Moderate/Low** Long views, gentle landform and fewer trees increase the visibility of this aspect area and reduce the capacity to absorb development. Night time pollution is slight (sparsely settled)
4 - THE VALLEY FLOOR and WOODED VALLEY SIDES ***(LLANCARFAN AND WAYCOCK VALLEYS - VLFGLVS453 and UPPER WAYCOCK VALLEY/DYFFRYN AREA - VLFGLVS608)***		
Moderate – Strong Valley sides and spurs are clothed in woodland closely following the less productive, steeper topography. Along the valley floor watercourses are traced by trees, and smaller pastoral fields bound by outgrown hedgerows and sometimes trimmed.	**High Value** **Very Attractive Quality** **Good Condition/ Constant Trend** **Moderate to high rarity** Unspoilt character (high integrity) Moderate to high scenic quality	**Low** High character integrity – landscape is not able to absorb inappropriate development. Constant trend

Landscape Character	Landscape Value	Landscape Capacity
The scale of the landscape is small where short distance views are attractive but simultaneously dominated by two runs of overhead power lines. Valleys are broader towards the upper reaches and trimmed hedgerows with hedgerow trees become more frequent. The scale of the landscape becomes medium. The majority of hamlets in the area are found within this character type, often attractive consisting of well integrated dwellings of stone. The area is a steep sided narrow and enclosed lowland valley, which contains a tranquil landscape of streams, woodlands and small farms.	Moderate to high rarity due to the enclosed valleys. Tranquil Includes Dyffryn Gardens, a Grade I listed Edwardian garden.	Night time pollution is slight (sparsely settled)
5 – BARRY ***(BARRY - VLFGLVS219)***		
Moderate The north western edge of Barry is situated on the slopes facing the study area, between 60 and 88 metres AOD. Perceived overall as a noisy, unattractive and settled area with a moderate sense of place overall due to different characters. Seen from the Waycock Valley the elevated edges of Barry are abrupt without integration into the rural landscape structure or landform. This housing area has more sense of place than some aprts of Barry.	**Ordinary Quality** **Moderate Value** **Fair condition/Constant trend** **Moderate Rarity** Scenic quality and integrity are evaluated as low overall; rarity and character as moderate (LANDMAP) The local character is classified higher than for LANDMAP's assessment of the whole of Barry.	**High** Urban character means the landscape has a higher capacity to absorb development. Night time pollution is substantial (urban).

Landscape Designations

5.3.17 The landscape within the Vale of Glamorgan is considered to be unique within the South East Wales Region so large areas have been classified as Special Landscape Areas (SLAs) - a local landscape designation. The route of the current Five Mile lane forms the boundary between two SLAs, Dyffryn Basin & Ridge Slopes and Nant Llancarfan. The Special Landscape Area designations contribute to the evaluation of landscape value which in turn informs landscape capacity and as such have been assessed alongside effects on landscape character.

5.3.18 The Green Wedge designation between Cardiff Airport and Barry is not effected by the route options.

5.3.19 No significant effect is likely to occur to the settings of above ground heritage features or the Llancarfan historic landscape area (medium value – please see heritage Chapter for more information) or to Dyffryn Gardens, a Grade I listed park and garden.

5.4 Impact Distribution

5.4.1 Landscape and visual effects can be experienced over wide areas, depending on the scale of the proposal, visibility due to topography and landscape structures and the sensitivity of the landscape. Visual effects of the proposed alignments would potentially impact across a 2-4 kilometre study area. However due to the nature of the landscape topography and features, and the scale of the scheme it is considered that effects beyond an approximate 500 metres would not significant and as such are not covered within this study.

5.4.2 Those whose visual amenity would be most affected by the proposals, both adversely and beneficially, are those that reside and work in the farms and dwellings alongside the existing Five Mile Lane, and people travelling through the landscape along the route. Others potential receptors include walkers, equestrians, and golfers. Effects on landscape character are generally confined to a similar study area for the purposes of this interim assessment.

5.4.3 Effects on Vehicle Travellers are most beneficial to local residents and workers and those who regularly visit community facilities for example the Amelia Trust Farm. Please see Social Impacts Chapter for more detail.

5.5 Potential mitigation principles

5.5.1 Within this section a summary of mitigation principles are described. Specific mitigation measures are considered within the option appraisal tables. It should be noted that:

- mitigation is yet to be agreed with the overseeing organisation;

- measures do not take account of mitigation required for other significant effects (where conflicts may occur) and as such are idealistic pertaining to landscape effects only; and
- not every measure would be required.

5.5.2 The choice of route options avoiding potential adverse effects and with good fit in the landscape is fundamental to reduction in adverse effects. Good fit is achieved through:

- The design of the horizontal and vertical alignment for the main line, side roads and junctions:
  - to get the best fit with the contours
  - to retain and make the best use of existing vegetation
  - to optimise protection for nearby houses through the use of cuttings, existing features or range
  - to avoid loss or damage to landscape features e.g. hedges, water features or field systems
- The use of specific landscape mitigation measures:
  - on and offsite planting
  - mounding
  - earth shaping
  - new water features
  - careful consideration of the form and finish of structures
  - the alignment and appearance of roadside ditches and fences
  - the appearance of other features such as street signs and gantries

Mitigation Design Objectives

5.5.3 At this stage a number of mitigation principles are being considered specific to the routes alignments proposed and site context.

- To choose the route least damaging to the landscape; the alignment that respects existing landform best and avoids disruption of major topographical features; that uses the existing landform to good effect and that which minimises the scale of earthworks.
- To design profiles which reflect existing natural slopes.
- To retain the least highway land, by the return of land to its former use where this does not conflict with the need to provide mitigation by planting.

- To use existing landform to minimise visual intrusion: for example, placing a road in a cutting or behind rising ground to screen dwellings/settlement.
- To develop new landforms, including mounds and false cuttings, to screen the road from dwellings/settlement.
- To utilise landscape elements that define landscape character to protect and enhance the sense of place.
- To continue landscape elements across and not along the road to provide good integration and to not emphasise its linearity.
- To utilise local native species and local hard materials and styles where practicable.

5.6 Landscape Effects Assessment

5.6.1 For assessment of effects on landscape character receptors and effects on visual amenity please refer to:

Alignment Assessment Tables within Volume 3;

Figures 5.5-5.14 Alignment Assessments; and

Assessment Summary towards the end of this chapter.

5.7 Vehicle Travellers Assessment

5.7.1 The following effects on vehicle travellers for the proposed scheme were assessed using the following criteria:

- View from the road; and
- Driver Stress.

Construction

5.7.2 Effects on vehicle travellers predicted during construction may include delays and local diversions but these would be of a short term nature. To reduce driver frustration and uncertainty relating to the route being followed appropriate signage would be installed informing vehicle travellers of the proposed scheme, diversions and that delays due to works would be probable.

Views from the Road

5.7.3 The narrow carriageway contained within roadside hedgerows restricts views to the landscape despite the fact it passes over the Plateau where views can be expansive. Views tend to be of landscape adjacent to the road where vertical alignments and topography allow. Enhancement to the baseline condition is sought to allow views across the Special Landscape Areas where this measure does not degrade landscape character and screening of the road is not required to minimise effects on visual amenity.

5.7.4 Please refer to the Figure 5.15 for the analysis of Views from the Road.

The Route Alignments

5.7.5 Mitigation measures are not considered in the following descriptions of potential views from the alignments, which instead describe where there is potential for views from the road, to be considered when agreeing the environmental design during forthcoming stages.

5.7.6 Generally the vertical alignments are in cutting on higher ground restricting potential expansive views, and on embankment on lower ground where views currently tend to be more intimate. The proposed alignments do however provide opportunities to expose road users to the scenery being passed through.

Sectors one and two

5.7.7 The roundabouts proposed at Sycamore Cross would likely be at grade along the A48 and in minor cutting at southern extents limiting views. As the new alignment joins the existing improved section of Five Mile Lane views from the carriageway would be as existing, restricted by roadside hedgerows. Nothing differentiates the options within these sectors.

Sectors three and four

5.7.8 As the alignments approach Blackland Farm the online widening works would begin to impact upon the existing roadside hedgerows which could open up views to The Rolling Ridge Slopes LCA.

5.7.9 The proposed alignments begin to diverge at Amelia Trust Farm Oak woodland which helps define the character of the existing road at this point. The Red option removes the majority of the edge of this woodland and some grassland on The Amelia Trusts land and would degrade the view. Other options remove the shorter edge of woodland along the east side.

5.7.10 Emerging south from the woodland the vertical alignments provide opportunities for views over The Plateau. Both the Orange and Red then maintain a vertical alignment that is similar to existing topography, potentially permitting views depending on roadside treatment.

5.7.11 As the route options travel south across The Plateau landscape character area the vertical alignments are generally in cutting over high ground and on embankment across shallow dips in topography associated with small watercourses. Across a minor shallow valley associated with the Ffynnon Whitton-mawr/Ford Brook between two high points, the vertical alignments changes from cutting to embankment and back to deep cutting. The result reduces potential long distance views gained from the high ground of The Plateau. The route option that takes best advantage of the open views is the Blue being on the shallowest cutting of approximately 0.5-0.75 metres at the high point near the site of Roman Settlement and Villa. The cutting along the Red alignment becomes quite shallow at points also.

5.7.12 In sector three the Red option is least favourable as it causes loss of Amelia Trust Farm Oak woodland which defines the character of the existing road at this point. Depending on mitigation, enhancement planting and slope treatments, the embankments on lower ground within Whitton-mawr field and near Moulton Brook may provide opportunities for views from any alignment.

5.7.13 In sector four the Blue and Red options are in the shallowest cutting through the high point near the sites of the Settlements and Roman Villa, where expansive views could be attainable, so being preferable options.

Sector five

5.7.14 The Blue Option, in deep cutting, passes under the side road overbridge, adjacent to Grovelands, providing a landmark to aid driver orientation and with the potential to reduce the

effect of the cutting through the skyline. All options, apart from the Red, are in deep cutting restricting views out. From the drivers' point of view the Red is therefore preferable at this point followed by the Blue.

5.7.15 The alignments are generally in cutting as they descend south into the Waycock Valley, on embankment across the valley floor and cutting (west shoulder) and embankment (east shoulder) up the valley side to Waycock Cross. As the routes descend into deep, 1:2 gradient cuttings only forward views would be possible. The landform and landscape treatment of the banks could enhance the sense of place for road users. The Orange route is preferable as it is located furthest east where local landform changes allow both embankments and cuttings providing variety in viewing distances. The Blue option is more consistent in the depth of the cuttings which could provide the opportunity to consider a single treatment along the length of the cuttings so providing a sense of place that can be enjoyed at the design speeds.

5.7.16 As the cuttings taper off onto high embankments, views would include the two woodlands between which the routes travel, towards the valley bottom where intimate pleasant views along the valley are restricted by the taller hedgerows and trees along The River Waycock. No option is markedly different from the others within this sector as far as the unmitigated schemes go but measures would be different for each option so altering the drivers' views and appreciation of place. During early operation years the Blue option takes best advantage of landscape character due to the horizontal alignment travelling between taller vegetation rather than causing loss of hedgerows as other alignments do.

5.7.17 The Red option is preferable route down into the Waycock Valley followed by the Blue and Orange.

Sector six

5.7.18 All routes are on embankment across the valley, potential for views is dependent on mitigation planting. The journey between valley bottom and Sycamore Cross is different for the Blue option compared to the others, as the route retains the existing road as a side access road with the main carriageway proposed to the west, generally on higher ground so resulting in the

removal of more woodland. Other options would be more enclosed and hence faithful to the existing atmosphere within the woodland.

5.7.19 Blue would provide the most interesting views for road users along the valley floor until mitigation planting establishes. Through the SSSI Middleton woodlands the Blue option is least favourable.

Sector seven

5.7.20 Views from the vertically adjusted on-line alignments are preferable than those from the Blue. Blue is the least favourable option.

Driver Stress

5.7.21 Influencing the three main components of driver stress (frustration, fear of potential accidents, and uncertainty relating to the route being followed) are factors such as road layout and geometry, surface riding characteristics, junction frequency, and speed and flow per lane. Taken together, these factors can induce in drivers the feelings of discomfort, annoyance, frustration or fear culminating in physical and emotional tension that detracts from the value and safety of a journey.

5.7.22 The baseline against which new alignments are assessed is the existing road which may be considered to induce driver stress:

- Poor forward visibility and inadequate sight distances, due to the rapidly changing horizontal and vertical alignment within roadside hedgerows of the narrow road;
- The occurrence of road traffic incidents; and
- Use of the road by agricultural vehicles; speed differential between slower vehicles and those who want to travel faster but have difficulties in overtaking.

5.7.23 The improved scheme may increase driver fear to some extent because it will increase traffic speeds and, by diverting traffic from a number of existing roads, may also increase flows. However, this increased perception of danger is likely to be more than offset in most cases by the superior design standards to which a new scheme is built.

5.7.24 The proposed alignments are all designed to improved design standards. The Blue, Orange and Green routes are designed to 100km/h with roundabout junctions serving:

- Whitton Lodge and the Amelia Trust Farm and the existing road northwards;
- the Northcliff turn off, Grovelands and the existing road southwards towards the Moulton turn off (Orange and Green only); and
- the Welsh Hawking Centre and the existing road northwards towards Sutton Farm.

In place of the central roundabout an overbridge is proposed on the Blue option to serve the Northcliff turn off from the existing road in the vicinity of Grovelands.

5.7.25 The proposed design speed for the Red and Purple routes is reduced to 80 kilometres per hour (km/h) due to the minimum curvature and numerous junctions and accesses along the highway. The Red alignment closely follows the existing road and apart from a new roundabout junction between the Moulton and "Northcliff" turn offs, which also serves Grovelands and Sutton Farm, the existing remaining junctions will in the main require improved vision splays as a minimum requirement.

5.7.26 All routes propose climbing lanes through the steep section of the Waycock Valley and improvements are likely at the terminal junctions for all in the north in joining the A48 and the Blue option at Waycock Cross.

5.7.27 Whilst the routes will be fully categorised in forthcoming EIA stages, when all components of driver stress can be measured, on initial evaluation the new alignments would reduce driver stress through reducing frustration, reducing fear of potential accidents and reducing uncertainty relating to the route being followed.

Reduction in frustration

5.7.28 Frustration may be caused by a driver's inability to travel at a constant speed due to the volume of traffic and slow moving vehicles, which in turn leads to unreliable journey times which further increases stress. Proposed routes would reduce frustration through:

- Use of existing route for local traffic including farm machinery (the mainly online Red route options, and to an extent Purple, would not perform so well).

- Good forward visibility, provision of climbing lanes through the Waycock Valley and consistent road standard to design speeds allowing traffic to generally drive at more consistent speeds.

Reduction in fear of potential accidents

5.7.29 Reduced fear of potential accidents would be due to improved road standards such as:

- increased sight distances due to improved horizontal and vertical alignments;
- widened carriageway including hardstrip and climbing lanes; and
- controlled access onto main carriageway.

The Red and Purple route options would not perform as well as the Blue, Orange and Green.

Uncertainty relating to the route being followed

5.7.30 Route uncertainty is caused primarily by signing that is inadequate for the individual's purposes. It is not possible to assess the size of this factor as a consensus has not appeared on the adequacy of existing signing practice along the route. Good design and layout of signs will be assessed in following EIA stages with recommendations put forward towards eliminating this cause of stress from new road schemes. However as the new alignments are broadly similar to the existing, orientation views are being considered, and forward visibility and signage would be improved, it is considered that this component of driver stress would likely also decrease in the long term.

5.7.31 Available research evidence has not established reliable correlations between physical factors and driver stress. However, the following DMRB tables give guidance on the appropriate category of stress for use in environmental assessments:

Average peak hourly flow per lane, in flow Units/1 hour	**Average Journey Speed Km/hr**		
	Under 50	**50-70**	**Over 70**
Under 600	High	Moderate	Low
600-800	High	Moderate	Moderate
Over 800	High	High	High

Note: Table for use with single-carriageway roads. A car or light van equals one flow unit whereas a commercial vehicle over 1½ tons unladen weight or a public service vehicle equals 3 flow units. However commercial vehicle data is not available at this stage so it has been assumed that all vehicles are equal to one flow unit.

5.7.32 Using this method the results would be the same for the baseline (existing road) and the worst year for the proposed alignments, being graded as Low. The figures given in the table are for guidance only so the assessment of specific routes is made in the light of full knowledge of local conditions which suggest that driver stress between Waycock Cross and the improved northerly section of Five Mile Lane could be described as being higher than Low, such as Moderate/High.

5.7.33 The proposed road would result in a significant improvement with regards to journey ambience, as road conditions would be significantly improved, with associated reduction in stress and potential reduced journey times.

5.8 Overall Significance

Table 5.5: Summary of Worst Case and Residual Effects on Landscape Character

	ROUTE ALIGNMENT									
RECEP-TORS	BLUE		RED		ORANGE		GREEN		PURPLE	
	WC	RE	WC	RE	WC	RE	WC	RE	WC	RE
Sector 1										
LC-all-1-1	- -	-	- -	-	- -	-	- -	-	- -	-
Sector 2 No Works Proposed										
Sector 3										
LC-all-3-1	- -	-	- - -	- -	- -	-	- -	-	- -	-
LC-all-3-2	- -	-	- - -	-	- -	-	- -	-	- -	-
Sector 4										
LC-all-4-1	-	+	- -	0	- - - *	-	- -	0	- -	0
Sector 5										
LC-all-5-1	- -	0	- - -	- -	- - -	- -	- - -	- -	- -	0
LC-all-5-2	- -	0	- - -	- -	- - -	- -	- -	-	- -	-
Sector 6										
LC-all-6-1	- - -	-	- -	0	- - -	0	- - -	-	- -	0
LC-all-6-2	- - -	- -	- -	-	- -	-	- -	-	-	0
Sector 7										
LC-all-7-1	- -	+	-	+	-	+	-	+	-	+

Table 5.6: Summary of Worst Case and Residual Effects on Visual Amenity

	ROUTE ALIGNMENT									
RECEP-TORS	BLUE		RED		ORANGE		GREEN		PURPLE	
	WC	RE	WC	RE	WC	RE	WC	RE	WC	RE
Sector 1										
LV-all-1-1	- -	-	- -	-	- -	-	- -	-	- -	-
LV-all-1-2	-	0	-	0	-	0	-	0	-	0
Sector 2 No Works Proposed										
Sector 3										
LV-all-3-2	- -	0	- -	0	- -	0	- -	0	- -	0
LV-all-3-4	-	0	- -	-	-	0	-	0	-	0
LV-all-3-5	- -	+	- - - *	-	- -	+	- -	0	- -	+
LV-all-3-6	- - -	+	N/A	N/A	- -	+ +	- -	+	- -	+ +
Sector 4										
LV-all-4-1	-	0	N/A	N/A	-	0	-	0	-	0
LV-all-4-2	-	0	-	0	-	0	-	0	-	0
LV-all-4-3	-	0	-	0	-	0	-	0	-	0
Sector 5										
LV-all-5-1	- -	+ +	- - -	-	- -	+	- - -	-	- -	+
LV-all-5-2	- -	0	- -	-	- - - **	- -	- -	-	- -	0
LV-all-5-3	- - -	0	- - -	-	- - -	-	- - -	-	- - -	-
LV-all-5-4	0	+ +	0	+ +	0	+ +	0	+ +	0	+ +
Sector 6										
LV-all-6-1	-	+	- -	-	- -	-	- -	-	- -	-
LV-all-6-2	0	0	- -	-	- -	-	- -	-	- -	-
LV-all-6-3	-	0	-	0	-	0	-	0	-	0
LV-all-6-4	- -	-	- -	-	- -	-	- -	-	- -	-
LV-all-6-5	-	0	- -	0	- -	0	- -	0	- -	0
Sector 7										
LV-all-7-1	- - -	+	- -	0	- -	0	- -	0	- -	0

NOTE: * Assessment of significance would be less if assessed in isolation but is recorded as higher to aid in differentiating options

** Preliminary visual assessment – Garden Vegetation may effectively screen dwelling from route options

Significance of Landscape Effects

5.8.1 The interim assessment of route alignments has identified a number of landscape receptors that would be affected by the improvement works. These include local residents and the character of the landscape which would experience some degree of adverse effect as a result of scheme construction although, with appropriate mitigation, these effects could be effectively minimised and, in the long term could lead to an overall benefit for certain receptors.

5.8.2 The worst-case scenario assessment, whether that would occur on a winters day in year one of operation or during construction, predicts that the Purple option is the most favourable, followed by Blue and Green and then Orange and Red. The Purple would cause the least adverse effect in the short term primarily due to the lower design speeds and exclusion of roundabouts and associated side roads. The best improvement through mitigation, from Moderate Adverse to Neutral/Slight adverse, is the Blue option. The Orange and Red options would have a significance adverse effect on landscape character in the short term.

5.8.3 *Effects on Landscape Character - Worst Case*

Purple route	-	--	**Slight/Moderate Adverse**
Blue route	--		**Moderate Adverse Effect**
Green route	--		**Moderate Adverse Effect**
Orange route	--	---	**Moderate/Severe Adverse Effect**
Red route	--	---	**Moderate/Severe Adverse Effect**

5.8.4 *Residual Effects on Landscape Character*

Purple route	0	-	**Neutral/Slight Adverse**
Blue route	0	-	**Neutral/Slight Adverse**
Green route	-		**Slight Adverse Effect**
Orange route	-		**Slight Adverse Effect**
Red route	-		**Slight Adverse Effect**

5.8.5 Significance adverse effects on visual amenity would result from all options in the short term until mitigation establishes. Once again the Blue option shows the most improvement through time and would be likely to improve upon the baseline condition in the long term.

5.8.6 *Effects on Visual Amenity - Worst Case*

Purple route	-	--	**Slight/Moderate Adverse**
Blue route	-	--	**Slight/Moderate Adverse**
Green route	-	--	**Slight/Moderate Adverse**
Orange route	-	--	**Slight/Moderate Adverse**
Red route	-	--	**Slight/Moderate Adverse**

5.8.7 *Residual Effects on Visual Amenity*

Purple route	**0**		**Neutral**
Blue route	**0**	**-**	**Neutral/Slight Adverse**
Green route	**0**	**-**	**Neutral/Slight Adverse**
Orange route	**0**		**Neutral**
Red route	**0**	**-**	**Neutral/Slight Adverse**

5.8.8 For both landscape character and visual amenity Option 1 roundabout at Sycamore Cross is preferred.

Significance of Landscape Effects on Vehicle Travellers

5.8.9 The proposed alignments provide an opportunity to improve the experience of driving, cycling or walking between Sycamore Cross and Waycock Cross.

5.8.10 *Effects on Vehicle Travellers*

Purple route	**+**		**Slight Beneficial**
Blue route	**++**	**+++**	**Moderate / Large Beneficial**
Green route	**+**	**++**	**Slight / Moderate Beneficial**
Orange route	**+**	**++**	**Slight / Moderate Beneficial**
Red route	**+**		**Slight Beneficial**

5.8.11 The Blue option is the most favourable, followed by Red and Orange with regard to effects on views from the road. It should be noted that both Blue and Red options impact both positively and negatively upon views from the road. The Purple and Green alignments are the least favourable but do improve upon the baseline with Slight Beneficial significance.

5.8.12 Blue would also be the preferred option to reduce driver stress as it accommodates climbing lanes as well as local traffic access via the Existing Five Mile Lane connecting to the main carriageway via roundabouts. The Red and Purple options are considered the least favourable as they do not tend to include roundabouts, with the main carriageway accessed by T-junctions which may be perceived as more dangerous. It should be noted that all options are an

improvement on the baseline road and that perception of danger would be reduced by the increased viewing distances.

Re-alignment Potential/Recommendations

5.8.13 The following section provides an outline of how adverse effects could be further reduced and beneficial effects could be maximised through horizontal and vertical alignment adjustments, reducing landtake or loss of landscape resource which feed into the iterative design process in forthcoming stages.

- Maintain a close relationship between vertical alignment, landform and topography where this does not conflict with visual amenity issues.

- Minimise loss of High Category woodland and then follow an offline alignment retaining as many hedgerows as practicable in sector three.

- To reduce adverse in sector five it is important to reduce junction landtake and avoid loss of High Category standard Oaks and deciduous woodland. Deep cuttings in combination with roadside hedgerows to west of carriageway would effectively reduce adverse effect on visual amenity. Explore opportunity to grade out cuttings to east side of carriageway to open up views to vehicle travellers and minimise effect on landscape character. Steep embankments between the woodlands would have an adverse effect on visual amenity but could be mitigated through woodland planting in the long term.

- Across the valley floor in sector six the embankments have an adverse effect on landscape character but allow the vehicle traveller to see down the valley to the east (Blue route restricts these views, set between tall hedgerows in parts). Landtake required for roundabouts also have an adverse effect through more extensive loss of landscape resource.

- Minimising effect on the SSSI woodland on the north facing valley side would improve the performance of any option. It is recognised that the Blue option would have the most

adverse effect at this point as it is the only option that provides a separate carriageway to the access road and climbing lanes.

6 Biodiversity

6.1 Introduction

6.1.1 This section of the ISAR describes the assessment of the route alignment options relating to nature conservation and biodiversity. The function of the ISAR has been set out in previous sections (see introductory section) and in terms of nature conservation, the report represents a single point of reference at this stage of the assessment process, drawing together the various ecological surveys undertaken in 2008 and 2009 following completion of the Stage 1 Assessment report (SBC 2008).

6.1.2 Any new construction, improvement or maintenance project may have an impact on biodiversity in addition to impacts from traffic using the road. Construction of roads, road improvements and road maintenance and management can directly and indirectly affect biodiversity in a number of ways including:

- Direct habitat loss within the scheme footprint;
- Increased incidence of wildlife/vehicle collision;
- Fragmentation of habitats;
- Damage or destruction of a resting place, breeding site or feeding area;
- Severance of traditional dispersal routes;
- Disturbance and changes to environmental conditions making habitats for resting, breeding and foraging un-suitable;.

6.1.3 Planning Policy Wales (2002) Section 8.5.7 states that '*Great care must be taken to minimise the adverse impacts of new transport infrastructure, or improvements to existing infrastructure, on the natural, historic and built environment and on local communities...*'. Relating to the natural environment, Section 5.5.2 of the same document states that '*When considering any development proposal... local planning authorities should consider environmental impact, so as to avoid, wherever possible, adverse effects on the environment. Where other material considerations outweigh the potential adverse environmental effects, authorities should seek to minimise those effects and should, where possible, retain and, where practicable, enhance features of conservation importance.*'

6.1.4 A Stage 1 Environmental Assessment based on Design Manual for Roads and Bridges (DMRB) guidance was undertaken in late 2007/early 2008 (SBC 2008) and identified actual or potential presence of protected and priority habitats and species (e.g. ancient woodland, amphibians, reptiles, birds and bats) in close proximity to the existing A4226 corridor. In terms of ecological considerations, the Stage 1 assessment concluded that '*adopting an alignment which broadly follows the existing A4226 alignment could reduce the potential for ecological impacts*.'

6.1.5 Subsequent to the Stage 1 Assessment, and in consideration of seasonal constraints, a number of surveys, equivalent in scope to those required to inform a Stage 2 DMRB assessment were undertaken over the course of 2008 and 2009 (see Baseline Conditions). The Stage 2 Environmental Assessment is likely to be progressed over 2010, subsequent to consultation on the ISAR with the statutory environmental bodies (e.g. Countryside Council for Wales, Environment Agency Wales, Vale of Glamorgan Ecologist etc).

6.1.6 This Interim Scheme Assessment Report (ISAR) aims to provide a link between Stages 1 and 2 relating to the ecological constraints and opportunities associated with each of the five route alignment options under consideration and to inform the process towards identification of a Preferred Route.

6.2 Appraisal Methodology

6.2.1 The Stage 1 Assessment of the proposed scheme on nature conservation and biodiversity features was undertaken in accordance with the guidance set out in the Design Manual for Roads and Bridges (DMRB) Volume 11, section 3, part 4 and Welsh Transport Planning and Appraisal Guidance (WelTAG). Consistent with the requirements of a DMRB Stage 1 Assessment, the aim at this stage in the evolution of the scheme was to:

- Identify the nature conservation advantages, disadvantages, opportunities and constraints within the broad route corridors associated with the proposed improvement of the A4226 including a possible south-western option.

6.2.2 The Stage 1 assessment was based on a desk study consultation and site familiarisation visit and the findings were carried forward to advise the requirement and scope of additional survey work that would be used to inform the Interim Assessment (i.e. the current report) and the Stage 2 assessment. The aim of the Stage 2 Assessment (yet to be undertaken), (as stated in DMRB, is to:

- Undertake sufficient assessment to identify the magnitude and potential importance of nature conservation features when developing and defining the route options. If nature conservation constraints are a significant factor in route selection, an appraisal comparing the merits of each route option will be produced.

6.2.3 Typically, the Stage 2 assessment is informed by a number of field surveys, including an Extended Phase I Habitat survey of the route alignment options under consideration in addition to targeted surveys for species (and/or habitats) likely to be present within the scheme footprint and which could be subject to development impacts. As indicated in the preceding text and described further under the Baseline Conditions, although the Stage 2 Assessment has yet to be undertaken, the surveys undertaken in 2008/2009 were comparable in scope and function to those typically undertaken at Stage 2. Surveys were based on a broad survey corridor that included the existing A4226 alignment and the adjoining areas, where the current route alignment options are proposed.

6.2.4 For the purposes of the Stage 1 assessment and the current ISAR the DMRB guidance set out in Volume 11, Section 3, Part 4 was followed in parallel with the recommended approach described by WelTAG. The guidance within DMRB for assessing the likely impact and significance on ecological receptors (Volume 11, Section 2, Part 5) is based on the correlation between the ecological value of the receptor (for example a hedgerow or population of reptiles) and the magnitude of the impact on a 5-point scale from Major to No Change.

6.2.5 No further assessment methodologies were considered at this stage. However, as part of the consultation exercise following issue of the ISAR, the use of additional guidance could be discussed. For example, use of the Guidelines for Ecological Impact Assessment described by

The Institute of Ecology and Environmental Management (IEEM; 2006) is generally viewed as industry best practice for a range of development projects.

6.3 Baseline Conditions

Study Area - Overview

6.3.1 The study area, as a whole, is set within an agricultural landscape comprising mostly of improved, sheep-grazed pasture and arable land separated by native hedgerows and scattered trees. There are many broad-leaved woodland blocks across the site, particularly in the southern and western parts of the study area, which link up with the hedgerow network. Areas of grassland verge are mainly associated with the northern part of the existing A4226 corridor. Localised standing and open water habitats also occur within the study area. The southern part of the study area, between the River Waycock and Waycock Cross supports several woodland blocks which fall within the Barry Woodlands SSSI – the existing A4226 alignment bisects two such blocks.

Ecological surveys 2008 - 2009

6.3.2 Based on the desk-based consultation and data search exercise undertaken to inform the Stage 1 Assessment, a range of additional habitat and species surveys were indicated to inform further assessment of the route corridor. The following surveys were undertaken:

- Extended Phase I Habitat survey - March 09;
- Amphibian survey (including Great Crested Newts) – March to May 2008;
- Dormouse nest tube survey – June to November 2008;
- Dormouse Nut Search – September/October 2009;
- Bat activity surveys – June/July 2008 & July to September 2009;
- Woodland survey (southern blocks only) - June 2008;
- Reptile survey (northern section) - May to July 2008;
- Reptile survey (southern section) – August/September 2009;
- Bird survey – June/July 2008;

- River Corridor survey (River Waycock) – September 2009;
- Aquatic Invertebrate survey (River Waycock) – September 2009;

6.3.3 A summary of the survey findings is provided below for the purposes of the ISAR report. Further detail is contained within the individual survey reports (see SBE 2008; SBE 2009a-c), copies of which have been provided to the Vale of Glamorgan Council and could be passed on to consultees as required.

Extended Phase I Habitat Survey

6.3.4 Fieldwork was undertaken throughout March 2009 and followed standard Phase 1 Habitat Survey protocol (JNCC 1990) as amended by the Institute of Environmental Assessment (1995). All habitats within a corridor extending approximately 250m east and 150m west of the existing A4226 alignment were classified and mapped as accurately as possible. The habitat plan and accompanying target notes are included in Appendix 6.1 of the ISAR.

6.3.5 The main habitat types comprised improved grassland or arable fields, with boundary features including hedgerows and fences. Other significant (in terms of area coverage) and localised habitat types included semi-improved neutral grassland, semi-natural broadleaved woodland, scattered trees, running water and marshy grassland. During the course of the survey, some limited evidence of use by Badgers *Meles meles* was recorded (suspected road casualty – i.e. carcass found within 5m of carriageway edge in the southern woodland block close to Barry College) together with several sightings of Brown Hare *Lepus europaeus*. Small amounts of Japanese Knotweed *Fallopia japonica* were also noted within the surveyed area (for the complete report see SBE 2009b).

Amphibian Survey

6.3.6 Following a site walk-over in March 2008 to verify the presence/potential suitability of waterbodies identified from desk study, a total of six ponds were subject to further survey work between March and May 2008 (see SBE 2008). Surveys were based on techniques described by English Nature (2001) and involved a series of evening surveys to establish likely presence/absence of Great Crested Newts *Triturus cristatus* (and other amphibians).

6.3.7 Three of the surveyed ponds, all located within the grounds of Whitton Rosser Farm (Amelia Trust Farm) supported one or more amphibian species. The Dew Ponds at Amelia Trust Farm supported a small population of Great Crested Newts and Palmate newts *T. helveticus* with the latter species also recorded from two other ponds at the Farm with Common Frog *Rana temporaria* and Common Toad *Bufo bufo*.

6.3.8 All ponds supporting amphibians (including Great Crested Newts) are located to the west of the existing A4226 alignment and no loss of ponds or adjacent terrestrial habitat (Dew ponds are approximately 400m west of existing A4226) would arise from any of the route alignment options under consideration.

Dormouse surveys

6.3.9 The Stage 1 assessment identified potentially suitable habitat for Common Dormouse *Muscardinus avellanarius* within the scheme corridor comprising of woodland blocks and hedgerows. A nest tube survey based on the survey protocol described by Bright *et. al.* (2006) was undertaken between June and November 2008 and involved the deployment and subsequent checking of artificial nest tubes. A total of 100 artificial nest tubes were deployed between the scrub/hedgerow east of the Amelia Trust Farm and Waycock Cross (Figure 6.1) and checked monthly between July and November. No evidence of use by Dormice was recorded over the course of the surveys (SBE 2009a) although a small number of nest tubes did indicate use by Woodmouse *Apodemus sylvaticus*.

6.3.10 Supplementary survey, involving searches for characteristically opened Hazel *Corylus avellana* nuts were undertaken within the southern woodland blocks as part of the nest tube survey and as a separate exercise in September and October 2009 (SBE 2009c). No evidence of Dormice was recorded with most of the fallen nuts examined opened by Grey Squirrel *Scirius carolinensis*.

Bat surveys

6.3.11 A series of bat activity and emergence/re-entry survey were undertaken over the summer of 2008 (see SBE 2009a) and summer/autumn 2009 (see SBE 2009c).

2008 survey

6.3.12 The surveys comprised a series of three evening (dusk) activity surveys on 23 June, 16 and 28 July by a team of three experienced surveyors walking transects in close proximity to the eastern roadside hedgerow to establish general levels of bat commuting and foraging activity and identify actual or potential roosts.

6.3.13 Field surveys and sonogram analysis confirmed the presence of at least four species of bat actively using the hedgerows and associated margins alongside; Common Pipistrelle *Pipistrellus pipistrellus*, Soprano pipistrelle *P. pygmaeus* and Noctule *Nyctalus noctula*. However, the presence of Myotid *Myotis spp.* were also frequently observed using the hedgerow network and agricultural buildings. From flight behaviour, time of encounter and sonogram analysis it is highly likely, although un-confirmed, that these Myotid bats were Whiskered/Brandt's *Myotis mystacinus/brandtii* and Natterer's *M. nattereri*.

6.3.14 The presence of a bat roost in a purposefully installed bat box on a stable block to the south east of Northcliff Cottage on the eastern side of the A4226 (Grid ref: ST07959 70512) during the course of the survey was observed and confirmed. The type of box observed, coupled with the presence and type of droppings (approximately 10, newly deposited, small, black faeces) on and below the bat box, is indicative of use by Pipistrelle *Pipistrellus spp.* bats.

6.3.15 The majority of activity-type observations and recordings were made by both commuting and foraging bats and were observed to extensively utilise the hedgerow network with bats also observed crossing over the A4226 in a number of places (e.g. Grovelands Farm/Northcliff Cottage, Sutton Wood and the River Waycock), in a west-to-east direction (see Figure 6.2).

2009 Surveys

6.3.16 A series of three evening (dusk) activity surveys were undertaken on 23 July, 11 August and 09 September by a team of three experienced surveyors walking three separate transects interspersed with stops (spot checks) to establish general levels of bat commuting and foraging activity and identify actual or potential roosts. The direction of the three separate transects were reversed alternatively throughout the field season to reduce the amount of bias between early or late emerging bat species.

6.3.17 In addition to the transect surveys, two ecological surveyors undertook a dusk emergence and dawn re-entry survey on 03 & 05 August of a group of mature Oak *Quercus robur* and Ash *Fraxinus excelsior* trees within the southern part of the study corridor (north of the River Waycock).

6.3.18 The transect surveys and sonogram analysis confirmed the presence of at least five species of bat actively using the hedgerows and associated margins alongside; Common Pipistrelle, Soprano pipistrelle, Noctule, Myotid *Myotis spp.* and Long-eared *Plecotus spp.* bats. As noted during the 2008 surveys, bats and were observed to extensively utilise the hedgerow network and were also observed crossing over the A4226 in a number of places, particularly in the southern survey area between Sutton Farm and the Waycock Bridge (Figure 6.3a – c).

6.3.19 Emergence surveys did not confirm the presence of roosting bats within any of the trees although the results indicated that a roost of Soprano Pipistrelle was located in close proximity (around Sutton Wood). Common Pipistrelle, Soprano pipistrelle, Noctule and Myotid bats were encountered foraging or commuting within the area of the trees surveyed (Figure 6.4).

Woodland survey

6.3.20 Within the southern part of the survey corridor, between Waycock Cross and the River Waycock, route alignment options would involve some loss of existing woodland (part of Barry woodlands SSSI) alongside north and south-bound carriageways (Wood 1 and Wood 2 respectively). Dependent on the route alignment selected, impacts to smaller, undesignated woodland at Sutton Wood (Wood 4) and Lidmore Wood (Wood 3) could also occur. Woodland location and numbering is illustrated on Figure 6.5.

6.3.21 In order to assign these woodland blocks to a recognised vegetation type and to provide an indication of their existing condition, an evaluation of vegetation quality within these four woodland blocks was undertaken in June 2008 (see SBE 2009a) and each woodland subjectively assigned a botanical value from Negligible to Very High.

Wood 1 & Wood 2

6.3.22 These woodlands are separated by the existing A4226 and share very similar floristic and structural characteristics and in NVC terms appeared to be closest to *W8 Fraxinus excelsior-Acer campestre-Mercurialis perennis* (Ash-Field Maple-Dog's Mercury) woodland. Ash was the most abundant canopy tree, followed by Pedunculate Oak and occasional Silver Birch *Betula pendula*. Fallen dead trees and branches were relatively frequent throughout the woodland, with the shrub understorey supporting outgrown Hazel *Corylus avellana* coppice and other shrubs such as Wych Elm *Ulmus glabra*, Hawthorn *Crataegus monogyna* and Field Maple *Acer campestre*. Holly *Ilex aquifolium* and Field-rose *Rosa arvensis* were locally common understorey species in Wood 2 (alongside the southbound carriageway). Bramble *Rubus* aggregate was a common low-understorey species, increasing in frequency close to the road. Carpets of Ivy *Hedera helix* dominated much of the ground flora throughout both woodlands, along with Enchanter's-nightshade *Circaea lutetiana* and False Brome *Brachypodium sylvaticum*.

6.3.23 Neither woodland showed any signs of recent management and the canopy was mostly closed with only low light levels reaching the woodland floor. As a consequence, Ivy dominated the ground flora although a number of the characteristic woodland flora species listed in the SSSI Citation were seen in low numbers. These included small colonies of Greater Butterfly-orchid, Herb Paris, Sanicle, Dog's Mercury *Mercurialis perennis* and Goldilocks Buttercup *Ranunculus auricomus*. There were more of these woodland floor species in the surveyed part of Wood 1 (i.e. alongside the northbound carriageway) than Wood 2 and the woodlands were valued (botanically) as Moderate-High and Moderate respectively.

Wood 3 (Lidmore Wood)

6.3.24 This woodland showed evidence of historical management similar to Woods 1 & 2 (i.e. coppice with standards), but at some point semi-natural woodland had been cleared and much of the woodland interior had been replanted with Western Red Cedar *Thuja plicata*. A narrow margin of semi-natural broad-leaved woodland remained intact along the western (lower) edge of the wood and supported the same canopy and shrub understorey species as Woods 1 & 2, and was considered to most closely match the W8d *Fraxinus-Acer-Mercurialis* woodland type. The ground flora was dominated by Ivy although species characteristic of old woodland persisted in low numbers throughout and especially close to the woodland bank at the southern end where

a colony of Greater Butterfly-orchid was present. With the exception of this southern area, the woodland was considered of Low botanical value.

Wood 4 (Sutton Wood)

6.3.25 Like Lidmore Wood, Sutton Wood had been extensively replanted over an area of what appeared to be older semi-natural broadleaved woodland, and remnants of the original woodland remained close to the existing A4226. The interior of the wood had been cleared of some trees and replanted with Hybrid Black-poplar *Populus* x *canadensis sensu lato*. Fragments of older woodland conformed to the W8d *Fraxinus-Acer-Mercurialis* woodland type. The number of woodland herbs and grasses present in the part of the wood near the road was greater than in any of the other three woodlands, and species not seen (including Giant Fescue *Festuca gigantea* and Bugle *Ajuga reptans*) in those were present, albeit in low numbers. Conversely, the wood did not seem to have some of the other species present in the other woods such as Primrose and Greater Butterfly-orchid – the woodland was considered of Low botanical value.

Reptile Surveys

6.3.26 Habitat with the potential to support common reptiles was associated with the existing A4226 road verges in the northern and southern areas of the scheme corridor (Figure 6.6). Much of the adjoining land comprising grazed pasture, arable fields and woodland was considered generally unsuitable.

6.3.27 Surveys in the northern section between May and July 2008 confirmed that small numbers of Slow worm *Anguis fragilis* (max count of 4) and Grass Snake *Natrix natrix* (max count of 2) were present within the road verges alongside the north and southbound carriageways (SBE 2009a). No reptiles were recorded from road-verge and scrub habitats in the southern part of the scheme following survey in August/September 09 (SBE 2009c).

Bird surveys

6.3.28 All of the proposed route alignment options would result in the loss of native hedgerows and displacement of field edge habitat to varying degrees, with these features of value to a range of bird species. In order to broadly identify the level and range of birdlife associated with these

habitats, a series of two survey visits were conducted in June and July 2008 along selected stretches of the existing A4226 road corridor from north of the Amelia Trust Farm to Waycock Cross (see SBE 2009a).

6.3.29 The survey protocol was based on Breeding Bird Survey (BBS) methodology (adapted field method (Bibby et al, 1992, BBS. BTO, 1995, Gibbons *et al*., 1996)) with birds identified both visually (using x8 binoculars) and by vocalisations. Each survey visit commenced at 06:00 and finished at 09:00 and involved transects running parallel along both sides of the road corridor. The direction of the routes was reversed on the second survey visit to avoid disturbance biases.

6.3.30 A total of 27 species were recorded during the course of the surveys (Figure 6.7) which were associated with the roadside hedgerows, within the fields, perching on telegraph wires or within the roadside woodland areas. Of the species recorded, nine are highlighted as being of some conservation importance[7] - Yellowhammer *Emberiza citrinella*, Dunnock *Prunella modularis*, Song Thrush *Turdus philomelos*, Linnet *Carduelis cannabina*, House Sparrow *Passer domesticus,* Skylark *Alauda arvensis*, European Starling *Sturnus vulgaris*, Herring Gull *Larus argentatus* and Barn Owl *Tyto Alba*.

6.3.31 During the bat emergence surveys in August 2009, a Tawny owl *Strix aluco* was seen and heard within the canopy of an Oak tree adjacent to the A4226 and could be nesting within a large cavity in the main trunk.

River Corridor Survey

6.3.32 A survey of the River Waycock based on standard River Corridor Survey (RCS) methodology (NRA 1992) was undertaken in September 2009. The survey incorporated two 500m survey sections of the River Waycock, one upstream and one downstream of the A4226 at Waycock Bridge. For the purposes of fieldwork and detailed mapping of channel and bank features, each section was further divided into 100m sub-sections - Nos. 1-5 upstream and Nos. 1-5

[7] Listed on one or more of the following: the UK Biodiversity Action Plan (BAP); Vale of Glamorgan LBAP, Section 42 List of Species of Principal Importance for Conservation of Biological Diversity in Wales, RSPB Red/Amber List (Gregory *et al* 2002), or on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended).

downstream (Figure 6.8). The survey was undertaken from both banks and much of the river channel and photographs were taken to highlight certain features (see SBE 2009c).

6.3.33 The river channel had been modified (culverted) near the A4226 and possibly straightened for approximately 200 m north of Waycock Bridge. Downstream of the bridge the river bore little evidence of significant modification and had several associated hydrological features including inflow streams and an impounded backwater. The river channel was generally steep-sided and 3-5m wide with water flow moderately fast and shallow. In the upstream section water quality appeared to be good and the water was clear; a sewage outfall just above Waycock Bridge pumped treated effluent from a nearby sewage treatment works into the river and below this point the water was more turbid. The substrate in the channel was a mixture of fluvially-rounded limestone cobbles, bedrock and shallow silt; the latter only found in pools and impounded sections.

6.3.34 The predominant adjacent land use was improved grassland with old and neglected hedges; at the time of survey sheep, cattle and ponies were grazing the pastures. The transition between pasture and channel was abrupt, given the vertical nature of the banks and consequently there was little marginal vegetation. Outgrown hedges heavily shaded a significant proportion of the channel and trees and open water was quite scarce. There were very few aquatic macrophytes in the channel and the only frequent emergent plants were communities of mosses on cobbles in the riffles.

6.3.35 Brown Trout *Salmo trutta* were seen in deeper parts of the river and the Bullhead *Cottus gobio* was noted to be a frequent inhabitant of riffles and runs. A single Kingfisher *Alcedo atthis* was seen flying along the river in the downstream section.

Aquatic Invertebrate Survey

6.3.36 A survey of the River Waycock for aquatic invertebrates was undertaken on the 26 September 2009 (SBE 2009c). A total of four sites, two upstream and two downstream of the A4266 bridge were selected (Figure 6.9), each supporting aquatic habitats representative of that stretch of the river. Semi-quantitative samples were taken in accordance with Environment Agency guidelines (Environment Agency, 1997) where River Invertebrate Prediction and

Classification System (RIVPACS) sampling methodology was used to collect samples. The river was sampled by a combination of three-minute kick and sweep netting marginal vegetation. Detailed site descriptions, including standard RIVPACS physical habitat variables, were recorded at each site.

6.3.37 In addition to the field survey, and to provide comparative data, information for macroinvertebrate families was also obtained from the Environment Agency Wales sampling site at Curnix Bridge, approximately 2.5 km downstream of the A4226 Waycock bridge (ST 06554 68822).

6.3.38 Macroinvertebrate samples from the field surveys were identified to the highest taxonomic level practical, with the exception of the Chironomidae (Non-biting Midges) and Oligochaeta (Segmented Worms) these were identified no further than Family or Order. Where invertebrates were present as incomplete specimens, only the portions, which had a head and a thorax or a thorax and abdomen, were included in the relative abundances (Environment Agency, 1997).

6.3.39 Macroinvertebrate abundance data were investigated in terms of tolerance to organic pollution (biological water quality), conservation assessment and taxonomic diversity using appropriate indices including the Biological Monitoring Working Party Score (BMWPS); River Invertebrate Prediction and Classification System (RIVPACS); Community Conservation Index (CCI) (Chadd and Extence, 2004) and the Shannon and Berger-Parker indices.

6.3.40 On the basis of the CCI index the river can be classified as being between Moderate and Fairly High/High conservation value (categories as described in Chadd and Extence, 2004). RIVPACS indicated the tolerance to organic enrichment to be low throughout the study stretch i.e. the biological water quality to be high; observed values meeting or exceeding those predicted. This quality is similarly reflected farther downstream at Curnix Bridge (Environment Agency data). The predominance of species favouring clean gravely habitats indicates a general sensitivity to any decline in water quality or clarity.

6.4 Potential Receptors

Overview

6.4.1 All proposed route options under consideration would result in the loss of improved grassland and arable habitats of limited ecological interest although breaching/removal of hedgerow networks and some loss of woodland habitat (within the Barry Woodlands SSSI) at the southern end of the scheme would also arise. Selection and design of the Preferred Route should therefore seek to avoid (where possible) or minimise the amount of hedgerow/woodland displaced or removed with appropriate mitigation provided where possible (see Mitigation section).

6.4.2 For protected species, the route alignment options could potentially affect reptiles, birds, bats, aquatic invertebrates and the riverine habitats of the River Waycock. The likely absence of Dormice from the scheme corridor has been demonstrated and no specific consideration of this species has been included. Similarly, only limited evidence of use by Badgers was reported (road casualty at the southern end of the scheme near Barry College) and consideration of effects on this species was limited to the woodland areas in the southern part of the scheme.

6.4.3 The following section provides a summary of the potential receptors that could be impacted by each of the five route alignments during the construction phase. For each of the alignment options, potential impacts are described in relation to Sectors as illustrated on Figure 1.1. Further detail relating to the significance of potential impacts during construction and operation as well as an indication of mitigation measures are provided in the Alignment Assessment Tables in Volume 3.

Construction

6.4.4 For all route alignment options, the greatest ecological impact would be associated with the loss of established habitats necessary to accommodate the scheme. Effectively this would reduce the available habitat for any species retained, potentially leading to local loss, degradation or fragmentation of populations of flora and fauna. In addition, these species would be subject to increased disturbance from construction vehicles as well as associated increases in noise, lighting

and pollution risk due to site activities. A summary of the ecological receptors potentially affected by each route alignment is provided in Table 6.1 with an assessment of the associated impacts on these receptors in the Alignment Assessment Tables in Volume 3. For some sections – for example Sectors 1 & 7 at Sycamore Cross and Waycock Cross respectively, the impacts are common to all of the alignment options. No development works, other than those required within the existing carriageway (e.g. re-surfacing works etc), are proposed within Sector 2.

6.4.5 Differentiation between the potential impacts of the route alignment options effectively equates to selecting an alignment that minimises impacts on ecological features between Sector 3 and Sector 6 and even on this basis, potential impacts are similar for one or more alignments. For example, at Sector 4, the Red, Orange and Green alignments would all result in very similar impacts to ecological receptors.

6.4.6 Breaching of hedgerows and the associated loss of resources for nesting birds and foraging/commuting bats would occur to varying degrees for all of the route alignments. However, the alignments that incorporate substantial areas of 'on-line' improvement (e.g. Purple, Orange and Red) would effectively remove large sections of the existing roadside hedgerows, particularly within Sector 3 and Sector 4. Although these hedgerows were not particularly diverse throughout, they are used by foraging/commuting bats and are likely to support nesting birds and other species (e.g. small mammals, invertebrates) and contribute to maintaining habitat connectivity within a predominantly agricultural landscape.

6.4.7 In addition to conserving road-side hedgerows in Sectors 3 & 4, minimising potential impacts through Sectors 5 & 6 is a key consideration for route selection. Within Sector 5, all the route alignments would result in hedgerow breaches east of the existing A4226 with the Blue Route also requiring removal of a species-rich hedgerow south of Northcliff cottage and affecting a number of mature Oaks to the west of Lidmore Wood. These trees, in addition to the western edge of Lidmore Wood could also be impacted by the Orange and Red alignments and, although Purple and Green alignments would avoid these trees and the woodland, they would likely impact upon the mature Oak and Ash immediately adjacent to the A4226.

6.4.8 Sector 6 incorporates the new crossing of the River Waycock and the improvements through part of the Barry Woodlands SSSI, with four of the alignments crossing the river at a similar location (Purple, Red, Orange and Green). The Blue Route crossing is further to the west (downstream) and this alignment would also necessitate removal of a swathe of SSSI woodland away from the existing A4226 corridor. The remaining route options would require comparatively less removal of woodland habitat and within a corridor already affected by the existing alignment.

Operation

6.4.9 The ecological receptors that could potentially be affected by the operational phase of the scheme are generally common to all route alignments with potential impacts principally related to the extent of habitat loss and/or degradation during construction. On this basis, the operational impacts offer little additional information to differentiate between the alignment options and consequently have not been incorporated into Table 6.1. The operational impacts are however addressed in the Alignment Assessment Tables in Volume 3.

6.4.10 During scheme operation, foraging bats and nesting birds would be impacted by the loss of hedgerows and, in the short term at least, mitigation for these impacts would not be possible. On-line route alignments, particularly through Sectors 3 & 4 would remove a substantial length of hedgerow habitat with the potential to result in habitat fragmentation or interruption of flight/feeding areas for bats and a loss of nesting/foraging resources for birds. In addition, where hedgerows have been removed this would exacerbate the disturbance effect of the road due to a reduction in the amount of available habitat – this is less of a consideration where hedgerows are breached (for example Blue route through Sectors 3 & 4) as some of the resource is retained.

6.4.11 Lighting provision at junctions could also impact on bat foraging/feeding behaviour, particularly for those species such as Myotids and Brown Long-eared, which are known to be sensitive to artificial light (e.g. Rydell & Racey 1995).

6.4.12 A key operational receptor is the River Waycock, with four of the five alignments crossing the river at a similar point and the Blue route, further to the west (downstream). Indirect impacts

arising from a reduction in water quality (from e.g. highway run-off) would be a key consideration for drainage and crossing design for all alignments.

Table 6.1 Summary of ecological receptors impacted by scheme construction.

Route Sector	Route alignment and potential impact on ecological receptors				
	Blue	**Purple**	**Red**	**Orange**	**Green**
Construction					
Sector 1	Loss of Semi-improved neutral grassland, scrub and species-poor road-side hedgerows to accommodate new junction Partial loss of species-rich hedgerow at southern limit of section on eastern side Common reptiles recorded in existing verges (loss of habitat) Nesting birds likely to utilise scrub & hedgerows (loss of habitat and increased disturbance of adjoining areas)				
Sector 2	No works proposed Retention of existing semi-improved grassland along verges and species-poor native hedgerows				
Sector 3	Loss of existing road-side hedgerows, grassland and woodland to west for on-line works (northern part of Sector) Loss of scrub linked to small woodland block (east of existing A4226) Breaching of 3no. species-poor hedgerows and 1 no. species-rich hedge at southern end of sector Loss of habitat for nesting birds and reptiles Increased disturbance to farmland birds in existing arable field including Skylark, Meadow Pipit and Goldfinch Interruption of bat feeding areas along hedgerows, potential for	As described for Blue Route with slight reduction in loss of existing road-side hedgerows (northern part of Sector). Loss of Oak trees along lane east of Whitton Lodge Breach of species-rich hedge east of A4226 and impacts to road-side neutral grassland west of A4226 in southern part of Sector.	On-line works resulting in loss of existing road-side hedgerows (ca.3km length), woodland (west of route) and grassland Loss of habitat for nesting birds and reptiles Increased disturbance to farmland birds in arable field Loss of bat feeding areas (road-side hedgerows) and interruption of flight routes	As described for Blue Route with reduced risk to Oak trees east of Whitton Lodge Additional breach of road-side hedge to south and east of Whitton Lodge to accommodate slip roads Breach of species-rich hedge at southern end of sector	As described for Blue Route with additional loss of road-side hedge at southern end of sector and to allow for slip roads Increased disturbance to birds north of Whitton Lodge to accommodate junction Breach of species-rich hedge east of A4226 and impacts to road-side neutral grassland west of A4226 in southern part of Sector. Reduced risk to Oak trees east of Whitton Lodge

Route Sector	Route alignment and potential impact on ecological receptors				
	Blue	**Purple**	**Red**	**Orange**	**Green**
	increased disturbance (lighting) to retained hedgerows Loss of mature Oak trees to allow for new roundabout at Whitton Lodge				
Sector 4	Breach of 3no. species-poor hedgerows Loss of bird nesting habitat Interruption of bat feeding areas along hedgerows Disturbance of retained features (noise, light)	Loss of existing road-side hedgerows on western side. Total hedgerow loss ca. 800 m Breach of 3no hedgerows west of A4226 including 1 species-rich hedge Loss of habitat for nesting birds and foraging/commuting bats	Loss of existing road-side hedgerows, including species-rich sections. Total hedgerow loss ca. 1.2km Loss of habitat for nesting birds and foraging/commuting bats		
Sector 5	Breach of 2no species poor hedgerows along Northcliff lane and loss of species-rich hedgerow (ca 100m in length) to south of lane Breach of 5no. hedgerows including 2 which are species-rich Loss of up to 3no. mature Oak trees with potential for roosting bats Disturbance of roosting bats in stable block south west of Northcliff Cottage Loss of bird nesting	Loss of road-side hedgerows, including species-rich areas in northern section to Moulton Junction. Total loss of up to 1km South of Moulton junction, breach of 3no. species-rich hedgerows to accommodate roundabout and slip roads and further breach (2no hedgerows) east of Sutton Farm Loss of mature Oak and Ash with possible bat roost and./or Tawny Owl nest.	As described for Blue Route with additional loss of road-side hedgerow in northern section (up to Moulton Junction) to accommodate roundabout and slip roads Potential for loss along western edge of Lidmore Wood	As described for Blue Route with additional loss of road-side hedgerow in northern section to accommodate roundabout and slip roads north of Northcliff lane Potential for loss along western edge of Lidmore Wood	As described for Red Route but with no risk of potential effects on Lidmore Wood Loss of mature Oak and Ash with possible bat roost and./or Tawny Owl nest.

Route Sector	Route alignment and potential impact on ecological receptors				
	Blue	**Purple**	**Red**	**Orange**	**Green**
	habitat Interruption of bat feeding areas along hedgerows Disturbance of retained features (noise, light)	Disturbance of roosting bats in stable block south west of Northcliff Cottage Loss of bird nesting habitat Interruption of bat feeding areas along hedgerows Disturbance of retained features (noise, light)			
Sector 6	Loss of existing road-side hedge up to 500m in northern section Loss of small woodland block/copse and breach of linear woodland north of River Waycock Potential for impact on 2no mature Oak trees in field corner in northern section New bridge crossing of River Waycock (effects on aquatic invertebrates and riverine habitat) Breach of 2no species-rich hedgerows south of the River Loss of woodland swathe (ca. 25m width) within SSSI west of existing A4226 over length of ca. 500m	Loss of existing road-side hedge up to River Waycock. Total length ca. 800m. Loss of 2no Mature Oak in northern section New bridge crossing of River Waycock at or immediately downstream of existing (reduced effects on aquatic invertebrates and riverine habitat) Some loss of SSSI woodland alongside existing alignment over length of ca. 500m Loss of habitat for nesting birds and interruption of bat feeding areas along road-side hedgerows (in northern section only)	Loss of road-side hedge north of River Waycock. Total length ca. 300m Breach of 2no hedgerows north of the River As described for Purple Route from the River Waycock to end of sector. Loss of habitat for nesting birds and interruption of bat feeding areas along road-side hedgerows (in northern section only)	As described for Red Route Junction arrangement allows slip road to use existing crossing of River Waycock Breach of species-rich hedgerow and linear woodland west of existing A4226 to accommodate junction and slip to Sutton Farm	As described for Red Route Junction arrangement allows slip road to use existing crossing of River Waycock Breach of species-rich hedgerow and linear woodland west of existing A4226 to accommodate junction and slip to Sutton Farm

Route Sector	Route alignment and potential impact on ecological receptors				
	Blue	**Purple**	**Red**	**Orange**	**Green**
	Loss of habitat for nesting birds and interruption of bat feeding areas along road-side hedgerows				
Sector 7	Loss of scrub, plantation woodland and ruderal vegetation to either side of carriageway. Blue Route would result in relatively greater loss compared to other alignments Nesting birds likely to use this area. Snipe flushed form area west of A4226 during Phase I survey (loss of habitat and increased disturbance of adjoining areas.				

6.5 Mitigation

6.5.1 In many cases, the mitigation will be determined by the legislative protection or planning policy relating to habitats or species/groups such as woodland, hedgerows, breeding birds, bats and reptiles. For example, any scrub or vegetation clearance would be undertaken outside the bird-breeding season, which typically runs from March-August inclusive. The following section sets out the mitigation measures considered appropriate to each of the route alignment Options within different Sectors – these measures, along with an assessment of impacts are summarised in Volume 3.

6.5.2 In determining the requirement and scale of mitigation considered for each alignment, the following key principles have been applied:

- Avoidance of the most sensitive areas through identification and adoption of best route option;
- Minimising the development footprint as far as practicable where avoidance of impacts is not possible;
- Timing of construction works to avoid or reduce disturbance to wildlife (e.g. maintenance and vegetation control activities outside nesting periods);
- On-site habitat enhancement within the scheme corridor or adjacent land;
- Sympathetic design and installation of hard structures, such as bridges and tunnels, and increase permeability through installation of nest/roost sites for wildlife;
- Appropriate Management of retained habitats/features;

Sector 1 – Sycamore Cross

6.5.3 All route alignments within this section would have similar impacts resulting from the construction and operation of a new junction and roundabout at the A48/A4226 interface. Ecological features potentially affected include semi–improved neutral grassland, hedgerows, nesting birds and common reptiles.

6.5.4 Prior to any construction works a strategy for minimising risks to common reptiles (Slow worm and Grass Snake) would be required. This is likely to involve some degree of reptile capture/transfer (translocation exercise) to move animals out of the development footprint to retained areas of verge – for example within Sector 2 where no development works are proposed. Transfer of animals to retained verges is likely to require some local enhancements

(e.g. log-pile provision) to increase carrying capacity. The reptile translocation exercise could be undertaken at any time between April and October when reptiles are active but should aim to be completed in September prior to colder temperatures in autumn. Other timing considerations for construction work would involve the removal of scrub/hedgerows outside the bird breeding season.

6.5.5 Mitigation measures appropriate to the operational phase of the scheme (post construction) would involve re-planting of hedgerows to re-establish habitat connectivity, sowing of new road-side verges with a wildflower/grassland mix to complement the existing grassland character and appropriate design of junction lighting to limit any increase in illumination of adjacent hedgerows and woodland (north of A48) over the existing level – this is in consideration of the likely use by foraging bats. Where hedgerow planting is undertaken, this should make use of native species known to occur locally (i.e. in retained hedgerows) such as Hawthorn *Crataegus monogyna*, Blackthorn *Prunus spinosa*, Elder *Sambucus nigra*, Hazel *Corylus avellana*, Field Maple *Acer campestre* and Holly *Ilex aquifolium*.

Sector 2

6.5.6 No development activities are proposed in this section for any of the route alignment options. Some works within the existing carriageway (e.g. re-surfacing) are likely to be required and such works should avoid any storage or stockpiling of materials within the adjacent road-side verges.

Sector 3

6.5.6 Four of the route alignment options (Blue, Purple, Orange and Green) would result in similar impacts in this section with some loss of road-side hedgerows and scrub in the northern part and loss/breach of hedgerows either side of the lane at Whitton Lodge. Much of the alignment for these options would cross the large arable field east of the A4226 corridor potentially impacting on farmland birds including ground-nesting species such as Skylark *Alauda arvensis*. The Red route follows the existing A4226 alignment, resulting in the loss of road-side hedgerows over the entire section. Bat activity alongside these hedgerows recorded up to four species foraging/commuting (Figure 6.3a).

6.5.7 Mitigation measures within this section would involve replacement planting for any road-side hedgerows as described for Sector 1. For the four off-line options, new hedgerow planting through the arable habitat represents an opportunity to increase the hedgerow resource in the

long term and provide a positive overall impact for the hedgerow and grassland resource. Avoiding/minimising impacts associated with the junction arrangement through route selection is also a consideration for this section. For example, the Blue Route junction would result in removal of a substantial area of hedgerow along Whitton lane and could affect a number of semi-mature Oaks to the east, whereas selection of either the Green or Orange route would limit loss of hedgerow with habitat loss associated with junctions on these alignments relating to arable land or improved grassland, both of which are of less ecological interest than the hedgerows.

6.5.8 Other mitigation measures considered as part of the assessment (see Volume 3) include avoidance of the bird breeding season for vegetation clearance works and appropriate design of lighting at new junctions to maintain bat flight corridors along hedgerows.

Sector 4

6.5.9 With the exception of the northern and southern junction sections (Sectors 1 & 7 respectively) Sector 4 is the shortest section of the route with the existing habitats comprising arable or pasture fields intersected by hedgerows. Bat activity levels within this section recorded three species utilising the hedgerow network north of the lane at Northcliff Cottage.

6.5.10 Only the Blue Route follows an off-line alignment within this section with the remaining four routes all resulting in substantial loss of road-side hedgerows over the length of the section. As described for Sector 3, avoiding and minimising impacts is a consideration for Sector 4 with the off-line solution, involving breaching/partial loss of hedgerows preferable to the complete loss required for on-line works. Other considerations for this section are as described for Sector 3 relating to replacement hedgerow provision, nesting birds and lighting design (bat foraging/commuting areas).

Sector 5

6.5.11 All of the route options in Sector 5 eventually follow an off-line alignment although the Purple, Red and Green routes remain on-line over the northern part of the section. Ecological features within Sector 5 include both species-poor and species rich hedgerows, improved grazing pasture and a number of mature Oak and Ash trees at selected locations. The hedgerow network within this section was also used by up to four species of bat (Figure 6.3b) with a confirmed roost (Pipistrelle species) within the stable south west of Northcliff cottage.

6.5.12 Mitigation considerations are comparable to Sector 4 with the off-line routes (Blue and Orange) demonstrating the principle of avoiding/minimising impacts to hedgerows in particular. However, the junction arrangement for the Orange Route, with a new roundabout and slip roads north of Northcliff lane would affect existing road-side hedgerows, including species-rich sections.

6.5.13 All of the route alignments could potentially affect the mature trees towards the centre of the section although the Blue, Orange and Red Routes offer the potential to minimise loss to a single tree. However, both the latter alignments (Red and Orange) could result in impacts along the western edge of Lidmore Wood and this should be avoided where possible.

6.5.14 Both the Green and Purple routes would likely result in the loss of a mature Ash and Oak immediately east of the existing A4226. As noted for Sector 3, all routes within Sector 5 offer an opportunity for Neutral/beneficial impacts in the long term (for the off-line sections at least) through increasing the amount of hedgerow and diverse grassland, with these features incorporated as part of the cutting/embankment design. However, the potential for a positive impact is reduced for those alignments involving substantial loss of existing road-side hedgerows (e.g. Purple, & Green) and the risk of impacts to existing woodland (Red and Orange Routes). In these instances, replacement planting would be viewed more as mitigation (for features lost) rather than an enhancement/beneficial effect on the existing biodiversity resource.

Sector 6

6.5.15 In contrast to the other Sectors, mitigation involving avoiding/minimising impacts in Sector 6 could be best achieved through on-line improvements, particularly through the southern part of the section which incorporates the Barry Woodland SSSI. All route alignments would affect ecological features to the east and west of the A4226 to varying degrees although the Blue Route would be particularly unfavourable resulting in the loss of at least one small woodland area north of the River Waycock and a swathe of woodland through the SSSI.

6.5.16 Within this section, a new crossing of the River Waycock would be required with four of the alignments (Purple, Red, Orange and Green) crossing at a comparable location at or immediately downstream of the existing bridge. Protection of the river from indirect impacts on water quality – from e.g. silt discharge, accidental spillage and highways run-off - would be a key consideration during construction and operation of the scheme with an Environmental Protection Plan (or similar) likely to be required as part of construction works. Drainage design

of the built scheme should also incorporate appropriate pollution control units to minimise the risks to water quality from highways run-off.

6.5.17 The Blue Route crossing of the River Waycock would be approximately 100m downstream of the existing crossing and would impact habitats adjacent to the river corridor (woodland, grassland and hedgerow) as well as the riverine habitats themselves. Minimising impacts through avoidance – in this case adopting a more on-line option that uses the existing bridge crossing – should be considered. However, the practicalities and feasibility (in engineering terms) of using the existing bridge crossing would require further investigation and design work.

6.5.18 All route alignments would also involve a degree of habitat loss within the Barry Woodlands SSSI, although minimising this impact through adoption of the more on-line solutions would be preferable. As identified within the woodland survey (see SBE 2009a), the quality of the woodland alongside the carriageway was broadly comparable within 50m of the carriageway although ground flora within Woodland 1 was marginally more diverse than in Woodland 2 (Figure 6.5). Mitigation for loss of woodland habitat could involve adoption of a woodland management plan (duration to be agreed) for the retained areas with the aim of restoring effective management through selective coppicing.

6.5.19 Other mitigation considerations for Sector 6 include avoidance of the bird breeding season for vegetation clearance, new hedgerow planting and appropriate lighting design along retained/newly created linear features.

Sector 7

6.5.20 All route alignments at the southern end of the scheme would result in similar impacts involving provision of a new roundabout/junction. The Blue Route would result in a comparatively greater loss of hedgerow and scrub to the west of the existing A4226 with the remaining route options all associated with loss of similar habitats adjacent to the carriageway.

6.5.21 Timing of vegetation clearance (nesting birds), replacement hedgerow planting and appropriate lighting design are all relevant mitigation measures for this section.

6.6 Residual Impact

6.6.1 The following section and the table in Volume 3 describe the residual impact of the five route options assuming that the mitigation measures described above are effectively implemented. Even with adoption of the mitigation measures, all route options would inevitably have some adverse impact during construction and in the short term post-construction (Year 1 of operation) due to the loss of existing habitats to accommodate the scheme. With the exception of the Blue Route in Sector 6, typically the ecological impact for the route alignments within each Sector was considered to be Slight Adverse (in the short term), moving towards Neutral and Slight Beneficial in some cases as mitigation/enhancement planting matures in the long term (Year 15 and beyond).

6.6.2 In general, those route alignments involving mainly on-line improvements would have the greatest adverse effects due to loss of existing road-side hedgerows. For example, within Sector 4, only the Blue Route adopts an off-line solution with the residual impact (long term) considered to be Slight Beneficial as there would be a net increase in hedgerow and grassland resource. In contrast, the remaining routes would result in a Moderate Adverse impact in the short term in Sector 4, reducing, at best, to Neutral in the long term as mitigation would effectively aim to replace the hedgerow resource.

6.7 Conclusions

6.7.1 The interim assessment of route alignment options has identified a number of ecological receptors that would be affected by the improvement works. This includes hedgerow, grassland (road verge), woodland and aquatic habitats (River Waycock) in addition to nesting birds, foraging/commuting bats and common reptiles. All of these features would inevitably experience some degree of adverse effect as a result of scheme construction although, with appropriate mitigation, these effects could be effectively controlled and, in the long term could lead to an overall benefit for certain features.

6.7.2 As described in previous sections and summarised within Volume 3, differentiation of the ecological impacts associated with the five routes under consideration effectively relates to an assessment between Sectors 3 and 6. For all route options, potential impacts would be comparable at Sector 1 (Sycamore Cross) and Sector 7 (Waycock Cross) with no development works proposed in Sector 2.

6.7.3 Based on consideration of the likely impacts, no single route alignment would be particularly favourable and the Preferred Route taken forward to the next stage of the assessment is likely to comprise a combination of different options, each of which minimises ecological impacts within a particular Sector. In terms of ecology and nature conservation, this route could adopt the following arrangement:

- Sector 3: Blue Route with Junction arrangement as for Orange Route;
- Sector 4: Blue Route;
- Sector 5: Blue Route;
- Sector 6: Red or Orange Routes

6.7.4 Dependent of the route taken forward as the Preferred Route, following consideration of all the environmental impacts (air quality, noise, landscape/visual etc.) further targeted survey work may be required to inform mitigation design, particularly at junctions and the new River Waycock crossing, and any licensing requirements if European Protected Species (bats in this instance) could be effected. For example, the bat roost identified within the stable at Northcliff Cottage and one or more mature Oaks within Sector 5, (presence of a roost considered likely) could be impacted by the route and this could require a licence from the Welsh Assembly Government (WAG).

7 Land Use

7.1 Introduction

7.1.1 The dominant land use in the study area is agriculture which in turn is influenced by geology and soils. The study area extends from Sycamore Cross at the north of the scheme to Waycock Cross at the south of the scheme. The assessment of effects on landholdings is based upon the section of the holding that is within 1km of and bordering against Five Mile Lane.

NOTE: All distances and areas given have been measured from a CAD plan and are approximate.

7.2 Appraisal Methodology

7.2.1 The methodology followed is based on that required for both a Stage 1 and Stage 2 assessment as set out in the HA Design Manual for Roads and Bridges Volume 11, Part 6.

7.2.2 This report has been prepared to provide the necessary information for a full Stage 2 assessment:

- Information on the agricultural land classification of the land that may be affected;
- Outline information on the agricultural holdings that may be affected;
- Information on any potentially substantive severance issues;
- Land uses and potential impact including contaminated land;
- Baseline geology and soils and potential impacts; and
- Mitigation options for adverse impacts.

7.2.3 The WelTAG '7 Point Scale' has been used to assess the significance of effects on Land Use, Geology and Soils. Please refer to the Approach and Methodology section in the introduction for more information.

7.2.4 Landholding boundaries in the vicinity of Five Mile Lane were identified, along with principal farm access routes. Consideration has been given to the main uses of the land potentially affected, together with an investigation of the potential impacts of the new carriageways'

construction upon each affected unit. Opportunities for possible mitigation of impacts are reported in this document.

7.2.5 Landholding information was obtained in 2008, confirming the holding limits, owners, lessees and description of land use. This was supplemented by field surveys during the period February to November 2009.

Double Counting

7.2.6 In order to avoid double-counting of impacts, where possible, receptors have been assessed in the chapters according to where the impacts experienced may be most significant. In this chapter, the landholdings that may experience impacts have been described. Community Facilities has been assessed fully under Social Impacts.

Cumulative Effects

7.2.7 At this stage, there haven't been any potential cumulative land use effects predicted or assessed as a result of completing this scheme.

7.3 Baseline Conditions

Woodland

7.3.1 Small woodlands are included within the study corridor, frequently occupying valley sides. Most woodlands are privately owned rather than commercial and there are also a good distribution of copses and hedgerow trees. A significant proportion of the woodland is designated as Ancient Woodland or SSSI. Impacts on the SSSIs are discussed under Biodiversity in Chapter 6.

Agriculture and Soils

7.3.2 Mixed farming is the dominant land use within the study corridor due to the good climate, good soils and gentle topography. Figure 7.3 illustrates land use while Figure 7.5 illustrates the distribution of agricultural land quality in the study area.

7.3.3 Where the underlying bedrock is carboniferous limestone these are overlain by well-drained alkaline soils. Other areas of the Vale are underlain by old red sandstone that produces acidic

well-drained soils. There are areas of high quality agricultural land - Agricultural Land Classification (ALC) Grades 2 and 3a within the study corridor.

Land Quality

7.3.4 The National Assembly for Wales Agriculture Department classify agricultural land by grades according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use for food production. There are 5 grades of land numbered 1 to 5, with grade 3 divided into two sub-grades. The best and most versatile land falls into grades 1, 2 and sub-grade 3a and is the most flexible, productive and efficient in response to inputs.

7.3.5 The agricultural land quality information was obtained from the Welsh Assembly Government in March 2008. The majority of land within the study corridor is Grade 3 although a sub – class of 'a' or 'b' is not given in the GIS data.

7.3.6 At the start of the improvement scheme, the land quality is grade 2. The route then passes through an area of grade 4, before entering a zone of grade 3 that continues to the end of the improvement scheme at Waycock Cross.

Geology

7.3.7 The dominant bedrock (solid gelogy) of the Vale is composed of sedimentary glacial and fluvial deposits (drift geology). A band of carboniferous limestone extends through the middle of the Vale. The study corridor is predominantly composed of Lower Jurassic (Blue Lias) with limited drift geology. Please refer to Figures 7.1 and 7.2.

7.3.8 The Vale of Glamorgan is geologically interesting as it is the only place in Wales where Jurassic strata can be seen on land; however there are no geological SSSIs, RIGS[8] or quarries within the study corridor.

[8] South Wales RIGS study awaiting publication. There is no active RIGS group in the area and therefore it is unlikely that there are any RIGS within the study corridor.

Community Facilities

7.3.9 The Amelia Trust Farm (Whitton Rosser Farm) is located to the west of the existing road. The Farm is open to the public with no admission charge. The volunteer charity supports adults with learning difficulties and disadvantaged young people.

7.3.10 The Welsh Hawking Centre, is a popular visitor attraction located close to the existing road and adjacent to the Barry woodland SSSI.

7.3.11 Community facilities are assessed under Social Impacts, please see Chapter 10.

Urban areas and settlements

7.3.12 The north west corner of Barry also falls within the study area although most of the study corridor is generally sparsely populated with isolated farms and houses. There is a small settlement at Moulton.

Contaminated Land

7.3.13 This is a fairly minor issue in this predominantly rural area although the Environment Agency has provided indicative evidence of one former landfill site within the study corridor:

- Blacklands Farm: Licensed Dec 1990 to Dec 1991 the type of waste buried here is **'Inert'** which means waste that remains largely unaltered once buried such as glass, concrete, bricks, tiles, soil and stones.

7.4 Potential Receptors and Impacts

Landholdings

7.4.1 In total twenty-five identified landholdings border the existing Five Mile Lane and may be affected by either loss of land, or access, or both. The new route is intended to be wider and have a higher design speed than the existing making it unsafe to cross, or make sharp turnings. With mitigation in the form of feeder lanes, underpasses and overbridges, this significant adverse effect may be greatly reduced, although this also needs to be balanced against the likely impact of greater land take and permanent loss of agricultural land.

7.4.2 Where the new route is off-line, small pockets of land may be created between the existing Five Mile Lane and the new highway. These may be too small to be agriculturally viable and compensation may be required in places.

7.4.3 To maintain confidentiality, receptors and farm holdings have been given reference numbers, which aid cross referencing between figures, tables and the report and place names have been given to holdings for ease of reference. Owners and lessees names are not given.

NOTE: Only significant impacts are covered within the main body of the text. Please see Appendix 7.1 for the remaining landholdings assessments.
References similar to 'LU-3-1a + b' can be cross referenced with figures and tables.

Sector 1

7.4.4 No significant effects.

Sector 2

7.4.5 No significant effects.

Sector 3

7.4.6 In Sector 3, four of the five options under consideration deviate significantly from the existing route.

7.4.7 Whichever option is chosen all landholdings bordering the edges of the new route are likely to experience impingement onto their boundaries.

Blackland Farm (LU-3-1a + b)

7.4.8 These two land parcels are located on the western and eastern sides of Five Mile Lane. Effects on this landholding can be summarised as follows:

- All routes: loss of farm access and connectivity.
- Red (on-line): minimal loss of 0.4Ha land area as a result of road widening
- Orange: Loss of 2.1Ha corner of field (b)
- Green: Loss of 0.9Ha corner of field (b)
- Blue: Loss 0.9Ha of corner of field (b)
- Purple: Loss of 1.1Ha corner of field (b)

7.4.9 The effect on the land parcel can be defined as **slight adverse,** as a corner may be affected, however, the effects on the landholding could be **severe adverse** without mitigation. Provision of access via a bridge or underpass may reduce this effect to **slight adverse.**

'Doghill Farm' (LU-3-3)

7.4.10 Located on the east of Five Mile Lane, this agricultural holding is at a point where a bend in the existing road needs to be straightened. Route options i.e. Purple or Orange, that leave a wider strip of land between the existing Five Mile Lane and the new route may be preferred to those that leave a narrower strip.

7.4.11 Effects on this landholding can be summarised as follows:

- Red route: minimal loss as a result of road widening (on-line)
- Orange or Purple: 11.8Ha of land between old and new road
- Green route: 8Ha of land between old and new road and a roundabout causing further fragmentation.
- Blue route: 6.2Ha of land between old and new road

The effects on the landholding could be defined as **moderate adverse,** although with provision of access to the land parcel that may be on the west of the new route, this could be reduced to **slight adverse**.

Whitton Lodge (LU-3-5)

7.4.12 The private dwelling of Whitton Lodge is located immediately to the east of Five Mile Lane. The red alignment would have a direct severe adverse effect on this property and it would need to be demolished. The other routes propose adding a new alignment on the other side of the dwelling, to the east. The Blue route includes a roundabout junction that may be placed behind the house, about 75 m away, whereas the Orange roundabout is approximately 130 m away and the Green roundabout 200 m away. The Purple route, designed for an 80 km/h speed, as opposed to 100 km/h, utilises a simple crossroad junction.

7.4.13 Effects on this dwelling can be summarised as follows:

- Red route: direct severe adverse impact and demolition
- Orange or Purple route: new route alignment 120m from house
- Green route: new route alignment 50m from house
- Blue route: new route alignment 100m from house

7.4.14 Due to the close proximity of the dwelling to the proposed route the impact is **severe adverse.** For the Red route this may not be possible to mitigate, although compensatory measures may need to be agreed. The other routes may provide more opportunities for mitigation over and above that of avoidance. Please refer to landscape chapter for further detail.

Little Hamston Farm (LU-3-6)

7.4.15 This agricultural holding is located to the east of the existing Five Mile Lane. The red on-line route may have a minimal effect on a small part of the holding boundary. The other routes would all slice off a corner of the holding. The Orange and Blue routes have a roundabout located mainly within the holding. The severed land may be too small to remain commercially viable.

7.4.16 Effects on this landholding can be summarised as follows:

- Red route: minimal loss as a result of road widening (on-line)
- Green route: 0.6Ha loss of corner of land between old and new road
- Orange, Blue and Purple routes: loss of up to 1.5 ha segment of land between old and new route with additional fragmentation caused by junction.

The effect on the holding from the Orange, Blue and Purple routes is **moderate adverse** due to a loss of up to 1.5 hectares.

Sector 4

Highfield (LU-4-2)

7.4.17 This holding, on the western side of Five Mile lane, also straddles Sectors 4 and 5. This particular land parcel is made up of three fields. The Red or Green routes may impinge on the boundaries, removing up to 0.1Ha. For the Orange route, part of the proposed roundabout would be within the holding.

7.4.18 The Blue or Purple routes may not affect the holding. These alignments are further eastwards of the existing road. The Blue route essentially leaves the existing Five Mile Lane in place and creates a parallel off line route at this point.

7.4.19 The Red or Green routes may have a **slight adverse effect** on this landholding. The potential fragmentation from the Orange route could increase the impact to **moderate adverse**.

Sector 5

Northcliff Cottage (LU-5-1)

7.4.20 This private dwelling is over 100m east of the existing Five Mile Lane and may be affected by any of the route options.

7.4.21 For the Red and Green options, an approach road for the new roundabout would be within 50m of the house. The main part of the Orange route may be 58m away from the house and the alignment for the Blue route may be 48m away with additional impacts from a junction improvements. The Purple route is most favourable.

7.4.22 The effects of either the Red or Green routes would be **slight adverse.** The predicted effect on this small landholding, particularly from the Orange or Blue routes, is **moderate adverse.**

Groveland Farm (LU-5-2)

7.4.23 This holding is on the western side of Five Mile lane. The Red and Green routes may have the greatest impingement on the boundaries, removing up to 0.1Ha. For the Orange option, part of the approach to a roundabout junction may affect a field corner.

7.4.24 The Blue or Purple routes may not affect the holding. These alignments are further eastwards of the existing road. The Blue route essentially leaves the existing Five Mile Lane in place and creates a parallel off line route at this point.

7.4.25 The Red, Orange or Green routes may have a **slight adverse effect** on this landholding. This could increase to **moderate adverse**, in consideration of the relatively small size of the holding.

Groveland House (LU-5-3a + 3b)

7.4.26 This is a private dwelling on the western side of Five Mile Lane, with attached land on the eastern side of Five Mile Lane. This small landholding is at a pivotal location where sharp bends are to be removed and as such it is affected by all options.

7.4.27 The Red, Orange and Green options include roundabouts and access roads in proximity to Groveland House. Local access to the dwellings would reduce the distance between receptor and road by approximately 12 metres for the Red and Green alignments. The increase in road network would have a severance effect on the associated fields to the eastern side of the road.

7.4.28 The main carriageway for the Orange and Blue routes is further to the east when compared to the others and as such would retain a greater proportion of paddock. The Purple route would retain approximately 3.3Ha, the Orange 2.5Ha and the Blue 1.8Ha.

7.4.29 The effects on this landholding are **severe adverse** as all options may lead to a significant loss of land, severance or impact on the quality of the dwelling. The Orange or Blue routes would provide more opportunities for mitigation.

Highmeade (LU-5-4)

7.4.30 This holding may be affected by the junction options for the Red and Green routes that would place an approach road through the edge of this holding. The Orange and Blue routes would not affect the holding, as these alignments are further east. The Purple route may have greatest effect, as half of the indicated roundabout junction may be located within the field that is next to Five Mile Lane.

7.4.31 The assessment of effects for the Red, Green and Purple routes is **moderate adverse**. The Orange and Blue routes would be preferred.

Sutton Fach Farm (LU-5-5)

7.4.32 This holding may be affected by all the options. The full extent of the holding beyond 1 km distance of Five Mile Lane is not known at this point. However, any of the options seem likely to leave the house and barns isolated from a substantial part of the eastern land area. The provision of access in the form of an overbridge or underpass needs serious consideration.

7.4.33 For each option, the approximate size of the workable land parcel left between the existing and proposed route may be: Red-10.5Ha, Orange-18.9Ha, Green-5.5Ha, Blue-13.3Ha, and Purple - 7.3Ha.

7.4.34 The Orange route may be preferable, leaving as it potentially leave the greatest workable area between the old road and the new alignment. There is also the benefit that the new route is located at a greater distance from the house and barns than either the present route, or any of the other options.

7.4.35 The worst-case effects for the holding may be **severe adverse,** due to land disturbance and severance. This effect could be reduced to **moderate adverse** with mitigation and could be reduced further to **slight adverse** if it was established that this land section is part of much larger landholding.

'Llancarfan' holding

7.4.36 This extensive landholding has been previously described above. The Blue option would potentially affect an area of woodland which is assessed below and in the appendices under 'woodland'.

Sector 6

7.4.37 In Sector 6, the severance effect described above for Sutton Fach Farm continues for approximately 240m until a point where all options again begin to follow the existing route. The Blue route may have the greatest impact in this section, as it leaves the existing route in place to use as a feeder and a new alignment is constructed alongside it. For the Orange and Green routes there may be additional effects and loss of 0.3 Ha due to a feeder lane and roundabout.

Woodland

7.4.38 The proposed routes may affect a number of areas of woodland. The biodiversity section of the report has assigned reference numbers and these are used below:

Wood 1 Middleton plantation & Wood 2 Vale & Barry College

7.4.39 These woodlands are separated by the existing A4226 and are part of the Barry woodlands SSSI (See Chapter 6 Biodiversity).

7.4.40 Within the southern part of the survey corridor, between Waycock Cross and the River Waycock, all route alignment options are on-line (except for the Blue route). There could be a shift of up to 8m westwards or eastwards due to the additional width of the new road.

7.4.41 All route alignments may have a marginal effect on woodland to the east and west of the A4226 to varying degrees although the Blue Route may be particularly unfavourable resulting in the loss of at least one small woodland area north of the River Waycock and a swathe of woodland – up to 60m from the existing road – may be affected.

7.4.42 The effect of the Blue option is **severe adverse** for wood 1 with no effect on wood 2.

'Waycock' holding (LU-6-1)

7.4.43 The holding contains small blocks of woodland, and the Blue route may directly affect these. The other routes - Red, Orange, Green and Purple are all on line although the increased width may lead to an impingement against the landholding boundary. For the Red and Green options, feeder lanes to a proposed roundabout may affect the edge of the holding. The Blue route has the greatest effect, leading to an approximate loss of 1.1ha.

7.4.44 The assessment of effects for the Blue route is **moderate adverse,** for the Orange or Green routes it is **slight adverse.**

New Farm (LU-6-2)

7.4.45 The Blue route may directly affect this landholding. The other routes are all on line although the increased width may lead to an impingement against the landholding boundary. The Red or Green routes would lead to the loss of a corner due to the roundabout slip roads.

7.4.46 The assessment of effects for the Orange or Green routes are **slight adverse,** and the predicted effect of the Blue route is **moderate adverse**.

Sector 7

7.4.47 No significant effects.

Land Quality

7.4.48 The predicted effects on agricultural land quality may be very similar for all route options.

Sector 1

7.4.49 In the worst - case scenario, 1.1 Ha may be permanently removed from Redland Farm. If a large roundabout is constructed on the Redland Court Farm landholding, the plans at this stage indicate that the land take may be 0.3Ha.

7.4.50 The land has an Agricultural Land Quality of Grade 2. The Environment Planning and Countryside section of the Welsh Assembly Government should be consulted regarding the options available

7.4.51 Due to the agricultural land quality of Grade 2, the predicted impact is **moderate adverse effect.**

Sector 2

7.4.52 There is mainly Grade 4 agricultural land and any proposed highway improvements would be on line, therefore there would be no impact on agricultural land quality.

Sector 3

7.4.53 In this section there is an area of Grade 4 agricultural land and then the rest of the section is Grade 3.

7.4.54 The Red route may lead to a loss off 0.7 ha of Grade 4 agricultural land, and an overall loss (Grade 3 & 4) of 0.23 ha.

7.4.55 All other routes have a similar effect to each other, leading to a loss approximately 0.4 ha of Grade 4 agricultural land. The Orange and Purple routes lead to a slightly lower loss of Grade 3 & Grade 4 land than the Green and Blue routes. For all options the amount lost is approximately 2.7 ha to 3.1ha.

7.4.56 The agricultural land quality affected is mainly Grade 3 with some Grade 4, this is given a **slight adverse** effect.

Sectors 4 to 7

7.4.57 In sector 4 the Red, Orange, Green and Purple options are all mainly online resulting in an overall loss of Grade 3 agricultural land of less than 1ha. The Blue option is aligned to the east of the existing road and may lead to greater land take of more than 1 hectare.

7.4.58 In sector 5, the Red option may lead to the least land take, preliminary measurements indicate that this may be in the region of 2.7ha. Due to differing curvatures of the options, the Orange and Green options have a slightly higher land take of up to 3ha. The highest land take is likely to occur for the Blue option, which may be almost 4ha. The indicative loss for the Purple route is approximately 3.5ha. In sector 5, the order of preference may be 1 Red, 2, Orange, 3 Green, 4 Purple, and then 5 Blue.

7.4.59 In sector 6, the Red, Orange, Green and Purple options are all mainly on-line. Widening of the existing road and the addition of roundabout may lead to an overall loss of between 1ha to 1.5ha. The additional land take of the Blue route leads to a loss in the region of 3.6ha.

7.4.60 In sector 7, the proposed roundabout may lead to an overall loss of 0.3 hectares from the Middleton plantation.

7.4.61 For sectors 4 to 7, the agricultural land quality is Grade 3 and the predicted impact of the Red, Orange, Green and Purple routes is slight adverse. The Blue option has the greatest land take, and preliminary measurement indicate that this is approximately 12ha (including Sycamore and Waycock junctions.)

Geology

7.4.62 The geological rock type through which the scheme passes is predominantly limestone with inter-bedded mudstone. The river valleys are overlain by deposits clay, silt, sand and gravel. Further geo-technical investigation may be necessary in order to assess the full impact on geology. The impact is likely to be similar for any of the options.

Urban areas and settlements

7.4.63 Junction improvements are proposed at the northern end of the scheme, near Bonvilston and St Nicholas, and the southern end of the scheme, on the urban fringe of Barry.

7.4.64 The proposed junction improvements would be unlikely to have a direct impact on these settlements. The indicative junction layouts are entirely on existing highway or agricultural land.

Contaminated Land

7.4.65 The former landfill site at Blackland farm is unlikely to be disturbed by any of the proposed route options.

7.5 Potential Mitigation Principles

7.5.1 In many cases, the mitigation may be determined by the legislation, planning policy or standard practice for highway schemes.

7.5.2 In determining the requirement and scale of mitigation considered for each alignment, the following key principles should be applied:

- Avoidance of the most sensitive landholdings through adoption of best route option;
- Minimising the development footprint as far as practicable where avoidance of impacts is not possible;
- Timing of construction works to avoid or reduce disturbance to working farms, and impacts on soil.
- Installation of hard structures, such as overbridges or underpasses, to limit impact on severance and loss of access.

7.5.3 In general, mitigation is likely to be more practical to apply to off line options, as these leave sections of the existing road in place, to use as a feeder road, and also, there is improved build-ability for underpasses and overbridges in a new alignment.

7.5.4 The assessment above has identified receptors where impacts could be reduced by mitigation. These are:

- **Blackland Farm** - As the holding straddles the existing Five Mile Lane, the scheme should include provision of safe access to the western and eastern sides
- **Doghill Farm** - The Orange, Green, Blue and Purple options may all lead to severance of a large field next to Five Mile Lane. The Orange and purple routes are likely to provide the more preferable options for mitigation.
- **Whitton Lodge** - The Red route would lead to demolition of the property. The preferable options for providing mitigation to the dwelling would be Orange or Purple.
- **Groveland House** – The Orange or Blue routes may provide more opportunities for mitigation.
- **Sutton Fach Farm** – all options would require mitigation in the form of provisions of access between the house and barns and fields.

7.5.5 In some cases, mitigation may not be possible and other compensatory measures may need agreement. The Orange, Blue or Purple options may have a greater impact on Little Hamston Farm than the Red or Green options.

7.5.6 Some of the smaller landholdings may be affected by particular options:

- The junction associated with the Orange route may particularly affect Highfield and Groveland Farm.

- The junction feeder lanes associated with the red or green options may particularly affect Northcliff Cottage, Groveland House and Highmeade.
- The junction in the Purple option may particularly affect Highmeade.

7.6 Limitations, Assumptions and Further Work

Landholdings

7.6.1 This assessment has predicted effects based on likely impacts to the agricultural areas that may be physically affected by the proposals. At the next stage of assessment, the full extent of the agricultural landholdings should be established, and interviews should be held with the landowners and tenants.

Land Quality

7.6.2 The information obtained from the Welsh assembly Government should be verified in the field. The Grade 3 land may include sub-grades 'a' and 'b', or there may be local variations in land quality that become evident when a detailed local survey is carried out.

Geology

7.6.3 A full geo-technical investigation would be undertaken, providing site specific detail to information obtained from the British Geological Survey.

Community Facilities

7.6.4 As the scheme progresses, representatives from the Amelia Trust, Welsh Hawking Centre and Barry College should be consulted regarding safe access arrangements and signage.

Urban areas and settlements

7.6.5 The urban areas of Barry, and village of Bonvilston and St Nicholas are not directly affected by the scheme but would likely be consulted as neighbours during Stage 2 as part of the public consultation process. The main effects are likely to arise from the proposed roundabout junctions at both ends of the scheme.

Contaminated Land

7.6.6 The area of possible contaminated land is not likely to be affected by the proposals and no further work is likely to be required.

7.7 Overall Assessment of Significance

Landholdings

7.7.1 The affected landholdings are of varying sizes and this has an influence on the level of impact and opportunities for mitigation. Prior to consultation with landowners, there is some difficulty in recommending a preferred option. Alignments that leave apparently viably sized fields between the existing Five Mile Lane and the new route may be preferred, provided that access throughout the holding can be maintained.

7.7.2 At this stage of the assessment, the main alignment for the Orange route seems to provide the most opportunities for mitigation; however, the junctions associated with the option have slight adverse effects at a number of receptors.

7.7.3 For all options, the overall predicted impact on landholdings is slight adverse.

Land Quality

7.7.4 The overall effect on land quality is **slight adverse,** as the majority of land affected is Grade 3. It is not possible to mitigate the impacts except through reducing landtake and severance, so respectively the Blue and Orange appear preferable.

8 Heritage

8.1 Introduction

8.1.1 This section of the report sets out the results of the cultural heritage assessment of the various route options. Cultural Heritage assets include Archaeological Remains, Historic Buildings and Historic Landscapes, as defined in the DMRB Vol 11, Section 3, Part 2, Chapter 2. The assessment has been based on a 'simple' assessment, but makes recommendations for further, more detailed assessment. There are no cumulative effects identified.

Appraisal Methodology

8.1.2 The appraisal methodology follows guidance contained in DMRB and has incorporated data from the following sources:

- The Glamorgan Gwent Archaeological Trust Ltd Historic Environment Record (HER)
- The National Monuments Record (NMR), including aerial photographs, maintained by the Royal Commission on the Ancient and Historical Monuments of Wales(RCAHMW)
- A site walkover in December 2009.

Study Area

8.1.3 The study area comprises the various route options plus a zone of up to c. 500m either side to provide context.

Impact Distribution

8.1.4 Those assets likely to be affected by the road improvements will comprise buried archaeological remains. The anticipated impacts on the cultural heritage assets within the study area will occur during the construction phase of road improvement. These impacts are likely to be of short duration (e.g. trial pit excavation, topsoil stripping, general excavation and plant movement etc) but their effects will be permanent (loss of physical fabric). There are no heritage assets, whose setting is currently affected by the existing road, for which the proposed improvements would have a positive, beneficial, effect. Similarly, there are no assets currently identified where the constructed and operational road would have an adverse effect on their setting.

8.2 Baseline Conditions

8.2.1 A total of 19 cultural heritage assets have been identified in the study area. A summary of all recorded sites is set out in Table 8.1; a depiction of aerial photographic data in Figure 8.1, and locations of all assets on Figures 8.2 – 8.6 in relation to the route options.

Recorded archaeological and cultural heritage assets

Archaeological remains

Prehistoric

8.2.2 One site (3) is a standing stone of presumed prehistoric date. It is considered to be of High value and is a Grade II listed building.

8.2.3 No other sites are known to date to this period although a fallen monolith (standing stone) at Site 4 may be of this period; cropmarks recorded at Site 16 (see below) may also date to this period.

8.2.4 It is likely that the potential for prehistoric remains within the study area is understated by the currently available data.

Table 8.1: Summary of cultural heritage features within study area

Site No.	HER	NMR	NGR	Form/Type	Description	Period	Status	Assessment of Value
(Figure 8.2)								
1		19956	ST 0714 7409	Building	Sheepcourt Cottage	?Post - medieval	-	Low
2	00373s	-	ST 0778 7418	Findspot	A valuable collection of coins was unearthed between Bonvilston and St Nicholas. Most of the coins are C17	Post - medieval	-	Negligible
3	00372s	307723 16327	ST 0804 7412	Site/ Structure	Cottrell Park Standing Stone. Bronze Age. An erect weathered slab removed from a previous location opposite the entrance to Cottrell Park	Prehistoric	Grade II	High
4	00370s	307721	ST 0781 7382	Site	Stone, Redland Farm. A fallen monolith, 2m x 1m x 0.5m. Reported in 1937 as erect but leaning. The stone stood on a parish boundary.	Undated	-	Medium
5	03870s	-	ST 0776 7382	Building	A barn , partly converted, with end external stair to hayloft	Post-medieval	-	Low
6	03039s	-	ST 081 721	Findspot	Single sherd of Roman pottery found	Roman	-	Low

Site No.	HER	NMR	NGR	Form/Type	Description	Period	Status	Assessment of Value
(Figure 8.2)								
7	03040s	-	ST 0800 7190	Findspot	Roman silver coin and human bone found	Roman	-	Low/Medium
8	00380s	-	ST 0800 7177	Findspot	Inhumation. Dimensions and description not known	Undated	-	Medium
9	02625s	-	ST 0770 7180	Cartographic	Thaw Valley Survey; OS1 58 lime kiln sheet 46.11	Post-medieval	-	Low
10	02624s	-	ST 0770 7170	Cartographic	Thaw Valley Survey; OS1 57 lime kiln sheet 46.11	Post-medieval	-	Low
11	00381s	-	ST 0805 7135	Findspot	Inhumation. Dimensions and description not known	Undated	-	Medium
12	00382s	227673	ST 0812 7131	Site of	Whitton Lodge Roman Villa. Discovered in 1956. Excavation has shown that there were ten phases of occupation between the later 1st century AD and c340AD, and that the site developed from a roundhouse settlement into a villa. Air photographs show further possible enclosures and features within the immediate vicinity	Roman	-	High
13	02626s	-	ST 0810 7130	Cartographic	Thaw Valley Survey; OS1 59 lime kiln sheet 46.11	Post-medieval	-	Low
14	03051s	-	ST 0831 7129	Cartographic	Lime kiln seen on 1762-3 estate map	Post-medieval	-	Low
15	03125s	-	ST 0775 7009	Aerial Photograph	Enclosures seen on Air photos	Undated	-	Unknown
16		309455 309456	ST 0782 7004	Cropmark	Cropmark enclosure SE of Moulton. A sub-rectangular ditched enclosure. Traces of further features/enclosures to the west.	Undated	-	Medium
17	03951s	-	ST 095 686	Cartographic	Lime kiln identified from the 1st edition OS maps	Post-medieval	-	Low
18	03952s	-	ST 0972 6872	Cartographic	Quarry identified from the 1st edition OS maps	Post-medieval	-	Low
19	HLCA 010	-	-	Historic Landscape Designation	Bonvilston Amalgamated Fieldscape (Historic Character area 010). A landscape characterised by the post-medieval agricultural landscape of large fields formed by the merging of smaller medieval and earlier post-medieval field systems. An additional characteristic of this landscape are small areas of broadleaf woodland forming field boundaries and small copses	Post-medieval	Historic Landscape Character Area	Medium

Romano-British

8.2.5 Of the three archaeological sites recorded, one (Site 12) is a complex site that is recorded over an extensive area. This includes a Roman Villa and extensive cropmark enclosures believed to be broadly contemporaneous. This site is considered to be of High value.

8.2.6 Several inhumation burials have been discovered in the Whitton Lodge area (Sites 8 & 11); these may be of Romano-British date and are considered to be of Medium value as they may indicate the location of more extensive cemetery sites.

8.2.7 Two further sites north of Whitton Lodge record the location of finds of Romano-British coins or pottery (Sites 6 and 7); the latter also includes human remains. These are of low/medium value.

8.2.8 The body of archaeological evidence for Romano-British sites within the southern portion of Sector 3 indicates that there is considerable potential for the presence of high value assets within the area.

Medieval

8.2.9 There are no sites of Medieval date recorded within the study area.

Post-Medieval

8.2.10 There are seven archaeological sites recorded from this period. Five are limekilns (Sites 9, 10, 13, 14, 17) and one is a quarry (Site 18); these are known from historical maps and are considered to be of low value. A further site comprises the location of a hoard of 17th century coins. This site is of uncertain or negligible value.

Undated

8.2.11 Five sites are recorded as undated. One (Site 4) is a fallen standing stone of probable prehistoric date; two record the presence of human inhumation (Sites 8 & 11), and two (Sites 15 & 16) record the presence of cropmark sites. More detail on Site 16 is set out below. Undated sites are considered to be of low or medium value.

Historic Buildings

8.2.12 Two historic buildings are recorded in the study area (Sites 1 and 5). Both are of post-Medieval date and lie to the north of the scheme area. Neither is listed and is considered to be of low value.

Historic Landscape

8.2.13 One historic landscape area has been identified in the study area, the east extent of the Llancarfan Character Area. This area comprises the historic landscape area of Bonvilston amalgamated fieldscape, designated by CADW and the Countryside Council for Wales. It

represents an area of land that is largely a post-Medieval agricultural landscape, with some agri-industrial features (limekilns etc), located within the historic parish of Bonvilston. Roads bound the character area to the east, where the A4226 runs north to south from the A48, and to the west, where a more minor road runs north to southwest from the A48 down to the junction at Pancross.

Aerial photographs

Methodology

8.2.14 A total of 118 RCHAMW oblique prints and 130 vertical air photographs were examined at the National Monuments Record of RCHAMW at Aberystwyth. The oblique cover dates between 1988 and 2003; the vertical cover comprises RAF photography taken from 1945 to 1962 and Ordnance Survey cover dated 1975 to 2001. A further 21 CUCAP prints held by RCHAMW were also reviewed. The Aerofilms collection was also examined. All vertical photographs were examined using a stereoscopic viewer and the oblique images with an x5 magnification hand lens.

8.2.15 All features of archaeological significance were hand plotted using the network method at a scale of 1:5000.

Results

8.2.16 Two blocks of archaeological features were noted and are presented on Figure 8.1. The largest area observed archaeology is centred on ST083713, southeast of Whitton Lodge and covers an area of at least 9 hectares on a plateau immediately to the east of the A4226 (Site 12). At ST081714 is a sub-rectangular ditched enclosure with an east facing entrance. Within the enclosure excavation between 1965 and 1970 recorded a series of timber roundhouses succeeded by a small stone built villa and ancillary buildings of Romano-British date (Jarrett and Wrathmell 1981). The excavated buildings appear on the photographs examined; the enclosure ditch and roundhouses have been plotted from the published excavation plan (Figure 8.1, Site 12 A). Some 150 metres to the east of point A, a further complex of unexcavated ditched enclosures and related linear features were recorded. A trapezoidal enclosure at B measures approximately 80m by 60m with a ditched internal sub-division. 30m to the south are traces of two further sub-rectangular enclosures (C and D); the easternmost (D) measures 50m by 60m and has traces of a north-south ditched sub-division. D is separated from C by probable track or drove over 10m wide.

8.2.17 Although undated, enclosures C, D and E appear to be laid out either side of a broad track or drove approaching the eastern entrance of enclosure A and are likely to be contemporaneous with it.

8.2.18 To the south of A and between the eastern enclosures, a series of roughly parallel ditches may represent remnants of a field system associated with the Roman settlement. This possible system extends under the A4226 and traces can be seen for at least 500m to the west of the modern road.

8.2.19 One kilometre to the south of the Roman complex at Whitton Lodge, centred on ST 078700, are cropmarks of a small ditched enclosure and linear features (Figure 8.1 Site 16). The cropmarks show an incomplete plan of a three-sided enclosure measuring approximately 30-35m across, showing indications of a circular structure, c.10m in diameter, within its SW angle (point A). The morphology of the features would suggest a probable prehistoric or Romano-British date. Immediately to the east a short length of linear ditch is visible. A further length of ditch 50m to the south (B) shares a partial alignment with the present parish boundary.

Site walkover

8.2.20 The walkover of the route was undertaken on December 17th 2009. Weather conditions were good with sunshine and light broken cloud. A note of the current land use adjacent to the route at the time of the walkover is held in archive, along with photographs of field conditions. The following present a record of those assets closest to the route proposals.

8.2.21 ***Site 1: Sheepcourt Cottage***

The thatched roofed cottage is sited on the north side of the A48 and the building is only five metres back from the A48 north kerb.

Plate 1: Sheepcourt Cottage. View from the west

8.2.22 ***Site 8: Undated inhumation burial***

The site of the inhumation is within a field under winter crop and the land slopes gently to the north. No surface features are visible; see Plate 2.

Plate 2: View to north-west of the area of site 8

8.2.23 ***Sites 9 and 10; Limekilns***

These two sites comprise Lime kilns shown on the 1st edition OS map. Site 9 is within the same field as site 8 and there are no surface features visible. Site10 is within a field currently under pasture at the crest of a gentle south facing slope. There are no surface remains; see Plate 3.

Plate 3: View north to area of site 10

8.2.24 ***Sites 11 & 13; Lime Kiln shown on 1st edition OS map; site of undated human inhumation***

Sites 11 and 13 lie on the west side of the A4226 and the current land-use is arable. No surface features were noted; see Plate 4.

Plate 4: View to west of Sites 11 & 13

8.2.25 ***Whitton Lodge Romano-British villa and associated features***

Sites 12 (Romano-British Villa), 13 and 14 (Lime Kilns) are all in an arable field and no surface remains were noted. The sites occupy a plateau with commanding views to the north, south, east and west; see Plate 5.

Plate 5: View east over site of Whitton Lodge Romano-British villa (Site 12, foreground) and lime kiln (Site 14, middle distance)

8.2.26 To the north of the villa site the land use is pasture and as a consequence there are no cropmark or soilmark features visible on the available air photograph cover. The proximity of the area to the Romano-British site would indicate a high archaeological potential and therefore suitable for geophysical prospection; see Plate 6.

Plate 6: Pasture to the north of Whitton Lodge Romano-British villa. View to east

8.2.27 ***Sites 15 & 16: Undated cropmark enclosures***

Sites 15 and 16 are under arable cultivation and there are no surface remains; see Plate 7.

Plate 7: View to west of Sites 15 and 16. The sites are located in the middle distance adjacent to the distant hedge line

8.2.28 **Site 17: Lime kiln shown on 1st edition OS map**

The site is under permanent pasture and there are no surface remains visible.

8.3 Option Assessment Tables

8.3.1 The assessment of value of cultural heritage assets, the anticipated impacts, proposed mitigation and assessment of overall significance have been considered in accordance with guidance set out in DMRB. Assessment option tables are set out in Volume 2.

8.4 Potential mitigation principles

8.4.1 The route options may provide opportunities for preservation in situ, particularly where the road will be on an embankment. Further detailed assessment (by Field Survey) is required to more fully define the extent and importance of the buried archaeological assets. Once such data exists then informed mitigation options can be considered.

8.4.2 We would recommend the adoption of the following mitigation principles:

- The area through which the road improvements will be constructed is of high archaeological potential, but detailed assessment of the (buried) archaeological assets within the scheme area will be required to inform mitigation decisions;
- Where assets of high importance, or groups of assets of lower importance, are located these should be preserved in situ wherever possible during construction, or route alignments changed to avoid such sites;
- Where preservation in situ is not desirable, or where preservation is not cost-beneficial then preservation by record (i.e. by archaeological excavation) is an acceptable second choice.

8.5 Limitations, Assumptions and Further Work

8.5.1 This study has been based on a 'simple assessment', as defined by DMRB. There are inherent weaknesses in relying on such data that are based entirely on results from previous, selective, investigations. The study area has not been the subject of detailed archaeological survey in the past and many of the assets are known either as isolated finds or historical documentary references. Such data can only be considered to provide a broad insight into the true cultural heritage potential of the area and should be treated with caution when being used to compare scheme options.

8.5.2 It should be assumed that further archaeological remains will exist in the vicinity of the existing road and which will require consideration at a higher level of survey.

8.5.3 We would recommend:

- Broad, non-intrusive, area surveys (initially by geophysical survey) in those areas presently considered to be of high archaeological potential (sector 3/4), to incorporate all route options;

- Broad, non-intrusive, area surveys (initially by geophysical survey) of other areas where multiple options exist (sector 5/6);
- More localised non-intrusive, survey of areas where route options are limited;
- Subject to the results of the non-intrusive surveys, further intrusive investigations may be required (e.g. by trial trenching) to resolve uncertainties about the location, character, extent, survival or value of buried archaeological remains.

8.6 Overall Significance

8.5.4 The overall assessment of Cultural Heritage significance for each option is as follows:

Blue:	Potential Moderate Adverse Overall Effect
Purple:	Potential Moderate Adverse Overall Effect
Red:	Potential Slight/Moderate Adverse Overall
Orange:	Potential Moderate/Slight Adverse Overall Effect
Green:	Potential Moderate Adverse Overall Effect

9 Water Environment

9.1 Introduction

9.1.1 The External Relations and Planning Liaison sections of the Environment Agency Wales office at Cardiff were consulted during the production of this baseline report. The original Scoping Report dated January 2008 defined the scope for this assessment.

Appraisal Methodology

9.1.2 The information presented is based on the general scope of work outlined in DMRB Volume 11 Part 10 and WelTAG. It follows the particular requirements described in the Scoping Report produced for the scheme in January 2008.

The baseline data for the assessment of baseline conditions of watercourses were obtained from[9]:

- Environment Agency Wales (EAW)
- Vale of Glamorgan Council
- Ordnance Survey
- The British Geological Survey

9.1.3 Assessment of effects is not against a drainage strategy, to be designed in forthcoming stages; residual effects would likely lead to betterment of the baseline situation with the aim of not increasing the risk of flooding elsewhere.

Double Counting

9.1.4 In order to avoid double-counting of impacts, where possible receptors have been assessed in the chapters according to where the impacts experienced may be most significant. The biodiversity chapter also covers aquatic invertebrates' survey and river corridor survey.

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[9] The Environment Agency (Wales) provided all information on licensed abstractions and consented discharges. The Environmental Health Department of the Vale of Glamorgan Council provided available information on private domestic water supplies

Cumulative Effects

9.1.5 At this stage, there haven't been any potential effects predicted or assessed as a result of completing this scheme.

9.2 Baseline Conditions

9.2.1 Please refer to Figures 9.1-9.5.

Regional Drainage

9.2.2 The existing Five Mile Lane is located along the watersheds of the Llancarfan and Waycock Rivers, which are both tributaries of the Thaw catchment.

9.2.3 The upper tributaries of the Waycock are within 100m of the existing road in Sector 3. The Waycock catchment is complex with some sections culverted and fed by Nant Bran, Goldsland Brook and Nant Brynhill and other smaller tributaries and drains. The waters have been used to form ornamental ponds at Dyffryn house.

9.2.4 Moulton Brook rises from a spring that is less than 50m from the existing road that flows westwards towards the Nant Llancarfan. Ford Brook rises from Ffynnon - Whitton Mawr on the eastern side of the existing Five Mile Lane, which flows under the road and then westwards towards the Nant Llancarfan.

River Crossings

9.2.5 The current A4226 crosses the Waycock Valley upstream of Cuckoo Mill, where there is a restricted runoff rate of 8 litres/sec/hectare on the River Waycock for all sites upstream of the bridge at Cuckoo Mill (NGR ST 0658 6882). The existing road also crosses a continuous channel of water that flows from Ffynnon Whitton Mawr and into Ford Brook. New crossings across the River Waycock would be designed with a soffit level at least one metre above the 1:100 storm flood level (taking into account climate change impact).

Flood Risk

9.2.6 The existing road extends across the Waycock Valley and its associated flood risk areas. These are defined as Zones B and C2 on the development advice maps associated with TAN 15,

Development and Flood Risk, issued by the Welsh Assembly Government in July 2004. The extents of the flood risk areas affected are illustrated in Figures 9.1-9.5.

Surface Water Quality

9.2.7 The water quality of River Waycock is monitored by the Environment Agency at Curnix Bridge ST 06600 68820. Full details of the records for the last five years are included in Appendix 9.1.

9.2.8 Information on the Environment Agency website includes the Biology, Chemistry, Nitrate and Phosphate levels for Nant Llancarfan and River Waycock. This is summarised below:

	Llancarfan	**Waycock**
	Grade	**Grade**
Chemistry		
Biochemical Oxygen Demand (mg/l)	**B**	**B**
Ammonia	**A**	**A**
Dissolved Oxygen (percentage saturation)	**B**	**A**
Biology	**A**	**A**
Nitrates (mg/l)	**3**	**3**
Phosphates (mg/l)	**4**	**4**

Notes: Grade A (very good) - These rivers have natural ecosystems and make very good salmonid and cyprinid fisheries. They may be used for any type of water abstraction including potable supply. **Grade F (bad)** - These rivers have severely restricted ecosystems and are very polluted.

9.2.9 The draft River Basin Management Plan for the Waycock indicated that it is included within the river basin District of Western Wales, in the Ogmore to Tawe management catchment. The typology description is 'low, small, calcareous'. The current ecological quality is 'moderate, and the predicted ecological quality for 2015 is 'moderate'. Probable pollution risks include: phosphorous from agriculture and combined source nutrients.

Consented Discharges

9.2.10 The Environment Agency provided information on Consented Discharges and there are a number within 1km of the route options corridors, they are summarised in the table below. Full details are included in Appendix 9.1.

Table 9.1 Consented Discharges

Name	Grid Ref	Type
Blackland Farm	ST0771472720	Domestic Property (Single)
Bonvilston East STW	ST0720073700	Sewage Disposal Works - water company
Redlands Court farm	ST0750073700	Domestic Property (Single)
Waycock Cross STW Barry	ST0887069430	Sewage Disposal Works - water company
St Nicholas STW	ST0879073090	Sewage Disposal Works - water company
New Farm	ST0904268420	Septic tank Livestock Prod. Food Prod.
Welsh Hawking Centre	ST0910069200	Recreational and Cultural
Waycock Cross STW Five Mile Lane	ST0908069500	Sewage Disposal Works - water company
Waycock Cross Annex	ST0930069100	Education
Great hamston farm	ST0906871092	Domestic Property (Single)

Geology

9.2.11 The dominant bedrock of the Vale is composed of sedimentary glacial and fluvial deposits. A band of carboniferous limestone extends through the middle of the Vale. The study corridor is predominantly composed of Lower Jurassic (Blue Lias) with limited drift geology.

9.2.12 The Vale of Glamorgan is geologically interesting as it is the only place in Wales where Jurassic strata can be seen on land. There are no geological SSSIs, RIGS[10] or quarries within the study corridor.

9.2.13 The geological rock type through which the scheme passes is predominantly limestone with inter-bedded mudstone. The river valleys are overlain by deposits clay, silt, sand and gravel.

Hydrogeology

9.2.14 The aquifer classification under the Groundwater Protection: Policy and Practice (EA 2008) or GP3 is defined a minor aquifer with areas of non-aquifer and an area of major aquifer to the north of the study area by Bonvilston. The majority of groundwater abstractions in the Thaw catchment area are from Carboniferous Limestone, although other aquifers supporting abstraction include Triassic Mudstones and Lower Lias.

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10 South Wales RIGS study is awaiting publication. There is no active RIGS group in the area and therefore it is unlikely that there are any RIGS within the study corridor.

9.2.15 Limestone has poor long-term storage properties, providing little baseflow to the rivers leading to low river flows during prolonged dry periods.

Groundwater Resources

9.2.16 The Environment Agency has indicated that there are a number of licensed abstractions in the area at distances ranging from 950 metres (m) to 1300m from the existing road. They are illustrated in Figures 9.1-9.5.

9.2.17 Current Vale of Glamorgan Council records indicate that there are up to thirty licensed private water supplies, on either dairy farms or domestic properties, within the county and it is likely that there are further abstractions that are not registered with the Council. The topographic map indicates that a large number of the farms in the vicinity of Five Mile Lane have wells although these may be historic.

9.2.18 One known private supply is within 500m of the proposed route; this is an agricultural supply at the Amelia Trust Farm at 420m from the existing road. Private supplies are also known to exist at Walterston (1300m away, dairy only), Tyn-y-Coed (1500m), and Holme Farm (1700m).

9.2.19 There is a groundwater quality network monitoring borehole about 1.2km west of the A4226, at Walterston Farm (306757, 171185). The bedrock at this site is Porthkerry Member Limestone and Interbedded Mudstone, which under the Water Framework Directive is classified as a Secondary A aquifer. The groundwater vulnerability varies within the study area as shown on Figures 9.1-9.5. The majority of the Study Area covers minor aquifers from Low through Intermediate to High. Beneath the Limestone Ridge along the A48 is an intermediate major aquifer.

9.2.20 Most of the abstracted water in the area is used for potable water supply and for industrial and commercial purposes. The majority of licensed abstractions in the Thaw catchment area are for agricultural purposes.

9.3 Potential Receptors and Impacts

Risk of Pollution during construction

9.3.1 Construction works can potentially lead to contamination of surface waters and groundwater from pollution incidents. The construction process can generate polluted run-off to watercourses and groundwater. It may have high levels of particulates, hydrocarbons, and heavy metals or be strongly alkaline. This has a potential impact on groundwater supplies and water quality. Please see Chapter 11 'Disruption due to Construction'.

Risk of Pollution during operation

9.3.2 During the operational phase, pollutants deposited on the road surfaces by vehicles may be washed by rainfall into road drainage systems and water bodies. Possible pollutants include: particulates, salts, heavy metals and hydrocarbons from fuel combustion, vehicle wear and road maintenance.

9.3.3 The potential impact would depend on the volume of traffic using the road, interception mitigation measures in place, and the quality and sensitivity of the receiving watercourse or aquifer.

Surface Water Quality

9.3.4 The potential long-term effects of the proposed scheme on water quality are from material deposited on the road being washed off during rainfall events. Potential pollutants include: suspended solids; metals such as zinc, copper, lead and cadmium; organics such as oil, bitumen and rubber; salt and other de-icing agents; herbicides and pesticides from roadside verge maintenance.

9.3.5 The highest concentration of pollutants is likely to enter a watercourse during an intense storm immediately following a dry period. The significance depends on many factors, such as the size and length of road drained, the drainage flows and the dilution available within the receiving watercourse.

Hydrological Effects

9.3.6 The initial drainage strategy will follow the principles of Sustainable Urban Drainage Systems (SUDS), which aims to minimise the adverse effects of drainage schemes and can also be used in conjunction with landscaping to provide environmental benefits.

Physical change to watercourses

9.3.7 New structures in watercourses such as culverts and stream diversions can cause physical changes to a watercourse affecting their capacity and flood storage. The main receptors are identified below. The presence of small water bodies was confirmed during field surveys undertaken in 2008.

Table 9.2: Water Environment Receptors

SECTOR	REF NO	RECEPTOR NAME
1		**0**
2	WE-2 - 1 WE-2 - 2	'Redland' Pond 'Oakland' Pond
3	WE-3 -1 WE-3 -2 WE-3 - 3 a + b WE-3 - 4 WE-3 - 5 WE-3 - 6	Source of River Waycock Nant Whitton Pond Amelia Trust ponds Ffynnon Whitton Mawr - source of Ford Brook Ford Brook spring 'Little Hamston' pond
4	WE-4 -1 a + b WE-4 - 2	'Moulton north' water bodies Source of Moulton Brook
5	WE-5 - 1 WE-5 - 2 WE-5 - 3	'Moulton south' Pond Sutton Fach Pond Waycock Tributary a
6	WE-6 -1 WE-6 -2	River Waycock Crossing Waycock Tributary b
7		**0**

9.3.8 The highway improvements in Sector 2 would involve a minimal change to the existing route and no direct adverse effect on a surface water body is predicted.

9.3.9 In Sector 3 it is likely that none of the route options would have a direct impact on any of the ponds at the Amelia Trust Farm, including Nant Whitton pond. The source of the River Waycock and Ford Brook would potentially be affected.

9.3.10 The Red mainly on-line route would be likely to have the least physical effect on these water bodies. Any of the remaining routes – Orange, Green, Purple or Blue – would have the effect of re-aligning the highway within 60m of a source tributary for the River Waycock. This has the potential to be a sensitive point for the catchment, as any effect on water quality at this location would have a far-reaching impact throughout the Waycock, and ultimately Thaw catchments.

9.3.11 Fynnon Whitton Mawr is located on the eastern side of the current highway. The alignment of the Orange, Green, Blue or Purple options would leave the pond on the western side of the new highway. Any of these alignments are likely to require a cutting at this location. The Orange and Purple routes potentially provide the greatest buffer, being approximately 100m east of the pond. The alignment of the Blue route is approximately 20 metres away from the pond. The Green route would have a direct impact on the Fynnon Whitton Mawr. As it is the source of Ford Brook, that runs into Nant Llancarfan and subsequently into the River Thaw, the potential impact from the Green route could be **severe adverse.**

9.3.12 A further pond in Sector 3 is located at Little Hamston Farm. None of the route alignment options would have a direct impact on the pond, although the Orange, Blue or Purple options would all be closer to the pond than the existing road.

9.3.13 Moulton Brook is immediately to the west of the existing highway and while the Red, Orange and Green routes are all on-line at this point, the construction process and widening of the existing road could potentially have adverse effects on the brook and the two small water bodies to the north. The Blue route would be located to the east of the existing alignment and would therefore be unlikely to have an effect on these receptors. The Purple alignment would be closest to Moulton Brook and the smaller water bodies and likely to have the greatest effect on them.

9.3.14 The pond to the south of Moulton would not be directly affected by any of the proposals. The pond at Sutton Fach is on the eastern side of the current road and all of the route alignment options would leave the pond on the western side of the new route although it would not be directly affected. The effects of this alignment on the landholding are discussed in Chapter 7 All route options could potentially affect a tributary of the River Waycock.

9.3.15 In Sector 6, it seems likely that the route options would potentially have an impact on the River Waycock and its tributaries. Protection of the river from indirect impacts on water quality – from e.g. silt discharge, accidental spillage and highways run-off - would be a key consideration during construction and operation of the scheme with an Environmental Protection Plan (or similar) likely to be required as part of construction works. Drainage design of the built scheme should also incorporate appropriate pollution control units to minimise the risks to water quality from highways run-off.

Loss of Floodplain Storage

9.3.16 The increase in hard surface area and the construction of active drainage systems draining to surface waters would increase the volume of water that drains to receiving water-bodies. Without mitigation to restrict the discharge of surface water, particularly during storm conditions, there may be an increased risk of flooding downstream. The floodplains of the Ely, Cadoxton and Thaw are vulnerable to flooding (in 1999 EAW carried out a 1 in 100 year study).

9.3.17 A new crossing of the River Waycock would be required with most of the alignment options. The Red, Orange, Green and Purple routes are all on-line through the Waycock Valley. This minimises the impact on potential loss of permeable land surface but the existing bridge would be too narrow for the improved road. In addition the Orange and Green options include slip roads to a roundabout that would require additional bridges upstream.

9.3.18 The Blue option would require the construction of a new bridge downstream of the existing crossing, and would have the greatest impact in terms of loss of permeable surfaces.

Accidental Spillage

9.3.19 The proposed highway improvements may mean that the route becomes more preferable for Heavy Goods Vehicles (HGVs). If involved in accidents, HGVs can cause serious pollution incidents, particularly when carrying a liquid cargo that can run into the highway drainage system, water bodies and groundwater.

9.3.20 Industrial cargoes could include fuel oil and chemicals; agricultural cargoes of slurry or food products such as milk may all potentially give rise to a significant pollution incident if they are spilt onto the surface of the road as a result of an accident.

Impact on groundwater and abstraction

9.3.21 The improvement scheme is likely to lead to an increase in paved impermeable surfaces and therefore the risk of rainwater infiltrating groundwater via the road drainage system.

9.3.22 This would potentially result in a decrease in recharge to the limestone aquifer. In addition construction works, such as cuttings and dewatering operations can affect the direction and magnitude of groundwater flows can affect local drawdown of the water table. This may influence the ability of groundwater to support existing abstractions and river baseflows.

9.3.26 At this stage of the assessment, it is not possible to predict whether large-scale interception of groundwater by the proposed scheme would occur.

Reduction in Groundwater Recharge

9.3.27 The reduction in infiltration caused by an increase in impermeable area would locally affect the limestone aquifer. On a regional scale the reduction would cause little effect on water resources, as the carriageway surface area is small compared to the outcrop area.

Derogation of Groundwater Quality

9.3.28 Groundwater quality could potentially be adversely affected as a result of pollutants infiltrating groundwater bodies by seepage from watercourses, drains or lagoons. Direct spillage of contaminants onto the outcrop, by-passing the road drainage is also possible. The actual effects are dependent on many factors such as the permeability of the underlying material. Unlike surface water, however, groundwater is generally not considered to be at risk from sediments collected on the road surface, as this would be removed by natural filtration in the ground.

9.3.29 There are no Source Protection Zones within the study area. The nearest - Biglis Wells Source Protection Zone - is approximately 4 km from the current road alignment at the northeast of Barry.

9.4 Potential Mitigation Principles

Hydrology

9.4.1. The primary strategy will follow the principles of Sustainable Urban Drainage Systems (SUDS). This may entail the use of balancing ponds, filtration ditches and storm cells at the lowest points prior to discharge. Other features that could be included in the final design are:

- Surface channels with carrier drains in the verge of embankments;
- Surface channels with carrier drains and filter drainage in verges of cuttings;
- Toe ditches or piped drains at the bottom of embankment slopes;
- Interceptor ditches or piped drains at the top of cutting slopes on the up fill side.

9.4.2 Impacts on the water environment during construction should be avoided through adherence to a Construction Environment Management Plan (CEMP) and frequent liaison and consultation with the Environment Agency.

Physical change to watercourses

9.4.3 In highway schemes it is usual practice for culverts and river crossings to be designed with sufficient capacity to convey flood flows to a return period of at least 100 years.

Loss of Floodplain Storage

9.4.4 Provision of compensatory floodplain storage should be located within the landscaped corridor, where possible.

Accidental Spillage

9.4.5 The potential effects from accidental spillage can be mitigated by the use of petrol-oil interceptors at currently un-attenuated highway outfalls.

9.5 Limitations, Assumptions and Further Work

9.5.1 An assessment of the expected accident frequency at each proposed outfall location should be undertaken in accordance with the methodology within DMRB Volume 11. This would indicate

the level of risk of major spill, with return periods. This assessment would indicate where the risk appears to be greatest with an indication of frequency.

9.5.2 A full geo-technical investigation and required surveys will be undertaken, in order to provide more details regarding geological structure, groundwater levels, and possible interception locations.

9.5.3 Prior to a planning application being submitted a Flood Consequence Assessment (in accordance with planning guidance) and Flood Defence Consent based on the specific details of the River Waycock crossing will be sought.

9.6 Overall Impact

Table 9.3 : Summary Of Residual Effects Water Environment

	ROUTE ALIGNMENT									
RECEPTORS	**RED**		**ORANGE**		**GREEN**		**BLUE**		**PURPLE**	
Sector 1	**WC**	**RE**	**WC**	**RE**	**WC**	**RE**	**WC**	**RE**	**WC**	**RE**
No Sensitive Receptors	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Sector 2										
WE2 –1 'Redland' Pond	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
WE2 – 2 'Oakland' Pond	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Sector 3										
WE3 - 1 Source of R. Waycock	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**
WE3 - 2 Nant Whitton Pond	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
WE3 - 3 a + b Amelia Trust Ponds	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
WE3 - 4 Ffynnon Whitton Mawr	**--**	**0**	**-**	**0**	**--**	**0**	**--**	**0**	**-**	**0**
WE3 - 5 Ford Brook Spring	**--**	**0**	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**
WE3 - 6 'Little Hamston' Pond	**0**	**0**	**-**	**0**	**0**	**0**	**-**	**0**	**-**	**0**
Sector 4										
WE4 -1 a+b 'Moulton North' Water bodies	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**	**--**	**0**
WE4 - 2 Source of Moulton Brook	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**	**--**	**0**
Sector 5										
WE5 – 1'Moulton South' Pond	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
WE5 – 2 Sutton Fach Pond	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
WE5 – 3 Waycock Tributary a	**---**	**-**	**---**	**-**	**---**	**-**	**---**	**-**	**---**	**-**
Sector 6										
WE6 - 1 River Waycock Crossing	**--**	**0**	**--**	**0**	**--**	**0**	**--**	**0**	**--**	**0**
WE6-2 Waycock Tributary b	**---**	**-**	**---**	**-**	**---**	**-**	**---**	**-**	**---**	**-**
Sector 7										
No Sensitive Receptors	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Sector 1 - 7										
WE Groundwater	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**
WE Floodplain (Loss of storage)	**--**	**-**	**--**	**-**	**--**	**-**	**--**	**-**	**--**	**-**
WE Surface Water Quality	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**	**-**	**0**

Note 1

WC = Worst Case (i.e. 1st Year Do Something)

RE = Residual (i.e. After mitigation measures have been put in place)

Note 2

This is a preliminary qualitative assessment: as the scheme develops further information regarding geotechnical issues and construction methods will inform a fully detailed quantitative assessment.

9.6.1 The five route alignment options would be similar in their predicted effects on the water environment. The main potential impacts of the new highway are likely to be effects on the sources of the main rivers in the study area, including the Waycock, Ford Brook and Moulton Brook. While these effects are similar for all options, engineers may prefer the mitigation opportunities of some options to others. An impact on floodplain storage in Waycock Valley is another likely effect of any of the route alignments for the proposed scheme.

9.6.2 Ffynnon Whitton Mawr is at the source of Ford Brook, and the choice of preferred scheme needs to consider potential impacts on this important hydrological feature. All the options may require suitable mitigation to be engineered into the scheme.

9.6.3 The maps appear to indicate that the Green route crosses the source of the spring. The potential effect on interruption and contamination of water flows and aquifer levels requires further investigation in forthcoming assessment stages.

9.6.4 Associated mitigated impacts on groundwater are likely to Neutral for other options.

9.6.5 The majority of potential impacts on the water environment can be mitigated by appropriate engineering design. The assessment of the scheme proposals on the water environment at this stage is considered to have the potential to be **moderate adverse**, although, with required mitigation, this would be reduced to **slight adverse**.

10 Social Impacts

10.1 Introduction / Impact Description

10.1.1 As stated within WelTAG Guidance (WelTAG page 137) "Social objectives, such as improving quality of life, health and welfare are central to policy in Wales...hence, it is essential that the appraisal process addresses the subjects which have been established as policy priorities in Wales and which are meaningful to most people, including concepts such as health and social inclusion". Pedestrians, cyclists, equestrians and community facilities users are all key receptors in achieving the above, therefore the purpose of this chapter is to assess the effects that each of the five proposed route alignment options would have on these groups, in terms of personal security, permeability, physical fitness and social inclusion.

10.2 Appraisal Methodology

10.2.1 The methodology used to assess the social impacts of the proposed road scheme on the A4226 Five Mile Lane follows current 'best practice' WelTAG and DMRB guidance published by the Welsh Assembly Government and the Highways Agency respectively.

10.2.2 The process adopts the standard approach using baseline desktop studies to identify potential sensitive receptors likely to be significantly affected and the potential effects brought about by the proposed scheme. The chapter will then judge the magnitude of effects and undertake a qualitative assessment of their significance.

Double Counting

10.2.3 In order to avoid double-counting, impacts have been assessed in the chapters according to where the impacts experienced are considered most relevant. For example impacts on the visual landscape or impacts on motorised travellers are assessed within Landscape and Vehicles Travellers chapter of this report.

Cumulative Effects

10.2.4 At this stage, there haven't been any potential cumulative pedestrian, equestrian, or community effects predicted or assessed as a result of completing this scheme.

10.3 Study Area / Sensitivity of Receptors

10.3.1 A 1:25,000 OS Map of the area surrounding the existing A4226 – Five Mile Lane has been consulted to build up an understanding of the distribution and frequency of recreational and community facilities that could potentially be effected by the proposed carriageway. This included the mapping of schools/colleges, hospitals/doctors, public houses, shops, community halls, sport and recreation facilities, post offices, libraries, public rights of ways, bridleways and cycleways. The impacts of each of these receptor types were then assessed against each of the five route alignment options. Please refer to Figures 10.1-10.5.

10.4 Baseline Conditions

10.4.1 The following paragraphs illustrate the existing provision of footpaths/pedestrian access, bridleways, cycle routes and community facilities that are located within the study area. For the purpose of this study, facilities have been identified within each sector.

Sector 1 Baseline:

10.4.2 Sector 1 features an east-west aligned section of the existing A48 and Sycamore Cross junction. The road runs adjacent to farmland, private gardens, and Cottrell Park Golf Club. It is a busy section of road used be a wide spectrum of motorists including commuters, haulage operators and holiday travellers.

10.4.3 There are no pedestrian routes, designated cycle routes, bridleways or other community facilities within Sector 1; therefore there would be no effects.

Sector 2 Baseline:

10.4.4 The existing A4226 runs in a general north-south alignment within Sector 2, it lies adjacent to farms, domestic dwellings and farmland and in the vicinity of Redland Wood. Within the sector there are five public footpaths. The closest of the five, connects with the existing A4226 Five Mile Lane (SI-2-1), approximately 170m south of the entrance to Ash Tree House. The

footpath runs in a northeast direction, connecting with the A48, to the west of the village of St. Nicholas. The remaining four public footpaths are between approximately 1.1km and 1.7km east of the existing and proposed routes and predominately run in a north-south direction, connecting with St. Nicholas in the north and other footpaths routes to the south. (SI-2-2 to SI-2-5). Footpath SI-2-3 forms part of the Valeways Millennium Heritage Trail, which is a National Trail. The section of the trail that runs through the study area starts in the village of Peterson Super Ely in the north, connecting with Barry in the south. There are no other existing public rights of way, cycle routes, bridleways, or community facilities within this sector.

Sector 3 Baseline:

10.4.5 Adjacent to the existing carriageway to the northern edge of Sector 3 is Blackland Farm. Approximately 900m to the southwest of Blackland Farm is Amelia Methodist Trust/Whitton Rosser Farm (SI-3-1). The farm is a community facility that allows people, particularly those within learning disabilities and from disadvantaged groups to learn about conservation, animals and the countryside. A public footpath connects with the carriageway and runs through the farm before arching in southerly direction, terminating on a minor road (SI-3-2).

10.4.6 Approximately 2.1km east of Amelia Trust Farm is the popular visitor attraction of Dyffryn Gardens (SI-3-4), a Grade I listed park and garden, covering an area of just over 22 hectares. The gardens have recently been restored and included the construction of the Cory Education Centre, which is used for talks and other educational activities. To the western boundary of the gardens, running in a north-south direction is a public footpath (SI-3-3 – Valeways Millennium Heritage Trail) that connects with footpaths in Sector 2. A network of other public footpaths is located to the east of Dyffryn Gardens (SI-3-5), which eventually connect with the northeastern fringes of Barry.

10.4.7 To the southern boundary of Sector 3 is an additional footpath (SI-3-6 - Valeways Millennium Heritage Trail) that travels through Little Hamston, continuing south into Sector 4. There are no other pedestrian routes, cycle routes, bridleways or community facilities within this sector.

Sector 4 Baseline:

10.4.8 Sector 4 is a relatively narrow and straight section of the road running north-south with tall hedges on the adjacent verges. There are two public footpaths within Sector 4, both

approximately 1.3km east of the existing A4226 Five Mile Lane carriageway. The first footpath (SI-4-2 - Valeways Millennium Heritage Trail) runs south from the boundary of Sector 3 to the boundary of Sector 5. The second footpath (SI-4-3) runs from the farms of New Wallace to Old Wallace, where it connects with the first footpath SI-4-2.

10.4.9 West of the existing carriageway is the northern section of a right of way (SI-4-1) that runs from the hamlet of Walterston, south for approximately 700m before crossing into Sector 5.

10.4.10 There are no bridleways or community facilities within this sector.

Sector 5 Baseline:

10.4.11 The right of way (SI-5-1) that starts within the hamlet of Walterston (SI-4-1) continues south for approximately another 600m where it enters the small settlement of Moulton. The Three Horseshoes Public House (SI-5-2) is situated within Moulton, which attracts people from surrounding larger settlements.

10.4.12 To the south of the settlement a public footpath (SI-5-3) runs in a general south easterly direction for 850m before joining the A4226 Five Mile Lane near the farm of Suddon Mawr. The only additional public footpath, other rights of way, bridleways or community facility with Sector 5, is a public footpath approximately (SI-5-4) 1.5km northeast of Moulton. The footpath runs from Northcliff Farm in a south-easterly direction towards the farm at Lidmore.

Sector 6 Baseline:

10.4.13 The existing Five Mile Lane is predominately positioned in a north-west to south-east alignment within Sector 6. Located within this sector is the Welsh Hawking Centre (SI-6-4) and also, though not currently in use, several buildings owned by Barry College of Further Education (SI-6-5). The Welsh Hawking Centre, which provides educational programmes for schools, is located adjacent to the existing carriageway and just under a kilometre from the urban fringe of Barry.

10.4.14 The Valeways Millennium Heritage Trail that passes through Old Wallace farm (SI-4-2 Sector 4) continues south, terminating at Highlight Farm, to the northern outskirts of Barry. Immediately adjacent to the footpath (SI-6-3) is Brynhill Golf Club, an 18-hole private course.

Sector 7 Baseline:

10.4.15 This is a small sector of approximately 100m and is adjacent to the urban settlement of Barry, where the majority of community facilities, such as schools, doctors and shops are concentrated. There are no footpaths, bridleways or cycle routes within this sector.

10.5 Results

10.5.1 Due to the limited number of pedestrian routes, cycle route, bridleways and community facilities that are within the vicinity of the A4226 – Five Mile Lane, social impacts are not considered to be significant along each of the five routes. Therefore no assessment tables have been produced for this section of the study, however the social impacts on user groups are illustrated in Figures 10.1-10.5 and summarised below.

Impacts of Pedestrians/Public Footpaths users

10.5.2 The majority of existing footpaths are located at a significant distance away from the proposed route alignments and do not impinge on it; therefore there would be no impacts on these footpaths. Two existing footpaths are accessed from the carriageway (SI-2-1 and SI-3-2). There would be no impacts on footpath SI-2-1 as no changes to the road alignment are proposed within Sector 2.

10.5.3 Footpath SI-3-2 is the most frequently used footpath within the study area, and forms part of a route towards the village of Llancarfan. The Red Route would allow for the continuation of direct access on to the A4226 – Five Mile Lane from footpath SI-3-2 if this route is the preferred route option and therefore it would have no negative or beneficial impacts. If one of the other routes were selected, then the footpath would be accessed from a 'Local Collector Road'. This may have a slight positive benefit to users of the footpath, as it may result in reduced levels of traffic volume and therefore the perception of safety may increase for pedestrians/walkers within this area. This may result in increased numbers of users and may have positive benefits in terms of physical fitness. Benefits of the 'Local Collector Road' may also extend to footpath SI-5-3 and is applicable to all route options.

10.5.4 There would be no impacts on the Valeways Millennium Heritage Trail regardless of which route alignment is selected.

10.5.5 No existing footpaths would be severed by any of the proposed route alignments therefore there would be no impacts on permeability.

10.5.6 Currently there is no provision for a footway adjacent to the five proposed routes which impacts to the greatest extent on the Red Route, as it follows the current route alignment. If a footway was to be provided for this route then additional land take would be required adjacent to the carriageway to incorporate any pedestrian footway. The off line routes (Orange, Green, Blue and Purple Routes) pose an opportunity to use the existing road (where they are not coincident) as a pesestrian route and therefore increasing the perception of safety for people on foot, as the separation between pedestrians and the potentially faster moving traffic becomes greater.

Impacts on Cyclists

10.5.7 There are no dedicated cycling facilities within the study area, with cyclists restricted to the potentially dangerous route of the existing A4226. Sections of the existing carriageway that are used as a 'Local Collector Road' would become more cycle friendly as a result of the realignment of the road. If a designated cycle lane is incorporated into the design of each of the route options, where it follows the existing online alignment, then this would require additional land take adjacent to the carriageway in order that the cycle lane could be integrated into the scheme. These potential benefits are applicable for all route alignments, while routes Blue, Purple, Orange and Green provide the greatest opportunity for the use of cycling as a means of transport along the proposed 'Local Collector Road' and the 'Red Route' the least. An effect of this is that more people may be encouraged to cycle, which may bring positive benefits to physical fitness.

Impacts on Bridleways/Riding Routes

10.5.8 Currently there are no bridleways or other types of riding routes within the study area and therefore there would be no direct impacts as a result of the proposed carriageway realignment, whichever is selected. However the use of existing routes as 'Local Collector Routes' may provide a quieter route for equestrians to use compared to the existing carriageway. As a result the perception of safety may increase for horse riders, encouraging greater participation and an increased level of physical fitness.

Impacts on Community Facilities

10.5.9 There would be no impacts on local communities with regards to access to key facilities, such as doctor's surgeries, hospitals, shops, post offices, churches and parks/recreation areas etc. The journey lengths to these facilities, which are predominately situated within Barry, are likely to remain comparable and access to them on foot or cycle would not be severed by any of the proposed route alignments. In addition no existing groups would be socially excluded from the use of facilities by any of the selected routes.

10.5.10 The Red Route is likely to have slight adverse effects on the land to the eastern boundary of Amelia Trust Farm, where land would be lost through the realignment of the carriageway. This would be a permanent long-term impact, though mitigation planting to compensate loss in habitat may result in a reduction in impacts over time.

10.6 Potential mitigation principles

10.6.1 As there are no significant adverse effects on pedestrians, equestrians, cyclists or community facility users/groups as a result of the five route alignments, no mitigation measures are considered necessary at this stage.

10.7 Limitations, Assumptions and Further Work

10.7.1 When assessing impacts on community facilities it has been assumed that people would use the nearest facility to them. It has been assumed that average journey speeds are 5km/hr for people on foot, 10km/hr for equestrians and 20km/hr for cyclists.

10.7.2 The main limitation of this study was the sole use of desk-based assessment. No user flow counts of public footpaths, cyclist, equestrians or community facilities users were carried out at this stage of the assessment and no assessment has been made of the type of groups who use the facilities.

10.7.3 Further work would involve completing the Stage 2 WelTAG and the DMRB methodology of assessment.

10.8 Overall Significance

10.8.1 Whichever route is selected, the road realignment would have some positive benefit effects in terms of the perception of personal safety. This may be achieved through improvements in forward visibility or through the introduction of a hard shoulder, which would provide room for cyclists and for vehicles that may have broken down.

10.8.2 There would be no significant impacts on permeability of footpaths; cycle routes and bridleways would not be affected by the routes alignments as none are severed by any of the five proposed route options.

10.8.3 There would potentially be some positive benefits in terms of physical fitness to the local population if Route Blue, Purple, Green or Orange were selected. The use of a 'Local Collector Road' on these routes may result in a decrease in vehicle traffic along this route, leading to an increase in the perception of safety and therefore an increase in the numbers of pedestrian, cyclists and equestrians using it as a recreational route.

10.8.4 The only public transport link along the A4226 – Five Mile Lane, is the Barry to Cardiff bus (Route 322), with stops at Sycamore Cross, Amelia Trust Farm and Waycock Cross. The bus also serves the village of Moulton. It is intended that whichever route is selected that the bus route and existing bus stops would remain, therefore there would be no impacts on public transport as a result of the route realignment. However the incorporation of a hard shoulder and the use of a 'Local Collector Road' for cyclists (though limited for the Red Route) may encourage an increase in this form of transport and therefore beneficial impacts in terms of social inclusion, for some sections of the community, as the choice of transport options increases.

10.8.5 In conclusion, following the assessment of the five route options in terms of their social impacts, either the Blue Route, Purple Route, Orange Route or Green Route is the preferred route option.

11 Disruption due to Construction

11.1 Introduction

11.1.1 This chapter considers the potential construction effects arising from the proposed improvements to Five Mile Lane and their mitigation.

11.1.2 The chosen contractor would be required to prepare a Construction Environmental Management Plan (CEMP), with which the construction works will be required to comply.

11.1.3 Preparation for the CEMP should include surveys of ancillary areas such as temporary construction compounds, access routes and material stores (including temporary soil stores) which are likely to generate additional environmental effects. Some of these areas would be selected by the contractor and may require separate planning permission, in which case specific mitigation would be called for through the development control process.

11.2 Appraisal Methodology

11.2.1 As WelTAG does not give specific guidance for Disruption Due to Construction, the methodology has been followed according to the guidance in the Design Manual for Roads and Bridges (DMRB) Volume 11, section 3, Part 3.

11.3 Baseline Conditions

11.3.1 The baseline for the construction phase of any scheme is the same as the baseline for the operational phase, as reported in the preceding chapters.

11.4 Environmental Effects & Mitigation

Air Quality and Greenhouse Gases

11.4.1 The main effect on air quality during construction would be dust arising during dry weather and this would mainly affect receptors in the construction corridor. Along the majority of any of the

proposed routes, few properties are within 200m of the proposed alignment. For all of the proposed options, 25 sensitive receptors were identified.

11.4.2 The potential for dust nuisance depends on a wide range of factors including prevailing meteorological conditions, nature of materials and type and duration of the activities. Dust would be mitigated against by wetting the working area and in particular wetting of the tyres of construction traffic leaving the site. Requirements for these measures would be incorporated into the CEMP.

Traffic Noise and Vibration

11.4.3 Receptors in the construction corridor would be most affected. A baseline monitoring noise survey would be carried out pre-construction to establish acceptable noise levels. The main detrimental effects of construction noise will be where construction is close to residential areas.

11.4.4 Along the majority of any of the proposed routes, few properties are within 300m of the proposed alignment. For the Red, Orange, Blue and Purple options, 25 sensitive receptors have been identified. For the Green option, 1 additional receptor has been identified; bringing the total to 26.

11.4.5 During the construction phase temporary mitigation techniques should include controlling working hours and noise levels from sites with contractual restraints; erecting temporary environmental barriers around the construction site where land is available should also be considered. Compensating homeowners for the disruption and annoyance caused may also be necessary. Temporary re-housing whilst the works are completed and installing additional insulation and glazing should also be considered, where necessary. The conditions would be incorporated into the CEMP, all subject to the agreement of the local Environmental Health Officer.

Cultural Heritage

11.4.6 The anticipated impacts on the cultural heritage assets within the study area would occur during the construction phase of road improvement. The movement of heavy construction machinery could compact solid and subsoil, leading to adverse effects on buried archaeological deposits.

11.4.7 Those assets likely to be affected by the road improvements would comprise buried archaeological remains. These impacts are likely to be of short duration, for example, trial pit excavation, topsoil stripping, general excavation and plant movement, but their effects would be permanent and result in loss of physical fabric.

11.4.8 The area through which the road improvements would be constructed is of high archaeological potential, but detailed assessment of the buried archaeological assets within the scheme area would be required to inform mitigation decisions.

11.4.9 Archaeological assets of high importance, or groups of assets of lower importance, should be preserved in situ wherever possible during construction, or route alignments should be altered to avoid such sites.

Biodiversity

11.4.10 Potential effects during construction works for the improvement of the A4226 Five Mile Lane relate principally to protected species issues and designated areas. The scheme design process will be influenced by the need to avoid nature conservation impacts wherever possible.

11.4.11 For all route alignment options, the greatest ecological impact would be associated with the loss of established habitats necessary to accommodate the scheme. This would reduce available habitat for any retained species potentially leading to adverse effects. There would also be increased disturbance from construction vehicles and associated increases in noise, lighting and pollution risk due to site activities.

11.4.12 Breaching of hedgerows would occur to varying degrees for all of the route alignments. In sectors 3 and 4 loss of hedgerow could be reduced if the Green or Blue options were followed.

11.4.13 Within Sector 5, all the route alignments would result in hedgerow breaches east of the existing A4226 although the Blue route may have the most adverse effects.

11.4.14 The Orange and Red alignments impact on a group of trees and while the Purple and Green alignments would avoid them, they would be likely impact upon the mature trees elsewhere.

11.4.15 In sector 6 the Red, Orange, Green or Purple route options would require comparatively less removal of woodland habitat than the Blue option.

11.4.16 The main principles of best practice for mitigation of effects on biodiversity during construction are:

- Avoidance of the most sensitive areas through identification and adoption of best route option;
- Minimising the development footprint as far as practicable where avoidance of impacts is not possible;
- Timing of construction works to avoid or reduce disturbance to wildlife (e.g. maintenance and vegetation control activities outside nesting periods);
- Reptile capture/transfer (translocation exercise) to move animals out of the development footprint;
- On-site habitat enhancement within the scheme corridor or adjacent land;
- Sympathetic design and installation of hard structures, such as bridges and tunnels, and increase permeability through installation of nest/roost sites for wildlife;
- Appropriate Management of retained habitats/features;
- The Construction Environmental Management Plan (CEMP) should seek to avoid further impacts from construction compounds, temporary haul routes and stores by considering sensitive areas and setting out a plan that avoids them.

Landscape Effects

11.4.17 Due to exposed earthworks and the enlarged site area, including contractors' compounds and soil stores, the construction effects on Landscape Character and Visual Amenity are generally more adverse, but temporary, than effects during the operational phase.

11.4.18 Little can be done to mitigate these temporary additional effects, but as much existing vegetation would be retained as possible to optimise screening. Retained trees and hedgerows within and adjoining the site would be protected in accordance with BS 5837:2005.

11.4.19 During construction areas of townscape near Sycamore Cross and Waycock Cross and individual dwellings across the study area may be temporarily affected by adverse influences on

their views and settings. Any operational lighting to extend winter working hours would need to be positioned and shaded as necessary to avoid visual intrusion on residential properties.

Water Quality and Drainage

11.4.20 The main temporary effects requiring control would arise from silt from construction operations. The construction of earthworks could cause silt contamination to be washed into watercourses from excavations and embankments by rainfall and site runoff; The Water Resources Act (1991) requires those carrying out construction activities to secure the complete protection of surface watercourses. This includes ensuring that no polluting discharge of solid or liquid is made to any watercourse and that work which is carried out in any watercourse is done in a manner that will not cause pollution or erosion.

11.4.21 The Environment Agency (EA) would set consent standards for discharges from the construction site. These would include the volumes and the concentration of suspended solids that it would be permissible to discharge to the receiving watercourses. Compliance with the discharge consent should mean that any effects on water quality would be slight.

11.4.22 In the CEMP, the contractor would need to draw up proposals for their compliance with the standards and obtain formal consent from the EA.

11.4.23 During the construction phase surface water run-off may be treated using any combination of installations or drainage management practices, including settlement lagoons, irrigation techniques, geo-textile fences and straw filters.

11.4.24 Spillage of fuel and chemicals could potentially cause contamination of the ground, groundwater and surface watercourses. The EA would specify conditions regarding the storage of all potentially contaminating materials and contaminating activities on site, particularly fuels.

11.4.25 The contractor would be required to produce detailed construction method statements to comply with the EA requirements. These would be incorporated into the CEMP, following EA approval. Compliance with the method statements would be verified by auditing and this should ensure that the impacts to the ground and groundwater would be negligible.

Land Use

11.4.26 The effects on land use during construction would have potential to be very destructive. The construction footprint of the scheme would be larger than for the operational phase, potentially taking land out of production, causing disturbance to livestock and severance of farm activities.

11.4.27 This disruption may continue for a prolonged time until mitigation in the form of crossing points or new access roads could be completed. While physical mitigation may not be possible in all cases, communication, negotiation and compensation may be the best course of action. As in the case of biodiversity, the timing of the construction programme could minimise impacts.

11.4.28 The appointed contractor should be considerate of landowners and occupiers in their plan for the construction process, the location of compounds, access roads and stores. They should be consulted during the finalisation of the CEMP.

11.5 Potential Mitigation Principles

11.5.1 There are standard means of mitigating the adverse effects of highway construction, examples include:

- Design development and re-alignment to avoid sensitive receptors
- Consultation with the Welsh Assembly Government, Countryside Council for Wales, Environment Agency and Local Authority Environmental Health Officer to devise and appropriate mitigation strategy
- Adherence to environmental law and guidance: e.g. The Water Resources Act (1991), UK Biodiversity Action Plan.
- Application of Best Practical Means (BPM).
- Reference to standard highway construction guidance, for example, Design Manual for Roads and Bridges Volume 10.
- Adherence to a Construction Environment Management Plan that would be agreed with statutory bodies- this covers pre-construction surveys, construction methodology, working hours, watching brief during construction, legislative and health and safety requirements
- Commitment to the provision of post-operational surveys, monitoring and revised mitigation.

11.6 Limitations, Assumptions and Further Work

11.6.1 A baseline monitoring noise survey would be carried out pre-construction to establish acceptable noise levels.

11.6.2 Detailed assessment of the (buried) archaeological assets within the scheme area would be required to inform mitigation decisions.

11.6.3 The chosen contractor would be required to prepare a Construction Environmental Management Plan (CEMP), with which the construction works will be required to comply.

11.7 Conclusion

11.7.1 In accordance with Best Practice the appointed contractor will consider the constraints and sensitive receptors that have been outlined in this Interim Scheme Assessment Report (ISAR). Appropriate mitigation measures would be included in the Construction Environment Management Plan.

12 Policies and Plans

12.1 Introduction

12.1.1 This section of the report assess the effects of the scheme options on planning policy, most notably that within the Adopted Unitary Development Plan 1996 – 2011. The Vale of Glamorgan Council is currently working towards Stage 4 of the Local Development Plan Deposit of Proposals.

Appraisal Methodology

12.1.2 This assessment follows the guidance set out in "DMRB Volume 11, section 3, part 12, Impact of Road Schemes on Policies and Plans" and WelTAG. At DMRB Stage 1 the objective is to undertake sufficient assessment of local, regional and national policy that may be affected by the broad route corridor.

12.1.3 The WelTAG guidance gives general advice relating to planning, rather than a particular methodology for assessment of effects on plans and policies.

12.2 Baseline Conditions

Welsh Policy Structure

12.2.1 In Wales, the planning policy structure and background are as follows:

NATIONAL
Planning Policy WALES (2002) Sets out the land use planning policies of the Welsh Assembly Government and is supplemented by Technical Advice Notes (TANs). Procedural advice is given in circulars and together this provides the national planning policy that is given consideration when local planning authorities prepare their UDPs.
Wales Spatial Plan in November 2004. Analysis and policy backdrop for all planning activities in Wales. Sets the context within which the Wales Transport Strategy has been developed
Wales Transport Strategy With other Assembly policy documents supports the Wales Spatial Plan The aim of the strategy is "to provide a framework that connects national, regional and local policy to maximise the contribution that transport can make to achieving a sustainable future for

Wales, where actions for social, economic and environmental improvement work together to create positive change."
EA Welsh Office Circular 11/99 Gives guidance on the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999.
REGIONAL
Strategic Planning Guidance for South East Wales, January 2000 ▪ Provides a context for the preparation, consideration and revision of Unitary Development Plans (UDPs). ▪ Minimizes delays and conflicts between planning authorities at the public inquiry stage. ▪ Identifies areas of agreement on common issues. ▪ Identifies strategic spatial policy issues that may need resolution and identify the mechanisms for resolving them. ▪ Provides an opportunity for interested organisations to contribute to the Regional Planning process.
LOCAL
The Adopted Vale of Glamorgan Unitary Development Plan 1996 – 2011 (finalised in *2005*). This is the development plan for the authority and supersedes all adopted / approved structure and local plans that were previously in force.
Local Development Plan (emerging)

Emerging Plans

12.2.2 The Welsh Assembly Government requires the Vale of Glamorgan Council to prepare a Local Development Plan (LDP) that will supersede the Unitary Development Plan (UDP) once adopted. The Council are currently preparing a LDP for the period 2011 to 2026 and the Delivery Agreement (Revised July 2009), sets out the timetable for its preparation.

12.2.3 The key stages of Plan preparation are:

- Stage 1 The Delivery Agreement (Feb'06 - July'06)
- Stage 2 Pre-Deposit Participation (Feb'06 - Oct'08)
- Stage 3 Pre-Deposit Consultation (Jan'07 - Oct'08)
- Stage 4 LDP Deposit of Proposals (May'10 - June'10)
- Stage 5 Submission of LDP to National Assembly (Dec'10 - Indicative) & Independent
- Examination (Apr'11 - Jun'11 - Indicative)
- Stage 6 Inspector's Report (Jan'12 - Indicative)
- Stage 7 Adoption (Apr'12 - May'12 - Indicative)

12.3 Potential Receptors and Impacts

12.3.1 The five potential route options under consideration, all travel through the same broad corridor, in which the main planning designations are Special Landscape Area and Green Wedge. The impact assessment applies to all of the options. The red route has an additional direct impact on a dwelling and this would cause it to be the least preferred from a planning perspective.

- Please refer to Table 12.1 Affected Planning Allocations and Policies: Main Allocations Affected
- Please refer to Table 12.2 Affected Planning Allocations and Policies: Other Policies Affected
- Please refer to Table 12.3 Planning Policy Schedule: full text of affected UDP policies

12.3.2 A large proportion of the study area is designated as Special Landscape Area's (SLA). Land to the west of Five Mile Lane is designated as the Nant Llancarfan SLA and Land to the east is Dyffryn Basin & Ridge Slopes SLA. See Figure 12.1. Chapter 5 Landscape Effects gives further assessment of the impacts on the Special Landscape Areas.

12.3.3 To the south of the A4226 between Cardiff Airport and the edge of Barry there is an area covered by Policy ENV 3 – Green Wedge. The residential settlement boundary of Barry covered by UDP Policies HOUS 2 and 8 is at the southern end of the scheme, where the roundabout junction needs to be improved at Waycock Cross.

12.3.4 The full text of the Unitary Development Policies mentioned in this chapter can be found below in the appendices. Please also refer to Figure 12.1 Planning Designations

Table 12.1 Affected Planning Allocations and Policies: Main allocations affected

UDP Policy		U	IMPACT			Description of impacts
			+	0	-	
ENV4	SPECIAL LANDSCAPE AREA				--	The proposed improvements would be likely to have an average of moderate adverse effect on this policy
ENV3	GREEN WEDGE				-	There may be a slight adverse effect (due to the junction improvements at

						Waycock Cross)
HOUS2	RESIDENTIAL SETTLEMENT BOUNDARY			**0**		Not affected
HOUS 8	RESIDENTIAL SETTLEMENT BOUNDARY			**0**		Not affected

U = Unknown at present **- = Adverse**

+ = Beneficial **0 = Neutral**

Table 12.2 Affected Planning Allocations and Policies: Other policies affected

UDP Policy		IMPACT			Description of impacts
		+	0	-	
Env29	Protection of Environmental Quality		**0**		The effects on this policy should be **neutra**l with mitigation
Env17	Protection of Built and Historic Environment			**--**	Further specialist assessment is required to more fully define the extent and importance of the buried archaeological assets. This will inform the potential mitigation options. A **moderate adverse** impact is predicted.
Env18	Archaeological field investigation			**--**	
Env19	Preservation of Archaeological Remains			**--**	
Env20	Development in Conservation Areas		**0**		The conservation areas at Penmark, Bonvilston and St Nicholas are within 1 km of the study area. They will not be directly affected by the proposal
Env13	International areas of nature conservation importance		**0**		There are no internationally important sites within the study area.
Env14	National sites of nature conservation importance		**0**	**--**	There are a number of SSSIs within the study area, with mitigation there could be expected to be a **moderate adverse i**mpact on this policy, in year 1, reducing to a **neutral** impact as mitigation takes effect.
Env15	Local sites of nature conservation significance		**0**	**--**	
Env16	Protected species		**0**	**--**	
Env11	Protection of landscape features		**0**	**--**	M**oderate adverse** effect reducing to Neutral/Slight adverse on average in the long term
Env10	Conservation of the countryside		**0**	**--**	M**oderate adverse** effect reducing to Neutral/Slight adverse on average in the long term
Env1	Development in the countryside		**0**		As infrastructure in a rural location the proposal accords with this policy
Env2	Agricultural land			**- / --**	There is likely to be a **moderate adverse** effect on agricultural land in Sector 1, no effect in Sector 2, and **slight adverse** effects in Sectors 3 – 7.
Env26	Contaminated land and unstable land		**0**		The impact should be **neutral** after mitigation

UDP Policy		IMPACT			Description of impacts
		+	0	-	
Comm5	Retention of community facilities		**0**		With appropriate design and consultation adverse impact would be avoided
Rec1	Protection of existing recreational facilities		**0**		With appropriate design and consultation adverse impact would be avoided
Env7	Water resources			**-**	Interim assessment indicates that the impact is likely to be **slight adverse**

12.4 Indirect Effects on Other Plans and Policies

12.4.1 Improving access to Cardiff International Airport would be a secondary benefit of the scheme to improve the safety of the A4226 (Five Mile Lane).

12.4.2 There are a number of plans and policies that specifically mention an access route to the airport.

12.4.3 In the **"*Strategic Planning Guidance for South East Wales*, January 2000"**, the issue of access to Cardiff Airport is specifically addressed in recommendation T8. The supporting text also states that, *"Cardiff International Airport and the region's ports are major regional economic assets"*.

12.4.4 The "***Adopted Vale of Glamorgan Unitary Development Plan (UDP) 2005"*** has protected an area of land - to the east of Wenvoe as a potential route for the Cardiff Airport Access Road, and this was the subject of earlier environmental assessments. The broad alignment corridor currently under consideration lies outside this protected route. POLICY TRAN 1 – STRATEGIC HIGHWAYS) states: *"Land will be protected and provision made for the development of the strategic highway network, including: i) The airport access road and ii) The Barry waterfront to Cardiff link"*

12.4.5 This is supported by a reference to national policy guidance: *"Planning Guidance (Wales) "Planning Policy" (1996) refers to the need to consider the increasing economic role of Cardiff International Airport. The importance of establishing a high quality link road to the airport from the M4 and Cardiff is seen as a unique strategic objective. In providing a high quality fast link, the Airport Access Road will serve new development at the airport, Barry Waterfront and Pencoedtre. It will relieve the congested major interchange at Culverhouse Cross, remove through traffic, improve environmental and road safety problems at the existing residential area of Wenvoe and North Barry and relieve the existing road network to the benefit of public transport, cyclists and pedestrians. The*

Council remains keen to encourage improved public transport links, both bus and rail, to Cardiff International Airport, as outlined in the text accompanying policy Tran 3."

12.4.6 The ***"Vale of Glamorgan Local Transport Plan 2001/02 – 2005/06",*** has specific plans and policies in relation to Cardiff International Airport, these are quoted below:

Policy 24

The continued use and development of Cardiff International Airport to cater for all types of traffic will be favoured

Paragraph 7.126 states that "the development strategy for the airport aims to develop facilities to cater for up to 3.6 million passengers per annum".

Paragraph 7.127 states that:

"The continued use and development of Cardiff International Airport will benefit the region as a whole. However if the region is to maximise the potential of the airport it will be necessary to enhance the transport links between the airport and the wider region. It will be important to ensure convenient and appropriate access to/from the airport to attract continued growth of business travellers, leisure users, and to ensure future opportunities to further developed the freight potential of the airport."

Policy 25

An airport transport forum will be established to develop a surface access strategy for the airport.

12.5 Overall Impact

12.5.1 The majority of the study area for the Five Mile Lane improvements is designated as a Special Landscape Area (ENV4) in the adopted Vale of Glamorgan Unitary Development Plan (1996 – 2011). All of the route alignment options would have an adverse on this policy designation reducing through mitigation towards Neutral. Please refer to the Landscape Effects chapter for more information.

12.5.2 The landscape effects chapter has examined the options in detail. These can be broadly summarised as the Purple route would have a slight/moderate adverse effect, the Blue and Green would have moderate adverse effect and the Red and Orange routes would have a moderate/severe adverse impact. With mitigation these effects can reduced to a neutral/slight effect in the long term.

12.5.3 A slight adverse effect is initially predicted for the Green Wedge (ENV3) as a result of alterations to the roundabout at Waycock Cross. With mitigation these effects would be reduced to neutral after 15 years

12.5.4 For most other policies no effects are predicted.

12.5.5 The impacts on Plans and Policies are similar for all options. The most pronounced effects are moderate adverse (landscape, heritage, biodiversity) that can be reduced to neutral effects after mitigation. There is an overall slight adverse effect on land use that cannot be completely mitigated.

12.5.6 The overall effect on Plans and Policies is Neutral / Slight Adverse.

13 Appraisal Summary Tables

13.1 Blue Route Option Appraisal Summary Table

Criteria	Assessment	Distribution	Significance
Traffic Noise and Vibration	Following mitigation, impacts throughout the route are likely to vary from significant beneficial through to slight but not significant adverse.	Principal beneficial effects around Sycamore Cross (Sector 1), Blacklands Fram/Tynant and Sutton Fach Farm' (Sector 5)	**+** Slight Beneficial
Local Air Quality	Once mitigation measures have been put in place, long-term there are likely to be Slight Positive Benefit to Moderate Positive Benefit.	Principal beneficial effects around Sycamore Cross (Sector 1), Blacklands Fram/Tynant and Whitton Lodge (Sector 3) Principal adverse effects around Northcliff Cottage (Sector 5) and Waycock Cross (Sector 7) due to the close proximity of receptors to the carriageway or potentially slow moving traffic at roundabouts.	**+ /+ +** Slight to Moderate Beneficial
Landscape	Neutral/Slight Adverse effect on Landscape Character and Neutral/Slight Beneficial effect on Visual Amenity	N/A	**0** Neutral
Vehicle Travellers	Moderate beneficial effect on views from the road and Large Beneficial on driver stress	Most beneficial to regular users of the road, such as local residents and workers.	**+ + / + + +** Moderate / Large Beneficial
Biodiversity	Overall impact in the long term likely to be Neutral –	N/A	**-**

Criteria	Assessment	Distribution	Significance
	Slight beneficial for most Sectors with appropriate mitigation. Impact in Sector 6 would be Moderate Adverse due to loss of SSSI woodland.		Slight Adverse overall (due primarily to effects on SSSI **+** Potential for Slight beneficial impact if SSSI impacts minimised
Soils, Agriculture and Land Use	Overall impact in the long term is likely to be slight adverse.	N/A	**-** Slight Adverse
Heritage	Overall impact may result in Moderate Adverse due to impact on known sites. High potential for further important remains in Sectors 3/4. Principal adverse effects around Whitton Lodge (Sectors 3/4) at current assessment level.	N/A	**- -** Moderate Adverse (current assessment level)
Water Environment	Overall impact in the long term is likely to be slight adverse.	N/A	**-** Slight Adverse
Social Impacts	Overall impacts in the long term are likely to be Slight beneficial for receptors in most Sectors, as there will be potential for improvements in personal safety, physical fitness and social inclusion and no existing recreational routes or services will be severed by the proposed route.	N/A	**+** Slight Beneficial
Planning Policy	Neutral / Slight Adverse.	N/A	**0 / -** Neutral / Slight Adverse
Transport Planning Objective	Moderate Beneficial effect	Most beneficial to regular users of the road, such as local residents and workers.	**+ +** Moderate Beneficial

13.2 Purple Route Option Appraisal Summary Table

Criteria	Assessment	Distribution	Significance
Traffic Noise and Vibration	Generally, the route creates neutral or slight positive impacts following the installation of appropriate mitigation.	Principal beneficial effects around Sycamore Cross (Sector 1), Blacklands Fram/Tynant and Sutton Fach Farm' (Sector 5)	**+** Slight Beneficial
Local Air Quality	Overall impact in the long term is likely to be Neutral to Moderate Positive Benefit.	Principal beneficial effects to Sycamore Cross (Sector 1), Blacklands Fram/Tynant and Whitton Lodge (Sector 3), plus Sutton Farm (Sector 5) Principal adverse effects around Grovelands Farm in Sector 5 due to the adjacent roundabout and also proximity to the carriageway.	**+ +** Moderate Beneficial
Landscape	Neutral/Slight Adverse effect on Landscape Character and Neutral effect on Visual Amenity	N/A	**0** Neutral
Vehicle Travellers	Slight beneficial effect on driver stress and on views from the road.	Most beneficial to regular users of the road, such as local residents and workers.	**+** Slight Beneficial
Biodiversity	Overall impact in the long term likely to be Neutral for most Sectors with appropriate mitigation. Impact in Sector 6 would be Slight Adverse due to minimal loss of SSSI woodland.	N/A	**-** Slight Adverse
Soils, Agriculture	Overall impact in the long term is likely to be slight	N/A	**-**

Criteria	Assessment	Distribution	Significance
and Land Use	adverse.		Slight Adverse
Heritage	Overall impact may result in Moderate Adverse due to impact on known sites. High potential for further important remains in Sectors 3/4. Principal adverse effects around Whitton Lodge (Sectors 3/4) at current assessment level.	N/A	**- -** Moderate Adverse (current assessment level)
Water Environment	Overall impact in the long term is likely to be slight adverse.	N/A	**-** Slight Adverse
Social Impacts	Overall impacts in the long term are likely to be Slight beneficial for receptors in most Sectors, as there will be potential for improvements in personal safety, physical fitness and social inclusion and no existing recreational routes or services will be severed by the proposed route.	N/A	**+** Slight Beneficial
Planning Policy	Neutral / Slight Adverse	N/A	**0 / -** Neutral / Slight Adverse
Transport Planning Objective	Slight Beneficial effect	Most beneficial to regular users of the road, such as local residents and workers.	**+** Slight Beneficial

13.3 Red Route Option Appraisal Summary Table

Criteria	Assessment	Distribution	Significance
Traffic Noise and Vibration	Generally, the route creates neutral or slight positive impacts following the installation of appropriate mitigation.	Principal beneficial effects around Sycamore Cross (Sector 1), Blacklands Fram/Tynant and Sutton Fach Farm' (Sector 5)	**+** Slight Beneficial
Local Air Quality	Overall impacts are likely to be Neutral to Slight Benefit. There will be some Moderate Positive effects on receptors where the carriageway is constructed at a greater distance than the current roadway alignment. Slight to Moderate Adverse effects will occur in locations where the proposed carriageway is within close proximity to receptors.	Principal beneficial effects around receptor Sycamore Cross (Sector 1), Blackland Farm (Sector 3) and Sutton Farm (Sector 5). Principal adverse effects around Grovelands Farm and Northcliff Cottage (Sector 5)	**0 / +** Neutral / Slight Beneficial
Landscape	Slight Adverse effect on Landscape Character and Neutral effect on Visual Amenity	N/A	**0** Neutral
Vehicle Travellers	A Slight/Moderate beneficial effect on views from the road and Slight Beneficial on driver stress	Most beneficial to regular users of the road, such as local residents and workers.	**+** Slight Beneficial
Biodiversity	Overall impact in the long term likely to be Neutral for most Sectors with appropriate mitigation. Large scale loss of road-side hedgerows in the short term Impact in Sector 6 would be Slight Adverse due to loss of SSSI woodland.	N/A	**-** Slight Adverse
Soils, Agriculture and Land Use	Overall impact in the long term is likely to be slight adverse.	N/A	**-** Slight Adverse

Criteria	Assessment	Distribution	Significance
Heritage	Overall impact may result in Slight/Moderate Adverse due to more limited land-take around Whitton Lodge. Low/Moderate potential for further important remains in Sectors 3/4. Principal adverse effects in Sector 3 at current assessment level.	N/A	**- / - -** Slight/Moderate Adverse (current assessment level)
Water Environment	Overall impact in the long term is likely to be slight adverse.	N/A	**-** Slight Adverse
Social Impacts	Impacts for this route are likely to be Neutral as pedestrian/cyclist/equestrians access along the route may not be provided for, resulting in no benefits to the community in terms of physical fitness, perception of safety and improvements in social inclusion	N/A	**0** Neutral
Planning Policy	Neutral / Slight Adverse	N/A	**0 / -** Neutral / Slight Adverse
Transport Planning Objective	Slight Beneficial effect	Most beneficial to regular users of the road, such as local residents and workers.	**+** Slight Beneficial

13.4 Orange Route Option Appraisal Summary Table

Criteria	Assessment	Distribution	Significance
Traffic Noise and Vibration	The route is likely to create neutral and positive effects throughout the route following the installation of appropriate mitigation. The route should not create any significant adverse effects.	Principal beneficial effects around Sycamore Cross (Sector 1), Blacklands Fram/Tynant and Sutton Fach Farm' (Sector 5)	**+ +** Significant Beneficial
Local Air Quality	Overall impacts are likely to be Neutral to Slight Benefit.	Principal beneficial effects on receptors Sycamore Cross (Sector 1) and Blackland Farm, Whitton Lodge (Sector 3) where the carriageway is constructed at a greater distance than the current roadway alignment. Principal adverse effects in Sector 5 due to the close proximity of a roundabout and the proposed carriageway.	**0 / +** Neutral / Slight Beneficial
Landscape	Slight Adverse effect on Landscape Character and Neutral effect on Visual Amenity	N/A	**0** Neutral
Vehicle Travellers	A Slight Beneficial effect on views from the road and Moderate Beneficial effect on driver stress	Most beneficial to regular users of the road, such as local residents and workers.	**+ / + +** Slight / Moderate Beneficial
Biodiversity	Overall impact in the long term likely to be Neutral for most Sectors with appropriate mitigation.	N/A	**0** Neutral impact

Criteria	Assessment	Distribution	Significance
	Impact in Sector 6 would be Slight Adverse due to minimal loss of SSSI woodland.		
Soils, Agriculture and Land Use	Overall impact in the long term is likely to be slight adverse.	N/A	**-** Slight Adverse
Heritage	Overall impact may result in Moderate/Slight Adverse due to more limited land-take around Whitton Lodge. High potential for further important remains in Sector 3. Principal adverse effects in Sector 3 at current assessment level.	N/A	**- / - -** Moderate/Slight Adverse (current assessment level)
Water Environment	Overall impact in the long term is likely to be slight adverse.		**-** Slight Adverse
Social Impacts	Overall impacts in the long term are likely to be Slight beneficial for receptors in most Sectors, as there will be potential for improvements in personal safety, physical fitness and social inclusion and no existing recreational routes or services will be severed by the proposed route.	Most beneficial to regular users of the road, such as local residents and workers.	**+** Slight Beneficial
Planning Policy	Neutral / Slight Adverse	N/A	**0 / -** Neutral / Slight Adverse
Transport Planning Objective	Slight / Moderate Beneficial effect	Most beneficial to regular users of the road, such as local residents and workers.	**+ / + +** Slight /Moderate Beneficial

13.5 Green Route Option Appraisal Summary Table

Criteria	Assessment	Distribution	Significance
Traffic Noise and Vibration	Generally, the route creates neutral or slight positive impacts following the installation of appropriate mitigation.	Principal beneficial effects around Sycamore Cross (Sector 1), Blacklands Fram/Tynant and Sutton Mawr' (Sector 5)	**+** Slight Beneficial
Local Air Quality	Overall impacts are likely to be Neutral to Slight Benefit.	Principal beneficial effects on receptors Sycamore Cross (Sector 1) and Blackland Farm, Whitton Lodge (Sector 3) where the carriageway is constructed at a greater distance than the current roadway alignment. Principal adverse effects in Sector 5 due to the close proximity of a roundabout and the proposed carriageway.	**0** Neutral
Landscape	Slight Adverse effect on landscape character and Neutral/Slight Adverse on visual amenity	N/A	**-** Slight Adverse
Vehicle Travellers	A Slight Beneficial effect on views from the road and Moderate Beneficial effect on driver stress	Most beneficial to regular users of the road, such as local residents and workers.	**+ / + +** Slight / Moderate Beneficial
Biodiversity	Overall impact in the long term likely to be Neutral for most Sectors with appropriate mitigation.	N/A	**0** Neutral impact

Criteria	Assessment	Distribution	Significance
	Impact in Sector 6 would be Slight Adverse due to minimal loss of SSSI woodland		
Soils, Agriculture and Land Use	Overall impact in the long term is likely to be slight adverse.	N/A	**-** Slight Adverse
Heritage	Overall impact may result in Moderate Adverse due to impact on known sites. High potential for further important remains in Sectors 3/4. Principal adverse effects around Whitton Lodge (Sectors 3/4) at current assessment level.	N/A	**- -** Moderate Adverse (current assessment level)
Water Environment	Overall impact in the long term is likely to be slight adverse.	N/A	**-** Slight Adverse
Social Impacts	Overall impacts in the long term are likely to be Slight beneficial for receptors in most Sectors, as there will be potential for improvements in personal safety, physical fitness and social inclusion and no existing recreational routes or services will be severed by the proposed route.	N/A	**+** Slight Beneficial
Planning Policy	Neutral / Slight Adverse	N/A	**0 / -** Neutral / Slight Adverse
Transport Planning Objective	Slight Beneficial effect	Most beneficial to regular users of the road, such as local residents and workers.	**+** Slight Beneficial

13.6 Summary of Appraisal of Different Options

	Summary of Significance				
Appraisal Criteria	**Blue Option**	**Purple**	**Red**	**Orange**	**Green**
Traffic Noise and Vibration	+	+	+	+ +	+
Local Air Quality	+ / + +	+ +	0 / +	0 / +	0
Landscape	0	0	0	0	-
Vehicle Travellers	+ + / + + +	+	+	+ / + +	+ / + +
Biodiversity	- / +	-	-	0	0
Soils, Agriculture and Land Use	-	-	-	-	-
Heritage	- -	- -	- / - -	- / - -	- -
Water Environment	-	-	-	-	- - -
Social Impacts	+	+	0	+	+
Planning Policy	0 / -	0 / -	0 / -	0 / -	0 / -
Transport Planning Objective	+ +	+	+	+ / + +	+

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15 Glossary

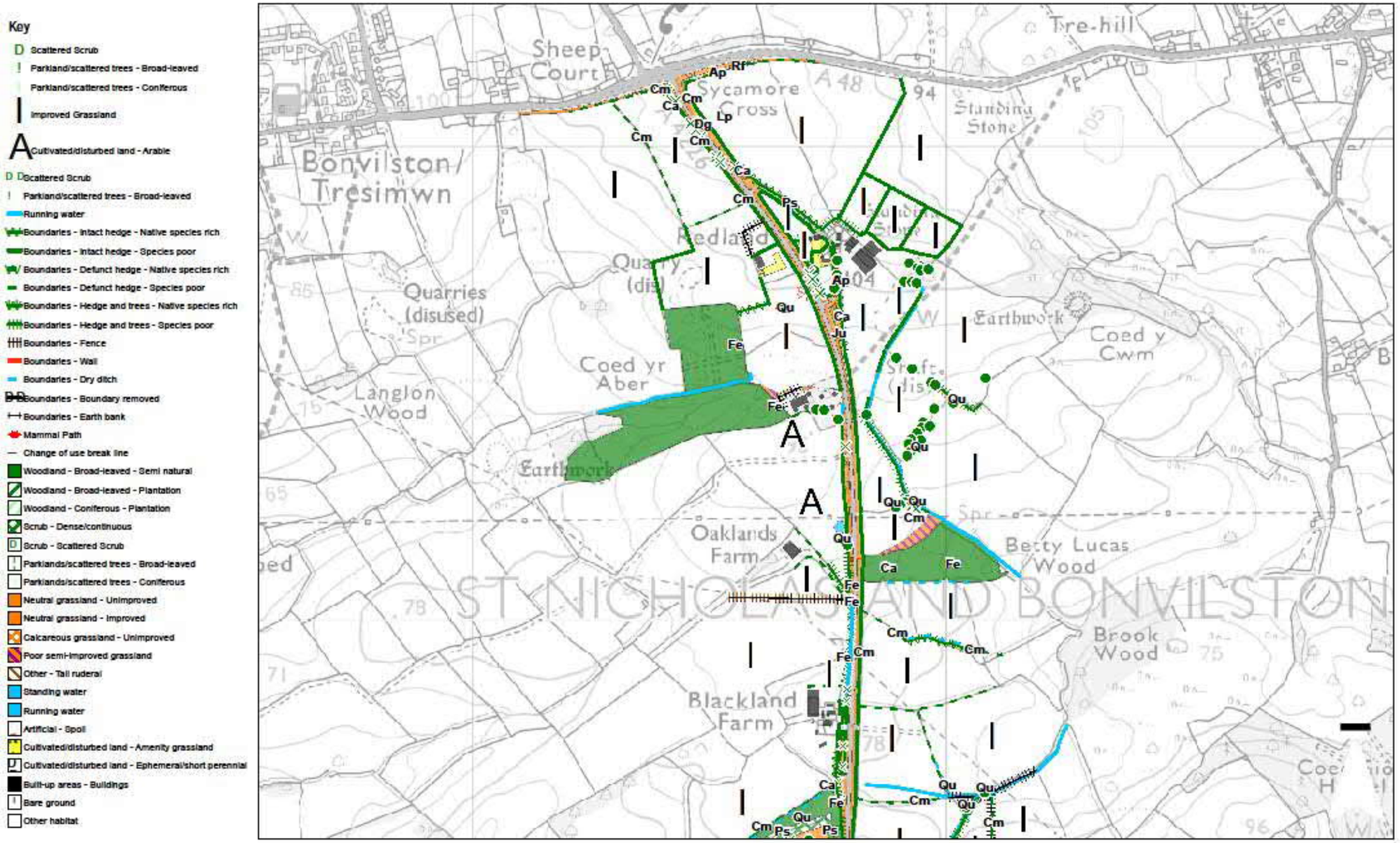
ALC	Agricultural Land Classification
AQMA	Air Quality Management Area
ARAD	Agriculture and Rural Affairs Department
AST	Appraisal Summary Table
Cadw	Cadw is a Welsh word which means 'to keep'. Cadw is the Welsh Assembly Government's historic environment division.
CCW	Countryside Council for Wales is the Welsh Assembly Government's Government's statutory advisor on sustaining natural beauty, wildlife and the opportunity for outdoor enjoyment in Wales and its inshore waters.
cSINC	Candidate Site of Interest for Nature Conservation – local authority level of designation
Development	For the purposes of planning regulation development is defined in primary legislation and statutory instruments as the carrying out of building, engineering, mining or other operations or the making of any change in the use of any buildings or land.
DMRB	Design Manual for Roads and Bridges (Highways Agency 2000)
EC directive	A type of legislation issued by the European Community that is binding on Member States in terms of the results to be achieved but which leaves Member States the choice of methods.
EIA	Environmental Impact Assessment The formal procedure that requires applications for specified types of development to be accompanied by an environmental statement that the local planning authority must take in to account when determining an application.
Environment Agency	Part of the corporate Environment Agency for England and Wales, a statutory body The EA has wide responsibilities for managing the environment: i) Acting as a champion for the environment ii) Reducing pollution and enforcing pollution legislation iii) Overseeing the management of waste, water resources and freshwater fisheries iv) Reducing the harm caused by flooding v) Influencing others to achieve positive environmental outcomes by changing attitudes and behaviour
ES	Environmental Statement
EU	European Union

GGAT	Glamorgan Gwent Archaeological Trust is one of four Welsh Archaeological Trusts working closely with other national, regional and local bodies, to help protect, record and interpret all aspects of the historic environment for the whole of Wales.
JNCC	Joint Nature Conservation Committee.
LDP	Local Development Plan
LNR	Local Nature Reserve
Listed Building	Buildings of special historical or architectural interest registered on statutory lists and subject to stricter planning controls
LTP	Local Transport Plan
LVIA	Landscape and Visual Impact Assessment
m	Metres.
OD	Ordnance Datum
PPG	Planning Policy Guidance
Ramsar	Wetland of International Importance, designated by the Convention on Wetlands, signed in Ramsar, Iran, in 1971
RIGs	Regionally Important Geological and Geomorphological Sites.
RPG	Regional Planning Guidance
SAM	Scheduled Ancient Monument
SMR	Sites and Monuments Records
SLA	Special Landscape Area
SPG	Supplementary Planning Guidance
SSSI	Site of Special Scientific interest. An area notified under Section 28 of the Wildlife and Countryside Act 1981 (as amended) for its 'special interest by reason of any of its flora, fauna or geological or physiographic features'.
TAN	Technical Advice Note
UDP	Unitary Development Plan - The type of development plan prepared by Metropolitan District or Borough Councils incorporating aspects of both Structure Plans and Local Plans.
VOGC	Vale of Glamorgan Council
WAG	Welsh Assembly Government
WelTAG	Welsh Transport Analysis Guidance
WebTAG	Transport Analysis Guidance Website

16 Appendices

Appendix 6.1	**Biodiversity - Phase I Habitat survey plan and accompanying Target Notes**
Appendix 7.1	**Land Use - Landholdings assessment**
Appendix 9.1	**Water Environment - Water Quality of River Waycock**
Appendix 12.1	**Planning Policy Schedule**

Appendix 6.1 Biodiversity - Phase I Habitat survey plan and accompanying Target Notes



Scale (metres)
0 250 500 1,000
Metres

Figure 6.1a: Phase 1 Habitat Survey

soltysbrewster CONSULTING

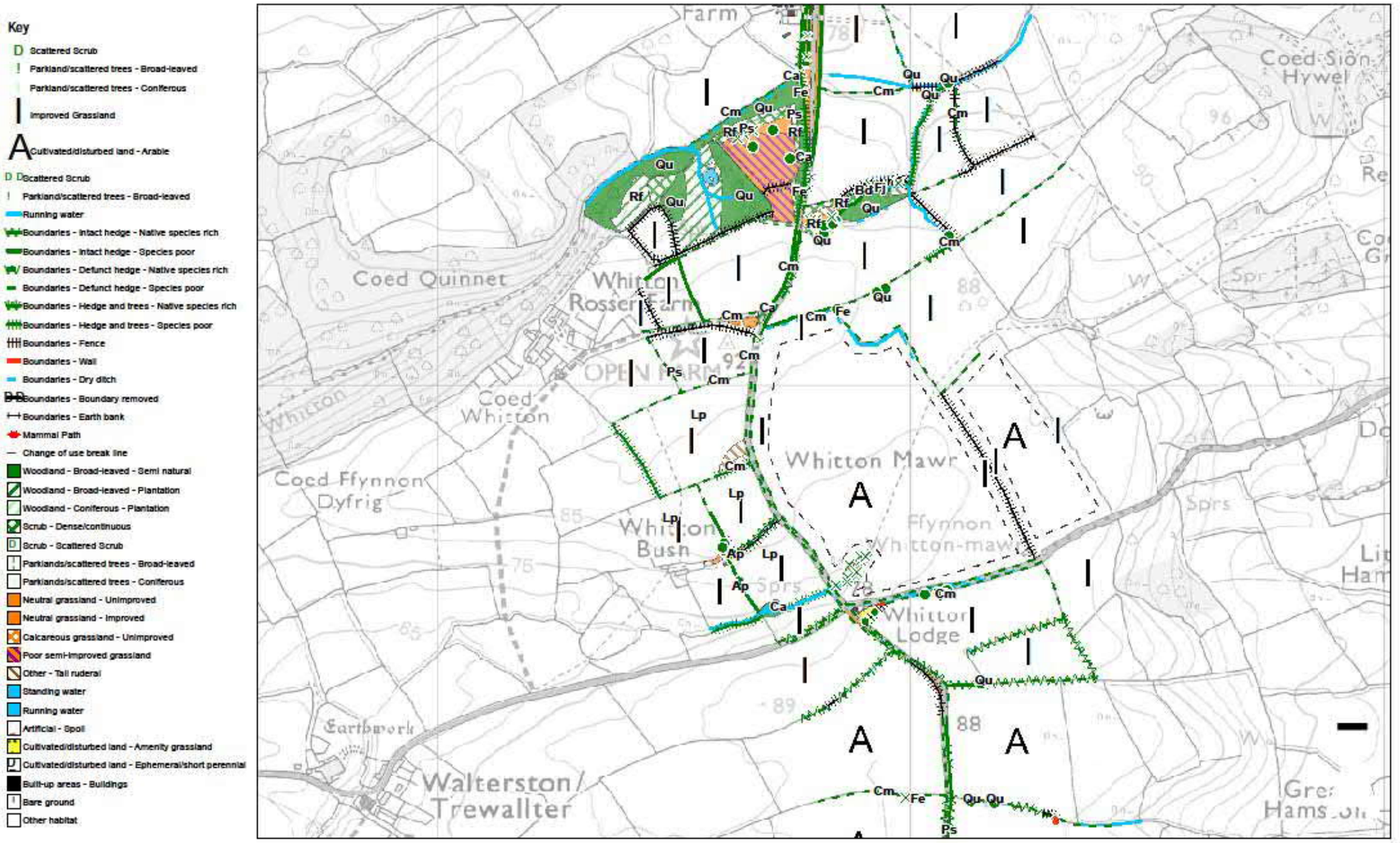


Figure 6.1b: Phase 1 Habitat Survey

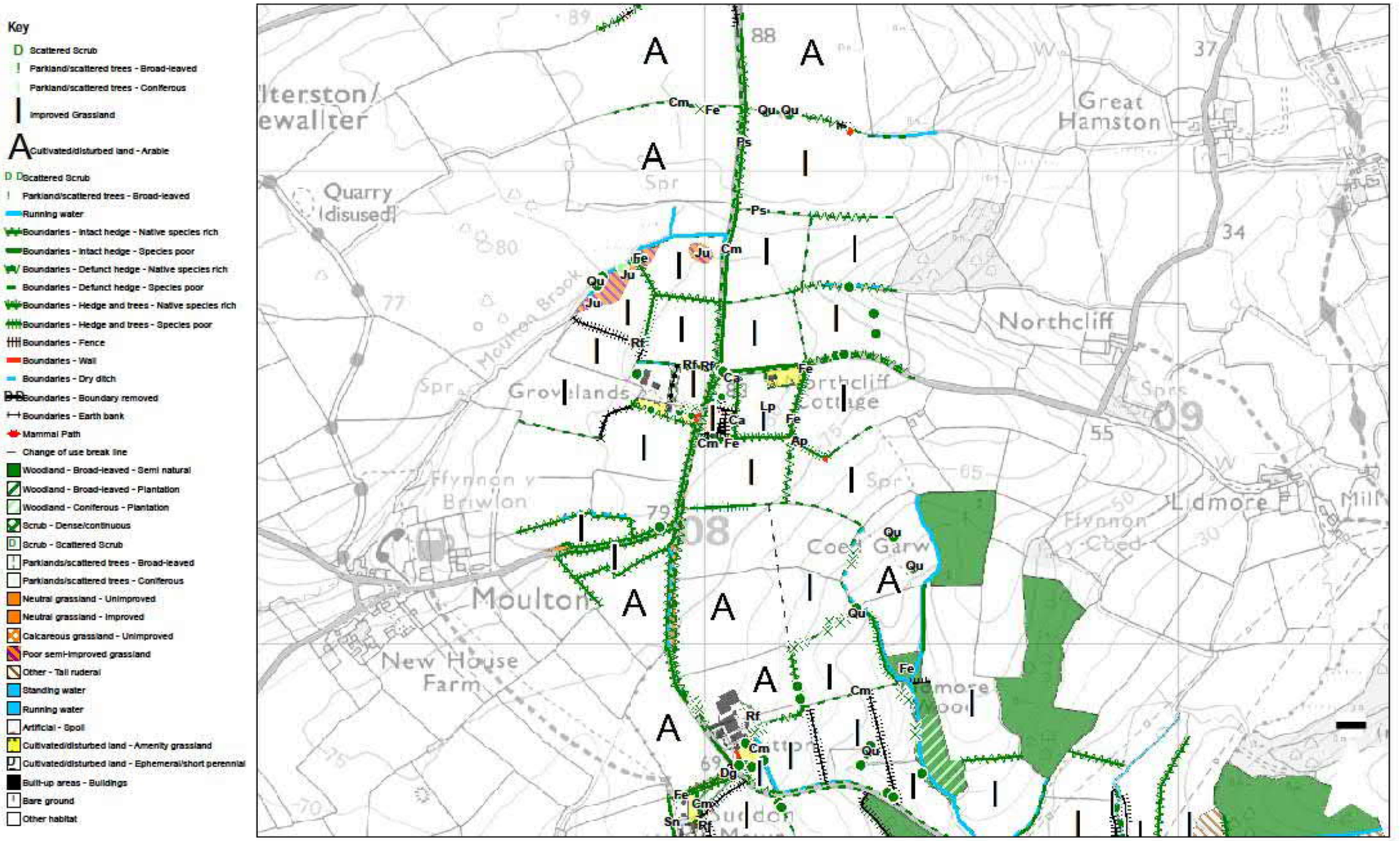


Figure 6.1c: Phase 1 Habitat Survey

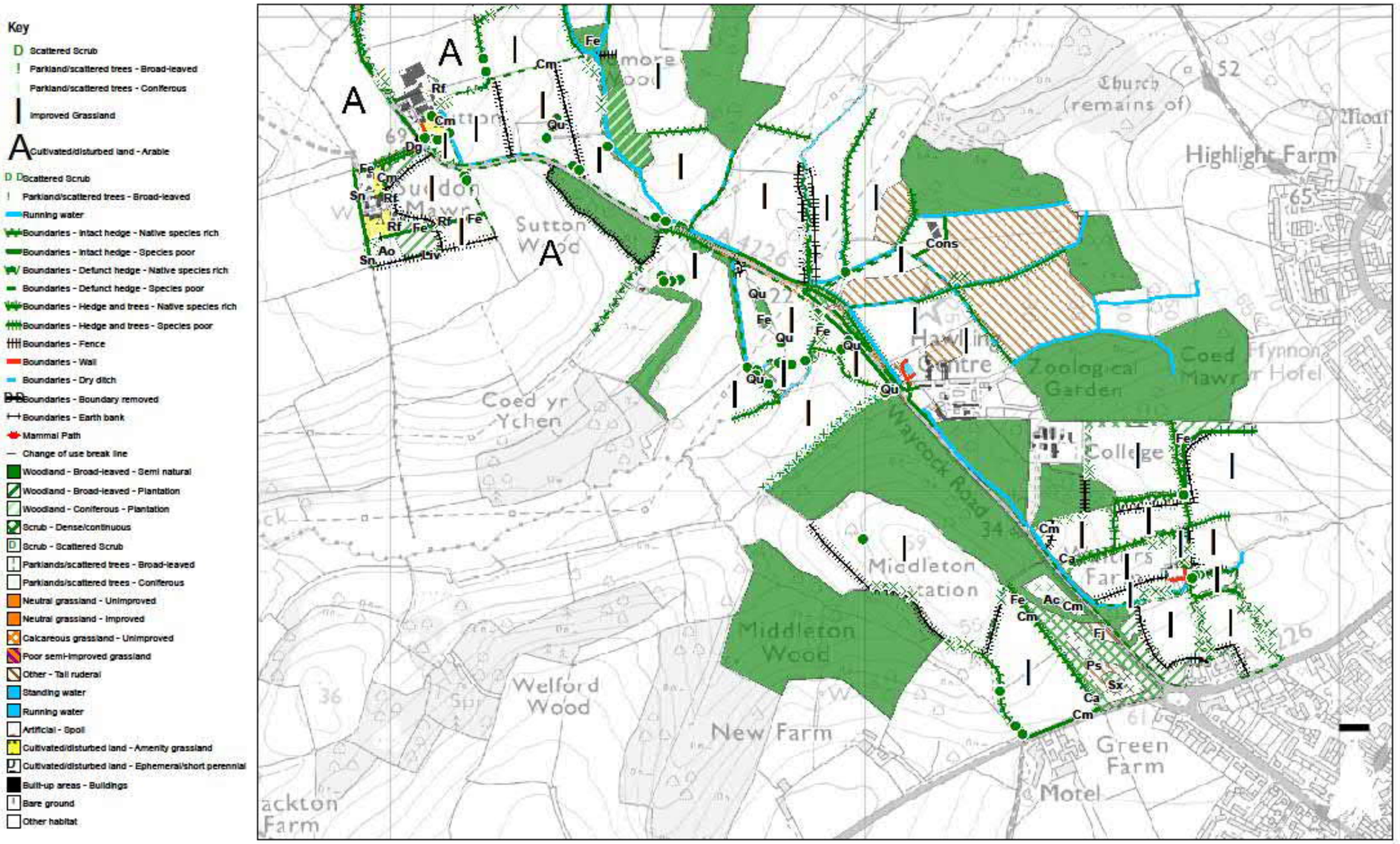


Figure 6.1d: Phase 1 Habitat Survey

Appendix 7.1 Land Use - Landholdings assessment

Potential Receptors and Impacts

Sector 1

Redland Farm (LU-1-1) and Redland Court Farm (LU-1-2)

In Sector 1, two land holdings – Redland Farm and Redland Court Farm - near Sycamore Cross, and to the south of the A48 are likely to be affected by changes to the junction. The current at-grade junction has been a focus of accidents and safety must be improved. The construction of either one large, or two small roundabouts is proposed.

In the worst-case scenario, 1.1 Ha may be permanently removed from Redland Farm. If a large roundabout is constructed on the Redland Court Farm landholding, the plans at this stage indicate that the land take may be 0.3Ha. The land holdings may lose field corners although this does not create significant problems such as fragmentation of the holding. However, in practical terms, the access to farm units requires detailed consideration; the agricultural land quality is Grade 2.

The effects on the land holdings are given **Slight Adverse Effect.** There is no preferred option.

Sector 2

In this section the existing road is of sufficient width with good sights lines and no further improvements need to be made. While this has no direct impact on land holdings, the improved road is intended to have a higher design speed and this may create severance problems, as discussed below.

All land holdings bordering the edges of the route may experience impingement onto their boundaries – even when improvements are on-line, as the new route is likely to be slightly wider.

Sector 3

In Sector 3, four of the five options under consideration deviate significantly from the existing route.

All land holdings bordering the edges of the new route – whichever option is chosen - are likely to experience impingement onto their boundaries – even when improvements are on-line, as the new route would be wider than the existing.

Whitton Rosser Farm (LU-3-2) and Whitton Bush Farm (LU-3-4)

Both located on the western side of Five Mile Lane, the Amelia Trust, which is a charitable organisation that mainly provides assistance to disadvantaged children and adults with social and emotional problems,

who utilise LU-3-2 as an open farm. Whitton Bush Farm is an agricultural holding. The red route curves inwards and shaves approximately 26m maximum from the fields bordering Five Mile Lane. This is a **slight adverse effect**. The orange, green, blue and purple routes all curve away from the holdings and have the additional advantage of leaving the existing Five Mile Lane in place, and providing safe access to the farms.

'Llancarfan' holding (LU-3-7a + 7b)

The ownership boundary includes four separate landholdings bordering Five Mile Lane. The landholding in Sector 2 is not affected, and the landholding in Sector 5 is affected by some of the route options.

The parts of the holding given the reference numbers LU-3 - 7 a and b) are on the west and east sides of Five Mile Lane, in Sector 3. Any of the options may potentially isolate the eastern field (12.5Ha). A telephone conversation with a land agent has confirmed that the entire holding is extensive, approximately 1214 hectares, so the adverse effects of the road may not be likely to make the holding unviable although the options would sever the eastern field. The full extents of other holdings are not known at this stage.

The Red route is mainly online but at this point it curves west of the existing road to lessen a sharp corner. This affects a large land parcel (numbered LU-3-7a) that straddles the join of Sectors 3 and 4. The route may effectively shave off the corner and may also impinge on the owner's other land area to the east of Five Mile Lane (numbered LU-3-7b). Purple and Green routes, with a maximum loss of 1.8Ha, may similarly affect the area.

The Blue route goes off line through the eastern field (numbered LU-3-7b) and may leave a narrow strip of land of 0.9 Ha between the old Five Mile Lane and the new route.

The overall impact on the land holding as a whole could be considered **slight adverse** although suitable compensatory measures may need to be agreed.

Sector 4

Northcliff Farm (LU-4-1)

This agricultural land holding is on the east of Five Mile Lane and straddles Sectors 4 and 5.

The Red route is aligned slightly to the east of the existing Five Mile Lane, so it may impinge on the field boundary and lead to a loss of 0.8Ha land. The Green route has a similar, further westwards, alignment to the red at this point.

The Orange route is mainly online at this point, it also curves westwards at Sector 5 and may skim off a field corner of 0.8Ha with further loss caused by the approaches to the proposed roundabout.

The Blue route is furthest to the east of the existing road and may lead to the greatest loss of land and the creation of an isolated narrow strip of 2.9Ha.

The Purple route is mainly located slightly to the west of the existing route, although it crosses to the east near the Sector 5 boundary, leading to a loss of 0.3Ha.

This agricultural land holding is on the east of Five Mile Lane and may receive **slight adverse effects** particularly from the Purple, Orange and Blue options. The Red and Green routes would have a minimal effect and are the preferred options for this holding. The order of preference of routes for this receptor is: 1 Green, 2 Red, 3 Purple, 4 Orange then 5 Blue.

Sector 5

All landholdings significantly affected by scheme options – please see main body of the report.

Sector 6

In Sector 6, the severance effect described above for Sutton Fach Farm continues for approximately 240m until a point where all options again begin to follow the existing route. The Blue route may have the greatest impact in this section, as it leaves the existing route in place to use as a feeder and a new alignment is constructed alongside it. For the Orange and Green routes there may be additional effects and loss of 0.3 Ha due to a feeder lane and roundabout.

Woodland

The proposed routes may affect a number of areas of woodland. The biodiversity section of the report has assigned reference numbers and these are used below:

Wood 3 Lidmore Wood

This woodland showed evidence of historical management. The Red and Orange routes impinge against the edges of the privately owned wood. The Red route may lead to a loss of approximately 0.8Ha while the Orange route may lead to a greater loss of up to 0.1Ha. The predicted effects of either the Red or Orange routes are **slight adverse.**

Wood 4 Sutton Wood (Llancarfan holding)

This area of woodland falls within an area of privately owned land. The landowner's entire holding is extensive (more than 1000 hectares) of mixed agricultural land. This area of woodland may be slightly affected by Red, Green and Blue options leading to a loss of approximately 0.02Ha. The predicted effects of either the Orange, Green and Blue options is **slight adverse.**

Welsh Hawking Centre (LU-6-3) & Vale of Glamorgan Council LU-6-4)

The proposed road improvements are on line at this point (except for the Blue route) and the Welsh Hawking Centre may not be directly affected although there could be a shift of up to 8m (maximum) westwards or eastwards due to the additional width of the new road. There should be an opportunity to provide an improved safer access to the facility with the new layout.

The effect of up to 8m-increased road width continues in the neighbouring area of woodland (Wood 2).

The effects from the Orange, Green or Blue routes could be **slight adverse,** although with appropriate mitigation and consultation, this could be reduced to **no effect**.

Barry College (LU-6-5)

The entrance to the college may be affected by the change in road width and design speed that may not improve the safety of the turning. The Blue option removes through traffic from the existing road/proposed local collector road that serves the buildings. For all other options, provision of safer/alternative access needs consideration.

'Llancarfan' Holding & Wood 4 LU-3–7 (see above and in main text)

This is another section of the landholding described above. For the Red, Green or Blue options, about 0.1Ha may be affected. The Red and Green routes have roundabout junction feeder lanes at this location, while the Blue alignment is west of the existing route. The effects on this section of the holding would be mitigated or compensated with the effects already described above.

'Walters Farm' Holding LU-6-6

This agricultural land holding may be affected by the increase in road width that may impinge against the existing boundaries**.**

Sector 7

Middleton plantation (Wood 1)

The final sector includes the roundabout junction options for the improvement of Waycock Cross. The Middleton Plantation (Wood 1) may be most affected with a loss of approximately 0.3ha of woodland. This **slight adverse effect** is currently associated with the Blue route, although all route options may necessitate some form of junction improvement.

Land Quality

The predicted effects on agricultural land quality may be very similar for all route options.

Sector 1

In the worst - case scenario, 1.1 Ha may be permanently removed from Redland Farm. If a large roundabout is constructed on the Redland Court Farm landholding, the plans at this stage indicate that the land take may be 0.3Ha.

The land has an Agricultural Land Quality of Grade 2. The Environment Planning and Countryside section of the Welsh Assembly Government should be consulted regarding the options available

Due to the agricultural land quality of Grade 2, the predicted impact is **moderate adverse effect.**

Sector 2

There is mainly Grade 4 agricultural land and any proposed highway improvements would be on line, therefore there would be no impact on agricultural land quality.

Sector 3

In this section there is an area of Grade 4 agricultural land and then the rest of the section is Grade 3.

The Red route may lead to a loss off 0.7 ha of Grade 4 agricultural land, and an overall loss (Grade 3 & 4) of 0.23 ha.

All other routes have a similar effect to eachother, leading to a loss approximately 0.4 ha of Grade 4 agricultural land. The Orange and Purple routes lead to a slightly lower loss of Grade 3 & Grade 4 land than the Green and Blue routes. For all options the amount lost is approximately 2.7 ha to 3.1ha.

The agricultural land quality affected is mainly Grade 3 with some Grade 4, this is given a **slight adverse** effect.

Sectors 4 to 7

In sector 4 the Red, Orange, Green and Purple options are all mainly online resulting in an overall loss of Grade 3 agricultural land of less than 1ha. The Blue option is aligned to the east of the existing road and may lead to greater land take of more than 1 hectare.

In sector 5, the Red option may lead to the least land take, preliminary measurements indicate that this may be in the region of 2.7ha. Due to differing curvatures of the options, the Orange and Green options have a slightly higher land take of up to 3ha. The highest land take is likely to occur for the Blue option, which may be almost 4ha. The indicative loss for the Purple route is approximately 3.5ha. In sector 5, the order of preference may be 1 Red, 2, Orange, 3 Green, 4 Purple, and then 5 Blue.

In sector 6, the Red, Orange, Green and Purple options are all mainly on-line. Widening of the existing road and the addition of roundabout may lead to an overall loss of between 1ha to 1.5ha. The additional land take of the Blue route leads to a loss in the region of 3.6ha.

In sector 7, the proposed roundabout may lead to an overall loss of 0.3 hectares from the Middleton plantation.

For sectors 4 to 7, the agricultural land quality is Grade 3 and the predicted impact of the Red, Orange, Green and Purple routes is **slight adverse.** The Blue option has the greatest land take, and preliminary measurement indicate that this is approximately 12ha (including Sycamore and Waycock junctions.)

Geology

The geological rock type through which the scheme passes is predominantly limestone with inter-bedded mudstone. The river valleys are overlain by deposits clay, silt, sand and gravel. Further geo-technical investigation may be necessary in order to assess the full impact on geology. The impact is likely to be similar for any of the options.

Urban areas and settlements

Junction improvements are proposed at the northern end of the scheme, near Bonvilston and St Nicholas, and the southern end of the scheme, on the urban fringe of Barry.

The proposed junction improvements would be unlikely to have a direct impact on these settlements. The indicative junction layouts are entirely on existing highway or agricultural land.

Contaminated Land

The former landfill site at Blackland farm is unlikely to be disturbed by any of the proposed route options.

Appendix 9.1 Water Environment - Water Quality of River Waycock

Water Body	WEYCOCK					LLANCARFAN								WEYCOCK						ELY			
Site/Station Name	U/S BRYNHILL					U/S WEYCOCK								AT CURNIX BRIDGE						AT PETERSTON-SUPER-ELY			
Site/Station ID	90466					45693								45692						45568			
Site/Station Location	ST-09339-71009					ST-05115-68867								ST-06554-68822						ST-08140-76130			
Sample Date	29.4.03	1.9.03	8.4.04	15.9.04	15.4.05	29.4.03	1.9.03	8.4.04	16.9.04	15.4.05	15.9.05	30.3.07	10.9.07	29.4.03	8.4.04	15.4.05	15.9.05	7.4.08	18.9.08	22.4.04			
TAXA																							
Nematoda	8											1										1	2
Valvatidae	2					1			1														
Hydrobiidae	300	300	2000	3000	2000	300	700	10	1				1	150	1	900	5000	120	22	5	10	4	8
Physidae					1												10						
Lymnaeidae	30	70	4	4		15	600	10	50	1	250		30						1	3	1		
Planorbidae	2		1		2																		
Ancylidae	40	200	40	40	60		10	3					1	7	4	7	40	1	1	1	3		3
Zonitidae					1												1						
Sphaeriidae (Pea mussels)	15	9	40	9	20	10	100	40	100	40	2		1	4	8	5	50	4	3	10	7		1
Oligochaeta	70	100	80	10	50	70	1000	400	100	300	200	110	30	50	200	400	200	150	180	700	70	200	35
Lumbricidae	1											5	3					1	1				
Piscicolidae	2	4																					
Glossiphoniidae	1	10	1		1		40	5	5	8	5	6	20				10	1	5	2	6		
Erpobdellidae	8	20	10	7	8		10	1	1			5	4	1		1	6		8				
Hydracarina	30	30	10	4					1	2	2		20	20				7	1	7	2	2	1
Ostracoda									10		25												
Asellidae	30	4	4	4	3						9	4	100	1	8	3	1			6	7		
Gammaridae	150	300	900	400	700			5		30	6	16	90	70	100	300	800	90	120	200	2000	30	100
Baetidae	50	30	700	50	800	1	3	30		200	4	23	100	50	400	100	3	80	36	400	200	200	30
Heptageniidae																				20	40	20	3
Leptophlebiidae	2	4	6							1				3	3					1		1	
Potamanthiidae																		2					
Ephemeridae	500		1		1	1						1		1	8	6	1	8	1			1	
Ephemerellidae		10	2000	30	200			30		30		2	2	80	100	100		15	1		2		12
Caenidae														1	3					20		2	
Nemouridae					1											1							
Leuctridae		1															5		1	2			3
Perlodidae	6				5			1		1				1	3	10		10					
Perlidae			1																				
Coenagriidae													1										
Calopterygidae													1									1	
Veliidae													1										
Corixidae																							

Haliplidae		1									2												1
Dytiscidae				2					3		50		7							2	1		
Gyrinidae	1		2	2	7						1		6	3	2	4		9	2				
Hydrophilidae																				1	1		
Scirtidae				1							1												
Elmidae	80	60	200	90	300	3	1	2		3	1	2	9	120	1000	700	700	600	700	300	500	100	80
Sialidae				1																			
Sisyridae																					1		
Rhyacophilidae	35	10	8	1	1								2		2	1	1	1	5	8	30	20	30
Glossosomatidae	9	20	50	7	50								10	5	2	10	20	80	200	2	20	1	
Hydroptilidae	80	50			1								4	130		50				40	7	5	15
Psychomyiidae		2		1	1								1	3	1	1		1				1	5
Polycentropodidae	1			1	1								5						2			2	1
Hydropsychidae	6	30	40	20	20								1	9	40	20	20	40	40	30	100	3	15
Phryganeidae																							
Lepidostomatidae		1											40	3	1	2	50	5					
Limnephilidae	1		3	1	1	1		2		1	4	5	2		1	2	2	2		1			
Goeridae																							
Sericostomatidae	1	20	10	10	20							1			8	3	20	17	2	3	5		1
Leptoceridae		3																		20	10	3	3
Tipulidae	3	8	1	2	1		4	2			2	1	1	11		1	2			20	3		
Limoniidae																		1				3	
Psychodidae	5	3	3	1			4	2	4		3		2		1		1						
Dixidae													6				1						
Ceratopogonidae	60	2	30		30	15	3	2	1	7	2	16	1		8	10		30		1		4	2
Ceratopogon														100									
Simuliidae	40	3	20	7	6	1		20	2	20	11	29	2000		70	7	1	50	21	20	200	1	2
Chironomidae	60	100	9	80	9	40	500	1000	300	900	400	1400	400	30	8	30		60	14	1000	60	400	160
Stratiomyidae	1			1							1												
Rhagionidae																							
Tabanidae																						1	
Empididae	50	5	40		30	9	7	1	1	4	6		9	90	10	4		70		6	2		
Muscidae		2		1							1	1	1								2		
Planariidae	18	30	6	6	10		40		2	4			8	1	1	6	6			3			
Dugesiidae								40	9		12	1	3				1						
Dendrocoelidae																							
Phoxinus phoxinus													6										1
Anguilla anguilla													1										
Nematomorpha				4											2		1						

Podiciidae													1					1					11
Barbatula barbatula																							1
BMWP	144	152	134	127	152	46	43	81	36	74	72	79	141	134	142	146	114	135	108	146	117	119	128
ASPT	5.14	5.63	5.36	5.08	5.43	4.18	3.58	4.76	3.27	5.29	4.24	5.27	5.22	5.83	6.17	5.84	5.43	6.14	5.4	5.62	5.32	6.26	6.1
No Of Taxa	28	27	25	25	28	11	12	17	11	14	17	15	27	23	23	25	21	22	20	26	22	19	21

Appendix 12.1 Planning Policy Schedule

Appendices 12.1 Planning Policy Schedule

AIR QUALITY	
UDP ENV 29	**Protection of environmental quality.** Development will not be permitted if it would be liable to have an unacceptable effect on either people's health and safety or the environment: By releasing pollutants into water, soil or air, either on or off site; or From smoke, fumes, gases, dust, smell, noise, vibration, light or other polluting emissions
TRAFFIC NOISE AND VIBRATION	
TAN11 (1997)	**Noise** This note gives guidance on noise policies. When area specific noise policies are useful, the relevant boundaries should be illustrated on the proposals map although it would inappropriate for a proposals map to show detailed noise contours as noise emissions may change significantly over time. Plans should contain an indication of any general policies which the local planning authority proposes to apply in respect of conditions or planning obligations.
UDP ENV 29	**Protection Of Environmental Quality** (as above)

ARCHAEOLOGY AND CULTURAL HERITAGE	
UDP ENV 17	**Protection of built and historic environment,** The environmental qualities of the built and historic environment will be protected. Development which has a detrimental effect on the special character appearance or setting of: A building or group of buildings, structure or site of architectural or historic interest, including listed buildings and conservation areas; Scheduled ancient monuments and sites of archaeological and / or historic interest; Designed landscapes, parks or gardens of historic, cultural or aesthetic importance Will not be permitted.
UDP 05 ENV 18	**Archaeological field evaluation** Where development is likely to affect a known or suspected site of archaeological significance, an archaeological evaluation should be carried out at the earliest opportunity and may be required before the proposal is determined. Detailed plans would need to reflect the conclusions of the evaluation.

ARCHAEOLOGY AND CULTURAL HERITAGE	
UDP 05 ENV 19	**Preservation of archaeological remains** Where development is permitted which affects a site of archaeological importance archaeological mitigation measures will be required to ensure preservation on site or adequate recording prior to disturbance
UDP 05 ENV 20	**Development in conservation areas** Proposals for new development or alterations to buildings or features within conservation areas will be permitted where they preserve or enhance the character of the conservation area. Such proposals will need to reflect: The scale, design, layout, character, materials and setting of those buildings which establish the character of the area; The patterns of use which establish the character of the area; Important open space within and adjoining conservation areas; Important trees and hedgerows; and Ponds and streams.

ECOLOGY, NATURE CONSERVATION & BIODIVERSITY	
TAN 5 (1996)	**Nature Conservation and Planning** The advice note emphasises that the countryside Council for Wales should be consulted with regard to proposed development that would potentially harm sssis or their immediate surroundings. The Consultation area is defined as 500m although it can extend up to 2km. The TAN refers to supporting legislation and guidance.
TAN 10 (1997)	**Tree preservation orders** The principal effect of a TPO is to prohibit the cutting down, uprooting, topping, lopping, wilful damage or wilful destruction of a tree or trees without the consent of the local planning authority.
UDP ENV 13 -	**International areas of nature conservation importance** International sites which are designated or potential Ramsar sites, special protection areas or special areas of conservation will be protected. Development or land use changes likely to have an adverse effect on such sites will not be permitted unless there is no alternative and there are imperative reasons of

ECOLOGY, NATURE CONSERVATION & BIODIVERSITY	
	overidding public interest. Where such sites host a priority habitat or species (as listed in theEC. Habitats Directive) developments will not be permitted unless required for reasons of human health or safety. If in exceptional circumstances development is permitted, appropriate conditions or agreed planning obligations will be used to secure adequate compensation or mitigation measures.
UDP ENV 14	**National sites of nature conservation importance** Development likely to have an adverse effect, either directly or indirectly on the conservation value of a national nature reserve or a site of special scientific interest will not be permitted unless there is no alternative and it can be demonstrated that the benefits arising from the development clearly outweigh the special interest of the site. If development is permitted, appropriate conditions or agreed planning obligations will be used to secure adequate compensation or mitigation measures.
UDP ENV 15	**Local sites of nature conservation significance** Development and land use change likely to have an unacceptable effect on a local nature reserve, a regionally important geological / geomorphological site, or a site shown to be of importance for nature conservation will not be permitted unless the reasons for the proposal clearly outweigh the local importance of the site. If development is permitted, appropriate conditions or agreed planning obligations will be used to ensure the impact on nature conservation is minimised.
UDP ENV 16	**Protected species** Permission will only be given for development that would cause harm to or threaten the continued viability of a protected species if it can be clearly demonstrated that: There are exceptional circumstances that justify the proposals; There is no satisfactory alternative; and Effective mitigation measures are provided by the developer.

LAND USE/AGRICULTURE/SOILS	
TAN 6 (2000)	**Agricultural and Rural Development** • This note mostly relates to issues such as agricultural buildings, farm diversification etc and does not specifically mention highway schemes. Paragraphs 3 to 6 discuss agricultural considerations in relation to development.

	• When planning applications, local planning authorities should consider the quality of agricultural land and other agricultural factors and seek to minimise any adverse effects on the environment. • Local planning authorities should bear in mind that, once land is built on, the restoration of semi-natural and natural habitats and landscape features is rarely possible and usually expensive, and archaeological and historic features cannot be replaced. • The National Assembly for Wales Agriculture Department classify agricultural land by grades according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use for food production. There are 5 grades of land numbered 1 to 5, with grade 3 divided into two sub-grades. The best and most versatile land falls into grades 1, 2 and sub-grade 3a and is the most flexible, productive and efficient in response to inputs. • The Agricultural Land Classification (ALC) map for Wales is published at a scale of 1:250,000 and provides a generalised indication of the distribution of land quality.
UDP Env 3	**Green wedges** Green wedges have been identified in order to prevent urban coalescence between and within settlements at the following locations: 1. Dinas Powys and Penarth and to the south and west of Llandough; 2. North west of sully; 3. North and east of Wenvoe; 4. South of Bridgend; and **5. Barry, Rhoose and St Athan.** Within these areas development which prejudices the open nature of the land will not be permitted.
UDP Env 1	**Development in the countryside** Within the delineated countryside permission will only be granted for: Development which is essential for agriculture, horticulture, forestry or other development including mineral extraction, waste management, utilities or infrastructure for which a rural location is essential; Appropriate recreational use; The re-use or adaptation of existing buildings particularly to assist the diversification of the rural economy; or Development which is approved under other policies of the plan.

UDP ENV 2	**Agricultural land** The best and most versatile agricultural land (grades 1, 2 and a) will be protected from irreversible development, save where overriding need can be demonstrated. Non-agricultural land or land of a lower quality should be used when development is proposed, unless such land has a statutory landscape, nature conservation, historic or archaeological designation which outweighs agricultural considerations.
UDP ENV 26	**Contaminated land and unstable land** Proposals for the redevelopment of contaminated land and unstable land will be permitted where the contamination and/or instability will be removed or reduced to a level where there is no unacceptable risk to the health and safety of those living or working on the site or nearby, to flora and fauna on the site or nearby, and to the quality of air and water on these sites or nearby.

PEDESTRIANS, CYCLISTS, EQUESTRIANS AND COMMUNITY EFFECTS	
UDP Comm 5	**Retention of community facilities** The retention of community facilities in rural settlements and villages will be favoured
UDP Rec 1	**Protection of existing recreational facilities** Development involving the loss of existing recreational facilities, whether in public or private ownership, will be permitted if: ▪ Alternative provision of equivalent community benefit is made available or ▪ There is an excess of such provision in the area and the facilities are not important to the character of a conservation area or the setting of the town or village.
UDP Rec 11	**Informal public open space and country parks** Land is allocated for informal public open space at: ▪ Pencoedtre, Barry; ▪ White farm, Merthyr Dyfan, Barry; ▪ South of St. Illtyds Church, Llantwit major; ▪ Plymouth park, Penarth; and ▪ Rhoose point;

PEDESTRIANS, CYCLISTS, EQUESTRIANS AND COMMUNITY EFFECTS	
	And for country park extensions at: Porthkerry, Barry; and Cosmeston, Penarth.
UDP Rec 12	**Public rights of way and recreational routes** During the plan period, the council will maintain and improve the existing pattern of public rights of way (including bridleways). Land will be protected and provision made for the establishment of the following routes as a framework for a network of linkages for the enjoyment of the countryside. ▪ Along the Ogney Brook, Llantwit Major; ▪ Along the Hoddnant, Llantwit Major; ▪ Extension of the Penarth railway walk south west towards sully, including the provision of a cycle route; ▪ Completion of a town trail in Barry; ▪ Development of the disused railway line between Aberthaw / Cowbridge / Pontyclun including the provision of a cycle route; ▪ Improvement of access to the coast at Lavernock Point, St Mary's Well Bay, Swanbridge, Sully, Rhoose Point, pleasant harbour and summerhouse point; ▪ Development of a seascape trail linking existing footpaths to provide an unbroken right of way from the Ogmore river to Cardiff bay; ▪ Creation of new access opportunities as part of development proposals; ▪ Development of a footpath around Penarth head, including the provision of a cycle path; and ▪ From the Cardiff bay barrage through Penarth haven and adjacent to the railway line, and also adjacent to the river ely. Where appropriate the council will favour the incorporation into these routes of bridleways, cycleways and facilities for users.

PEDESTRIANS, CYCLISTS, EQUESTRIANS AND COMMUNITY EFFECTS	
Hous 2	**Additional residential development** Housing infill, small-scale development and redevelopment which meets the criteria listed in POLICY HOUS 8 will be permitted within the settlement boundaries of the following: Urban settlements of: Barry (among a list of other settlements) And rural settlements of: Rhoose, St Nicholas, Bonvilston (among a list of other settlements) Favourable consideration will be given, other than within areas identified as green wedges, to small-scale development which constitutes the "rounding off" of the edge of settlement boundaries where it can be shown to be consistent with the provisions of POLICY HOUS 8 and particularly criterion (i).
Hous 8	**Residential development criteria - POLICY HOUS 2 settlements** Subject to the provisions of POLICY HOUS 2, development will be permitted which is within or closely related to the defined settlement boundaries provided that it meets all the following criteria: ▪ The scale, form and character of the proposed development is sympathetic to the environs of the site; ▪ The proposal has no unacceptable effect on the amenity and character of existing or neighbouring environments of noise, traffic congestion, exacerbation of parking problems or visual intrusion; ▪ The proposal does not have an unacceptable impact on good quality agricultural land (grades 1, 2 and 3a), on areas of attractive landscape or high quality townscape or on areas of historical, archaeological or ecological importance; ▪ When appropriate and feasible the provisions of POLICY REC 3 are met; ▪ The provision of car parking and amenity space is in accordance with the council's approved guidelines; Adequate community and utility services exist, are reasonably accessible or can be readily and economically provided.

LANDSCAPE AND VISUAL IMPACT	
UDP ENV 4	**Special landscape areas** New development within or closely related to the following special landscape areas will be permitted where it can be demonstrated that it would not adversely affect landscape character, landscape features, or visual amenities for the special landscape area: 1.Ely Valley and ridge slopes 2.Lower Thaw valley 3.Upper

	Thaw valley 4. Nant Llancarfan 5. Cwrt yr Ala Basin 6. Duffryn Basin and ridge slopes 7. Castle upon Alun
UDP ENV 11	**Protection of landscape features** Development will be permitted if it does not unacceptably affect features of importance to landscape or nature conservation including: trees, woodland, hedgerows, river corridors, ponds, stone walls and species rich grasslands.
UDP ENV 10	**Conservation of the countryside** Measures to maintain and improve the countryside, its features and resources will be favoured, particularly in the Glamorgan heritage coast, areas of high quality landscape, and areas subject to development pressure and/or conflict such as the urban fringe.

TRANSPORT	
TAN 18 (2007)	**Transport** This guidance note explains that local authorities must apply for planning permission for their own roads schemes and in some cases the Welsh Assembly Government should be notified. In para 3.10 and 3.11 there is specific advice for transport in rural areas. This acknowledges that transport schemes can promote social inclusion and reduce rural isolation. It advises that Development in rural locations should accords with the principles of sustainability and balance the need to support the rural economy.
The Transport Framework for Wales (Nov 2001)	Under section 6 "The Transport Strategy", it is stated that the strategy will "help create the right conditions to enable the strategic potential of Cardiff International Airport (CIA) to reflect Wales' business and leisure needs; and to improve access to other UK airports important to Wales." It is also stated that, at the time of writing, the Welsh Development Agency were leading an aviation and economic opportunities group that was established by the Assembly to look at the economic potential of Cardiff International Airport (CIA). An Environment Strategy is also due to emerge from the Welsh Assembly Government.
Strategic Policy Guidance for SE Wales January 2000	**RECOMMENDATION T2** T2 where appropriate land will be allocated for the development of transportation schemes which promote the development of an integrated transport network within south east wales particularly those which: ▪ Contribute to the development of the local economy;

TRANSPORT	
	▪ Alleviate local environmental and safety problems; ▪ Assist regeneration strategies and initiatives.
Strategic Policy Guidance for SE Wales January 2000	**RECOMMENDATION T9** T9 where appropriate land will be protected and provision made for the development of the strategic cycle network in south east wales. Local transport plans should include measures to increase the role of cycling and walking as a form of transport.
UDP	There are no policies that have particular relevance to the proposed scheme

WATER ENVIRONMENT	
TAN 15 (2004)	**Development and Flood Risk** The advice note aims to direct development away from areas that are at high risk of flooding. There is a development advice maps that classifies the degree of flood risk and there are definitions of vulnerable development and advice on permissive uses. The TAN is used for both forward planning and development control.
UDP Env 7	**Water resources** River, other inland waters and underground water resources will be safeguarded. Developments which improve the water environment or help to prevent flooding will be favoured. Development will be permitted where it would not: have an unacceptable effect on the quality or quantity of water resources or on fisheries, nature or heritage conservation, recreation or other amenity interests related to such waters; Or Be potentially at risk from flooding, or increase the risk of flooding locally or elsewhere to an unacceptable level
UDP Env 29	**Protection Of Environmental Quality** (as above)

GEOLOGY	
TAN 5 (1996)	**Nature Conservation and Planning** (as above) & The procedure for the protection of RIGS is defined.

DESIGN	
TAN 12 (2002)	**Design** The advice note for design tends to be more concerned with urban design and use of space rather than road design.
DMRB	**Design Manual for Roads and Bridges** The "Design Manual for Roads and Bridges" (DMRB) was introduced in 1992 in England and Wales. It provides a comprehensive manual system which accommodating; all current standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads (including motorways). Volume 10 of the DMRB *"Environmental Design"* provides detailed guidance on environmental mitigation for road schemes and will be used as the primary reference for environmental inputs to the scheme design.
UDP Env 27	**Design of New Developments** Proposals for new development must have full regard to the context of the local natural and built environment and its special features. New development will be permitted where it: 1. Complements or enhances the local character of buildings and open spaces; 2. Meets the council's approved standards of amenity and open space, access, car parking and servicing; 3. Ensures adequacy or availability of utility services and adequate provision for waste management; 4. Minimises any detrimental impact on adjacent areas; 5. Ensures existing soft and hard landscaping features are protected and complemented by new planting, surface or boundary features; 6. Ensures clear distinction between public and private spaces; 7. Provides a high level of accessibility, particularly for public transport, cyclists, pedestrians and people with impaired mobility; 8. Has regard to energy efficiency in design, layout, materials and technology; and 9. Has regard to measures to reduce the risk and fear of crime.

DESIGN		
SPG	Design in the landscape contains the following guidelines: ▪ DG1 SUSTAINABLE DEVELOPMENT ▪ DG5 MITIGATION OF LARGE SCALE VISUAL DETRACTORS ▪ DG7 ROADS - RURAL ▪ DG11 RIVERS - MANAGEMENT AND INTEGRATION OF DEVELOPMENT ▪ DG12 URBAN EDGE ▪ DG13 RURAL SETTLEMENTS (1) ▪ DG15 FARM ACCESS ▪ DG16 WOODLANDS AND HEDGEROWS ▪ DG17 DESIGN AND MANAGEMENT FOR NATURE CONSERVATION ▪ DG20 PALETTE OF MATERIALS HARD - RURAL VALE ▪ DG22 PALETTE OF MATERIALS: PLANTING - GENERAL GUIDANCE ▪ DG23 PLANTING IN THE INLAND VALE	*Other supplementary planning guidance on topics that are related to or may have an influence on design are:* ▪ Special landscape areas topic paper ▪ Amenity standards ▪ Supplementary planning guidance ▪ Draft sustainable development ▪ Supplementary planning guidance ▪ Conservation area appraisals (various)# ▪ Landscapes working for the vale of Glamorgan

APPENDIX A-2

BAT TREE SURVEY REPORT

Bat Surveys of Trees

At

Five Mile Lane
St Athan
Cardiff

Version 2 (amendments)

Date: 12/10/2015

AVA Ecology Ltd, 6 Hook Close, Osbaston, Monmouth. NP25 3BD Tel. 01600 772294
Reg.no.8644091

Client	TACP
Site / job	Five Mile Lane
Report title	Bat survey of trees at Five Mile Lane.
report ref	AVA/TACP/FiveMileLanetrees/2014
Local Authority	Vale of Glamorgan

version	status	changes	author	position	Date
1	draft		S Wadley	Director	18/08/2014
2	1st final	Text & Format	S Wadley	Director	16/12/2014
3	2nd final	Habitat map	S Wadley		12/10/2015

Name	Position	Date

Reviewed by	J Wadley	Director	12/10/2015
Approved for issue	S Wadley	Secretary	12/10/2015
Issued by	S Wadley	Secretary	12/10/2015

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Disclosure: "The survey information and opinions which we have prepared and provided in this report is true and has been prepared and provided in accordance with the Chartered Institute of Ecological and Environmental Management's code of professional conduct. We confirm that the opinions expressed are our true and professional bona fide opinions."

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Contents

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Author

This survey and report was carried out by Mr Steve Wadley of AVA Ecology Ltd. Mr Wadley has 3 years experience of bat conservation, research and survey work. He holds a Natural England (NE) class 2 bat survey license (Number 20123667) and VBRV licence as well as a Natural Resources Wales (NRW) bat licence (58638:OTH:EPS:2014)

Mr Wadley is actively involved in woodland bat research in South East Wales (Wye Valley Bechstein's and Barbastelle bat Project) and provides educational presentations on bat conservation. He is also a qualifying member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and Committee member of Gloucestershire bat group.

Non Technical Summary

The trees inspected at five mile lane were identified as having potential for roosting bats as a result of a phase 1 extended habitat survey carried out by TACP. The categories of trees were assessed from ground level using Bat Conservation Trust (BCT) guidelines. Any trees categorised as Category 1, 1* and 2 were then subject to an aerial survey carried out by Mr S Wadley of AVA Ecology Ltd and assisted by Mrs J Wadley (Assistant climber and trainee bat worker) Category 3 trees were not subject to aerial survey.

Generally the trees inspected by climbing offered varying potential for roosting bats but no evidence of bats was identified in any the trees during the inspection. (See results)
However, tree 17 has high potential and is within 3m of a recorded long eared bat roost.

Although the trees have been subject to aerial inspection in August 2014, it must be remembered that tree dwelling bats can start to use trees at any time and have multiple roosting sites changing roost on average every 1.5 – 4 days. Evidence of roosting bats can be washed away by rain and wind and eaten by insects.

The trees which are given category 2, 1 or 1* must be surveyed by climbing immediately prior to any works to ensure that bats are not present during any felling or remedial works.

1: Introduction

1.1 Site description

Five Mile Lane (A4226) runs in a general north to south direction. The road is bordered by mostly improved pasture but also some arable crop fields. Parts of the road are bordered by woodland including deciduous semi natural ancient woodland (See Phase 1 habitat survey appended).

There are several farm buildings along the road some being of older style and have good potential for bat species.

1.2 Proposed development

The development includes road improvements and widening of the road in some places which will necessitate the felling or pruning of some trees near to the proposed road / new route.

1.3 Aims of study

The objective of this study is to identify evidence of any use of the trees by bat species. The report aims to assess the level of usage, classification of roost present, and requirement for development license. It will also provide mitigation proposals to be carried out prior to, during and after the works.

2: Methodology

2.1 Desk study

A desk study was undertaken to identify any records of bats along the road and other bat roosts and activity within the route area. Records were obtained from South East Wales Biodiversity Centre (SEWBReC). The data search also included information on European and UK designated sites (e.g. Special Areas of Conservation (SACs) and Site of Special Scientific Interest (SSSIs).This information was provided by Natural Resources Wales.

2.2 Field surveys

The methods used were appropriate to achieve the aims of the survey following *Bat Surveys - Good Practice Guidelines* (2nd Ed; Bat Conservation Trust 2012) and BS 42020:2013 Biodiversity (Code of practice for planning and development).

The survey was carried out on the 4th August 2014 in clear weather and 19°C. Cloud cover was around 25%, wind speed 0-5mph.

The trees inspected are shown in Figures 1a-1d. The trees was inspected externally and internally (within potential roost features) using binoculars, endoscope and a high powered torch. Photographs of any evidence of bat activity and potential exit or entry points identified in the trees were taken and noted for the report.

Name	Bat Licence	Experience
Steve Wadley	51659:OTH:CSAB:2013	Experienced and licensed bat specialist.
Joanna Wadley		Experienced bat surveyor

3: Results

3.1 Desk study

The desk study resulted in the following information.

3.1.1 Designated sites

Site of Special Scientific Interest
- Cliff Wood - Golden Stairs
- Coedydd Y Barri / Barry Woodlands
- East Aberthaw Coast
- Ely Valley

Local Nature Reserve
- Cliff Wood - Golden Stairs
- Cwm Talwg Woodlands

3.1.2 Protected species

The desk top survey identified the following bat records within the route area:
Common Pipistrelle bat
Noctule bat
Nathusius bat
Brown long eared bat
Whiskered bat
Serotine bat (maternity roost within 3km of trees surveyed)
Lesser Horseshoe bat
Greater horseshoe bat
Whiskered / Brandts bat
Natterers bat

3.2 Field survey

Tree Number	Grid Ref	Species	Category	Survey method	Notes
1	ST:08148 71376	Oak	3	Aerial	Mature tree, no potential or evidence of bats
5	ST: 08132 71133	Oak	3	Aerial	At 4m on west side of tree is a hole measuring 4cm quite shallow with no upward decay column. No evidence of bats.
17	ST:08030 70430 (metallic tag no. 1075)	Ash	1*	Aerial	At 6m on south side of tree is a west facing hole 7cm x 20cm key shaped, extends vertically to .5m, No evidence of bats but cat 1* potential.
18	ST:08034 70292	Mixed	3	Aerial	Hedgerow with several trees inc. Ash, Oak and Hawthorne. No bat potential in any of the trees.
22	(3 trees) a) ST: 08572 69588 b) ST: 08333 69742 c) ST: 08378 69700	Oaks	1 1 1	Aerial	a) Hollow tree with potential features but no evidence of bats. b) Potential features but no evidence of bats c) No evidence but good potential features.
23	ST: 08547 69576 ST: 08558 69575	Oak	1 & 3	Aerial	a) No evidence of bats, Hollow tree. Good potential Cat 1 b) No evidence of bats very limited potential Cat 3
26	ST: 08048 71562	Mixed	?	?	**No access allowed**
26a	ST: 08048 71562	Oak	?	?	**No access allowed**
32	ST: 07891 72626	Oak	3	Aerial	No evidence of bats and very limited potential.

4: Assessment

4.1 Survey constraints (Inc. equipment)

Trees 26 and 26a were not surveyed due to access issues. However from the nearby road it was possible to see the trees had a good potential for bat roosting.

4.2 Potential impacts

4.2.1 Designated sites

In the absence of further survey and mitigation the proposed development would have a no potential impact on designated sites. This is because of the distance to the sites and no bat roosts being discovered during the survey.

4.2 Bat roosts

In the absence of further survey and mitigation the proposed development would have a medium to high potential impact on bat roosts. This is due to the fact that bats may start to use the trees prior to works starting.

4.2.3 Bat foraging and commuting habitat

In the absence of further survey or mitigation the proposed development would have a low potential impact on bat foraging and commuting routes. This is due to the possibility that bats may use the trees for foraging.

5: Legislation and policy guidance

This legislation must be considered at all stages of development.
All bat species occurring in the UK are fully protected by European and UK law.

Under regulation 41 of the Conservation of Habitats and Species Regulations 2010 (as amended)

(1) A person who—

(A) Deliberately captures, injures or kills any wild animal of a European protected species,

(b) Deliberately disturbs wild animals of any such species,

(c) Deliberately takes or destroys the eggs of such an animal, or

(d) Damages or destroys a breeding site or resting place of such an animal,

is guilty of an offence.

Under the Wildlife and Countryside Act 1981 (as amended) it is an offence to:

- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used by bats for shelter or protection.
- Intentionally or recklessly disturb bats whilst in their place of rest or shelter.
- Sell or advertise for sale or transport bats (including their derivatives).

The Countryside and Rights of Way Act 2000 (CRoW)

The Act places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

Schedule 9 of the Act amends SSSI provisions of the Wildlife and Countryside Act 1981 including provisions to change SSSIs and providing increased powers for their protection and management. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increases penalties on conviction where the provisions are breached; and introduce a new offence whereby third parties can be convicted for damaging SSSIs. To ensure compliance with the Human Rights Act 1998, appeal processes are introduced with regards to the notification, management and protection of SSSIs.

Schedule 12 of the Act amends the species provisions of the Wildlife and Countryside Act 1981, strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable', create a new offence of reckless disturbance, confer greater powers to police and wildlife inspectors for entering premises and obtaining wildlife tissue samples for DNA analysis, and enable heavier penalties on conviction of wildlife offences.

Planning Policy Advice

Planning Policy Wales Chapter 5 "Conserving and Improving Natural Heritage and the Coast"
The Welsh Government's objectives for the conservation and improvement of the natural heritage are to:
• promote the conservation of landscape and biodiversity, in particular the conservation of native wildlife and habitats;
• ensure that action in Wales contributes to meeting international responsibilities and obligations for the natural environment;
• ensure that statutorily designated sites are properly protected and managed;
• safeguard protected species, and to
• promote the functions and benefits of soils; and in particular their function as a carbon store.

The UK Biodiversity Action Plan (UKBAP) includes objectives to conserve, and, where practicable, enhance:
• The quality and range of wildlife habitats and ecosystems;
• The overall populations and natural ranges of native species;
• Internationally important and threatened species, habitats and ecosystems;
• Species, habitats and natural and managed ecosystems characteristic of local areas
• Biodiversity of natural and semi-natural habitats where this has been diminished over recent decades.

The Welsh Government is committed to promoting Habitat and Species Action Plans relevant to Wales prepared under the UKBAP in fulfilment of its obligations under the Countryside and Rights of Way Act.

Protected species
The presence of a species protected under European or UK legislation is a material consideration when a local planning authority is considering a development proposal which, if carried out, would be likely to result in disturbance or harm to the species or its habitat. Local planning authorities should advise anyone submitting a planning application that they must conform to any statutory species protection provisions affecting the site concerned, and should consult Natural Resources Wales before granting permission. An ecological survey to confirm whether a protected species is present and an assessment of the likely impact of the development on a protected species may be required in order to inform the planning decision.

Developments are always subject to the legislation covering European protected species regardless of whether or not they are within a designated site. New developments for which development works would contravene the protection afforded to European protected species require derogations from the provisions of the Habitats Directive.

Derogations may only be authorised if there is no satisfactory alternative and if the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in its natural range. The development works to be authorised must be for the purposes of preserving 'public health or safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment.

Derogations are granted by a licence issued by the Welsh Government Local planning authorities are under a duty to have regard to the requirements of the Habitats Directive in exercising their functions. To avoid developments with planning permission subsequently not being granted derogations in relation to European protected species, planning authorities should take the above three requirements for derogation into account when considering development proposals where a European protected species is present.

6: Recommendations and Mitigation Measures

6.1 Mitigation proposals

The mitigation proposals for the development are as follows:

a) A bat licensed ecologist must carry out an aerial re-inspection of those trees categorised as Category 1 or 1* immediately prior to works commencing and be employed to be on site during any tree works to category 1 trees.
b) A toolbox talk regarding bats must be given to the tree work contractors by the onsite ecologist.
c) The client must ensure that the contractors are aware that no trees must be subject to works until the ecologist has given the toolbox talk.
d) If bats are discovered during works, NRW must be informed. Work must stop and not resume until advice has been given by the onsite ecologist. The ecologist must have the necessary equipment to care for any discovered bat(s) and a method statement regarding actions on discovering bats must be in place prior to works commencing.
e) Bright lighting must not be directed to towards the trees identified as having potential for roosting bats.

6.2 Further survey

Further survey was deemed to be necessary to ensure bats are not harmed as a result of the development. This should include the surveys detailed in 6.1.a.

6.3 Requirement for licence.

A European protected species licence was deemed not necessary at this stage but if bats are discovered in the trees between the date of survey and start of works or during works, then a licence will be required.

If required, an EPS Licence will only be issued if the following 3 tests have been met:

- The purpose of the work is for preserving public health or public safety or other imperative reasons of over-riding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment
- There is no satisfactory alternative
- The action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status (FCS) in their natural range

7: Photographs


1) Tree 17 (category 1 tree)


2) Tree 17


3) Tree 32 and a shallow hole.


4) Tree 32


5) Tree 22a Hollow oak with high potential.

8: References

Bat Surveys - Good Practice Guidelines 2012. Hundt, L. Bat Conservation Trust, London.

The bat workers' manual (3rd Edition). Joint Nature Conservation Committee
Mitchell-Jones, A.J. & McLeish, A.P. (2004)

Bat mitigation guidelines. English Nature. Mitchell-Jones, A.J. (2004)

Bats and lighting. A. Fure (London Naturalist No. 85 2006)

South East Wales Biological Records Centre (SEWBReC) (bat records)

The Conservation of Habitats and Species Regulations 2010 (as amended)

The Wildlife and Countryside Act 1981 (as amended)

Tan 5 Planning Policy in Wales

Figures 1a-1d. Trees inspected for bats (see also the Table in Section 3.2).

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Legend

- Locations of Bat trees surveyed
- Proposed Scheme

N

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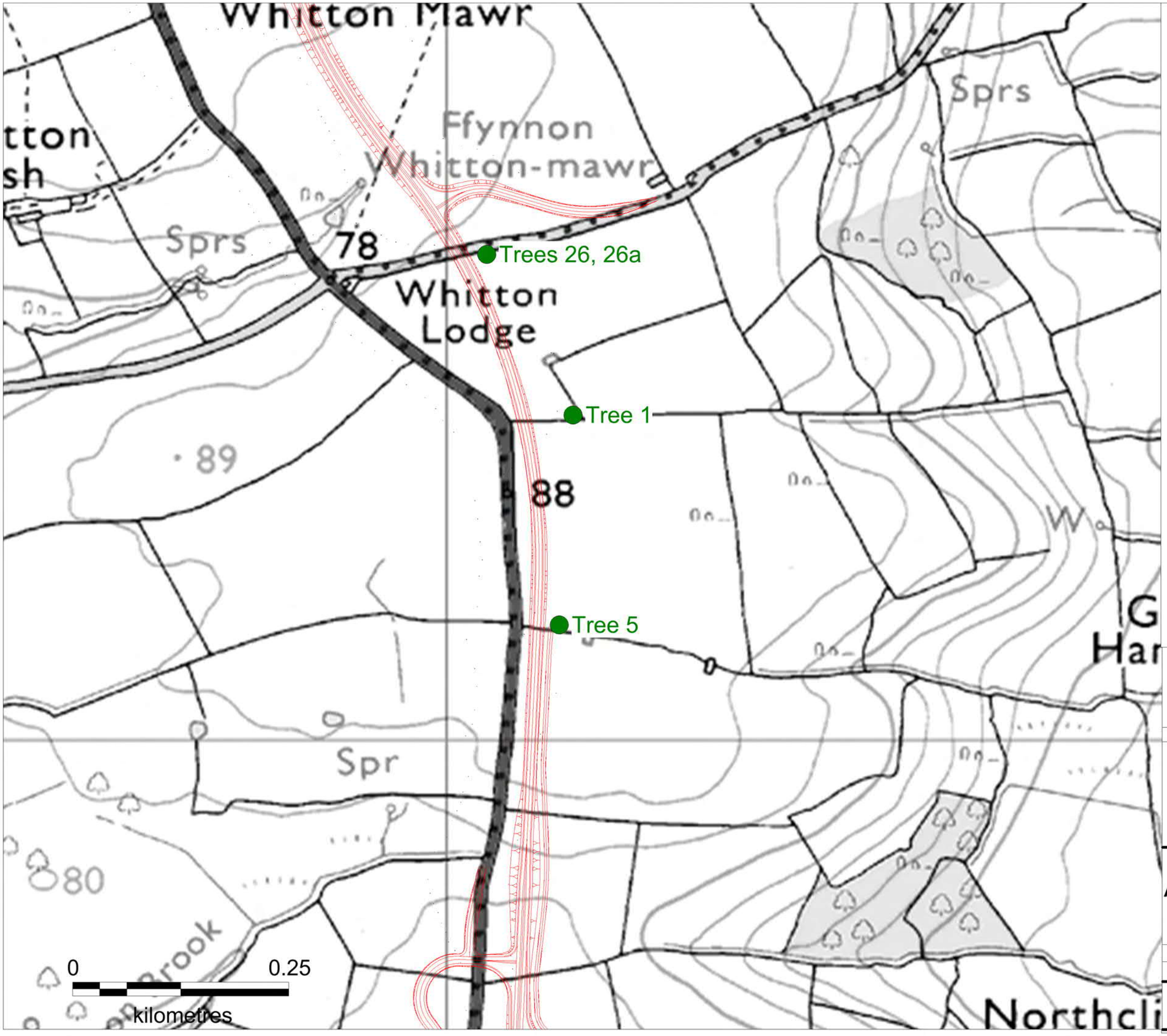
Vale of Glamorgan
A4226 Five Mile Lane Improvements
Bat Tree Survey

○ DRAWN JB	○ CHECKED TR	○ OFFICE : CARDIFF
○ NOT TO SCALE	○ DATE OCTOBER 2015	

FIGURE / DRAWING NO.	REV
60654_BT001	0



Legend

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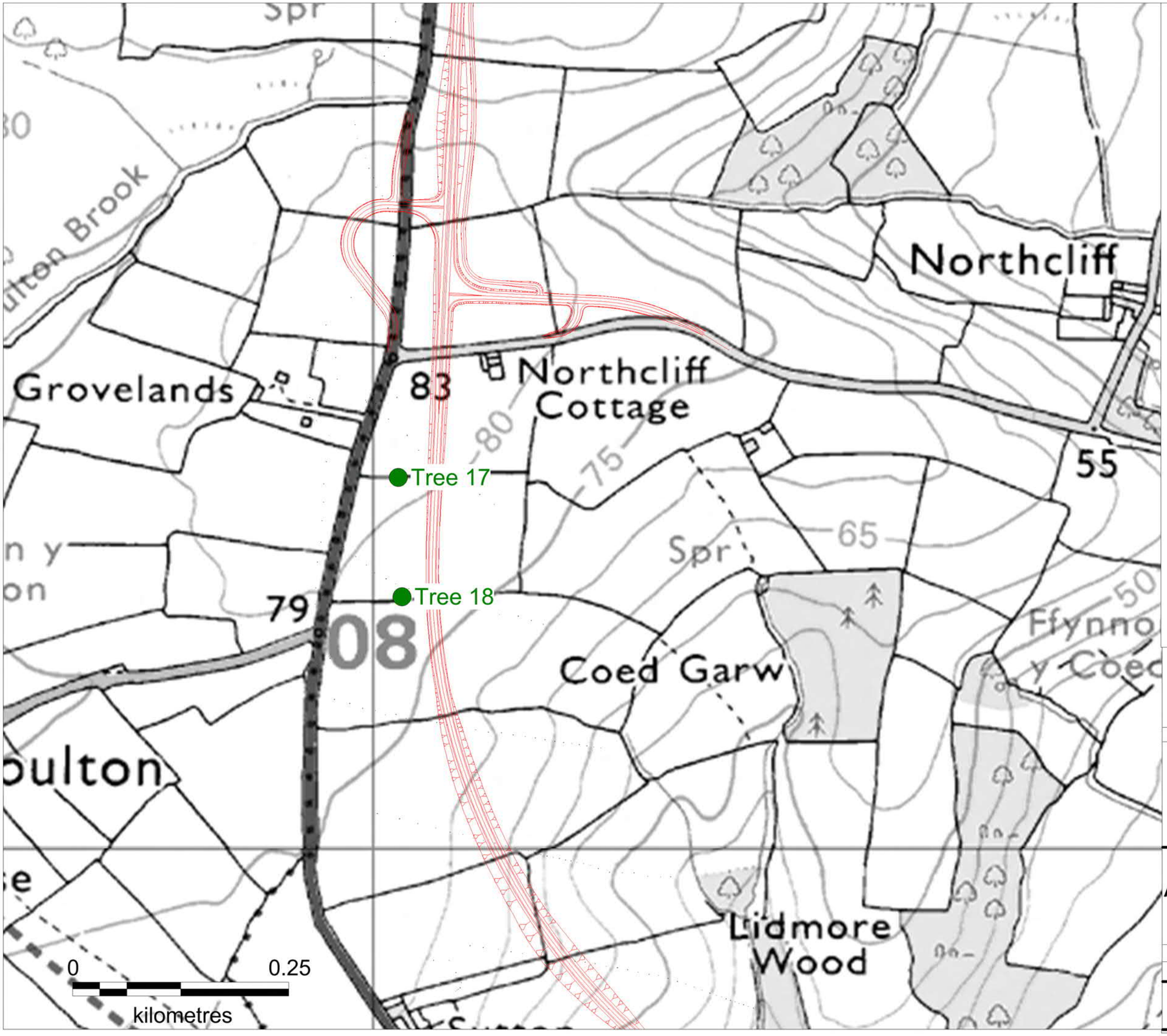

Legend

Locations of Bat trees surveyed

Proposed Scheme

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FIGURE / DRAWING NO.	REV
60654_BT003	0

Tree 18
Tree 22b
Tree 22c
Tree 23a
Tree 22a
Tree 23b
Coed Garw
Ffynnon y Coed
Lidmore Wood
Sutton
Suddon Mawr
Sutton Wood
A4226
Coed yr Ychen
79
08
69
22
50
30
20
0
0.25
kilometres

Legend

Locations of Bat trees surveyed

Proposed Scheme

N

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FIGURE / DRAWING NO.	REV
60654_BT004	0

Appendix B

FIGURE 1

Legend

- Transect Locations
- Proposed Scheme

N

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FIGURE / DRAWING NO.	REV
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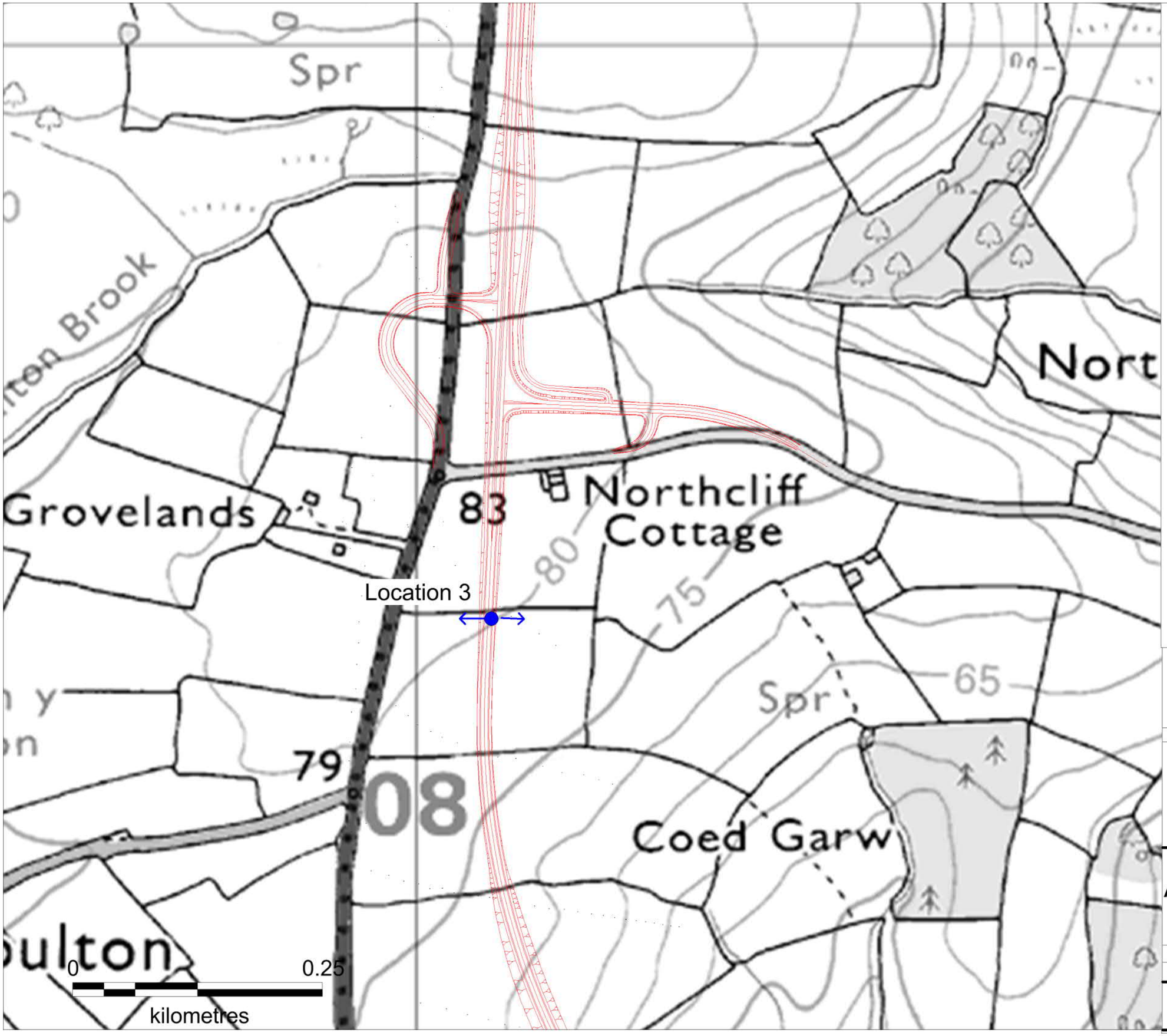

Legend

- Transect Locations
- Proposed Scheme

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Bat Activity Surveys

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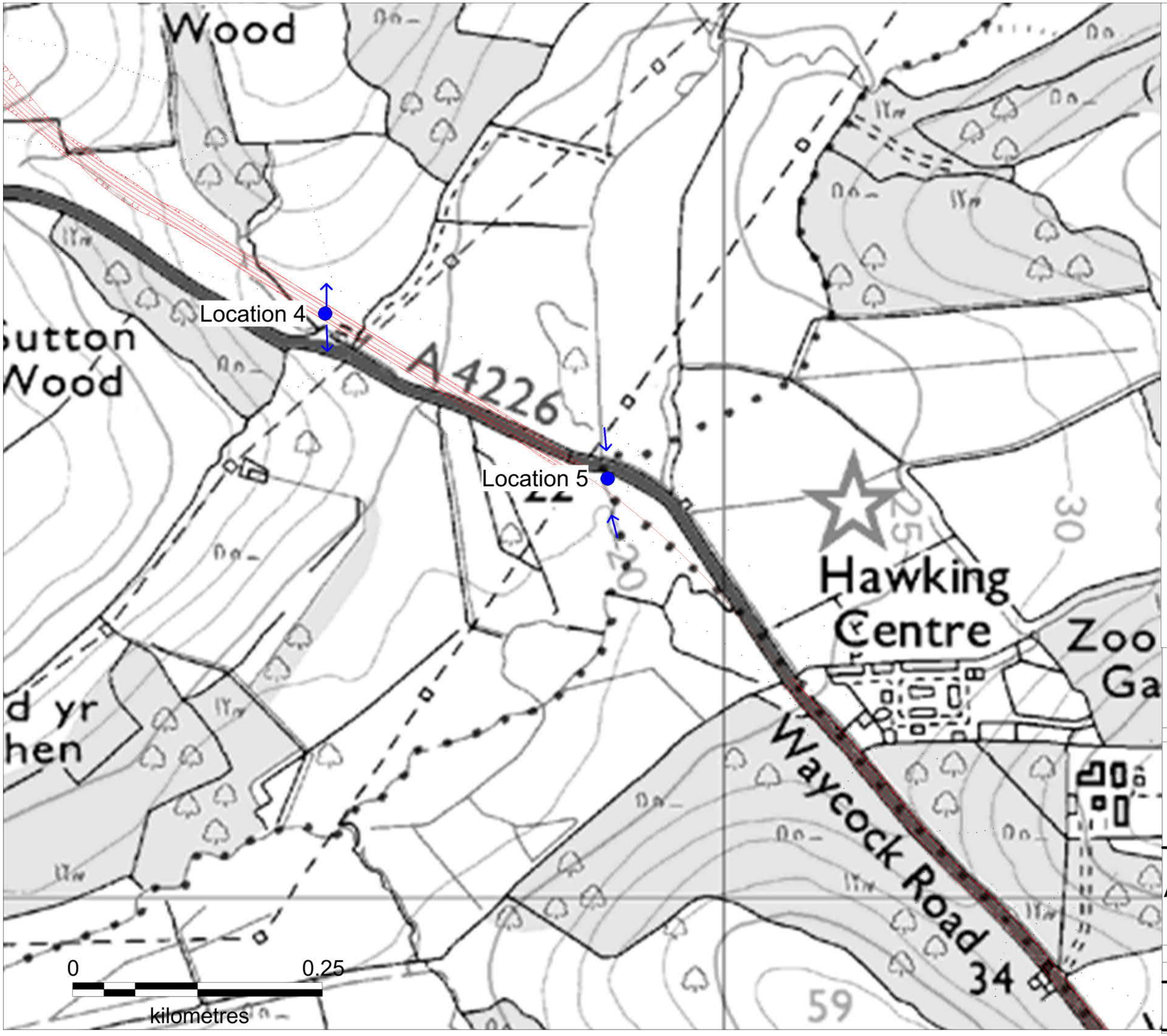
FIGURE / DRAWING NO.	REV
60654_BA01b	0



Legend

- Transect Locations
- Proposed Scheme

N

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NOTES

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Vale of Glamorgan
A4226 Five Mile Lane Improvements
Bat Activity Surveys

○ DRAWN JB	○ CHECKED TR	○ OFFICE : CARDIFF
○ NOT TO SCALE	○ DATE OCTOBER 2015	

FIGURE / DRAWING NO.	REV
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