ECC/Epping Forest District Local Highways Panel

Feasibility Studies and Designs – April 2014

a. Buckhurst Hill & Loughton South

b. Epping & Theydon Bois

c. Loughton Central

d. Nazeing & North Weald

e. Waltham Abbey

Feasibility study

Station Way, Buckhurst Hill
Pedestrian Crossing Facilities Feasibility Study

Job Number:	**DC1692**
Doc Ref:	**Feasibility Report**
Author:	**Jamie Twinn**

Document History

Revision	Purpose	Originated	Checked	Approved	Date
N/A	Draft for approval	JT	SM	CB	05.02.14

1. Introduction

1.1 Project Background

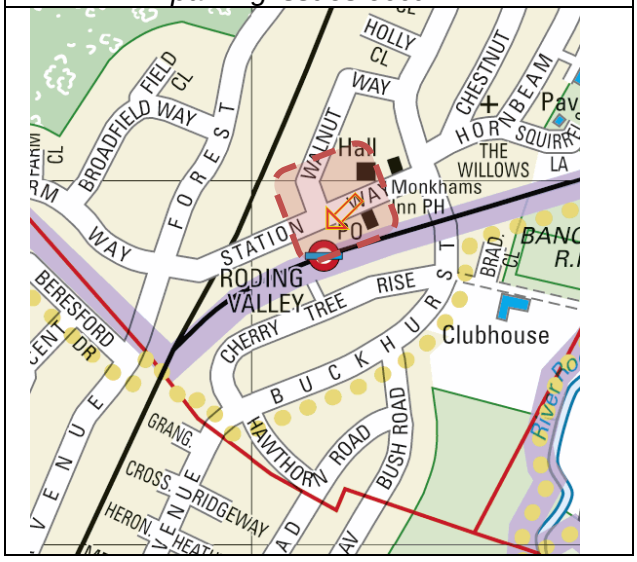
Funding for this scheme has been approved by the Epping Local Highways Panel. County Cllr. Valerie Metcalfe and District Cllr. Sylvia Watson have asked for the feasibility of a pedestrian refuge island to be considered at this location. The proposal will look at options for providing a dedicated crossing point between the parade of shops and Roding Valley tube station.

2. Existing Conditions

2.1 Location / Land Use

- Station Way, Buckhurst Hill, is classified as a minor road. Figure 1.1 below provides detail of the site location

Fig 1.1 Location Plan and highlight area parking issues occur



- Station Way has an equal split of commercial and resident units, with the commercial units congregating around the centre of the road – outside Roding Valley tube station.

- Station Way and Walnut Way are staggered junctions which means providing a suitable location for crossing facilities is potentially more difficult.

- Station Way is a two way road; there is a typical footprint of groups of parked vehicles parking partially on the footway on both sides of the carriageway to the East of the station. To the West of the station vehicles park off the footway and only on the southern kerb line.

Eastern side of Station, parking patterns	*Western side of Station, parking patterns*
	

2.2 Traffic Flows & PV² Survey Results

- A representative PV² Survey was undertaken at this location on the 27th Feb 2014, the results of which are detailed in fig. 2.1 below. Observations were made for a 2 hour PM peak period beginning at 15:34.

Period Ending	Westbound Traffic Count	Eastbound Traffic Count	Total Both Directions (V)	Pedestrians (P)
15:34-17:34	652	857	1509	115

PV2 Calculation

Qualifying Criteria $PV^2 > 2*10^8$

PV^2 $115(1509^2)$

$= 261864315$

$> 2*10^8 = 2000000000$

$\therefore$ **Observed PV^2 is larger than $2*10^8$ which meets the qualifying criteria**

Figure 2.1 – PV^2 results and Analysis

2.3 Site Observations

- The site was visited on the 21st Aug 2013 and the results of this site visit were recorded in the figure 2.2 below.

Site Assessment Record	
Engineer	*Jamie Twinn*
Date	*21-Aug-13*
1.1 Site Location	Station Way, Buckhurst Hill
OS Coordinates	541,580,192,934
1.2 Carriageway Type	Single Carriageway
1.3 Carriageway Width	7.3m
1.4 Footway Width	5.4m
1.5 Road Lighting Standard	The street lighting facilities at this site were not formally tested in accordance with BS 5489 from a luminosity perspective. Although, the site seems to be generally well lit, and operates on a mainly single sided lighting system. If a crossing were to be feasible it is likely that the existing lamp column outside the parade of shops 38-50 Station Way would need to be relocated.
1.6 Nearby Junctions	The nearest significant traffic junction is 150m east of the site, there are no other crossing facilities for pedestrians until this junction.
1.7 Other nearby Crossing facilities	The nearest crossing facility to the west of the site is a refuge island 200m away
1.8 Waiting/Load/Stopping Restrictions	The site has some Double Yellow Lines on the junction of Station Way/Walnut Way and a disabled bay outside no. 50 Station Way. Other than this it is mainly unrestricted and occupied by either residents or parked vehicles for access to the tube. There is currently a consultation process being undertaken into the parking facilities at this site which will impact on the site observations and requirement for crossings.
1.9 Road Surface Conditions	Whilst no skid resistance test have been undertaken at this location, the surface looks well maintained and adequate.

Figure 2.2 – Site Assessment Record

2.4 Collision Analysis

- There has been one reportable PIC involving pedestrians at this location in the last 5 years, the details of which are listed in Table 2.1 below. This collision may have been mitigated by the presence of some form of crossing facility. Although, the number of collisions at this site are lower and statistically proportionate to through-put of pedestrians observed at this location.

Involving	Severity	Date/Time	Conditions	No. of Casualties
Car and Pedestrian	1 Serious	22nd Oct 2011 @ 13:30	Dry	1 Pedestrian

Table 2.1: 60 months PICs Station Way, Buckhurst hill

2.5 Statutory Services

- There are multiple statutory services buried in the footway at this location. These would conflict with any dropped kerb installations at this site and increase the cost of any construction works. If kerb realignment works were to be required at this location there would be a high chance of conflict with stats of which would probably lead to the requirement for redirection of the services.

- There are also some statutory services which run perpendicular as well as along the footway to the footway. These would conflict with refuge island location as well as conflict with dropped kerb installation. The presence of these stats may result in additional cost through the diversion of statutory undertaker's plant.

2.6 Linked Schemes – DC349 Buckhurst Hill Parking Review

- In parallel to these works, there is a major parking review being undertaken in Buckhurst Hill, of which some parking restrictions are being considered on Station Way which may affect some of the solutions being put forward in this study. Therefore, this feasibility study should not be finalised until the parking restrictions are decided and are on the ground. The measures being taken forward may effect any conclusions that are drawn in the meantime.

3. Feasibility Study Requirement

3.1 Brief Requirement

- The brief for this scheme was to undertake an initial investigation into improving the pedestrian crossing facilities along Station Way; the main mandate was to explore the option for a pedestrian refuge at this location.

3.2 Site photos

View from western side of Station, looking east.	*View level with central island, Roding Valley tube Station.*	*View from eastern side of Station, looking east.*
		

4 Option 1 – Refuge Island

4.1 Design Introduction – *as illustrated in Appendix B*

- This option looks into the feasibility of introducing a central reservation on Station Way to the east of it's junction with Walnut Way, the location identified in appendix B is likely to be the closest possible to meet the observed pedestrian desire lines.
- This design looks at installing a 1.2m clear width for waiting pedestrians, in accordance with the minimum allowed *(Paragraph 3.2, LTN 2/95 – The design of pedestrian crossings).*
- This leaves a carriageway width of 3.0m in both directions, which does not meet policy and would not be fit for purpose.
- The refuge would require 1:20 taper markers (minimum allowable) to Diagram 1040 of the Traffic Signs Regulations and General Direction (TSRGD). These limit where the refuge island can be located as the taper markings should not run across side roads, in this case Walnut Way.
- This option would require some form of Yellow Line restriction to protect access through the site and the sight lines of pedestrians. The only options at this location would be Double Yellow Lines as we are utilising the minimum requires which inherit access difficulties issues.

4.2 Advantages

- Safely allows pedestrians to wait in the centre of carriageway for a break in the traffic.

4.3 Disadvantages

- Would require yellow lining work to protect pedestrian sightlines, ideally in the form of No Waiting & No Loading At Any Time. This would be controversial and may have a high likelihood of strong objections from the commercial outlet owners at this location.
- Implementation of this scheme would also require the removal of the disabled parking bay at this location, which is likely to be controversial with the owner.
- 3.0m carriageway width is not enough for this type of road, it would need to be at least 3.65m, this would have to be increased to 4.0m if buses utilise this road.
- The staggered junction and taper lengths restrict where the island can be located and take it away slightly from the most common pedestrian desire lines.

4.4 Option Evaluation

- This is not feasible as the remaining widths of carriageway are inadequate. It is unlikely that kerb realignment can be undertaken at this site. Although, the full feasibility of kerb realigning and how this effects the scheme feasibility would not be known until the detailed design is undertaken. Either way this would likely increase the cost of the project exponentially.

5. Option 2 – Zebra Crossing

5.1 Design Introduction *- as illustrated in Appendix C*

- Option 2 looks in to the feasibility of installing a Zebra crossing in accordance with the design outlined in Appendix C. This option would require the existing disabled bay to be removed as well as adjusting the Yellow lines in place at this site to tie up with the extents of the Zig-Zags. This would require the installation of dropped kerbs and tactile facilities either side of the crossing.

5.2 Advantages

- Provides a safe crossing point for pedestrians.

5.3 Disadvantages

- Will likely cause delays to the journey times of through traffic at peak times.
- Crossing location is limited by the staggered junction nearby; this therefore means the crossing location is away from the pedestrian desire lines.
- Implementation of this scheme would require the removal of the disabled parking bay at this location, which is likely to be controversial with the owner.
- Would require the installation of Zig-Zags and extension of yellow lines outside the parade of shops, this is likely to be controversial with the shop owners at this location.
- This option would be more expensive than option 1; Internal Essex CC guidelines (LHP Terms of Reference & Members' guide- July 2013) approximate the cost of Zebra crossing facilities to be around £25k. The unknown cost of the work required diverting stats and design work is likely to increase this cost significantly.

5.4 Option Evaluation

- The cost of the above scheme would not justify the limited benefits that may result from its implementation. The feasibility of this option will also not be fully known until the completion of a detailed design has been completed. This in turn increases the risk of remedial or abortive work being required. There are also no guarantees the schemes implementation would solve the pedestrian safety issues at this site entirely.

6. Option 3 – Do Nothing

6.1 Design Introduction

- Whilst it is understood that there may be times where pedestrians would benefit from some form of crossing facilities at this site, there are inherit issues with the geometry and function of the site setup which inhibit the implementation of any solution. The carriageway at present is 7.4m wide on average; this does not provide enough space to justify the installation of a refuge island which would restrict the carriageway width for vehicles even further. The demographics of this site do not lend themselves towards installing a zebra crossing. Therefore, the option of doing nothing or no change becomes an important option to explore as part of this report.

6.2 Advantages

- The other options would require some form of Zig-Zag/At Any Time restriction to protect pedestrian sight lines around any crossing point. These restrictions would not be welcomed by the shop owners at this location and would lead to a complicated and controversial engagement.
- Collision stats do not suggest there is a major issue at this site from a safety perspective. There would not be any guarantee that a crossing point would reduce the risk on a pedestrian incident, as it would be likely the that the only feasible location for a crossing point would not met the ideal location the general public would require, which may lead to an adherence issue and people still crossing in undesignated locations.
- Doing nothing would reduce the chance of abortive work/ remedial work being required at this location. This may not be viewed as a suitable and adequate use of public funds.
- There is currently a parking study being undertaken at this location as previously mentioned in paragraph 2.6 of this report. As a result Option 1 or 2 should not be taken forward prior to the completion of the parking study.

6.3 Disadvantages

- The perceived problem will remain.

6.4 Option Evaluation

- Doing nothing would be the best option to take at the present time. The only other feasible option is for the installation of a Zebra crossing at this location. Although, the negatives strongly outweigh the positives for this option. Therefore, the only feasible option is to keep the site as it is at present.

7. Other Options: discarded during the design process

7.1 Puffin Crossing

- The possibility of introducing a puffin was explored at this location. Although, pedestrian volumes were not high enough to justify this facility. The cost of would likely exceed £140k (source = LHP Terms of Reference & Members' guide- July 2013).

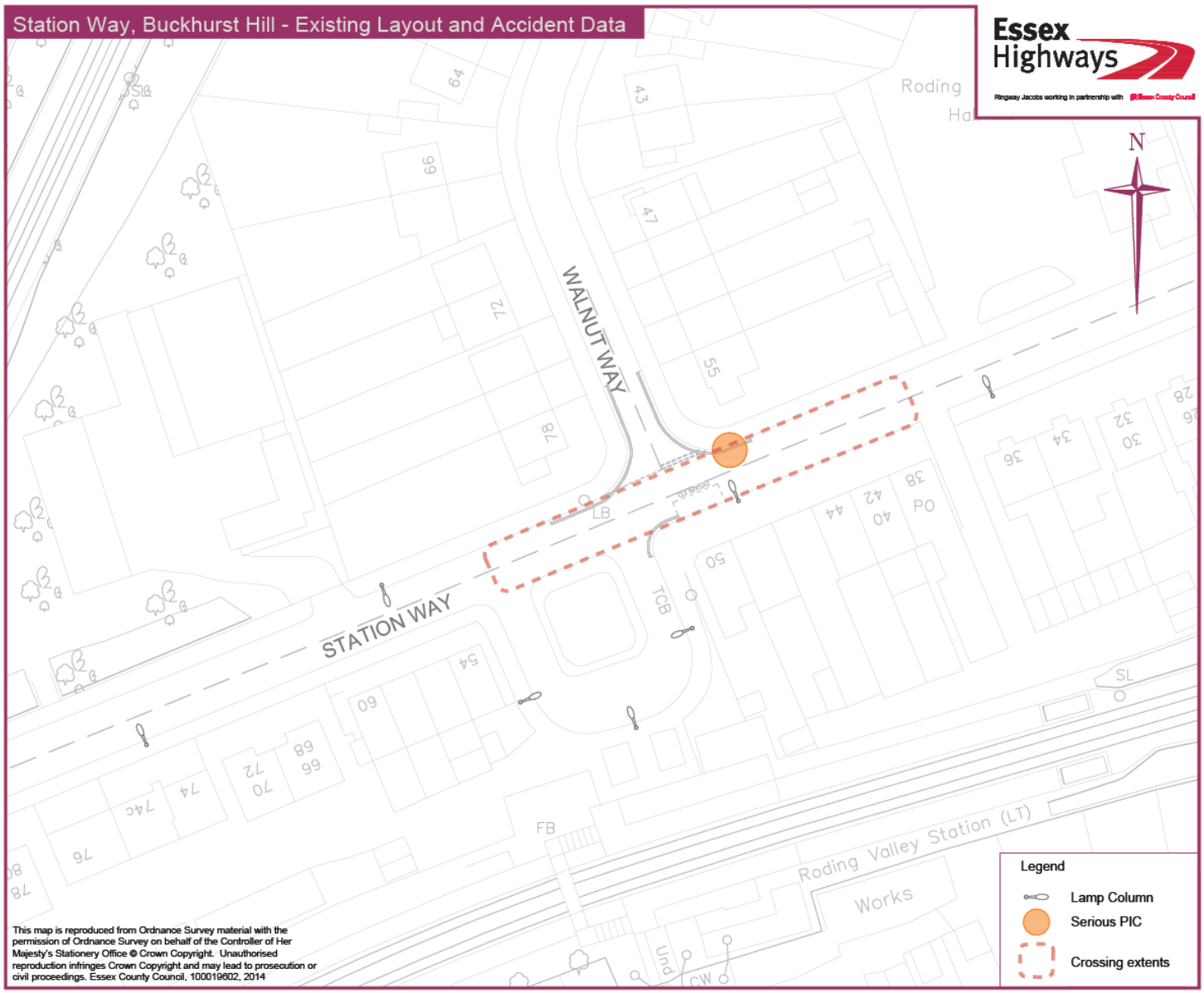
7.2 Footway Realignment Works

- Footway re-alignment work was considered at this site. Although, pinch points at this location look likely to make any major kerb re-alignment works very difficult, the presence of excessive levels of statutory services at this location as indicated in paragraph 2.5 of this report are likely to increase the cost of the project exponentially.

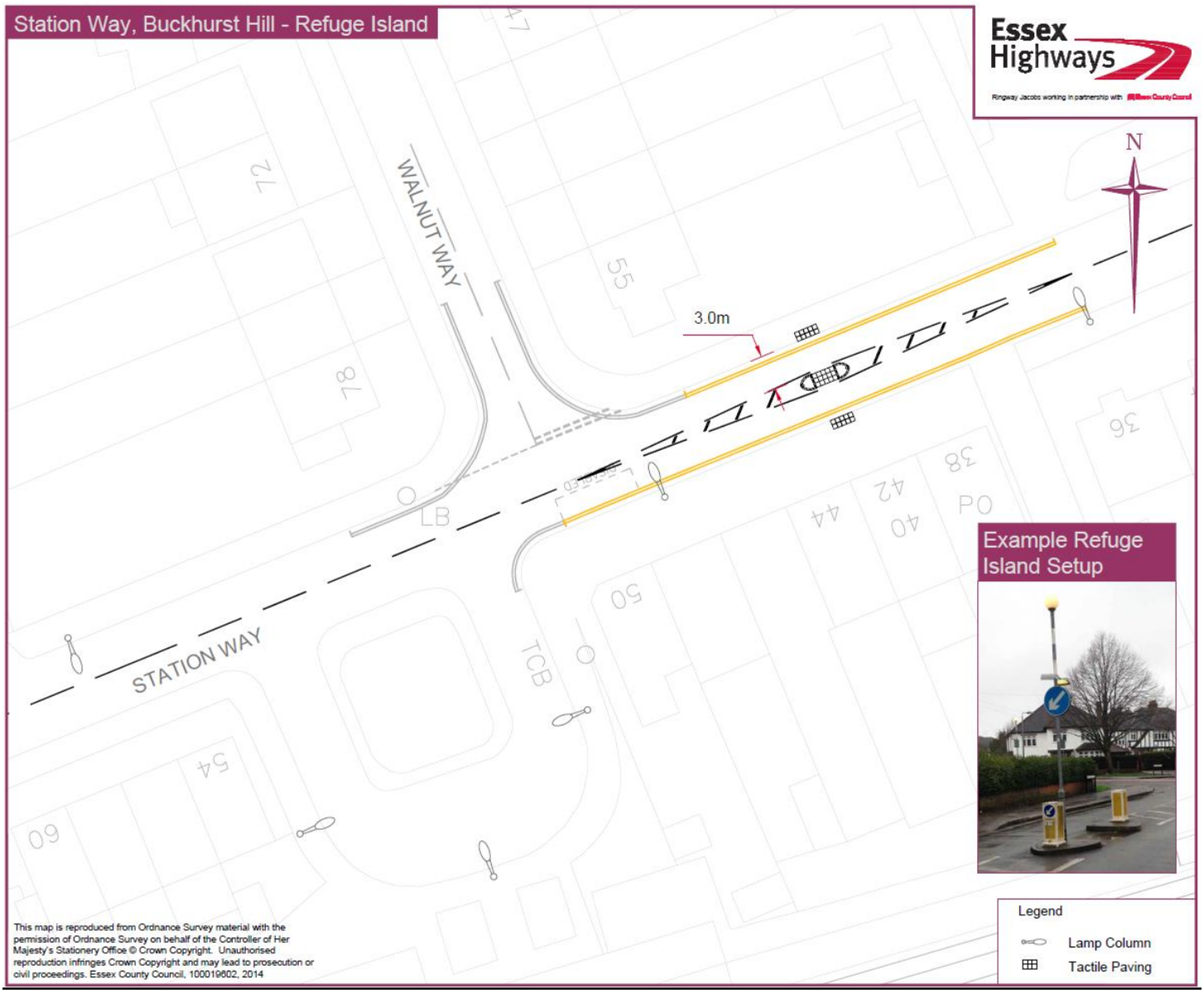
8. Conclusions and Recommendations

It is recommended that Doing Nothing (Option 3) at this location would be the best option to follow in this instance. From an engineering perspective it does not look possible to fit a refuge island at this site, in line with the concerns raised earlier in this report. A zebra crossing at this location is likely to be very controversial, costly and may require abortive and/or remedial works. It is not likely to provide the holistic solution required mainly due to the fact it is not possible to align the designed location of crossing with the general demand identified by observed pedestrian desire lines. Therefore, we have no guarantees that the implementation will have any impact on the safety of pedestrian facilities at this site.

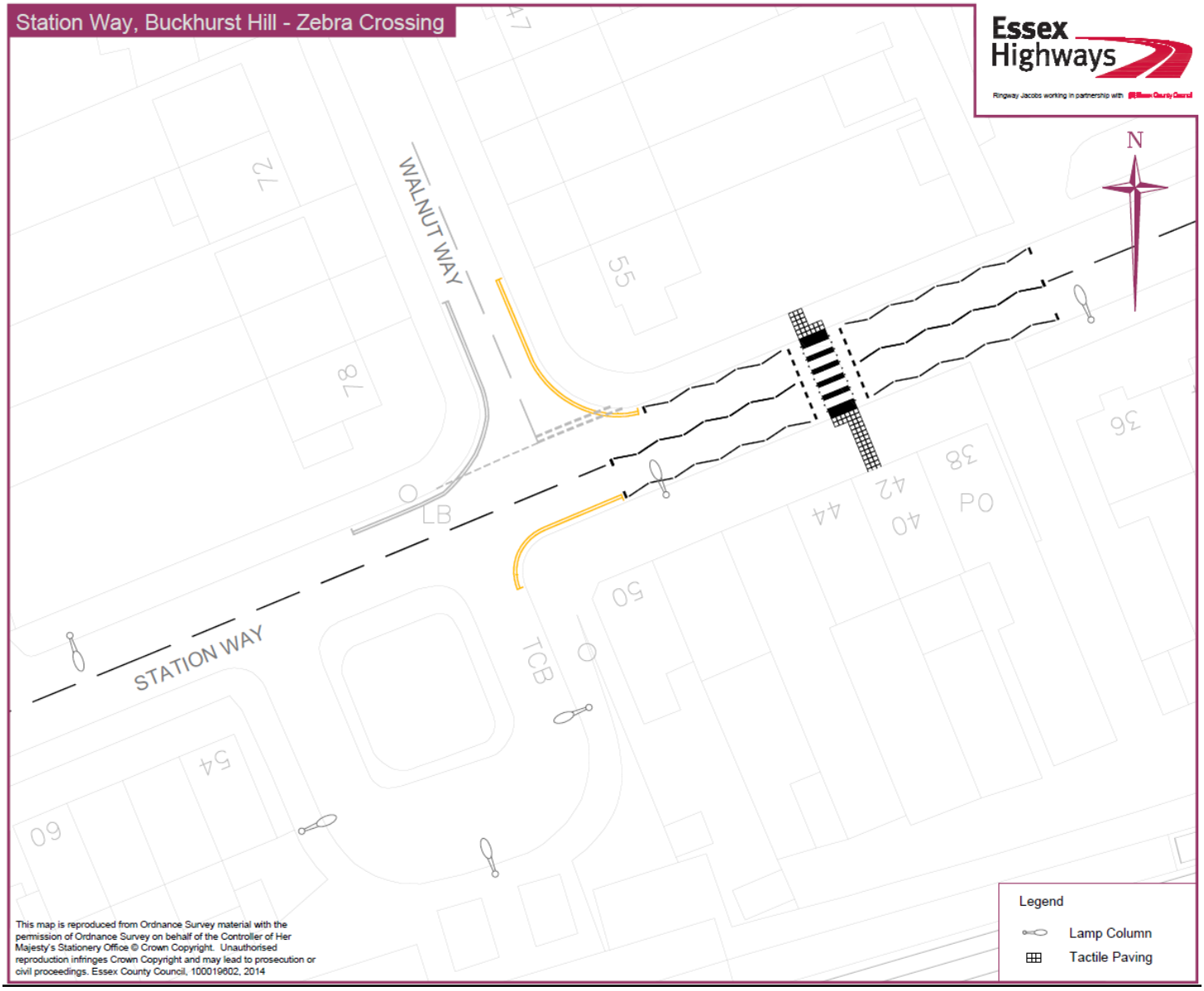
Appendix A: Existing Layout Plan



Appendix B: Option 1 Layout



Appendix C: Option 2 Layout



VAS Feasibility study

Lindsey Street/Centre Dive - Epping

Job Number:	**DC1670**
Doc Ref:	**Feasibility Report**
Author:	**Jamie Twinn**

Document History

Revision	Purpose	Originated	Checked	Approved	Date
N/A	Draft for approval	JT	ADJ	CB	11.03.14

1. Introduction

1.1 Project Background

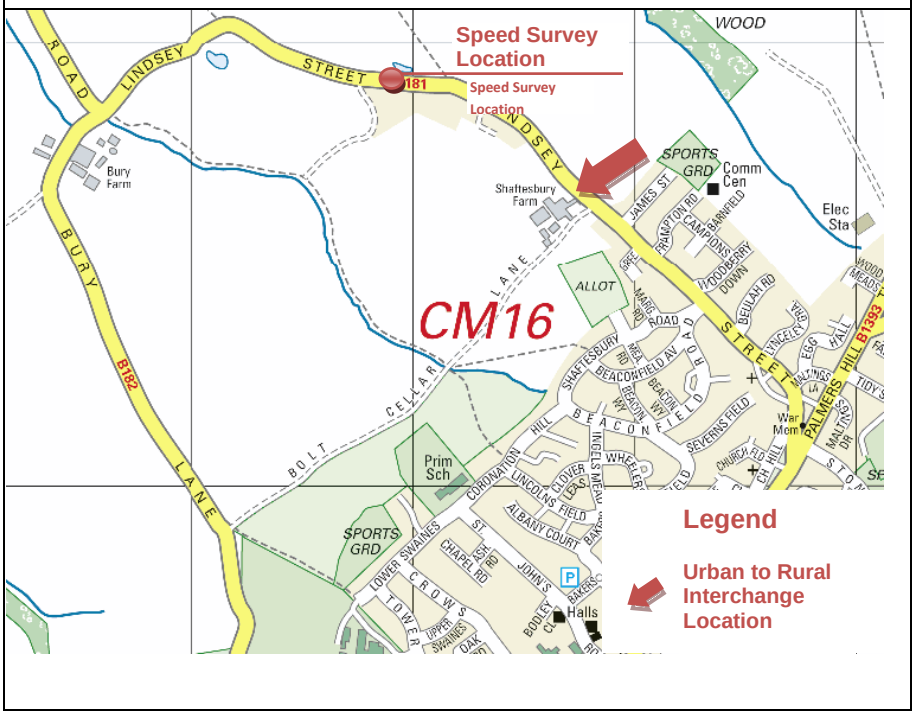
Funding for this scheme has been approved by the Epping Forest Local Highways Panel and requires a feasibility study to be undertaken to investigate the speeding issues observed on Lindsey Street and Centre Drive, Epping. Local residents have raised concerns over vehicles speeds along these routes to Cllr. Whitehouse, who raised the request for this scheme.

2. Existing Conditions – *Lindsey Street*

2.1 Location / Land Use

- Lindsey Street, Epping is a two way single carriageway and is a priority route 2 (PR2). It has junctions with the High Street in the South and Epping Road (also a PR2 route) which leads to Harlow and Epping. The current speed limit of this road is 30 mph.
- The road changes from urban to rural at the location indicated on Fig. 1.1 below. Drivers travelling northbound begin to build up excessive speed at this point. Further down Lindsey Street there are natural traffic calming features such as residential parking and residential units on both sides of the carriageway which bring down the average speeds observed.
- Fig 1.1 below shows a map of Lindsey Street and the surrounding area.

Fig 1.1 Lindsey Street location plan and speed survey location



2.2 Speed Survey Results

- A seven day speed survey for Lindsey Street was carried out between 6th-12th August 2013; the survey was taken from a point to the north of Lindsey Street's junction with James Street at a location where the road becomes more rural in nature as indicated in Fig 1.1. A summary of speed survey results are below:
    - NW bound average: Weekday 39.5 mph; 7 day 39.8 mph *(meets +5 mph mean speed criteria)*
    - SE bound average: Weekday 32.1 mph; 7 day 31.6 mph *(does not meet +5 mph mean speed criteria)*

2.3 Site Observations

The following observations were made during a site visit to Lindsey Street, conducted on the 18th July 2013 at 3pm:

- The presence of overhanging vegetation on Lindsey Street is potentially obstructing any proposed sign location.
- Existing residential parking and the presence of residency on both sides of the road on the carriageway to the South of Lindsey Street does naturally slow the average speed of traffic.

2.4 Statutory services

As part of the investigation of this project, a statutory undertaker's plant request was made; this highlighted multiple potential conflicts at the site. These potential conflicts may result in complications for installing the new post, and may even result in additional cost being incurred. Although, the details of this would be unknown until the actual sign post location is decided as part of the detailed design works.

2.5 Photographs - *(Lindsey Street)*

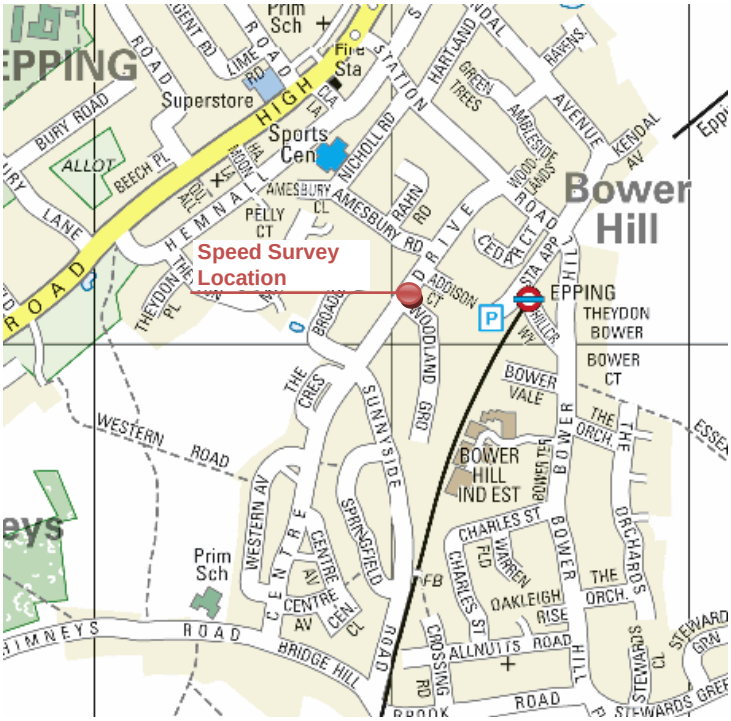
Lindsey Street towards junction with Epping Road	*Rural section of Lindsey Street and survey location- Lindsey Street*
	

3. Existing Conditions – *Centre Drive*

3.1 Location / Land Use

- Centre Drive, Epping is a two way single priority route 2 carriageway (PR2). Its main junctions are with Ivy Chimney's Road and Station Road. It is located near Epping tube station. The current speed limit of this road is 30 mph.
- The road benefits from natural traffic calming features in the form of residential parking, which spans from its junction with Ivy Chimneys road to a point opposite its junction with The Crescent.
- Fig 3.1 below shows a map of Centre Drive and the surrounding area.

Fig 3.1 Centre Drive location plan and speed survey location



3.2 Speed Survey Results

A seven day speed survey was carried out from 4th-10th February 2014; the survey taken from a point between the side road junctions of Woodland Grove and Addison Court along Centre Drive, as indicated in Fig 3.1. A summary of the speed survey results are below:

- NE bound average: 5 day 30.9 mph; 7 day 31.1 mph *(does not meet +5 mph mean speed criteria)*
- SW bound average: 5 day 30.6 mph; 7 day 30.4 mph *(does not meet +5 mph mean speed criteria)*

3.3 Site Observations

The following observations were made during a site visit to Centre Drive, conducted on the 18th July 2013 at 2pm:

- The presence of overhanging vegetation on Centre Drive is potentially obstructing any proposed sign location.
- Existing residential parking from The Crescent towards it's junction with Ivy Chimneys Road does provide natural traffic calming effects for that section of Centre Drive.

3.4 Statutory services

As part of the investigation of this project, a statutory undertaker's plant request was made; this highlighted multiple potential conflicts at the site. These potential conflicts may result in complications for installing the new post, and may even result in additional cost being incurred. Although, the details of this would be unknown until the actual sign post location is decided as part of the detailed design works.

3.5 Photographs - (Centre Drive)

Start of residential parking opposite The Crescent	*View looking North along Centre Drive*	*Speed survey location - Centre Drive*
		

4. VAS feasibility requirements

4.1 Brief requirement

- The project brief required an investigation into the feasibility of incorporating three Vehicle Activated Signs (VAS) and new posts both the sites listed above. One VAS on Lindsey Street for northbound traffic at the point where the road becomes rural in nature, and two VAS on Centre Drive in both directions past the residential parking observed at the southern most junction of The Crescent until Addison Court.
- In accordance with the Essex County Council Speed Management Strategy any proposed VAS sign would have to meet the following criteria;
  1. Is there a proven speeding issue at this site
  2. Has the existing speed limit been in place for 12 months
  3. The average speed is more than 5mph above the posted limit
  4. The sign is more than 70 metres inside the existing speed limit
  5. The signs will be powered by wind/solar wherever possible
  6. Is there sufficient space to safely install the device
  7. Can the device be secured at the site
  8. Is there a visibility of between 50m and 100m from which the drivers will be able to clearly see the device (enabling a 3 second view from the approach)

5. Economic Analysis

5.1 Approximate cost of a VAS sign

- The Table 5.1 below shows a estimated works cost based on previous schemes using Solagen as or supplier for the construction and installation of a VAS. Please note that this does not include any ongoing maintenance cost, though the VAS sign itself comes with a five year warranty. There is also the option to purchase an extended warranty from the supplier direct, to cover future maintenance.

Table 5.1 Approximate cost per unit VAS Sign - correct as of Sept 2013

	Quant	Unit	Supply Chain Composite Rate	Total Supply Chain Cost
SERIES 100 PRELIMINARIES				
TSM				
CAT scan	1.0	item	117.65	117.65
Install new flagpole and sign				
89mm diameter galvanised post	5.20	m	18.38	95.55
Concrete ST5 foundation (Inc. excavation - in house)	1.35	m^3	306.25	413.44
Solagen VAS sign (roundel and triangle)	1.0	item	4794.00	4,794.00
OPTIONAL EXTRA.. Solagen VAS sign (roundel and triangle) SLOW DOWN text an for additional £1000 /sign				
Total Cost				**5,420.64**

- Total cost listed above excludes cost for design and supervision.

- The costs above do not include any potential requirement for diverting or relocating stats, nor do they include the cost of trenching from existing UKPN connections if mains power is deemed to be the correct solution to power the sign.

6. Recommendation

6.1 Lindsey Street

We recommend a VAS sign is installed for vehicles travelling in the northbound direction only along Lindsey Street; this matches the requirement of the project brief. The detailed design should look at locating the VAS sign at a point where Lindsey Street becomes more rural in nature. Although, the VAS would be most effective if located within an area with residential activity on one side of the carriageway, thus reducing the risk of a vehicle vs pedestrian collision. Therefore, It is suggested locating the VAS at a point just south of where the speed survey was undertaken as indicated in figure 1.1 may be beneficial. The speed survey results for Lindsay Street listed in paragraph 2.2 show that this site could benefit from some form of traffic calming measures implemented to reduce average speeds, of which a VAS looks like a suitable solution. However, there are some potential conflicts with overgrown vegetation at this site which should be avoided in the design.

6.2 Centre Drive

The average speeds listed for Centre Drive in paragraph 3.2 do not meet the qualifying criteria for installation of VAS. Both sides of the carriageway at this location are below the average speed required to justify a VAS sign (qualifying criteria = 35.0mph).

DC1810 – Lindsey Street, Epping – Footway Construction

1.0 **Brief**

1.1 This scheme has been Identified by Epping Town Council and the Local Highway Panel to consider improving the existing junction layout of the B181 Lindsey Street with the B1393 in Epping and improve the view to the War Memorial.

1.2 The subject of this feasibility study is to investigate the removal of the highway rights and change the use of the carriageway adjacent to the War Memorial and to see what improvements can be made to the junction of the B181 Lindsey Street / B1393 High Street.

1.3 Design & Consultancy Group has been commissioned to look at the site and investigate the feasibility of carrying out improvements works.

2.0 **Initial site investigation**

2.1 An initial site visit was undertaken at 10:30hrs on Thursday 17th October 2013.

2.2 A site survey sketch was completed.

2.3 Site photographs were taken and uploaded onto the network.

2.4 Observations:

a) B181 Lindsey Street is a PR2 road
b) B1393 High Street is a PR1 road that is heavily trafficked with 62 vehicles counted in a 3 minute period.
c) B1393 is also a bus route.
d) War Memorial link road is 3.8m wide and the verge is heavily overrun by vehicles.
e) The War Memorial has a footpath but it does not connect to the existing footway system.
f) The current highway boundary limit is being used to its maximum.

Photographs: Looking north westbound on Lindsey Street link road

Photographs: Looking southeastbound on Lindsey Street link road

Photographs: Looking northeastbound on B1393 High Street

3.0 **Options**

Option 1

3.1 One option put forward for this scheme is shown on the Outline Design drawing referenced DC1810/000/001.

3.2 This option includes changing the existing link road to a 2.5m wide footpath, with the remainder having highway rights removed and being returned to grass.

The Level 1 budget cost estimate can be broken down to general areas as:-

Civil Works (Including RJ fee & overhead)	£18,500
D&C Design and Supervision	£1,500
Removal of highway rights legal process	TBA

3.3 **Option 2**

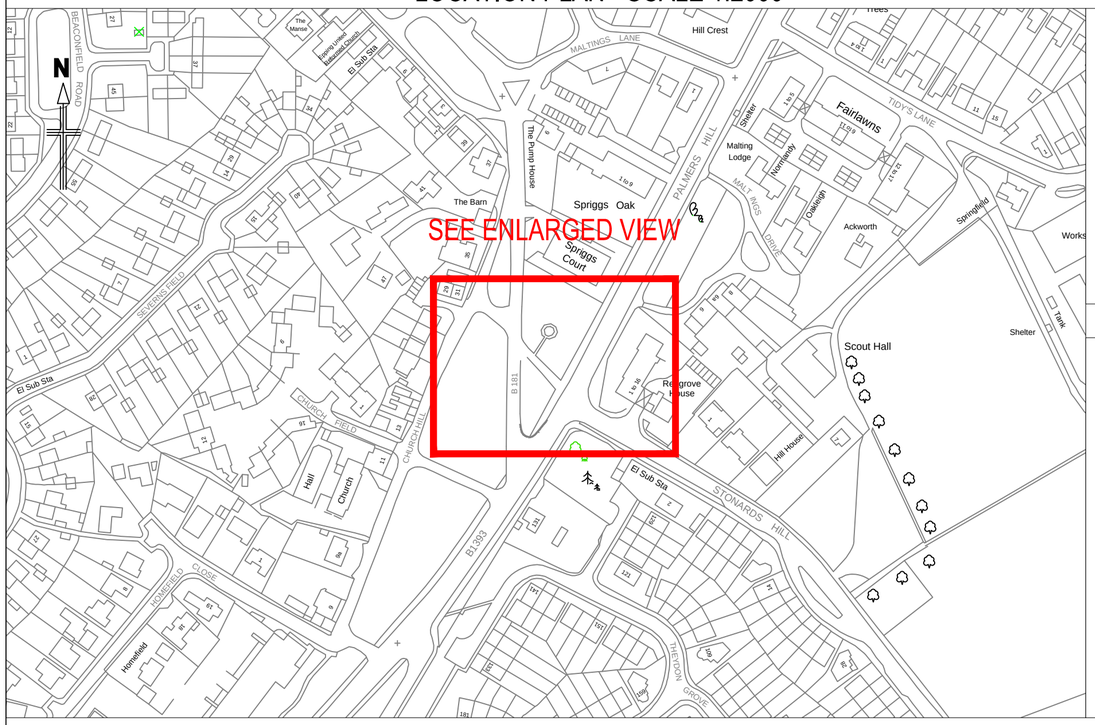
3.4 Another option for this scheme would be to turn the whole existing link road to grass and totally remove highway rights over the area.

3.5	The Level 1 budget cost estimate can be broken down to general areas as:- Civil Works (Including RJ fee & overhead) £23,500 D&C Design and Supervision £1,500 Removal of highway rights legal process TBA
3.6	**Option 3**
3.7	In removing vehicle access along the existing link road, it would seem sensible to alter the alignment of the junction of B181 Lindsey Street with the B1393 High Street to assist larger vehicles making the left turn onto the High Street/Palmers Hill. This option is shown on the Outline Design Drawing referenced DC1810/000/002. This option includes realigning the kerb line and making the carriageway slightly wider. To enable this scheme some of the Epping Conservators grassed area would need adding to the highway and it is envisaged that the agreement for this could be combined with one of Options 1 or 2 above, effectively creating a land part exchange.
3.8	The Level 1 budget cost estimate can be broken down to general areas as:- Civil Works (Including RJ fee & overhead) £13,500 D&C Design and Supervision £1,500 Adoption of land into the highway legal process TBA
3.9	**Option 4**
3.10	Another possibility would be to make the link road across the green one way to vehicles. Potential disadvantages with this idea include: • Four additional signs detracting from the aesthetics of the area • Ongoing enforcement would be required to ensure the one way system is not abused • Overrun of the grass would still likely occur on the entry and exit corners to the link road
4.0	**Recommendations**
4.1	It is recommended to discuss the options that are viable for the improvement of the junction and link road with the LHP and Epping Forest Conservators. By removing vehicle access to the link road (as described in Options 1 & 2), this would have implications on the B181 Lindsey Street/B1393 Palmers Hill junction. Vehicles would be forced to use the B181/B1393 junction which is very tight. Consequently larger vehicles may not be able to manoeuvre the junction without over running the footpath/verge, which would mean that the existing problem on the link road would be moved to the B181/B1393 junction. Therefore, if Option 1 or 2 was introduced then we would recommend that Option 3 be implemented as well to achieve the objective of making the green area more aesthetically pleasing. If Option 3 was to be taken forward then additional land from Epping Forest Conservators would need to be added to the highway because the Highway Boundary limit is currently being used to the maximum. This highway adoption could be processed at the same time as the legal process for the removal of highway rights for the existing link road. A plan for this proposal can be found on the attached drawing DC1810/000/002.

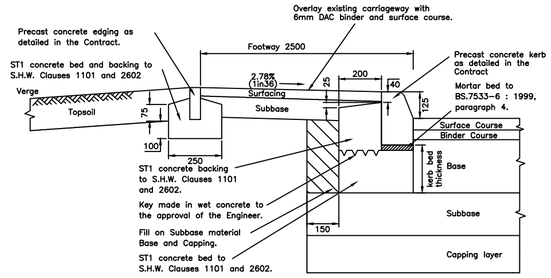
	Another factor to take into consideration is another potential scheme at the junction of the High Street and Station Road where ITS are considering a right turn lane on the main road. This scheme would also require land from Epping Forest Conservators to be made into highway and should be dealt with in conjunction with the land issues associated with this report. There is currently a Casualty Reduction (CR) Scheme looking predominantly at the B1393 Palmers Hill/Stonards Hill junction which has some overlap with this feasibility study. The CR report recommends changing the existing warning sign on Palmers Hill from a 'staggered junction ahead' to a 'crossroads' warning sign but this would not be necessary if the link road was closed to vehicular traffic. The CR Report also recommends rationalising the existing number of traffic signs on the corner of Palmers Hill/link road which also depends upon whether or not the link road is eventually closed. The CR Report also mentions the possibility of making the link road one way (also Option 4 of this report). This option is not recommended due to the disadvantages described in Option 4 above. All the preliminary Level 1 cost estimates above will be subject to change through the target cost process.
5.0	**Summary**
5.1	Whatever decisions are made following this feasibility report must also take into consideration this other scheme DC1806 Palmers Hill/Stonards Hill.
5.2	Before proceeding with any works it is recommended that stats plans are requested and the works are target costed by the Commissioning Team to get a more detailed cost. Also a Safety Audit should be undertaken to identify any safety issues with the proposed scheme.

Prepared by:	Shaun Morgan	Date:	12th February 2014

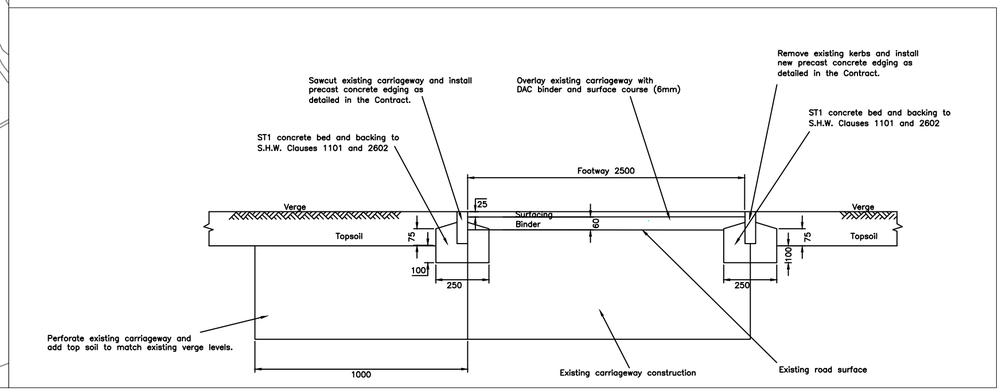
LOCATION PLAN - SCALE 1:2000



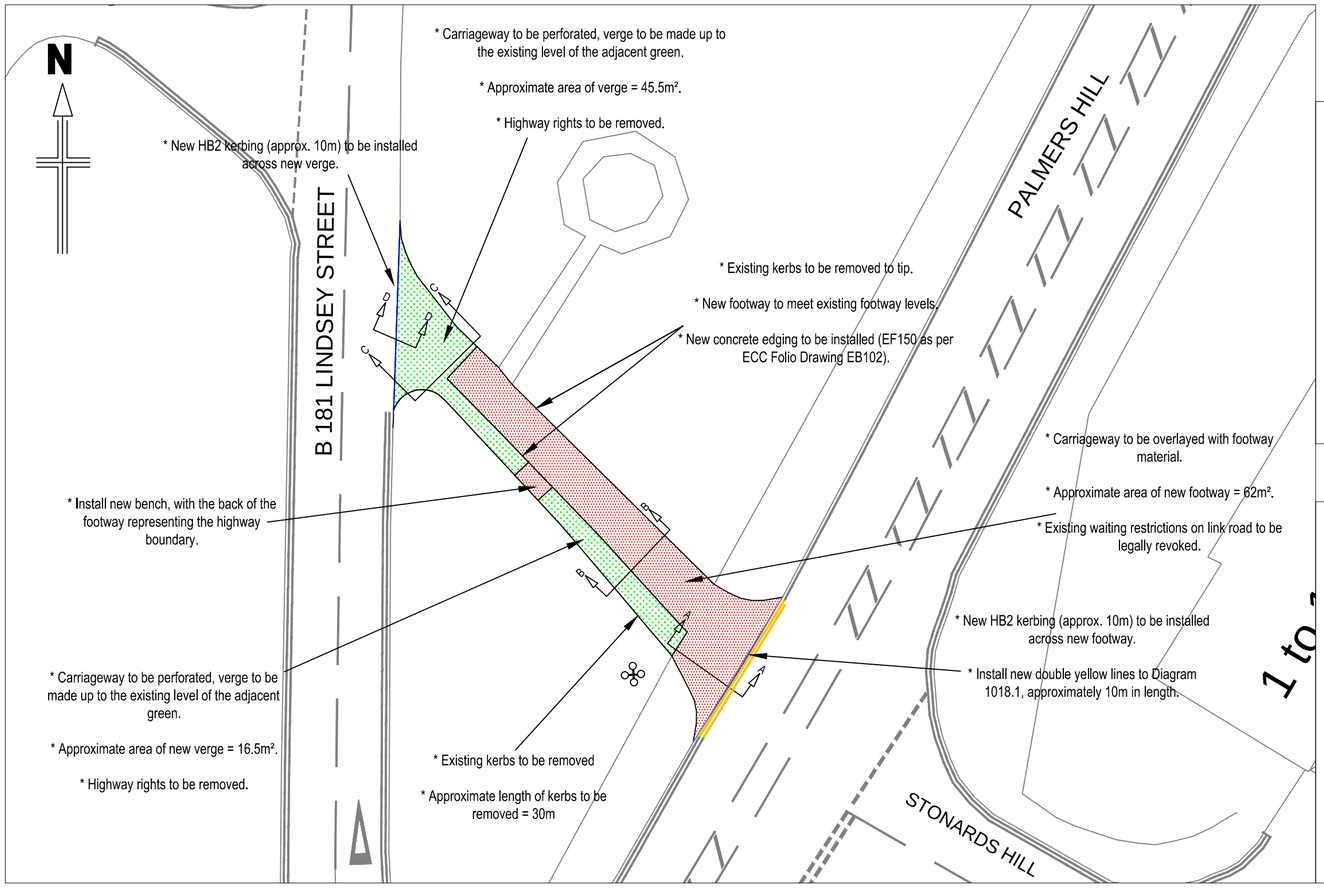
CROSS SECTION A-A - SCALE NTS



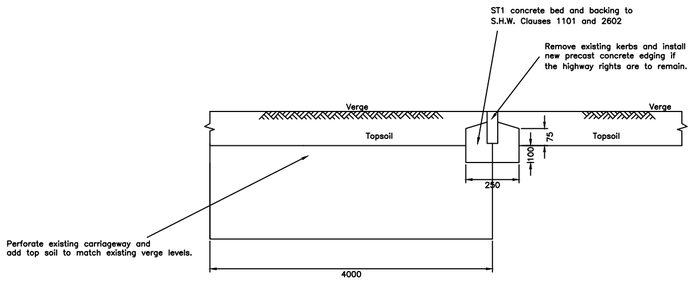
CROSS SECTION B-B - SCALE NTS



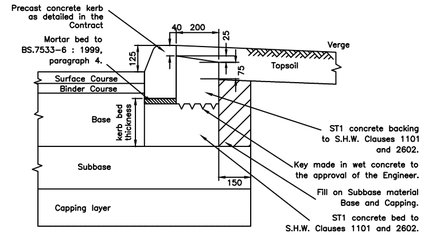
ENLARGED VIEW - SCALE 1:250



CROSS SECTION C-C - SCALE NTS



CROSS SECTION D-D - SCALE NTS



If there are any discrepancies in this drawing they should be referred to the Design & Consultancy Services Group Manager before proceeding.
Only figured dimensions are to be worked to, all dimensions are in metres unless otherwise noted.

Key

- Proposed kerb
- Proposed new footway
- Proposed new lining
- Existing signs
- Existing lining
- Proposed new verge

REV.	DATE	AMENDMENT DESCRIPTION	DRAWN	CHECKED

DRAWING STATUS

FEASIBILITY DESIGN

Essex Highways

Ringway Jacobs working in partnership with Essex County Council

Mark Rowe, Service Director, Essex Highways
County Hall, Chelmsford. CM1 1QH
Tel: 0845 6037631

SCHEME TITLE

DC1810 LINDSEY STREET, EPPING

DRAWING TITLE

PROPOSED FOOTWAY CONSTRUCTION

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
SM	SM	CN	ML	ML
DATE	DATE	DATE	DATE	DATE
OCT 14	OCT 14	DEC 14	FEB 14	FEB 14

DRAWING UNITS U.N.O.
DIMENSIONS IN MILLIMETRES
LEVELS IN METRES

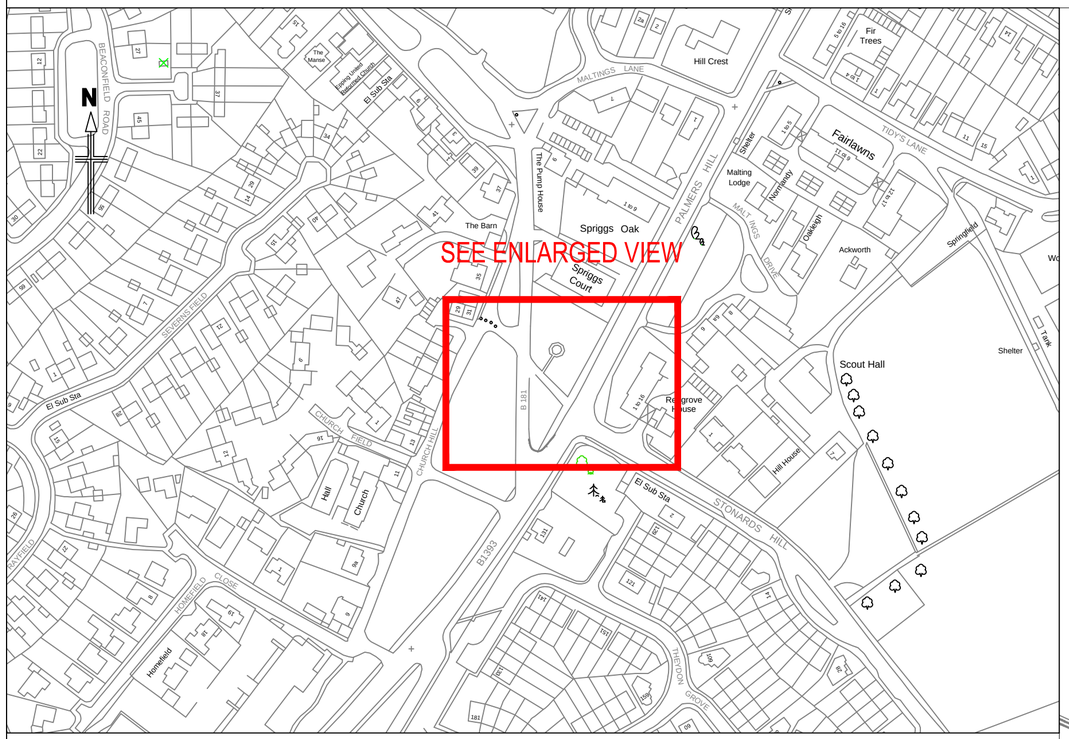
SCALE AT A2 (594x420mm)
AS SHOWN

DRAWING No.
DC1810/000/001

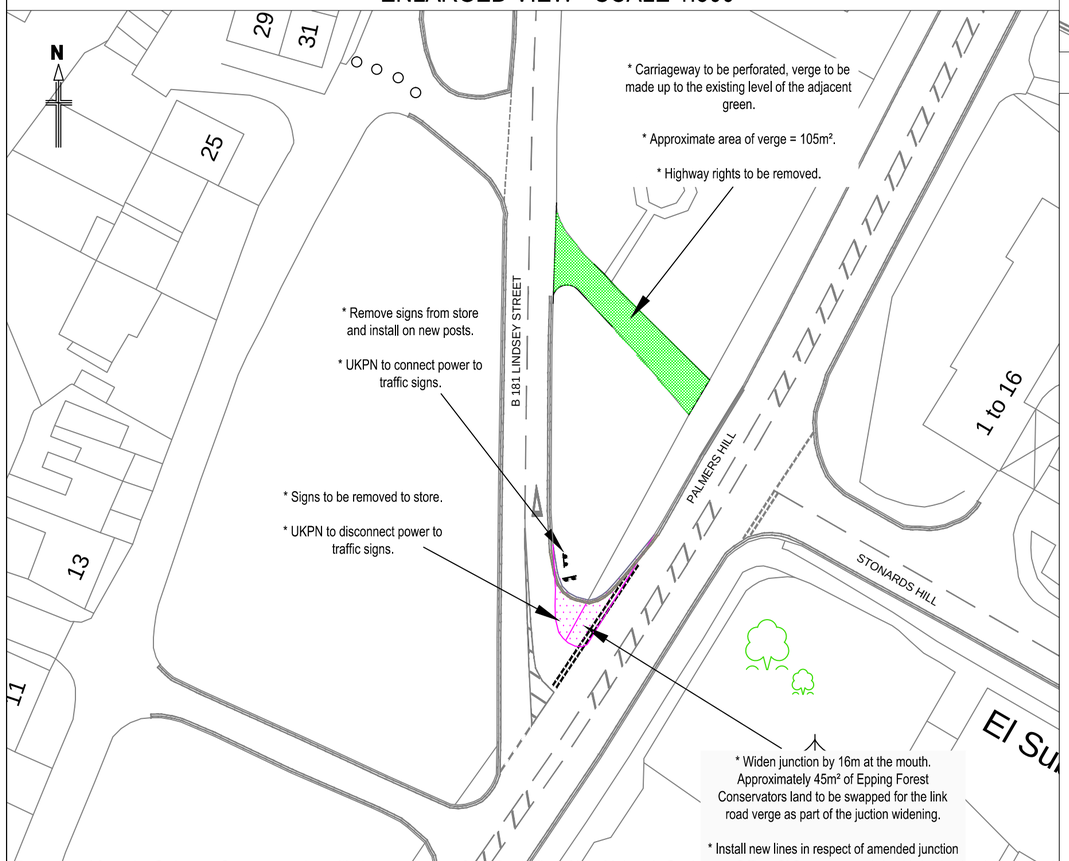
REV.
-

Drawing - X:\Design Consultancy\Capital Programme\DC Scheme Files 2013-14\DC1810 - Lindsey Street, Epping\3 - Drawing Records\DC1810-000-001 recovered.dwg. Layout - A2. Plotted Tuesday 18 February 2014 - 11:46 by shaun.morgan

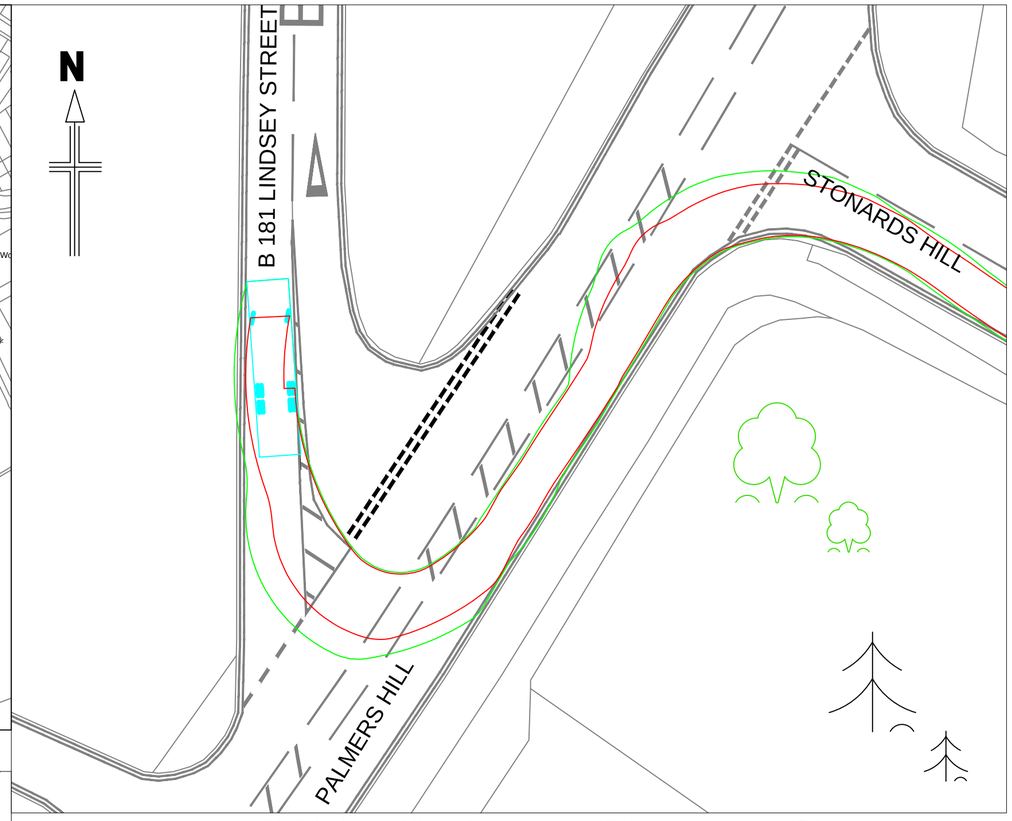
LOCATION PLAN - SCALE 1:2000



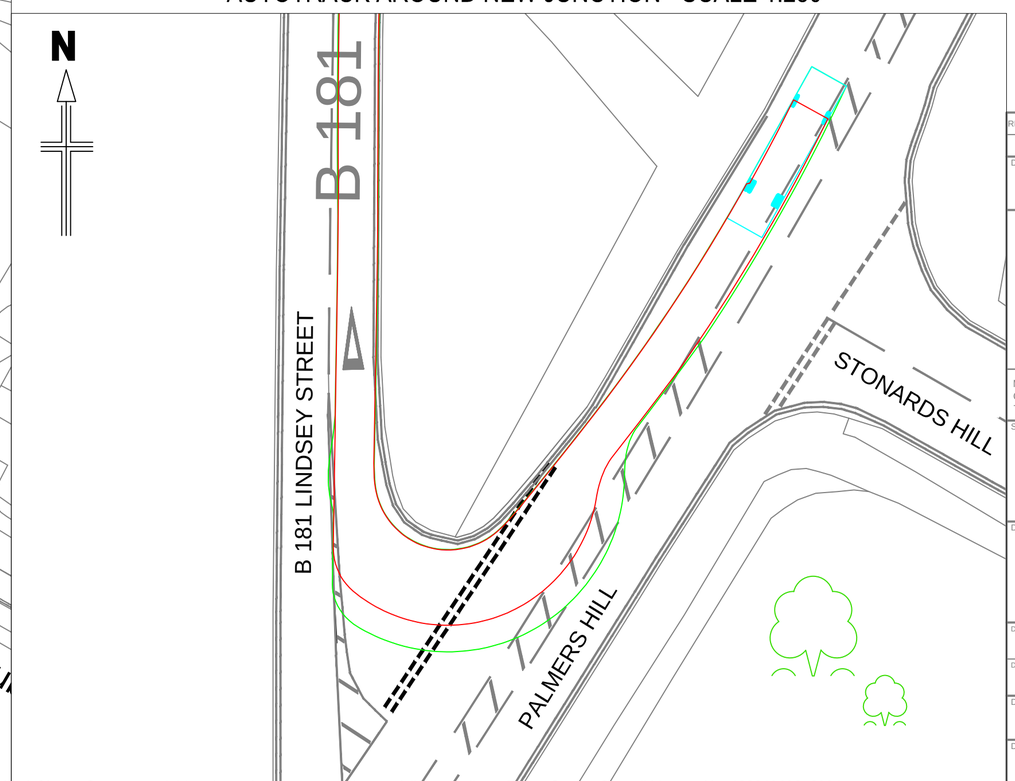
ENLARGED VIEW - SCALE 1:500



AUTOTRACK AROUND NEW JUNCTION - SCALE 1:250



AUTOTRACK AROUND NEW JUNCTION - SCALE 1:250

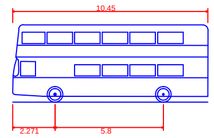


If there are any discrepancies in this drawing they should be referred to the Design & Consultancy Services Group Manager before proceeding.
Only figured dimensions are to be worked to, all dimensions are in metres unless otherwise noted.

Key

- Proposed new kerb line
- Proposed new carriageway construction
- Proposed new double yellow lining
- Proposed new lining
- Existing signs
- Existing lining
- Proposed new verge

Autotrack Information



Trident II - 10.45m 2-Axle

Overall Length	10.450m
Overall Width	2.400m
Overall Body Height	4.140m
Min Body Ground Clearance	0.311m
Track Width	2.363m
Lock to Lock Time	4.00s
Kerb to Kerb Turning Radius	8.958m

REV.	DATE	AMENDMENT DESCRIPTION	DRAWN	CHECKED

DRAWING STATUS

DRAWING STATUS

Essex Highways

Ringway Jacobs working in partnership with Essex County Council

Mark Rowe, Service Director, Essex Highways
County Hall, Chelmsford. CM1 1QH
Tel: 0845 6037631

SCHEME TITLE

DC1810 LINDSEY STREET, EPPING

DRAWING TITLE

PROPOSED FOOTWAY CONSTRUCTION

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
SM	SM	CN	ML	ML
DATE	DATE	DATE	DATE	DATE
OCT 14	OCT 14	DEC 14	FEB 14	FEB 14

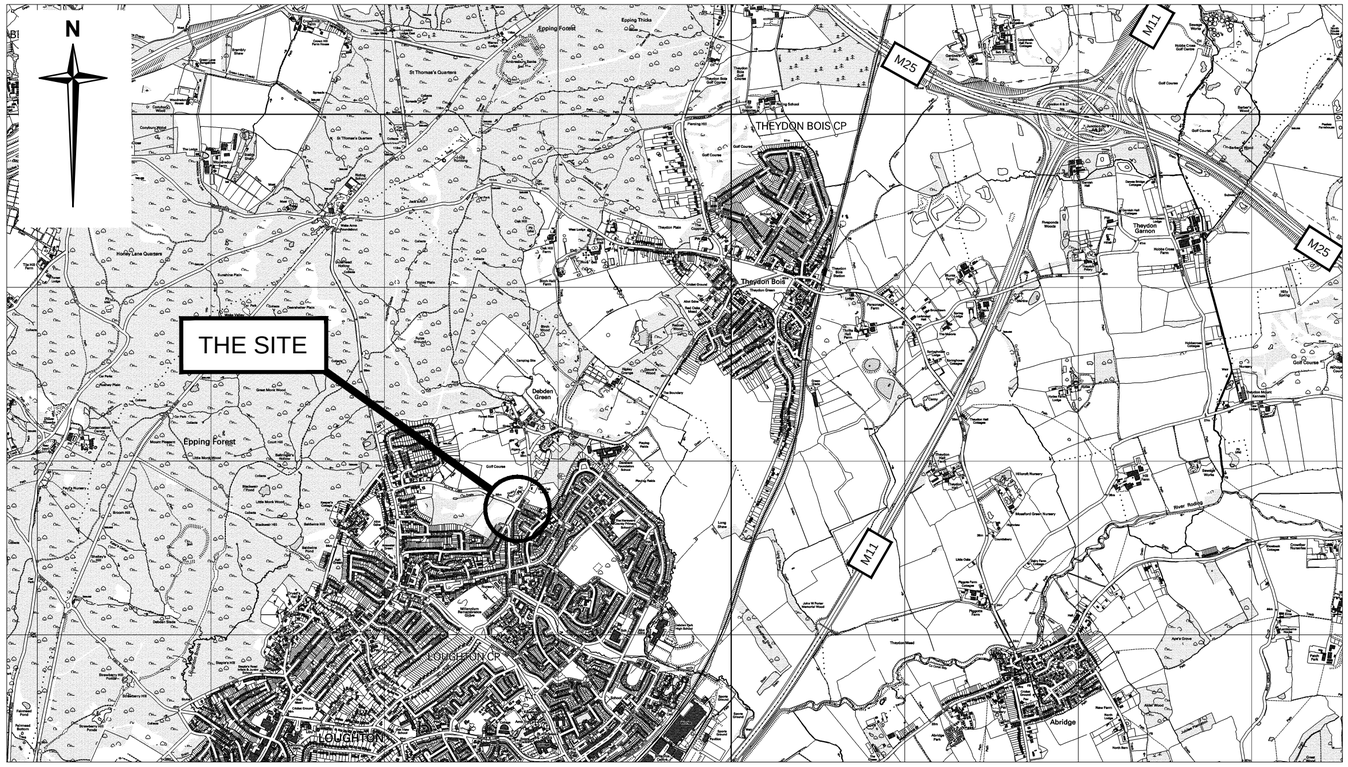
DRAWING UNITS U.N.O.: DIMENSIONS IN MILLIMETRES, LEVELS IN METRES

SCALE AT A2 (594x420mm): AS SHOWN

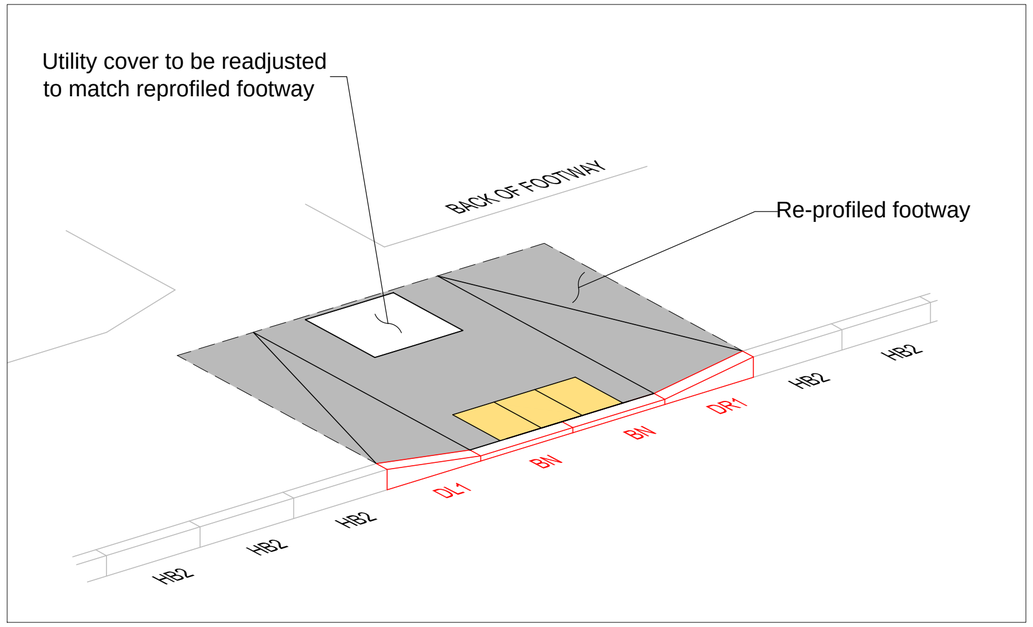
DRAWING No.: DC1810/000/002

REV.: -

Drawing - X:\Design Consultancy\Capital Programme\DC Scheme Files 2013-14\DC1810 - Lindsey Street, Epping\3 - Drawing Records\DC1810-000-001 recovered.dwg. Layout - A2. Plotted Tuesday 18 February 2014 - 11:47 by shaun.morgan



Location Plan - Not to Scale



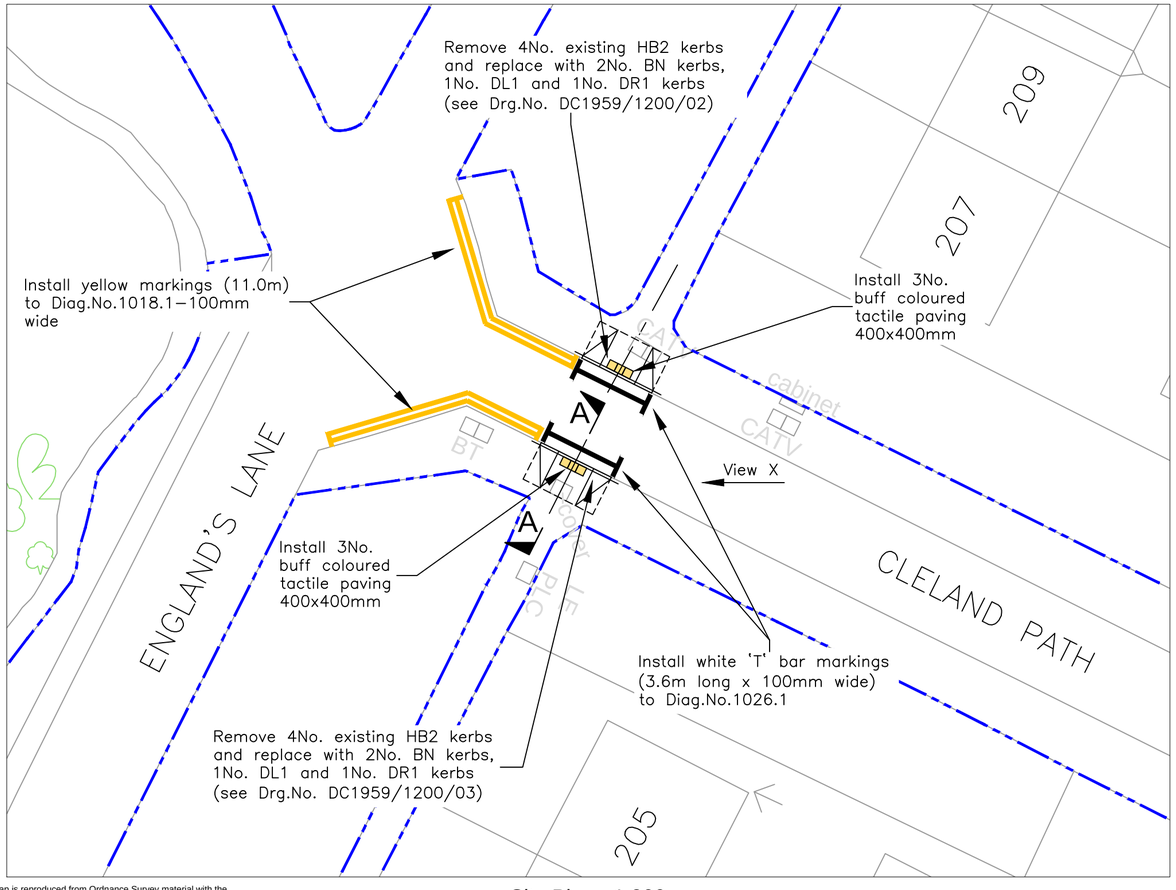
View looking from X - Not to Scale

Notes.

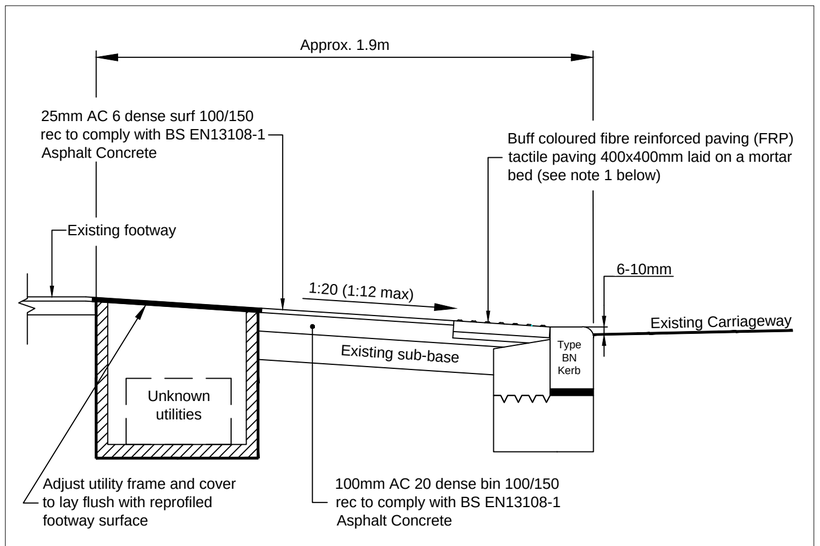
1. Do not scale. This drawing is to be read in conjunction with all other contract documents.
2. All works to be in accordance with the Department for Transport Specification for Highway Works and Essex County Council Specifications and Standard Construction Drawings.
3. All traffic signs and lines are to comply with The Traffic Signs Regulations and General Directions 2002 (TSRGD 2002).

Key

- Highway Boundary
- Extents of excavation



Site Plan - 1:200



Paving Notes.

1. Due to the endemic parking of cars on the footways at this location it is considered that fibre reinforced tactile paving (FRP) be used to reduce future maintenance liabilities, minimise broken, twisted or uneven slabs and maintain the aesthetics of the crossing for a longer period.
   NB Fibre reinforced tactile paving likely not to be a stock item and will have a longer delivery time.
2. Refer to Essex County Council Folio Drawings EB105 (kerb details) and EB121 (tactile paving details.

Section A-A - Not to Scale
(north side similar)

REV.	DATE	AMENDMENT DESCRIPTION	DRAWN	CHECKED

DRAWING STATUS

PRELIMINARY

Essex Highways

Ringway Jacobs working in partnership with Essex County Council

Mark Rowe, Service Director, Essex Highways
County Hall, Chelmsford. CM1 1QH
Tel: 0845 6037631

SCHEME TITLE

CLELAND PATH FOOTWAY IMPROVEMENTS

DRAWING TITLE

UNCONTROLLED PEDESTRIAN CROSSING POINT

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
TS	TS			
DATE	DATE	DATE	DATE	DATE
MAR 14	MAR 14			

CHECK PRINT

DRAWING UNITS U.N.O.
DIMENSIONS IN MILLIMETRES
LEVELS IN METRES

SCALE AT A2 (594x420mm)
AS SHOWN

DRAWING No.
DC1959/1200/01

REV.
0

DC1813 Middle Street FP59, Bumbles Green

1.0 **Brief**

Essex Highways have been asked to investigate the possibility of constructing a walkable verge from the existing footway in Middle Street to FP59.

Since the creation of FP59 last year, some walkers have expressed concerns regarding the difficulties reaching the footpath. Currently, those wishing to use FP59 have to either walk on the verge or on the road. Whilst the verge might not be an issue during the summer months, verges in the winter months can become slippery and difficult to negotiate.
The other alternative for walkers is the road which could be considered a road safety issue, especially being located close to a bend.

2.0 **Site Location**

The site in question is Middle Street from the end of the existing footway up to Footpath 59, Bumble Green, Nazeing.

Middle Street is a single carriageway street lit road, subject to the national speed limit of 30mph.

It is classed as a residential road which runs from its junction with Waltham Road and Nazeing Common, through to where it becomes Nazeing Road.

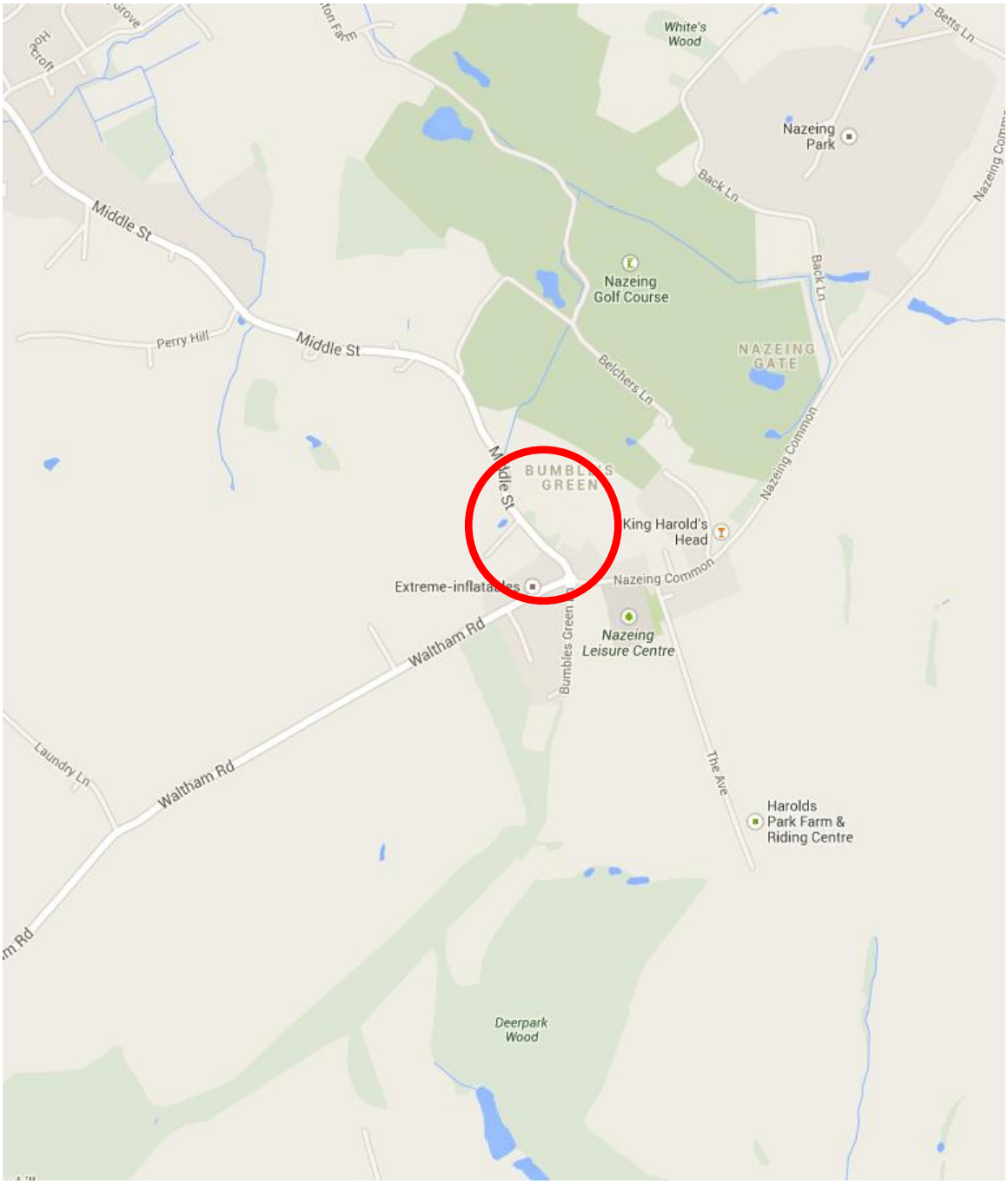
Whilst Middle Street is not classed as a strategic route it is often used as a cut through from Lower Nazeing to Bumbles Green and as such does attract greater volumes of traffic than other residential roads.

Ariel view

Southern approach

Northern approach

Location Plan



5.0 **Personal Injury Collision**

A study of the Personal Injury Collision (PIC) data for the period from 01/01/2009 and 31/12/2013 at this location shows no real pattern of accidents involving pedestrians.

The data shows there is 1 serious PIC at this location involving 2 vehicles, resulting in 1 serious casualty and one slight casualty.

The PIC occurred in 'Wet/Damp' conditions and occurred during daylight hours. It was thought that slippery conditions was the main cause.

6.0 **Site Observations**

It should be noted that there is a roadside ditch on the south western side of the road. This should be borne in mind when considering any new lengths of footway on that side.

Street furniture

No street furniture present at this location.

Pavements/Drainage

- The carriageway appears to be in good condition with no evidence of utility scarring.
- There is currently no kerbed channel either side of the carriageway, therefore surface water will naturally drain onto verge. If kerbs are to be installed, additional drainage should be considered.

Lining

- It was observed that existing road markings are also in reasonable condition and meet the visual assessment criteria as prescribed in Volume 8 section - TD 26/07 of the DMRB

Signage

- Existing signage is minimal. Relocation of existing signage is to be included as part of the proposals, where appropriate.

Other observations

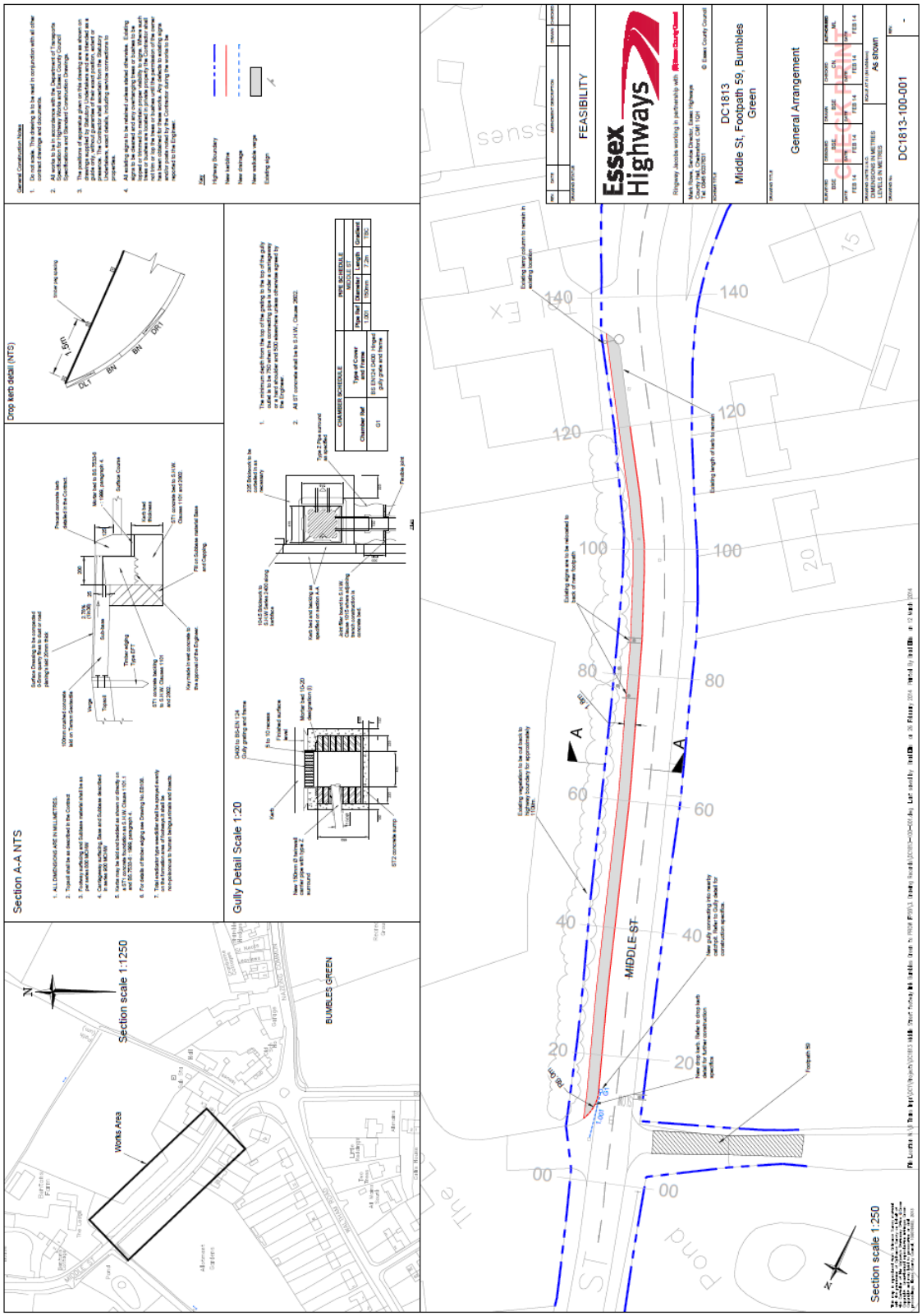
- A badly damaged area of verge on the eastern side of the carriageway, mid way between

	the proposed site extents suggests that overrun is an issue and could be down to vehicle parking.
7.0	**Recommendations** Following a study of the site a plan showing the proposed new section of walkable verge has been prepared. 1. Refer to appendix A (DC1813/100/001) for proposed general arrangement. It is recommended that a full height kerb be installed for the length of walkable verge to minimise the risk of vehicle parking and to help retain the granular material used for construction. A dropped kerb will need to be provided at the northern end of the length of walkable verge. The new kerbline will tie into the existing length of kerbline at the southern end, which already includes provision of a drop kerb. It is suggested that an additional gully be installed by the existing vehicle access to 'The Lodge' as the removal of natural drainage could result in ponding at the lower areas. Some siding back of vegetation will be required in order to accommodate the proposed walkable verge. Where such vegetation is located on private property the Contractor shall not carryout any further work until the permission of the owner has been obtained. *Notes* The utility plans indicate that existing underground equipment shouldn't affect the proposals. Trial holes should still be carried out to determine the location and depths of any such equipment. 1. Refer to Appendix B for utility plans.
8.0	**Economic Analysis** The estimates for the proposed works have been worked out using 2011/12 rates with a presumed uplift of 3.71%. These estimates are only for guidance and may change under the new Ringway Jacobs contract. • Civils – £12,330.15 • Design & supervision – £1,500.00 • Total – £13,830.15.

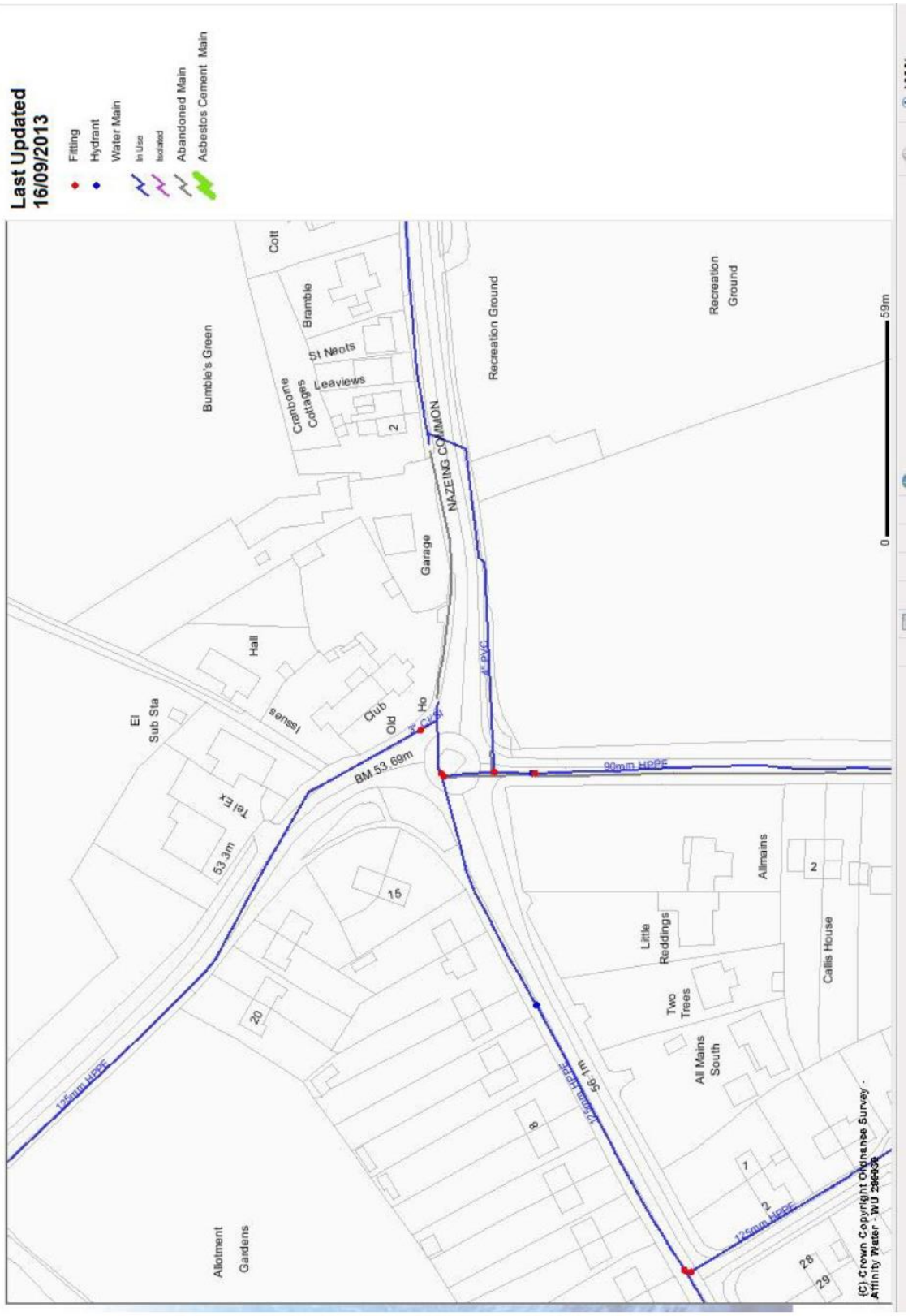
FEASIBILITY REPORT – DC1813

Prepared by:	Brad Ellis	Date:	24th Feb 2014

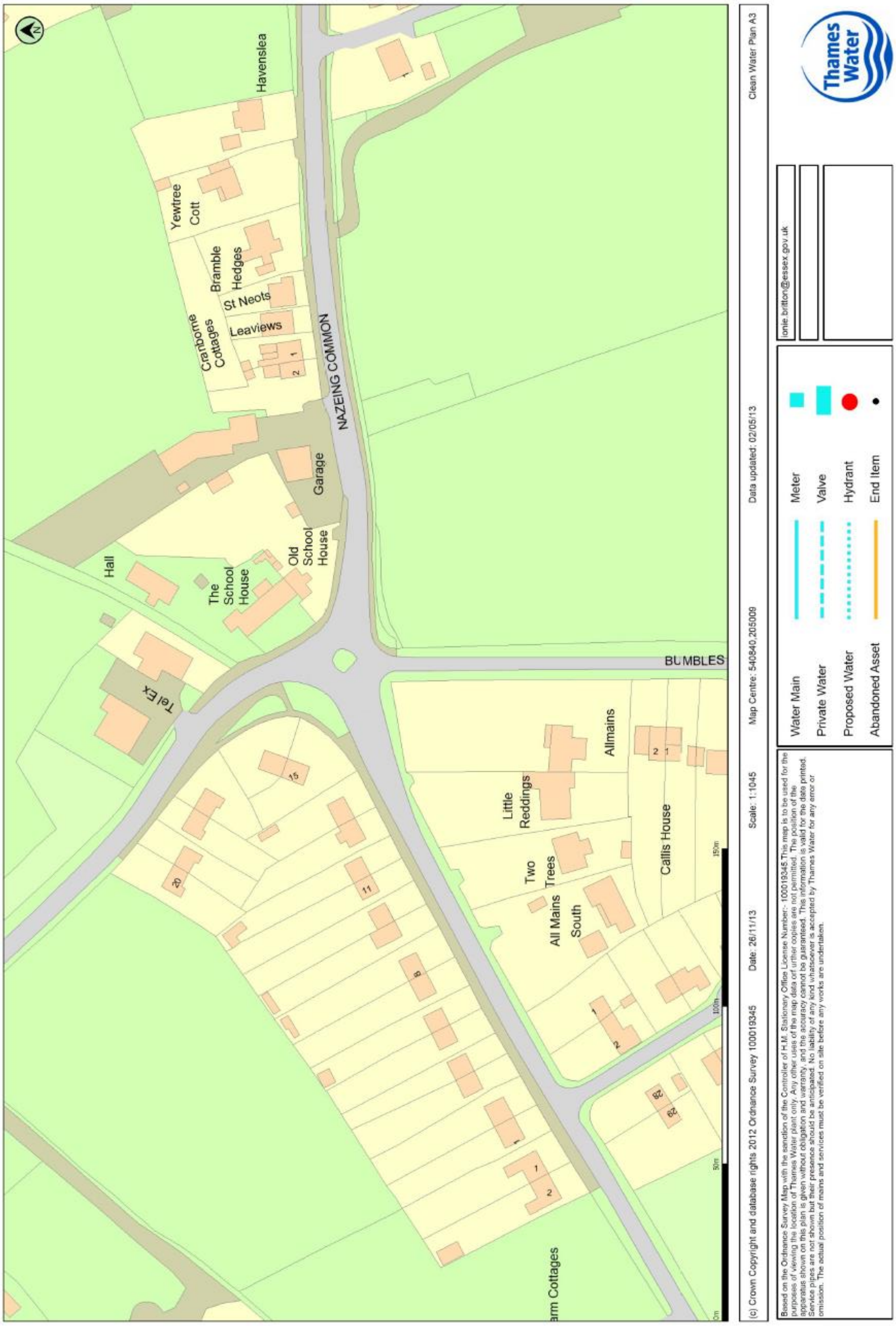
Appendix A

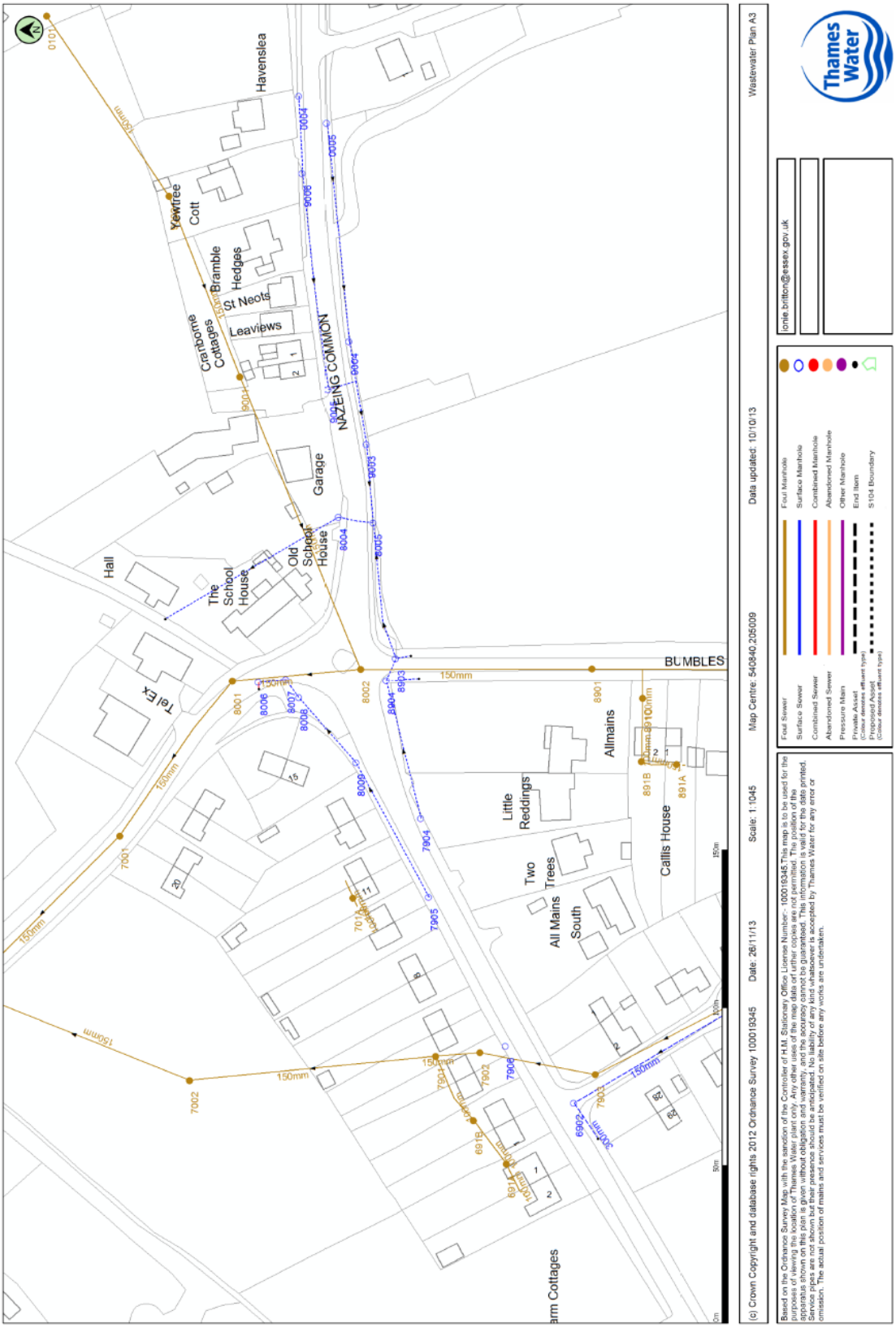

Drop kerb detail (NTS)
Section A-A NTS
Gully Detail Scale 1:20
Section scale 1:1250
Works Area
BUMBLES GREEN
MIDDLE ST
Section scale 1:250
FEASIBILITY
Essex Highways
DC1813
Middle St, Footpath 59, Bumbles Green
General Arrangement
DC1813-100-001
As shown

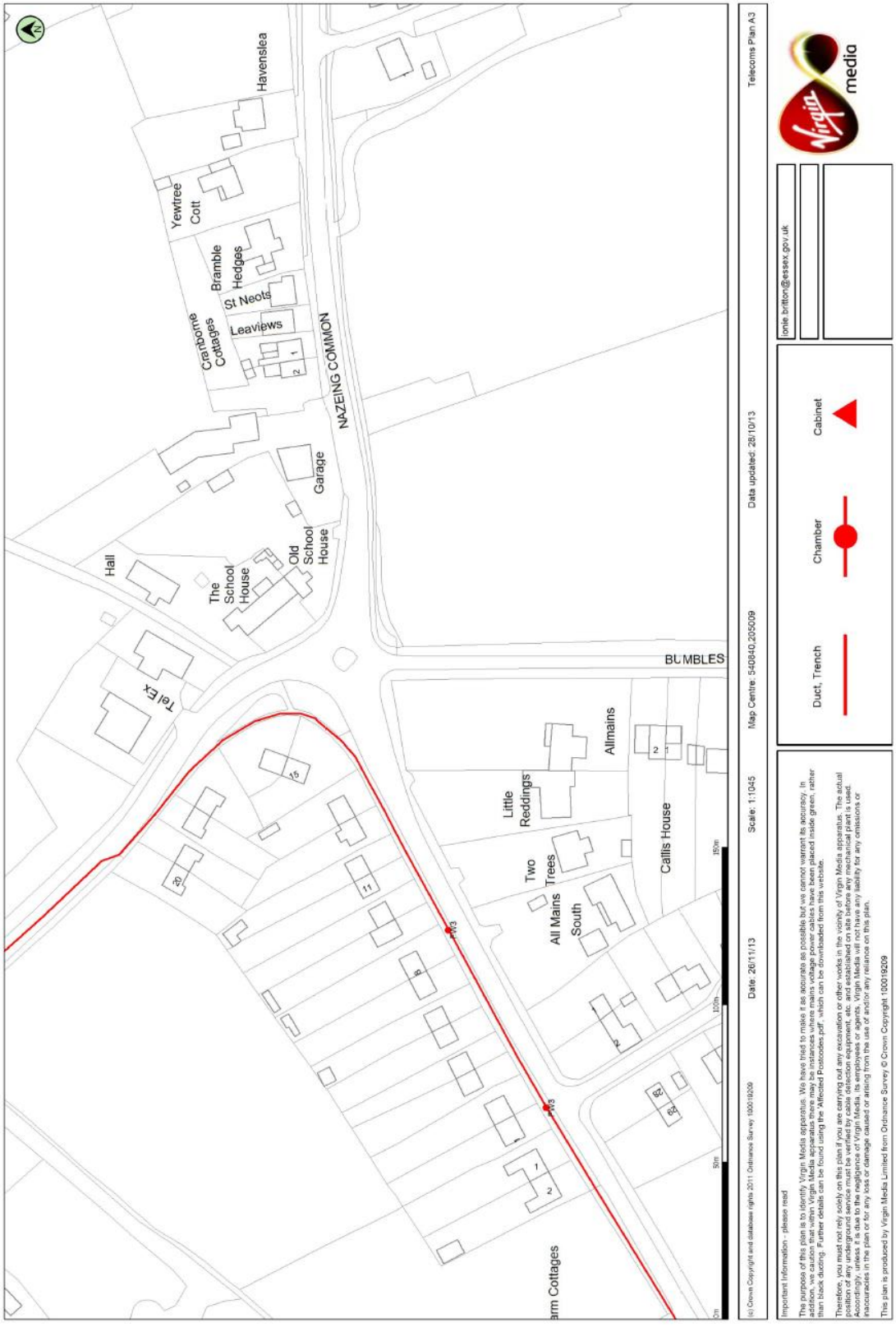
Appendix B


Last Updated
16/09/2013
Fitting
Hydrant
Water Main
In Use
Isolated
Abandoned Main
Asbestos Cement Main
Cott
Bramble
St Neots
Leaviews
Cranborne Cottages
Bumble's Green
Recreation Ground
Recreation Ground
NAZEING COMMON
Garage
Hall
Club
Old
Ho
El Sub Sta
BM 53.69m
Tel Ex
53.3m
90mm HDPE
125mm HDPE
Allmains
Little Reddings
Two Trees
All Mains South
Callis House
Allotment Gardens
59m
0
(C) Crown Copyright Ordnance Survey - Affinity Water - WU 280008

FEASIBILITY REPORT – DC1813




Havenslea
Yewtree Cott
Bramble Hedges
St Neots
Leaviews
Cranborne Cottages
NAZEING COMMON
Garage
Old School House
The School House
Hall
Tel Ex
BUMBLES
Allmains
Little Reddings
Two Trees
All Mains South
Callis House
150mm
Wastewater Plan A3
Thames Water
Data updated: 10/10/13
Map Centre: 540840 206009
Scale: 1:1045
Date: 26/11/13
(c) Crown Copyright and database rights 2012 Ordnance Survey 100019345
ionie.britton@essex.gov.uk
Foul Sewer
Surface Sewer
Combined Sewer
Abandoned Sewer
Pressure Main
Private Asset
Foul Manhole
Surface Manhole
Combined Manhole
Abandoned Manhole
Other Manhole
End Item
5104 Boundary
Based on the Ordnance Survey Map with the sanction of the Controller of H.M. Stationary Office License Number:- 100019345.This map is to be used for the purposes of viewing the location of Thames Water plant only. Any other uses of the map data or further copies are not permitted. The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not normally shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified on site before any works are undertaken.


Havenslea
Yewtree Cott
Bramble Hedges
St Neots
Leaviews
Cranborne Cottages
NAZEING COMMON
Garage
Old School House
The School House
Hall
Tel Ex
BUMBLES
Allmains
Little Reddings
Two Trees
All Mains South
Callis House
Telecoms Plan A3
Data updated: 26/10/13
Map Centre: 540640,205009
Scale: 1:1045
Date: 26/11/13
(c) Crown Copyright and database rights 2011 Ordnance Survey 100019209
Duct, Trench
Chamber
Cabinet
sonie.britton@essex.gov.uk
Important Information - please read
The purpose of this plan is to identify Virgin Media apparatus. We have tried to make it as accurate as possible but we cannot warrant its accuracy. In addition, we caution that within Virgin Media apparatus there may be instances where mains voltage power cables have been placed inside green, rather than black ducting. Further details can be found using the 'Affected Postcodes.pdf', which can be downloaded from this website.
Therefore, you must not rely solely on this plan if you are carrying out any excavation or other works in the vicinity of Virgin Media apparatus. The actual position of any underground service must be verified by cable detection equipment, etc. and established on site before any mechanical plant is used. Accordingly, unless it is due to the negligence of Virgin Media, its employees or agents, Virgin Media will not have any liability for any omissions or inaccuracies in the plan or for any loss or damage caused or arising from the use of and/or any reliance on this plan.
This plan is produced by Virgin Media Limited from Ordnance Survey © Crown Copyright 100019209

Maps by email Plant Information Reply

IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy.
It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

DIAL BEFORE YOU DIG

FOR PROFESSIONAL ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS

ADVANCE NOTICE REQUIRED
(Office hours: Monday-Friday 08.00 to 17.00)

Tel: 0800 9173093
E-mail: dbyd@openreach.co.uk
Website: www.dialbeforeyoudig.com

KEY TO BT SYMBOLS

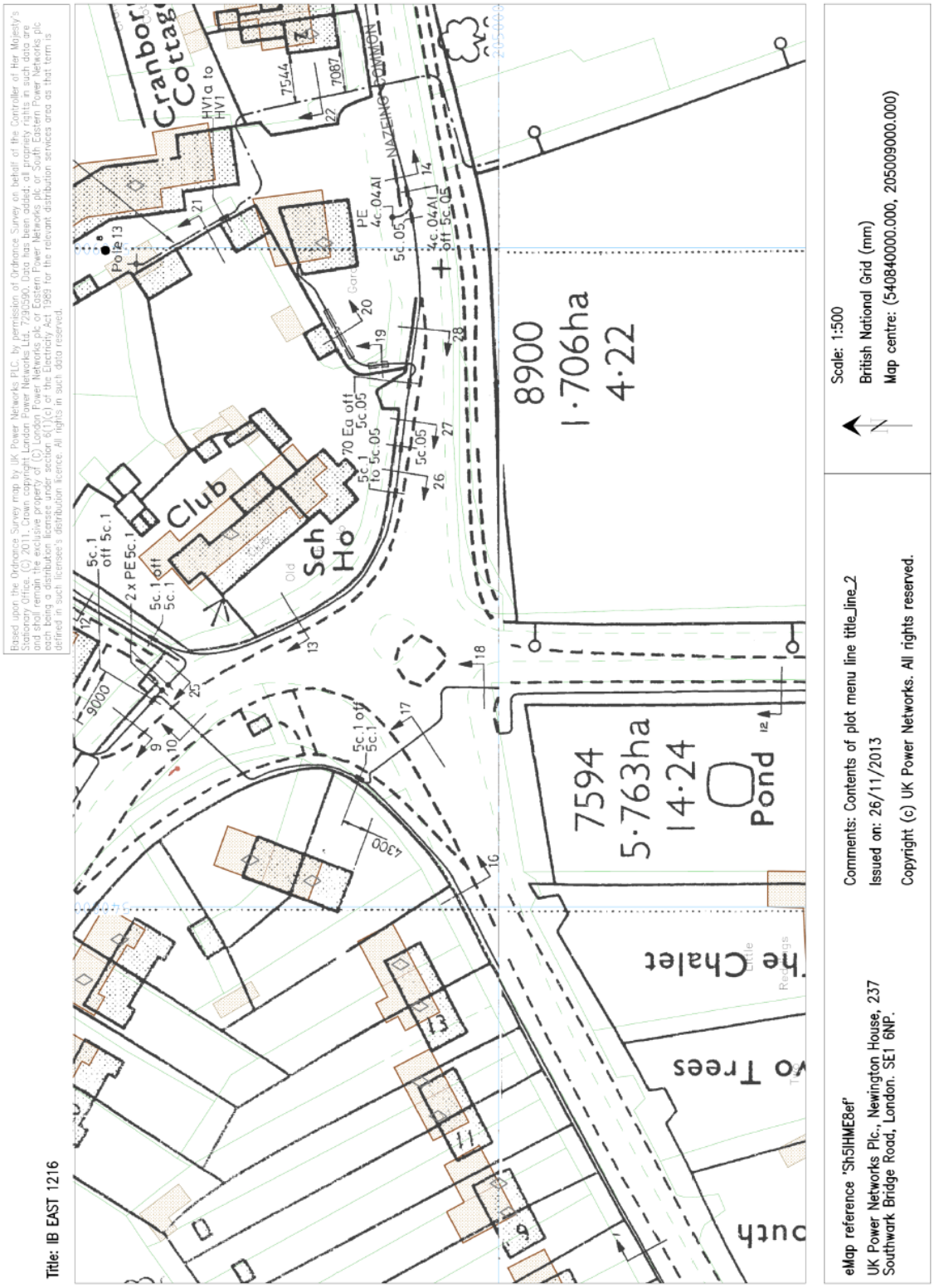
UNDERGROUND PLANT	POLE
OVERHEAD PLANT	CABINET
JOINT BOX	BURIED JOINT
DISTRIBUTION POINT	JOINTING POST
MANHOLE	PROPOSED U/G
DP BOUNDARY	PROPOSED O/H
OTHER BT BOUNDARY	PROPOSED BOX

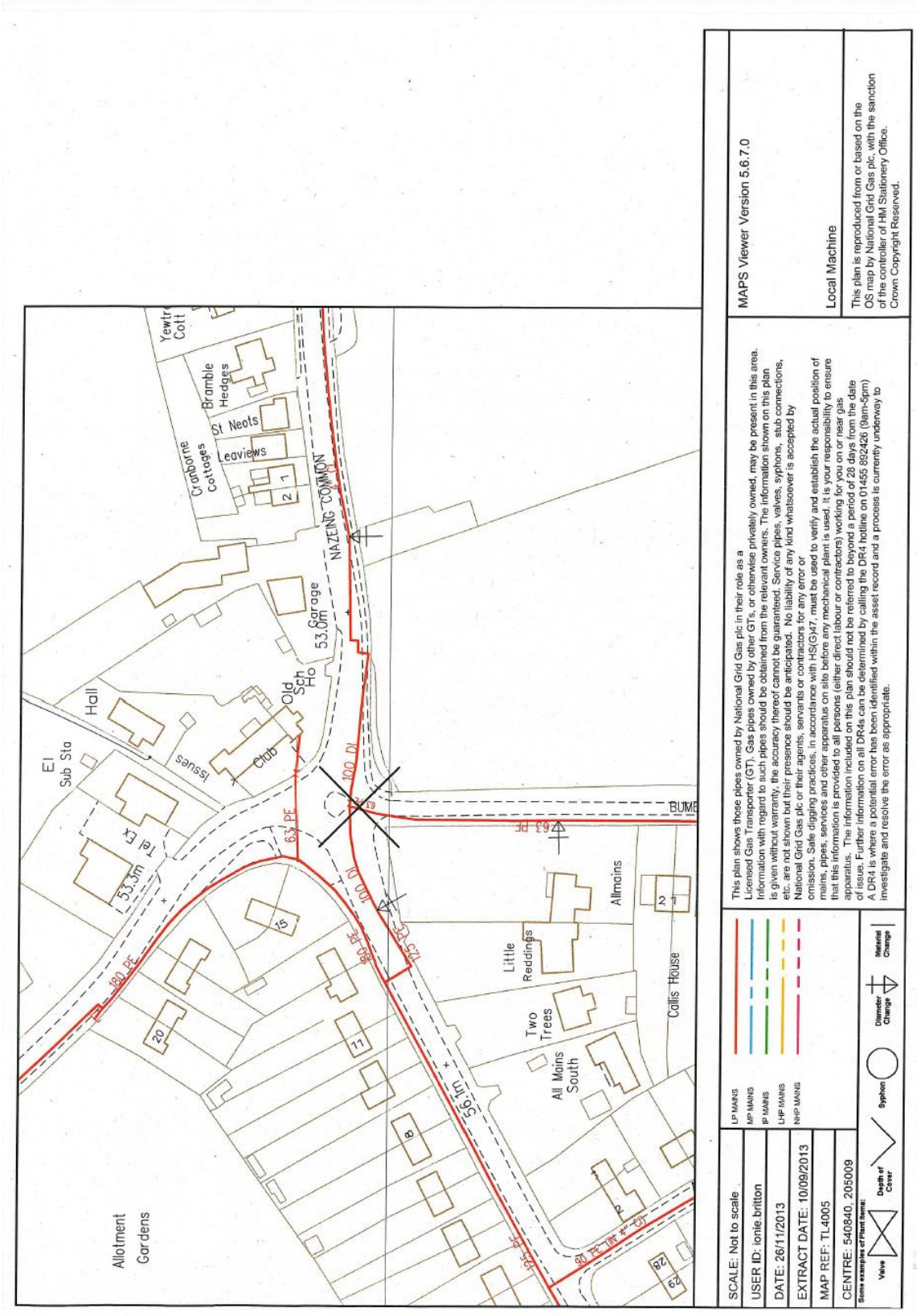
Other proposed plant is shown using dashed lines. BT symbols not listed above may be disregarded. Existing BT plant may not be recorded. Information valid at the time of preparation.

openreach
a BT Group business

BT Ref : QHA02193N
Map Reference : (centre) TL4084005009
Easting/Northing : (centre) 540840,205009
Issued : 26/11/2013 14:19:26

FOOTNOTE: WARNING IT IS ESSENTIAL THAT YOU CONTACT NATIONAL NETWORK HANDLING CENTRE BY EMAIL nnhc@openreach.co.uk BEFORE PROCEEDING WITH ANY WORK IN THE HATCHED AREA


Based upon the Ordnance Survey map by UK Power Networks PLC. by permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office. (C) 2011. Crown copyright London Power Networks Ltd. 7290590. Data has been added; all propriety rights in such data are and shall remain the exclusive property of (C) London Power Networks plc or Eastern Power Networks plc each being a distribution licensee under section 6(1)(c) of the Electricity Act 1989 for the relevant distribution services area as that term is defined in such licensee's distribution licence. All rights in such data reserved.
Title: IB EAST 1216
Cranbor Cottag
HV1a to HV1
7544
7087
Z
22
21
Pole 13
PE 4c.04Al
5c.05
NAZEING COMMON
4c.04Al off 5c.05
14
20
19
28
70 Eq off 5c.05
5c.1 to 5c.05
5c.05
27
26
Club
Sch
Ho
5c.1 off 5c.1
2 x PE 5c.1
5c.1 off 5c.1
12
13
9000
25
9
10
18
17
5c.1 off 5c.1
1300
16
8900
1·706ha
4·22
7594
5·763ha
14·24
Pond
12
The Chalet
Yo Trees
outh
Scale: 1:500
British National Grid (mm)
Map centre: (540840000.000, 205009000.000)
N
eMap reference 'Sh5IHME8ef'
UK Power Networks Plc., Newington House, 237
Southwark Bridge Road, London. SE1 6NP.
Comments: Contents of plot menu line title_line_2
Issued on: 26/11/2013
Copyright (c) UK Power Networks. All rights reserved.


Yewtree Cott
Bramble Hedges
St Neots
Leaviews
Cranborne Cottages
NAZEING COMMON
Garage
53.0m
Old Sch Ho
Hall
El Sub Sta
sanssi
Club
Tel Ex
53.3m
100 DI
63 PE
180 PE
BUME
Allotment Gardens
Allmains
Little Reddings
Two Trees
All Mains South
Collis House
55.1m
SCALE: Not to scale
USER ID: ionie.britton
DATE: 26/11/2013
EXTRACT DATE: 10/09/2013
MAP REF: TL4005
CENTRE: 540840, 205009
LP MAINS
MP MAINS
IP MAINS
LHP MAINS
NHP MAINS
Some examples of Plant Items:
Valve
Depth of Cover
Syphon
Diameter Change
Material Change
This plan shows those pipes owned by National Grid Gas plc in their role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by National Grid Gas plc or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue. Further information on all DR4s can be determined by calling the DR4 hotline on 01455 892426 (9am-5pm) A DR4 is where a potential error has been identified within the asset record and a process is currently underway to investigate and resolve the error as appropriate.
MAPS Viewer Version 5.6.7.0
Local Machine
This plan is reproduced from or based on the OS map by National Grid Gas plc, with the sanction of the controller of HM Stationery Office. Crown Copyright Reserved.

Essex Highways

A121 Meridian Way/B194 Highbridge St, Waltham Abbey

Junction Improvement Study

March 2014

RINGWAY JACOBS
integrated expertise

Essex County Council

Document Control Sheet

Document prepared by:

Tony Fitch Senior ITS Engineer	Essex Highways County Hall, E3 Chelmsford Essex. CM11QH	**T** **E** **W**	01245 342790 tony.fitch@essexhighways.org www.essex.gov.uk/highways

Report Title	A121 Meridian Way/Highbridge St Junction Improvement Study
Project Number	ITS0035
Status	Final
Revision	-
Control Date	21/3/14

Record of Issue

Issue	Status	Author	Date	Check	Date	Authorised	Date
1	Draft	ADF	19/2/14	SMR	3/3/14	-	-
2	Final	ADF	21/3/14	SMR	28/3/14	31/3/14	LS

Distribution

Organisation	Contact	Number of Copies
Essex County Council	Jon Simmons	1
Essex Highways	Gary Webster	1

Contents

Tables

Figures

Executive Summary

This feasibility study investigates if recommendations made in a Casualty Reduction (CR) report following a high incidence of collisions at the junction can be carried forward to the implementation stage.

The collision pattern identified indicates that vehicles entering the junction from Meridian Way are in conflict with vehicles which have right of way from Station Road and may indicate a combination of incorrect lane choice and misinterpretation of the signals. The current signal arrangement is a result of improvements made to the junction in 2009 to address safety and efficiency concerns highlighted in a previous CR investigation undertaken in 2008.

The study identifies a number of possible options for amendment to the signals on the Meridian Way approach and evaluates which of these options are likely to provide the greatest benefit with regard to enhanced safety and minimal impact on congestion.

The measure believed to give the most benefit in addressing the findings of the CR report is to provide a filter green arrow signal for the Meridian Way approach, which would return to the signalling method previously in place before the 2009 improvement scheme. This measure, if implemented alongside remedial measures to signing and white line markings recommended in the CR report, would help to enhance drivers' understanding of the junction and aid correct lane choice and compliance with the signals.

A cost estimate for the recommended measures is included in Section 4 of this study.

In addition two further junction improvement measures have been assessed following feedback from the Local Highways Panel. These measures are the improvement of facilities for right turners from Highbridge Street to Beaulieu Drive and investigation into linking the signals with Hertfordshire CC's adjacent signals on Station Road to reduce congestion. Cost estimates for these measures is also included in Section 4.

Introduction

Essex Highways has been commissioned by the Local Highways Panel for Epping Forest District to investigate improvements to the existing traffic signal controlled junction at A121 Meridian Way/B194 Highbridge Street/A121 Station Road/Beaulieu Drive in Waltham Abbey.

A 2013/14 Casualty Reduction (CR) Site Investigation Report identified a pattern of vehicle collisions at the junction and has recommended a number of remedial measures, including further investigation of the signal layout and operation to address this problem.

This report investigates possible measures to mitigate the occurrence of collisions, including modifications to the signal operation and implementation of other recommended actions in the CR Report.

1. Scheme Background

1.1 Site description

The site is a 4-arm traffic signal controlled junction between A121 Meridian Way, B194 Highbridge Street, A121 Station Road and Beaulieu Drive in Waltham Abbey.

A121 Meridian Way forms part of a southern bypass route to Waltham Abbey town centre and links to M25 Junction 26 to the east. A121 Station Road and B194 Highbridge Street provide an east/west link between Waltham Abbey town centre and Waltham Cross to the west. Beaulieu Drive is a predominantly residential access road and also provides access to the Royal Gunpowder Mills tourist attraction.

All junction approaches are subject to a 40mph speed limit.

Figure 1: Aerial photograph of the junction. A121 Meridian Way approach is in the foreground

In peak periods the heaviest traffic movements are the east-west and west-east movements between A121 Station Road and B194 Highbridge Street and turning movements in both directions between A121 Station Road and A121 Meridian Way.

The junction is also impacted by traffic movements associated with a small retail area and fast food drive-in restaurant located on the southwest corner with vehicle access from A121 Meridian Way approximately 30m from the traffic signal stop line.

The traffic signals operate under the 'MOVA' real-time adaptive control system which allows the signal timings to respond to real-time changes in traffic flow. MOVA is widely regarded as the industry-standard signal control method to best maximise traffic flow and manage delays at isolated junctions.

1.2 Site modification history

Traffic signals were installed at the junction in 1999 as part of the construction of A121 Meridian Way. The current signal layout and operation dates from 2009 when the junction was modified under a previous Casualty Reduction scheme.

The specific safety problem identified was a high incidence of collisions involving vehicles turning right from Station Road to Meridian Way across the path of oncoming vehicles. Improvements to the junction under this scheme included amending the Station Road right turn to be controlled by a full red/amber/green arrow phase with exclusive right of way; separating Meridian Way and Beaulieu Drive to run in separate stages (to remove right turn conflicts) and provision of MOVA adaptive control to improve efficiency.

A further amendment to the signals in the 2009 scheme was to replace the filter green arrow signal for Meridian Way left turning traffic with a fully signalled left turn phase with red/amber/left turn green arrow signal aspects. This amendment was not identified in the 2008 CR report recommendations and it is believed this was introduced alongside the use of MOVA control to increase the efficiency of the left turn movement.

In October 2013 the secondary signals for Meridian Way were relocated following two separate vehicle collisions in the previous six months with the signal pole on which these signals were located (further details are given in Section 2.2).

2. Identified Issues and Improvement Options

2.1 Casualty Reduction report

A Casualty Reduction (CR) site investigation was carried out at the junction in 2013 as a result of 14 Personal Injury Collisions having occurred during the four year period from 01/04/2009 to 31/03/13. The investigation identified a pattern of collisions involving drivers travelling from A121 Meridian Way disobeying the signals and colliding with other vehicles entering the junction from A121 Station Road.

The CR report makes recommendations for further assessment of the signals operation and layout to mitigate the recorded collision pattern, which is the subject of this study.

A number of further recommendations were made to amend signing and road markings on the Meridian Way approach to the signals to enhance correct driver behaviour and lane choice. The report recommends the signing and road marking amendments are implemented along with appropriate amendments to the signals. Full details of these amendments can be found in Section 2.7.

Full details of this site investigation can be found in the CR site investigation report in Appendix A.

2.2 Assessment of current signal operation

As part of the improvements carried out in 2009 the signals controlling Meridian Way were amended so that the left turn lane (to Station Road) is controlled by separate signals to the ahead/right turn lane (to Beaulieu Drive and Highbridge Street).

The primary signals (close to the stop line) currently have red/amber/green arrow aspects adjacent to each lane with left or ahead/right green arrows as appropriate. During the investigation period covered in the CR report detailed above the secondary signal heads controlling both lanes were located on the pedestrian refuge island at Beaulieu Drive directly opposite the Meridian Way approach. The signals for each lane do not always show green at the same time and it is possible that collisions may be occurring because drivers are misinterpreting which signal applies to the lane they are using.

NB. In October 2013 the secondary signals for the Meridian Way traffic movements were relocated from the side-by-side arrangement on Pole 11 (on the pedestrian refuge island) following two separate vehicle collisions with this pole between March and September 2013. The secondary signal for the left turn lane is now located on Pole 9 (left hand side of Beaulieu Drive) and that for the ahead

and right turn lane on Pole 12 (right hand side of Beaulieu Drive). This was carried out as a temporary measure to mitigate possible damage to the signal equipment in the event of further collisions pending the outcome of this study.

A related possibility is that drivers are incorrectly selecting the left turn lane to go ahead to Beaulieu Drive. The junction layout is such that the left turn lane on Meridian Way is in line with the exit to Beaulieu Drive and this could contribute to drivers thinking this is the correct lane for this ahead movement. When the left turn lane is first at green in the cycle the adjacent ahead/right turn lane is still at red. Drivers attempting to go ahead to Beaulieu Drive from the left turn lane would be in conflict with vehicles proceeding from Station Road who have right of way during this stage (see Figure 2).

Figure 2: Meridian Way left turn traffic is at green at the same time as Station Way traffic. Note that signal for the ahead/right turn lane is still at red and drivers wishing to proceed ahead to Beaulieu Drive must wait for the green signal.

It should be stressed that the above assessment is a based on an interpretation of possible driver behaviour based on the current signal layout. The CR report does not provide any statements from car occupants or witnesses for any of the recorded collisions to provide confirmation of actual events.

Based on the findings and recommendations of the CR report consideration has been given to engineering measures on Meridian Way approach to enhance correct lane choice by drivers approaching the signals. Whilst improving safety is

the major objective of this study, any remedial measures implemented must have due regard to maintaining efficiency for all road users, particularly during peak times when the junction becomes heavily congested.

The CR report recommends that any amendments to the signalling are assessed using LinSig software to identify the impact on congestion. This has been undertaken for the improvement options below where this would result in changes to signal phasing and timings.

2.3 Option 1: Provide left turn filter against red signal

This option proposes to remove the separate signals for each lane (Figure 2) and return to the left turn filter signal arrangement as was previously in operation before the 2009 junction improvements detailed in Section 1.2.

The use of a filter signal arrangement would permit vehicles to turn left from Meridian Way to Station Road whilst the ahead/right turn lane is held at red. Station Road traffic would continue to run with the left turn movement as at present.

Figure 3: Meridian Way approach showing left turn filter green arrows (circled in red) before 2009 improvements

When the filter signals were previously installed (prior to the 2009 improvement) there were no recorded personal injury collisions following the pattern of those recorded in the period 01/04/2009 to 31/03/13. It is considered that returning to

the filter signal arrangement may help to reduce the instances of vehicles misreading the signals. In addition it is recommended that signing and road marking improvements detailed in section 2.7 are also implemented to reinforce correct driver lane choice.

In this option the existing green arrow aspects for both lanes would be replaced with full green aspects. As shown in Figure 3 the left turn filter arrow would be mounted next to the full green aspect on the signal head to the left of the stop line. As detailed in section 2.2, the secondary signals have been relocated from the centre island to poles on the left and right hand sides of Beaulieu Drive where they will be less vulnerable to vehicle collisions. It is proposed that the secondary signals remain on these poles. A left turn filter arrow would be located on the left hand head next to the full green aspect. The right hand head would require an indicative green arrow next to the full green aspect to reinforce to drivers that they can turn right unopposed.

NB. When the left turn filter signal arrangement shown in Figure 3 was previously used before 2009 both Meridian Way and Beaulieu Drive traffic ran together in the same stage. Right turning traffic on both arms would have to give way to oncoming traffic. These two arms have run at green in separate stages since the 2009 improvements.

This option has been assessed using LinSig software. This assessment indicates that replacing the existing left turn signals with filter signals would have no adverse impact on congestion.

2.4 Option 2: Convert nearside traffic lane to ahead/left movements

The CR report has identified possible driver confusion resulting from the current lane destination arrow and signal arrangement for Meridian Way as a possible cause of collisions and has recommended assessment of the following measures:

- Convert A121 Meridian Way nearside traffic lane to ahead and left movements
- Remove Meridian Way left turn movement from running at the same time as Station Road movements

In this option both Meridian Way traffic lanes would be green at the same time, with all other traffic movements including Station Road, at red. This would allow the current Meridian Way left turn lane to be designated as ahead and left to permit drivers to use this lane to go ahead to Beaulieu Drive without conflicting with Station Road traffic.

Whilst this solution is ideal in safety terms, junction capacity modelling using LinSig software indicates that the loss of green time to Meridian Way left turning

traffic by preventing this movement from running with Station Road would impact unacceptably on junction capacity. This left turn flow is very heavy in both weekday peak periods and the measures in this option would result in greatly increased queue lengths and delays on Meridian Way (see Table 1).

Given the severe impact on junction capacity that would result, this measure is not recommended as a suitable option for remedial action.

2.5 Option 3: Relocate secondary signals to same side of approach

In this option it is proposed that the Meridian Way secondary signals, currently on the far side of the junction, are relocated to the Meridian Way side of the junction close to waiting drivers. This arrangement is referred to as closely-associated secondary signals. The secondary signal for each lane would be placed a few metres ahead of the existing primary signal as shown in the example in Figure 4.

Figure 4 : Example of closely-associated secondary signals on a junction approach

This would have the effect of physically separating the signals for each lane to minimise any misinterpretation by drivers reacting to the 'wrong' signal. In each lane drivers would have a clear view of the signals intended for the lane they are using with potential distraction by the signals for the other lane kept to a minimum.

As this option would not change the existing signal phasing or timings there would be no impact on junction capacity and congestion and for this reason it is not necessary to carry out further assessment using LinSig software.

To be effective the relocation of the secondary signals would need to be undertaken with the signing and road marking improvements detailed in section 2.7 below to enhance correct driver lane choice.

2.6 LinSig junction capacity assessment summary

Table 1 summarises the junction capacity assessment of the proposed improvement options undertaken using LinSig software. For comparison purposes all options have been assessed against existing junction operation.

Traffic flow data used in the LinSig assessments dates from 2008 and was originally used for capacity assessment during design of the improvements implemented in 2009 and described in Section 1.2. Whilst these flows are more than 5 years old they are suitable to allow the *relative* impacts of the different options detailed above to be assessed.

It should be noted that the junction is currently overcapacity as indicated by the negative Practical Reserve Capacity (PRC) values shown in Table 1. In addition queue lengths in passenger car units (pcu - where 1 pcu = 1 car) are shown for the Meridian Way left turn lane. These values are indicative only but provide base values against which the relative impacts of proposed improvements can be measured.

As can be seen Options 1 and 3 do not impact on existing capacity, however the measures detailed in Option 2 would significantly reduce capacity with a corresponding increase in queuing and congestion.

Table 1: Summary of impact of Options on junction capacity

	Existing Operation		**Option 1** Left turn filter signal		**Option 2** Nearside lane ahead/ left		**Option 3** Relocate secondary signals	
AM Peak	Q Length (pcu)	63	Q Length (pcu)	No change	Q Length (pcu)	184	Q Length (pcu)	No change
	PRC (%)	-60%	PRC (%)	No change	PRC (%)	-108%	PRC (%)	No change
PM Peak	Q Length (pcu)	13	Q Length (pcu)	No change	Q Length (pcu)	107	Q Length (pcu)	No change
	PRC (%)	-49%	PRC (%)	No change	PRC (%)	-77%	PRC (%)	No change

2.7 Improvements to road signs and markings

The recommendations in the CR report also include measures to amend existing signing and road markings, primarily on Meridian Way approaching the junction, to ensure it is clear to a driver which is the correct lane for their destination.

These measures are detailed in the CR Report but in summary these are:-

- Add details of retail park to advance direction sign on Meridian Way approach
- Provide a traffic lanes direction sign on Meridian Way approach to indicate correct lane for each turning movement
- Provide 'Turn Left' and left directional arrow road markings in the Meridian Way left turn lane between the retail park and stop line
- Replace existing bifurcation arrow with a 'reversed' arrow that better reflects the junction layout (see Figure 5)
- Refresh all other worn markings throughout the junction and on approaches

These measures are shown on the drawing in Appendix B.

Figure 5: Meridian Way approach showing bifurcation arrow at start of lanes. Arrow to be reversed to indicate 'ahead' direction is via right hand lane

2.8 Further junction improvements

In addition to the above improvements two further concerns have been raised by the Local Highways Panel regarding the junction operation, difficulties for drivers wishing to turn right from Highbridge Street into Beaulieu Drive; and linking between the junction signals and the signalised junction to the west (A121 Station Road/Lea Road, for which Hertfordshire County Council are the highway authority.

2.9 Highbridge Street right turn facility

Vehicles turning right from Highbridge Street into Beaulieu Drive do not have exclusive right of way and have to wait to turn in gaps or for the oncoming traffic from Station Road to stop at red. Road markings are provided in the centre of the junction to guide right turning traffic, however these are now severely worn. These markings were laid out to provide a 'hooking' right turn arrangement with right turn traffic from Station Road and were originally employed before the 2009 junction improvements, when Station Road right turners had to wait in the junction for gaps in the opposing flow. This layout provides space for only one car turning right into Beaulieu Drive to wait in the centre of the junction in line with the traffic island. It is understood that drivers wishing to turn right into Beaulieu Drive find this layout difficult to use, although there is no indication from the Personal Injury Collision data of any safety issues with the current arrangement.

An 'all red' clearance stage was provided in the 2009 improvements to allow vehicles waiting to turn right into Beaulieu Drive to clear the junction with all other traffic movements stopped at red. The clearance stage is called by a loop in the centre of the junction, however it appears this loop may no longer be working as intended, particularly as the worn road markings make it difficult for drivers turning right to be positioned over the loop.

It is suggested that to alleviate this problem the markings in the centre of the junction are modified to allow right turning vehicles from Highbridge Street to wait clear of through traffic movements and the path taken by vehicles turning right from Station Road to Meridian Way. As part of the 2009 improvements the right turn from Station Road was changed to a fully signalled phase and these vehicles no longer wait in the centre of the junction to turn and so do not need give-way type markings. It should be possible to provide greater storage space for vehicles waiting to turn into Beaulieu Drive with the All Red clearance loop repositioned accordingly to ensure reliable demand of the all red clearance stage.

The proposed changes to the road marking for right turning vehicles and the repositioned 'all red stage' loop are shown on the drawing in Appendix C.

2.10 Coordination with Hertfordshire CC signal junction

The efficiency of traffic leaving the junction on the A121 towards Waltham Cross can be affected by downstream traffic congestion, resulting in periods when green time is not fully used and leads to queuing on the junction approaches. This has mainly been observed to occur during the weekday AM peak period and affects both the A121 Meridian Way and B194 Highbridge Street arms which experience the heaviest traffic flows at this time.

Observations confirm that the major source of this 'exit blocking' problem is traffic being stopped at the signal junction of A121 Station Road and Lea Road situated some 200m west of the Highbridge Street junction. This junction is operated by Hertfordshire County Council and therefore operates independently of the Highbridge Street signals. This results in the green period of the Lea Road signals being uncoordinated with the green periods of the major traffic movements at the Highbridge Street junction.

It may be possible to improve the coordination between the two junctions by linking the signal controllers via a cable to provide 'Linked MOVA' operation. This would require the cooperation of Herts CC and would require them to fund modifications to their signal equipment to set up this facility. It is understood that the Lea Road junction is equipped for MOVA control although it is not known whether this is operating at present.

There some 'history' regarding linking of the signals between the two junctions. When the Highbridge Street junction was improved in 2009 some additional cable ducting was installed across A121 Station Road to the east of the river bridge and close to the end point of the cable ducting system for the Lea Road signals. It is believed this was to facilitate a connection between the two junctions, however it is not currently known if the two duct systems were joined together at this time. In 2012 the Olympic Delivery Authority (ODA) investigated with ECC and Herts CC the possibility of linking the two junctions to maximise efficient working during events at the Lee Valley White Water Centre during the Games. It was proposed to provide the cable linking described above which would have remained as a permanent facility, however this was not progressed and the ODA instead funded the manual control of both junctions during the events.

Further investigation would be needed to determine the extent of works necessary to install the Linked MOVA facility and whether Herts CC would be prepared to fund and carry out the necessary works to their signal equipment.

3. Conclusions and recommendations

3.1 Conclusions

Option 1 to restore the left turn filter operation on Meridian Way was previously used to control left turns prior to the 2009 junction improvements. The 2008 CR report, which formed the basis of these improvements, did not identify a personal injury collision problem related to Meridian Way ahead movements at the time the filter signal was operating. The filter operation would not impact on congestion on Meridian Way or other junction arms. It is therefore concluded that removing the current separate lane signals and restoring the left turn filter may reduce instances of driver confusion and incorrect lane choice if implemented with the signing measures detailed in Section 2.7.

Option 2 to convert the Meridian Way left turn lane to allow both ahead and left movements would allow drivers to proceed ahead to Beaulieu Drive from the nearside lane of Meridian Way. Whilst this measure would possibly provide the most easily understood layout for drivers on Meridian Way the loss of capacity for the left turn movement would increase congestion, particularly on Meridian Way, resulting in greatly increased queuing and vehicle delays.

Option 3 to relocate the Meridian Way secondary signals to the same side of the approach would allow the current separate lane signals to remain. The secondary signals would still be clearly visible to the drivers in the lane they are apply to but could reduce potential confusion to drivers by physically separating the secondary signals. This measure would need to be carried out together with the signing improvements in Section 2.7 to ensure maximum benefit. However, it is not certain that this option would provide the same potential safety benefits as Option 1, where the filter signals when previously used did not appear to lead to any safety concerns.

3.2 Recommendations for remedial action

It is recommended that the measures outlined in Option 1 be implemented at the junction to meet the recommendations of the CR site investigation report, together with the road signs and markings modifications detailed in Section 2.7.

In addition to the Casualty Reduction measures it is recommended that the junction improvements detailed in Sections 2.9 and 2.10 are also implemented.

Estimated costs for the recommended measures are provided in Section 4.

4. Estimate of Costs

Cost estimates for the two feasible options detailed above, Options 1 and 3 and the recommended road signing and lining improvements in Section 2.7 are provided below for comparison purposes.

i) Casualty Reduction Measures

Option 1: Provide left turn filter

To design and install traffic signal measures = £11,200

Road signs and white line marking improvements

This work is required in addition to the signal remedial works in Option 1 above. It includes the works shown on the drawing in Appendix B and also includes renewal of worn road markings throughout the junction.

To design and install signing and road markings = £3,300

Total cost for Casualty Reduction measures = £14,500

ii) Further Junction Improvements

Highbridge Street right turn facility

To design and install facility = £4,700

Investigation of coordination with Herts CC signals

To undertake investigation = £4,500

NB. The costs for the above junction improvements are on the basis that both items will be undertaken at the same time.

Total cost for Junction improvements = £9,200

Appendices

Appendix A: Casualty Reduction Site Investigation 2013/14

A121 Station Road/Meridian Way j/w B194 Highbridge Street and Beaulieu Drive

Appendix B: Proposed road markings and sign design

Drawing No. DC1808/1200/001

Appendix C: Proposed improvements to Highbridge Street right turn facility

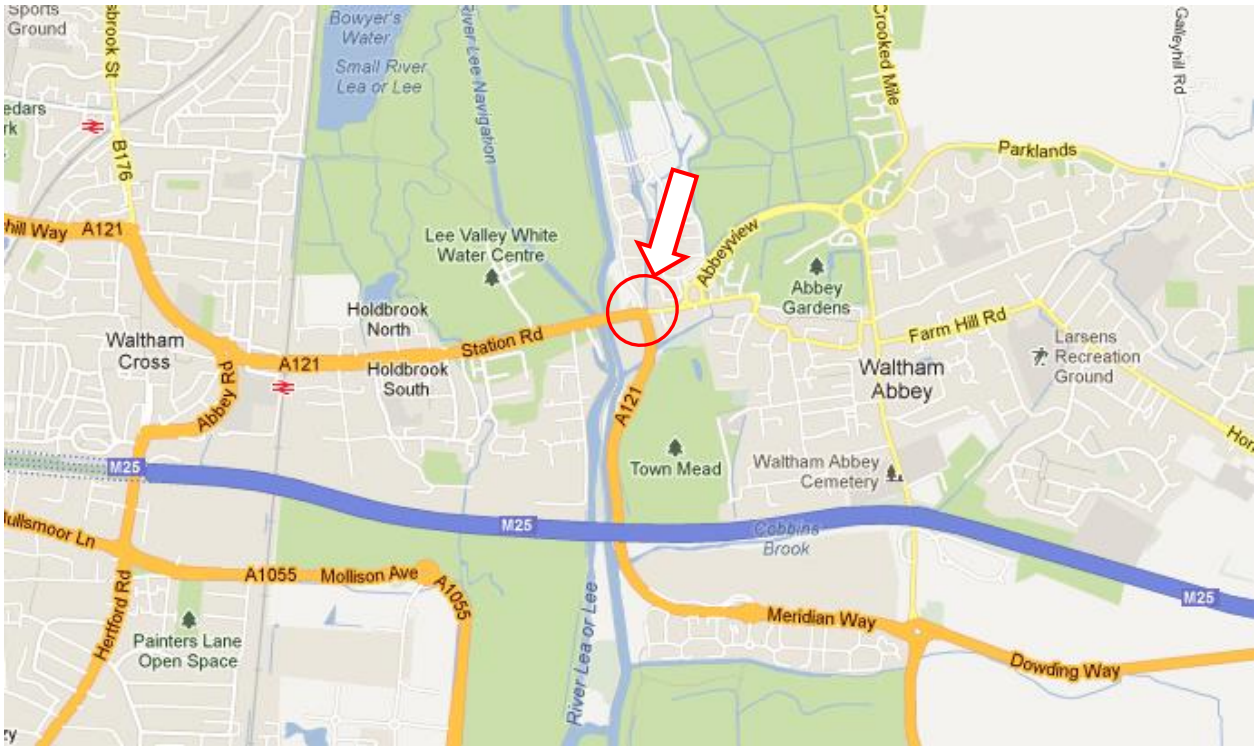
ECC Casualty Reduction Site Investigation 2013/14

Location: A121 Station Rd – Meridian Way J/w B194 Highbridge Street & Beaulieu Dr, Waltham Abbey

District: Epping

Investigation Period: 01/04/2009 to 31/03/2013 Grid Reference: 537721 200572

1.0 Site Location Plan



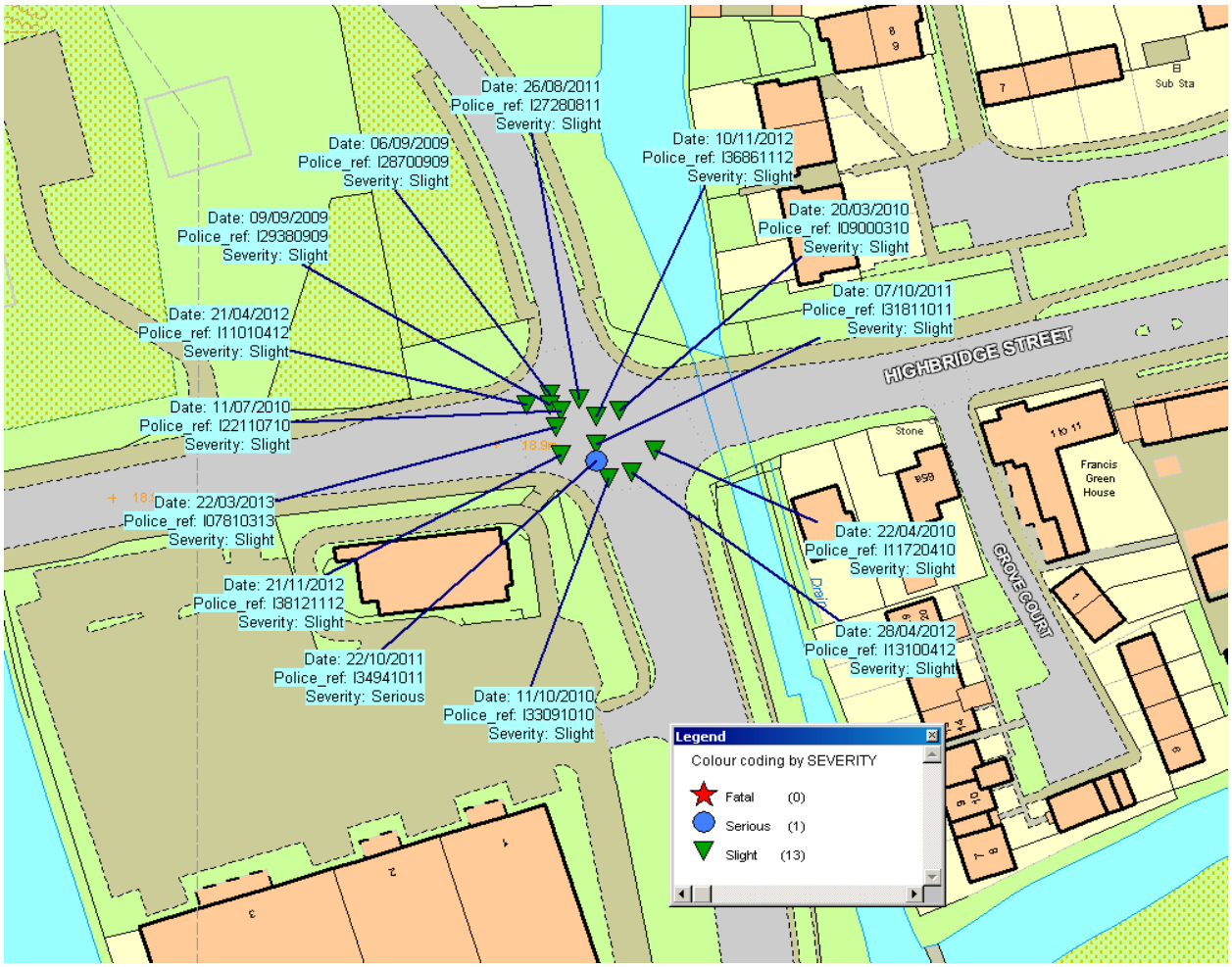
2.0 Aerial Photograph

3.0 Site Description

The site under investigation is the traffic signal controlled crossroads junction of A121 Station Rd – Meridian Way with B194 Highbridge St & Beaulieu Drive in Waltham Abbey.

All four roads are single carriageway and are subject to a 30mph speed limit at this location.

4.0 Personal Injury Collision Analysis (see AccsMap Data & attached stick diagrams)



A study of the Personal Injury Collision (PIC) data for the period from 01/04/2009 to 31/03/2013 at this location shows a pattern of collisions involving motorists travelling from A121 Meridian Way disobeying the traffic signals and colliding with other motorists, mainly motorists that were entering the junction from the A121 Station Road.

The data shows that overall there have been 14 PIC's at this location, 1 Serious and 13 Slight, resulting in 1 Serious and 17 Slight casualties.

42% of the PIC's occurred on a 'Wet/Damp' road surface and 50% occurred during the hours of darkness.

7% of the PIC's involved powered two wheelers.

*** It should be noted that the latest Department for Transport (DfT) guidance predicts that approximately 17.7 'Damage only' collisions occur in urban environments for every Personal Injury Collision that is recorded.***

Based on this guidance it is predicted that in the region of 250 collisions may have actually occurred at this junction over the four year investigation period.

5.0 Site Observations

5.1 During numerous site visits and numerous drives through the site travelling in all directions it was observed that the junction gets congested throughout the day. Numerous larger vehicles such as HGVs, LGVs, buses and coaches were observed to be travelling through the junction throughout the day.

Photo 1 – Junction can get congested throughout the day.

5.2 The operation of the junction is also impacted by the presence of a small retail park area and a fast food restaurant all located to the south-western corner of the junction with the vehicle access to both located less than 50m away from the traffic signals on the southern arm (A121 Meridian Way).

5.3 This junction has been controlled by traffic signals for a number of years and was subject to a traffic signals upgrade scheme in March 2009. The traffic signals were upgraded to a Microprocessor Optimised Vehicle Actuation (MOVA) system. MOVA is a proactive self-optimising control system for Traffic Signals where the signal phases are adjusted to suit prevailing traffic conditions to minimise congestion.

5.4 It was observed that the junction has an unusual layout. On the A121 Meridian Way northbound approach to the junction the nearside traffic lane that is directly in-line with the opposing Beaulieu Drive is assigned as a 'left turn only' lane and is subject to its own left turn filter traffic light phase. The offside traffic lane that does not line up with the opposing Beaulieu Drive is assigned as an 'ahead or right turn' lane and is controlled by a full green and accompanying right turn arrow light. It is believe that this unusual arrangement may be leading to confusion for northbound motorists resulting in them travelling straight ahead from either the nearside or offside traffic lane when the traffic signals indicate a green 'left turn only' filter arrow.

Photo 2 – Different traffic signals relate to the nearside and offside traffic lanes.

5.5 It was observed that it may not be completely clear to motorists which lane they should be in to travel in each direction as they approach the traffic signals on the A121 Meridian Way northbound approach. The presence of the vehicle access to the small retail park area and a fast food restaurant located to the left hand side just prior to the junction.


Photo 3 – Left turn arrow markings just prior to the vehicle access to the small retail park area and a fast food restaurant may mislead motorists into using the wrong traffic lane at the junction.

5.6 There is a large advanced directional sign present on the A121 Meridian Way northbound approach but it does not indicate the presence of the retail park.

5.7 The arrangement of the existing bifurcation arrow may also mislead motorists into thinking that they should be in the nearside traffic lane to go straight ahead.

5.8 It was observed that some of the stop lines, directional arrow markings and other road markings throughout the junction are partially worn.

Photo 4 – Advanced directional sign on A121 Meridian Way northbound approach. Also shows worn directional arrow markings.

6.0 Recommendations

Following the site inspection and an analysis of the previous Personal Injury Collisions, it is recommended that the following measures are undertaken:

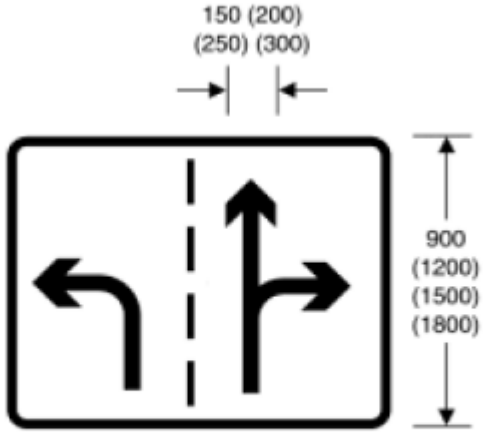
6.1 Assess the Linsig traffic signals modelling data to identify the impact on congestion of possible changes to signal phases and layout. (E.g. Convert nearside traffic lane on A121 Meridian Way northbound approach to be ahead and left)

6.2 Subject to the result of the assessment implement the most suitable changes, if any.

6.3 If changes to the signal phases and layout are deemed to be un-suitable then investigate possible options for relocation of traffic signal heads on this approach to reduce confusion for approaching motorists.

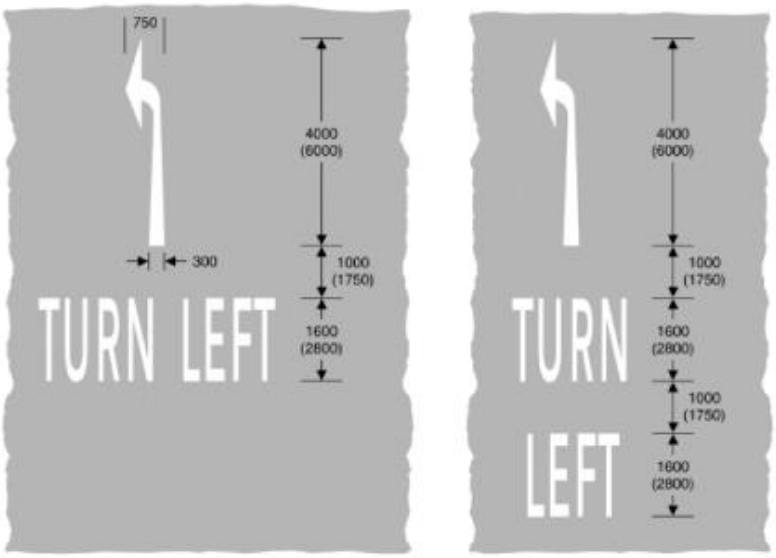
6.4 Add details of the retail park located to the left hand side just prior to the junction to the large advanced directional sign (New sign plate – existing one has graffiti present anyway).

6.5 Provide a traffic lanes directional sign to TSRGD dia.877 on the A121 Meridian Way northbound approach to junction to reflect the road layout (Design dependant on signal phases and layout). Ensure that the sign is located just north of the vehicle access to the retail park to avoid any confusion. Signs will need to be mounted at least 2.3m above the footway and sign posts located to impair visibility splays for motorists exiting the retail park.



877
Appropriate traffic lanes for different manoeuvres at a junction ahead
(Alternative types)

6.6 Subject to the signal phases and layout being altered, provide two sets of 'Left turn' directional arrow markings and text to TSRGD dia.1036.1 to the nearside traffic lane between the entrance to the retail park and the stop lines at the junction to re-enforce the message that motorists in this lane must turn left.



1036.1
Vehicular traffic must turn left
(Alternative types)

6.7 Subject to the signal phases and layout being altered, replace the existing misleading bifurcation arrow with one that better reflects the junction layout (I.e. Bifurcation to the left).

6.8 Refresh all other worn road markings throughout the junction and on approaches.

First Year Rate of Return (FYRR) Calculation

% FYRR = Annual Accident Savings x 100
Scheme Cost

Assumptions:

Average annual accident cost (£)	£104,720.00	(TAG 3.4.1)
Accidents treated	14	
Casualties treated	18	
Investigation time period (years)	4	

Estimated cost of recommended remedial measures (including Design, Audit and Traffic Management)

As per recommendations in Section 6	£20,000.00
	£20,000.00

Accident saving produced by proposed treatment (%)	42

%FYRR 770

Number of accidents that would not have occurred had the remedial actions been implemented at the start of the five-year accident period

5.88 or 1.47 each year

Number of casualties that would not have occurred had the remedial actions been implemented at the start of the five-year accident period

7.56 or 1.89 each year

8.0 Scheme Approval & Authorisation

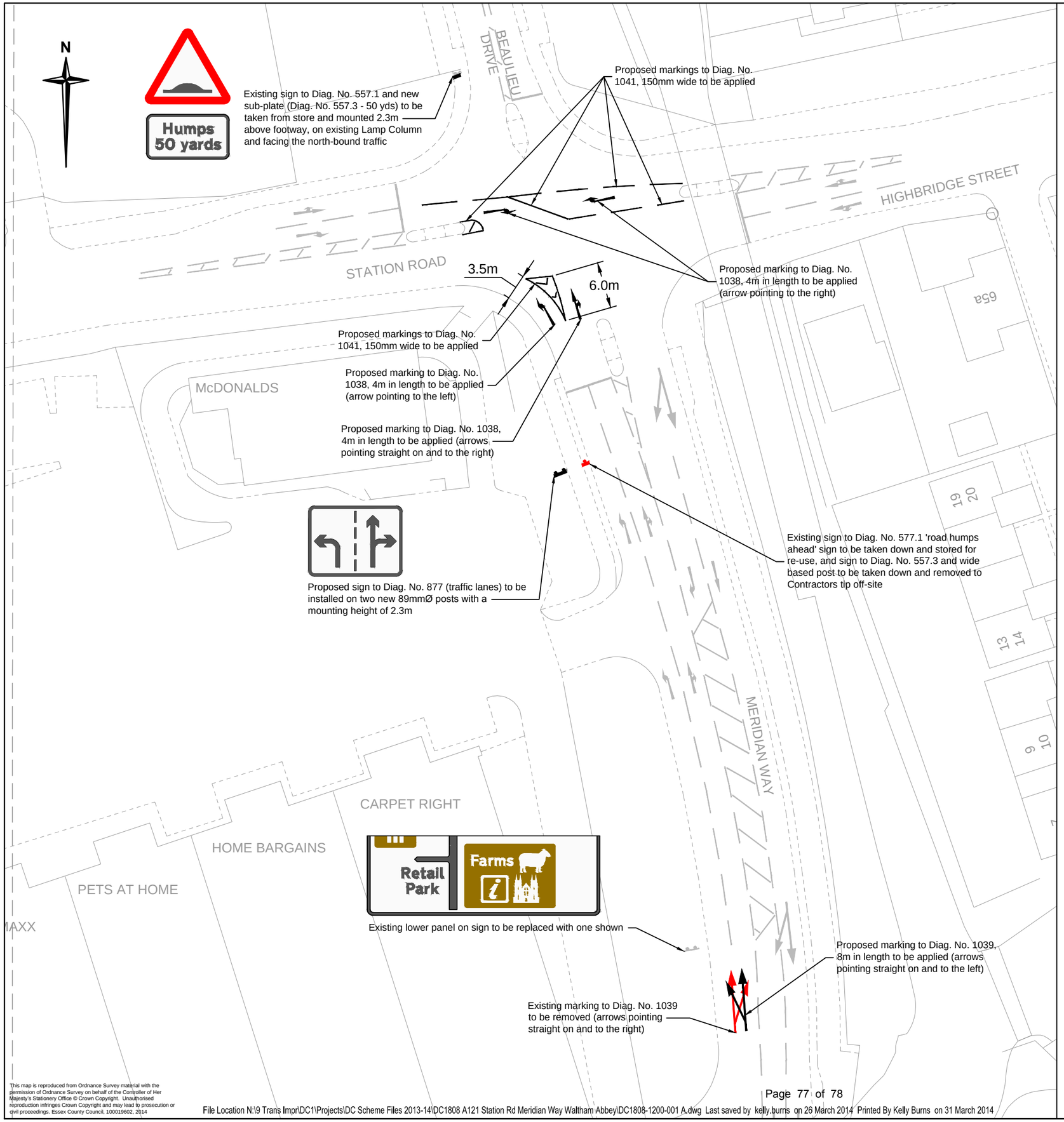
Approvals			
Name/role	**Tel No.**	**Signature**	**Date**
Lead Safety Engineer: Gary Webster	*01245 437257*		
Safety Engineering Manager: Nicola Foster	*01245 437146*		

Discussed/Agreed with Area Contact			
Name/role	**Tel No.**	**Signature**	**Date**
Senior Design Engineer: Matthew Lambert	*01268 297529*		

Financial Authorisation Code	Date of Authorisation

Contacts	
Name/role	**Address and/or Tel No.**
Essex Police Representative:	
County Councillor:	
Other:	

Comments



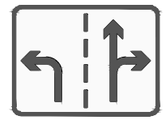
Panel x-height: to be determined
Background colour: WHITE
Border colour: BLACK
Text colour: BLACK
Material Class: as existing
Width: subject to x-height
Height: subject to x-height
Area: subject to x-height

Mounting Height: as existing

Sign Diag. No. 557.1 (existing)

Sign Diag. No. 557.23
Text colour BLACK
Background colour WHITE
Border colour BLACK
Material Class: Class RA2 (12899-1:2007)
Width 530mm
Height 290mm
Area 0.15sq.m

Mounting Height 2300mm
Post No. 1 (existing Lamp Column)



Sign x-height: 100mm
Background colour: WHITE
Border colour: BLACK
Material Class: Class RA2 (12899-1:2007)
Width: 1200mm
Height: 900mm
Area: 1.08sq.m

Mounting Height: 2300mm
Post No.: 2
Post Type: 3.2x89.0CHS

Notes

1. Do not scale. This drawing is to be read in conjunction with all other contract drawings and documents.
2. All works to be in accordance with the Department for Transport's Specification for Highway Works and Essex County Council Specifications and Standard Construction Drawings.
3. All traffic signs and lines are to comply with The Traffic Signs Regulations and General Directions 2002. Markings are to be white thermoplastic screed with applied solid glass beads unless otherwise stated.
4. The Contractor is responsible for the removal of all existing road markings affected by the works. The Contractor shall obtain the Engineer's approval to his proposed method of removing existing markings and shall not remove any existing markings without the prior approval of the Engineer.
5. All existing signs to be retained unless stated otherwise. Existing signs to be cleaned and any overhanging trees or bushes to be lopped or trimmed to maintain proper visibility to signs. Any defects to existing signs and/or posts noted by the Contractor during the works to be reported to the Engineer.

Key

- Existing white lines/markings (to remain)
- Existing white lines/markings (to be removed)
- Proposed white lines/markings
- Existing sign and posts
- Existing signs (to be taken down)
- Proposed sign
- Existing Lamp Column

REV.	DATE	AMENDMENT DESCRIPTION	DRAWN	CHECKED
A	03/13	Right turn lanes added to junction	KMB	BSE

DRAWING STATUS

FEASIBILITY DESIGN

Essex Highways

Ringway Jacobs working in partnership with Essex County Council

Mark Rowe, Service Director, Essex Highways
County Hall, Chelmsford. CM1 1QH
Tel: 0845 6037631

SCHEME TITLE

A121 STATION ROAD MERIDIAN WAY, WALTHAM ABBEY JUNCTION IMPROVEMENT
FEASIBILITY

DRAWING TITLE

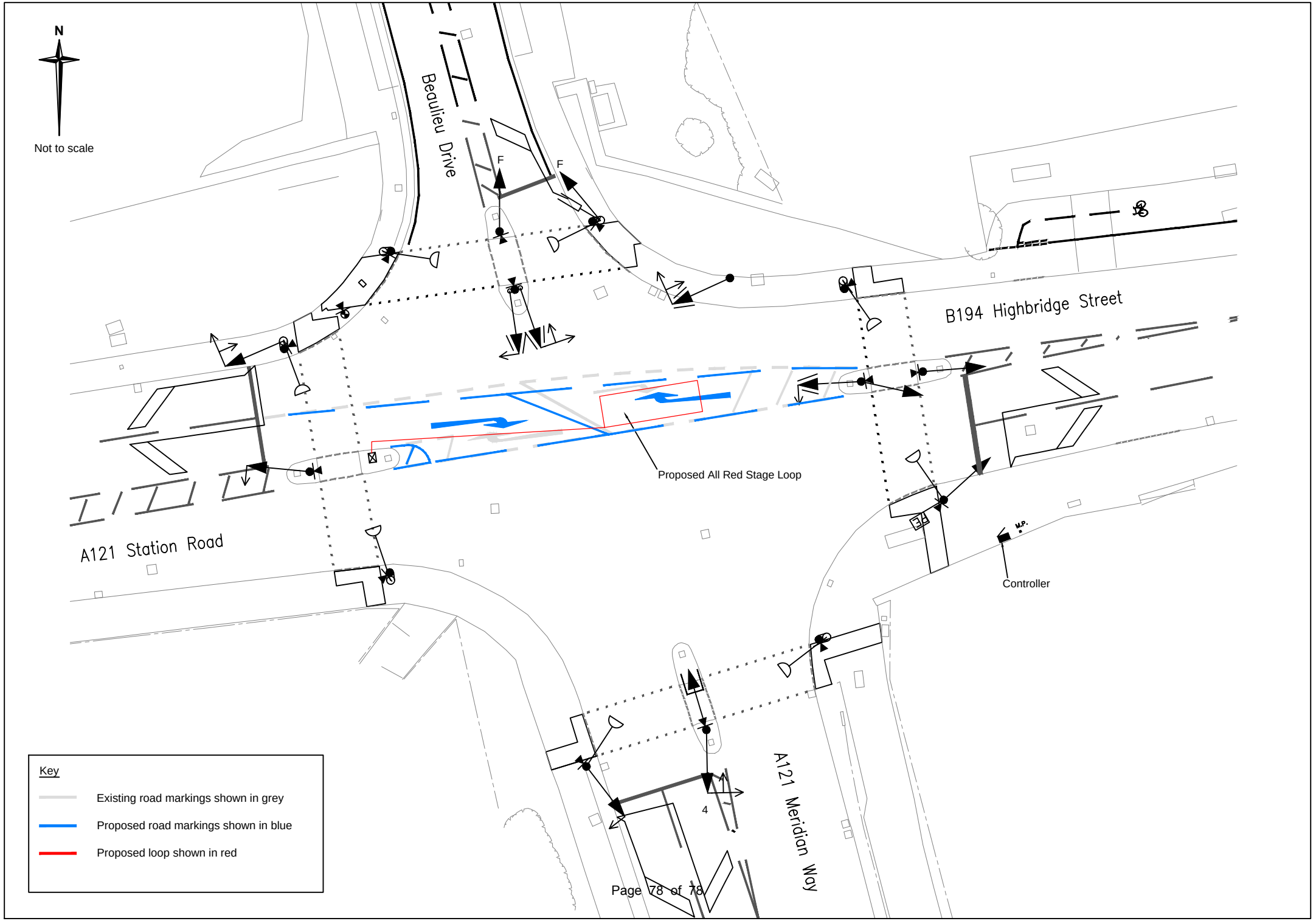
PROPOSED ROAD MARKINGS AND SIGN

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
KMB	KMB	BSE	BSE	ML
DATE	DATE	DATE	DATE	DATE
FEB 14	FEB 14	FEB 14	FEB 14	21/02/14

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES
SCALE AT A3 (420x297mm): 1:500

DRAWING No.: **DC1808/1200/001**
REV.: **A**

File Location N:\9 Trans Impr\DC1\Projects\DC Scheme Files 2013-14\DC1808 A121 Station Rd Meridian Way Waltham Abbey\DC1808-1200-001 A.dwg Last saved by kelly.burns on 26 March 2014 Printed By Kelly Burns on 31 March 2014


N
Not to scale
Beaulieu Drive
F
F
B194 Highbridge Street
Proposed All Red Stage Loop
A121 Station Road
M.P.
Controller
A121 Meridian Way
4
Key
Existing road markings shown in grey
Proposed road markings shown in blue
Proposed loop shown in red