

**Stroud Local Plan Capacity  
Assessment  
Final Report**  
Stroud District Council

December 2014

**ATKINS**

**Plan Design Enable**

# Notice

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# 1. Introduction

## 1.1. Background

This Local Plan Junction Capacity Assessment has been prepared to form part of the Local Plan evidence base and inform the Infrastructure Development Plan. It follows on from the Stroud District Council Local Development Plan – Draft Transport Impact Assessment prepared by Atkins in March 2014. The purpose of the previous report was to estimate the impact of the traffic generated by major developments within the emerging Stroud Local Plan at key highway junctions within the district. The scope of this report was increased to consider additional junctions and to assess the junction capacity.

Core Policy CP13 (Demand Management and Sustainable Travel Measures) of the Stroud District Draft Local Plan states that Stroud District Council (SDC) will mitigate any significant adverse effects upon the transport network that arise from the development proposed – through development management and by committing to improving the existing infrastructure. This report considers the significance of the development impact and identifies mitigation measures required.

Figure 1-1 shows the Strategic Growth and Development Locations from the Development Strategy for Stroud (Stroud District Draft Local Plan).

**Figure 1-1 Stroud Development Strategy: Locations for Strategic Growth and Development**

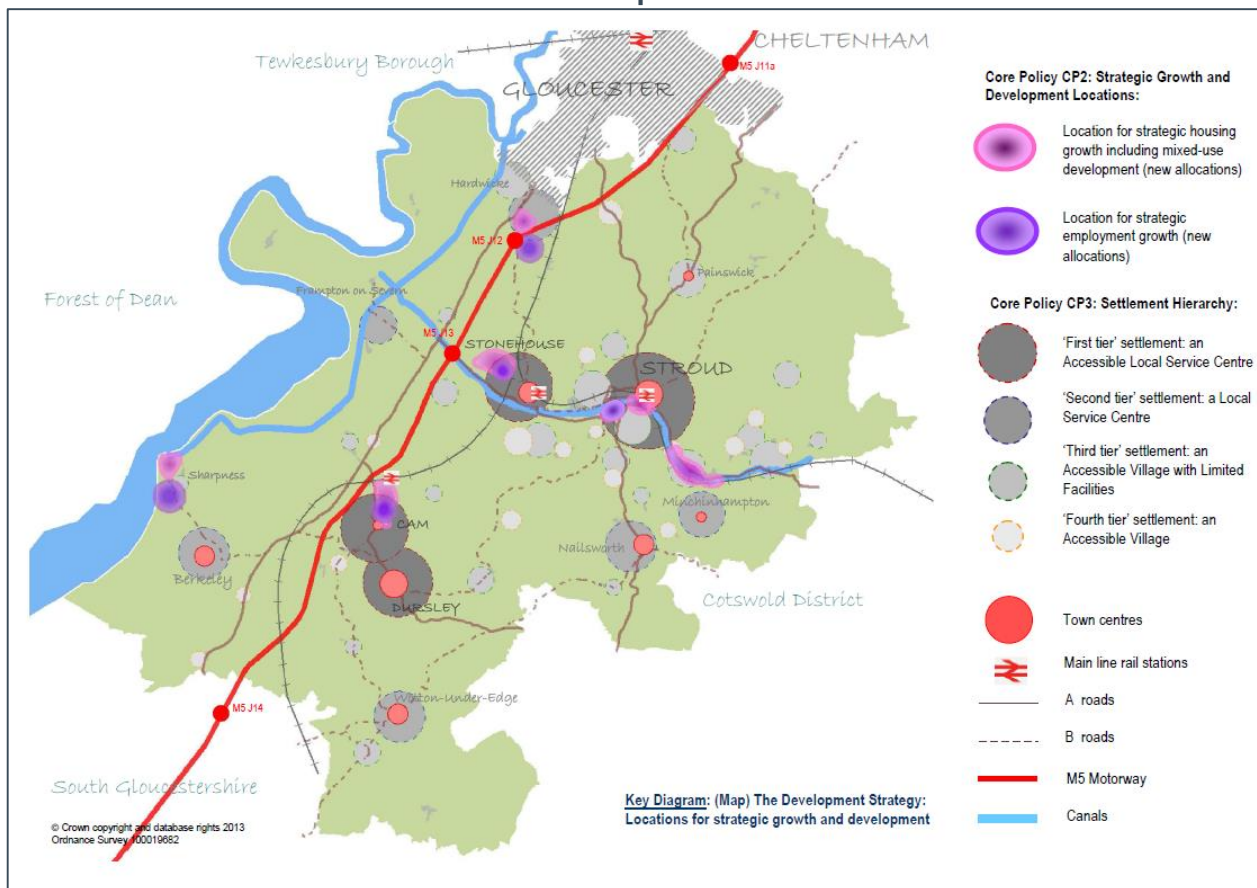


Table 1-1 shows the level of development (i.e. number of dwellings and area of employment) in Stroud which has been assessed in this study.

**Table 1-1 Proposed Level of Development in Stroud**

Site		Local Plan Development	
		<i>Residential (dwellings)</i>	<i>Employment (hectares)</i>
A	Hunts Grove	750	
B	Quedgeley East		13
C	North East Cam	750	12.5
D	Sharpness	300	17
E	Stroud Valleys	400	
F	Stonehouse	1,350	10
-	Council Housing	150	
-	Windfall <sup>1</sup>	750	
<b>Total proposed development:</b>		<b>4450</b>	<b>52.5</b>

The Hunts Grove and North East Cam sites have been assessed for 750 dwellings each but are only proposed to accommodate 500 and 450 dwellings respectively. This assessment therefore considers a robust scenario.

This study has considered the traffic generation and distribution of the developments to determine if the existing highway network has sufficient capacity or whether junction mitigation is required. Gloucestershire County Council (GCC) identified junctions that required assessment and they are shown in proximity to the strategic growth and development locations in **Figure 1-2**.

The numeric junction references relate to junctions considered in the March 2014 Draft Transport Impact Assessment and the additional junction considered in this assessment are referenced with letters.



## 1.2. Document Structure

This report is set out in the following format:

- Chapter 2: Methodology
- Chapter 3: Junction Capacity Analysis
- Chapter 4: Mitigation Results
- Chapter 5: Scheme Cost Estimates
- Chapter 6: Summary and Conclusions
- Appendix A: Meeting Minutes (SDC, GCC, Highways Agency and Atkins)
- Appendix B: Junction Reference Table
- Appendix C: Mitigation Scheme Drawings

## 1.3. Technical Annexe

This report should be read in conjunction with the Technical Annexe which provides additional details and modelling outputs for each junction including the traffic count data, traffic flow analysis and detailed junction capacity analysis outputs.

## 2. Methodology

### 2.1. Inception Meeting

The scope of works was agreed with Gloucestershire County Council, Stroud District Council and The Highways Agency (HA). Regular meetings were held to review the work being undertaken and refine the methodology where required. Meeting minutes are provided in **Appendix A**.

Details regarding the methodology used is provided in the following section.

The strategic junctions identified for assessment by GCC are provided in **Table 2-1** below.

**Table 2-1 Assessment Junctions**

Junction No.	Junction Name
1	A38 / A430 / B4008 / Cole Avenue
2	A38 / B4008 (Cross Keys Roundabout)
3	M5 Junction 12 / B4008
4	A419 Bristol Road / Oldends Lane / Sperry Way (Stroudwater Roundabout)
5	A419 Bristol Road / A419 / B4008 Bath Road / B4008 Ebley Road
6	A419 London Road / Toadsmoor Road
7	A38 Bristol Road / A4135 / St Johns Road
8	B4066 / Alkington Lane
9	A38 / Alkington Lane (Actrees Farm Junction)
10	M5 Junction 13 / A419
A	A38 Southern Avenue / A38 Finlay Road / A4173 Stroud Road / B4072 Stroud Road / Reservoir Road (St. Barnabus Roundabout)
B	A419 / A419 Dudbridge Road / Dudbridge Road Golden Jubilee Way
C	A46 Bath Road / A419 Dr Newtons Way
D	A419 Dr Newtons Way / A419 London Road / London Road (Field Road Roundabout)
E	A46 Painswick Road / A46 Beeches Green / A4171 Stratford Road
F	A38 / B4066 Berkeley Road (Cam side)
G	A38 / B4066 (Berkeley side)
H1	A4135 Tiltdown / A4135 Cam Pitch / B4060 Woodfield Road
H2	A4135 Kingshill Road / A4135 Tiltdown / B4066 Dursley Road
I	A419 / Cirencester Road (Aston Down Airfield)
J	A4135 Bull Pitch / A135 Woodmancote / B4066 Lister Street
K	B4066 / Canonbury Street
L	A419 / Grove Lane / Spring Hill
M	M5 Junction 14 / B4509
N	A419 Dudbridge Road / Caincross Road / B4008 Westward Road / Paganhill Lane (Caincross Roundabout)
P	A38 / A419 / A38 Claypits Hill / Access Road (Whitminster Roundabout)
Q	A38 Claypits Hill / A38 Roman / Road Bath Road
R	A46 Bath Road / Walkley Hill / Dudbridge Hill

### 2.2. Data Review

Historic traffic count data was provided by GCC for several of the junctions. Traffic count surveys were commissioned for junctions where existing data wasn't available.



Intelligent Data Systems, National Data Collection and Streetwise Services were commissioned to undertake traffic surveys and collect traffic data at nine sites, shown in **Table 2-2**. The traffic count data is contained in the **Technical Annex**.

**Table 2-2 Commissioned Traffic Counts**

Junction		National Data Collection	Intelligent Data Systems	Streetwise Services
1B	A430 / Goodridge Avenue		18/11/14	
10	M5 J13 Roundabout			14/10/14
D	Field Road Roundabout			18/11/14
H1	A4135 / B4060 Woodfield Roundabout			14/10/14
H2	A4135 / B4066 Dursley Road Roundabout			14/10/14
J	A4135 / B4066 Lister Street Roundabout			18/11/14
M	M5 J14 Roundabout (East and West)	23/10/14		
P	Whitminster Roundabout	23/10/14		
Q	A38 Claypits Hill / Bath Road	23/10/14		

## 2.3. 2014 Baseline Data

The traffic data sourced from GCC and the commissioned traffic counts were undertaken over various years. To create a consistent baseline, the traffic data was factored so that the data at all junctions equated to 2014 flows. This was done by calculating background traffic growth using TEMPro adjusted NTM growth rates for Stroud District (Rural and Stroud Valleys) for an average weekday, AM peak hour and PM peak hour, to determine a base year flow at each junction.

## 2.4. 2031 Traffic Forecasting

The future forecast design year is 2031 to match Stroud's Local Plan period. It is considered that the background traffic growth in Stroud District over the forthcoming period will be entirely accounted for by the residential and employment development sites included in the Local Development Plan. Traffic associated with these developments has been assigned to the network as part of this study.

To accurately forecast the number of trips generated by the proposed growth, development trip rates have been derived from the following sources:

- TRICS; and
- Transport Assessments for committed local developments.

The only exceptions to this are the Windfall (750 units) and Council Housing (150 units) allocations for which no specific development sites have been identified. A growth factor has therefore been calculated using TEMPro to account for the 900 residential units associated with Windfall and Council Housing.

Allowing for both Windfall and Council Housing, the growth factors that have been applied from TEMPro are:

- AM – 1.00345 (0.35% growth)
- PM – 1.0192 (1.92% growth)

All trip rates are provided for the AM (08:00 – 09:00) and PM (17:00 – 18:00) peak periods.

A trip rate reduction factor of 6% was applied to sites where sustainable travel was viable. The reduction reflects the requirements for Travel Plans to identify measures to promote sustainable travel and provide targets for increasing sustainable mode share. The sites benefiting from sustainable travel reductions were:

- Hunts Grove
- Stonehouse

- Cam

A trip rate reduction of 4% for shared trips in mixed use sites or for proposed developments adjacent to existing facilities was applied to the following sites:

- Hunts Grove
- North East Cam
- Stroud Valleys

## 2.5. Trip Distribution and Assignment

Trips generated by the development sites have been assigned onto a base network, modelled in Excel. This has been done by adopting a variety of methods, including using journey to work data from the 2011 Census, by visual inspection of the network and relevant guidance and research. This work has allowed trip matrices to be generated for a Base + Development case.

In the first instance turning proportions at local junctions was used, where available, to distribute development traffic across the wider highway network. To support the distribution assumptions a gravity distribution model was then produced to determine the proportion of trips from each development to the main destinations surrounding Stroud Valleys, including; Gloucester, Bristol, Cirencester, Swindon, Cheltenham and Stroud District.

## 2.6. Junction Impact Assessment

The baseline data and forecast traffic flows were used to determine the percentage impact of traffic on each of the junctions. A threshold of 5% impact was used to determine where development impact was significant and where further capacity assessment was required. The 5% limit was considered appropriate as it is a threshold which is typically considered to be significant for development traffic on congested highways. Daily variations in traffic flows can exceed 5% and therefore increases in development traffic of less than 5% may not be perceptible.

Junctions were considered to have reached capacity when the Ratio of Flow to Capacity reached 1.0 or the Degree of Saturation reached 100%. These thresholds are considered to be appropriate when taking into account the strategic nature of this assessment and NPPF guidance which species that developments should not be refused unless their impact is severe.

**Table 2-3** shows junctions where the impact was not considered to be significant and therefore no further analysis was required.

Table 2-3 Junctions with Insignificant Traffic Impact

Junction No.	Junction Name	Mitigation Required?	AM	PM
			Impact on Junction (%)	Impact on Junction (%)
A	St. Barnabus Roundabout	X	2	3
E	A46 / A4171 Stratford Road Roundabout	X	2	2

Several junctions considered in this assessment already have committed and funded mitigation schemes as a result of a committed development or from the Gloucestershire Strategic Economic Plan and therefore no further analysis was required. These junctions are shown in **Table 2-4** below.

Table 2-4 Junctions with Committed Mitigation Schemes

Junction No.	Junction Name	Mitigation Required?	AM	PM
			Impact on Junction (%)	Impact on Junction (%)
2	Cross Keys Roundabout	x	19	16
4	Stroudwater Roundabout	x	26	25
5	A419 / B4008 Ebley Road Roundabout	x	25	24
L	A419 / Grove Lane Roundabout	x	35	34

## 2.7. Junction Capacity Assessment

Junctions 8 (ARCADY and PICADY) and LinSig software was used to assess the capacity of each junction in existing 2014 traffic conditions and in forecast 2031 traffic conditions. The industry standard software was used to assess junction capacity as follows:

- ARCADY for roundabout junctions;
- PICADY for priority junctions; and
- LinSig for signal controlled junctions.

Full details of the junction capacity assessments and mitigation measures are provided in Chapters 3 and 4.

## 2.8. Mitigation Proposals

Mitigation schemes were identified for junctions which had one or more arm shown to be exceeding capacity with the local plan development traffic.

The mitigation measures have been designed with the following objectives:

- Increasing junction capacity so that the overall junction works within capacity or is no worse than existing operation;
- Being provided within the existing highway boundary; and
- Providing a cost effective solution to capacity issues due to increases in traffic levels.

The mitigation schemes were assessed for capacity and the results are provided in Chapter 4.

### 3. Junction Capacity Analysis

In this section a summary of the development traffic impact is provided at each junction and the junction capacity assessment results for the existing junction layouts. **Table 3-1** summaries the results and the full capacity analysis is provided in the **Technical Annex**. The junction capacity analysis results have been colour coded to show junctions operating within capacity as green, approaching capacity in amber and exceeding capacity in red.

**Table 3-1 Summary of Capacity Assessment Junctions**

Junction No.	Junction Name	Mitigation Required?	AM			PM		
			Impact on Junction (%)	Existing 2014 Capacity	Forecast 2031 Capacity	Impact on Junction (%)	Existing 2014 Capacity	Forecast 2031 Capacity
				RFC unless stated			RFC unless stated	
1	A38 / A430 Junction	✓	12	98.2.1% (Degree of Saturation)	102.1% (Degree of Saturation)	11	91.1% (Degree of Saturation)	94.9% (Degree of Saturation)
	A430 / Goodridge Avenue	-	-			-		
3	M5 J12 Junction (North and South)	x	24	78% (Degree of Saturation)	86.3% (Degree of Saturation)	34	64.5% (Degree of Saturation)	93.4% (Degree of Saturation)
6	A419 / Toadsmoor Road Junction	x	8	0.68	0.80	8	0.39	0.48
7	A38 / St Johns Roundabout	x	41	0.45	0.65	35	0.41	0.53
8	B4066 / Alkington Lane Junction	x	116	0.31	0.67	79	0.26	0.62
9	Actrees Farm Junction	x	44	0.33	0.64	30	0.36	0.85
10	M5 J13 Roundabout	x	38	0.38	0.54	31	0.47	0.66
B	A419 / A46 Dudbridge Road Roundabout	✓	55	0.84	1.01	50	0.84	1.07
C	A419 / A46 Bath Road Roundabout	x	31	0.82	0.91	31	0.74	0.86

D	Field Road Roundabout	✓	14	1.04	1.14	14	1.07	1.27
F	A38 / B4066 Berkeley Road Junction (East)	✓	48	0.69	1.11	33	0.77	1.48
G	A38 / B4066 Junction (West)	✓	154	0.35	1.34	130	0.66	1.36
H1	A4135 / B4060 Woodfield Roundabout	✓	51	0.80	1.40	39	1.03	1.60
H2	A4135 / B4066 Dursley Road Roundabout	✓	28	1.01	1.40	22	1.03	1.21
I	A419 / Cirencester Road Roundabout	x	11	0.55	0.59	8	0.47	0.50
J	A4135 / B4066 Lister Street Roundabout	x	30	0.66	0.92	25	0.64	0.87
K	B4066 / Canonbury Street Roundabout	x	122	0.25	0.72	79	0.27	0.48
M	M5 J14 (East and West)	✓	13	87.6% (Degree of Saturation)	100.8% (Degree of Saturation)	11	76.2% (Degree of Saturation)	88.8% (Degree of Saturation)
N	Cainscross Roundabout	✓	11	0.82	0.94	10	0.85	1.02
P	Whitminster Roundabout	x	40	0.40	0.55	28	0.44	0.58
Q	A38 Claypits Hill / Bath Road	x	43	51.7 (Degree of Saturation)	71.4 (Degree of Saturation)	34	67.7 (Degree of Saturation)	82.1 (Degree of Saturation)
R	A46 Bath Road / Dudbridge Hill	✓	6	81.9% (Degree of Saturation)	90.7% (Degree of Saturation)	6	91.8% (Degree of Saturation)	101.7% (Degree of Saturation)

A brief description of the operation of each junction is provided below and considers the existing operation, impact of the proposed development and future year operation of the junction, identifying if mitigation measures are required.

### **Junction 1A and 1B: A38/A430 and A430 / Goodridge Avenue**

Junction 1 is currently operating close to capacity in the 2014 baseline. The level of delay and queuing in both peaks periods is projected to increase as a result of the Local Plan development traffic. This results in the junction operating over capacity and mitigation will be required.

### **Junction 2: Cross Keys Roundabout**

Junction 2 is currently operating close to capacity and experiences queues of up to 25 vehicles in 2014. The level of delay and queuing is projected to increase significantly as a result of the Local Plan development traffic.

There is already a committed mitigation scheme for Junction 2 and therefore no mitigation is proposed as part of this study.

### **Junction 3: M5 J12 North and M5 J12 South**

Junction 3 is currently operating within capacity. The model shows that although the Local Plan development traffic does have an impact on the junction, the Degree of Saturation does not exceed 100% on any arm. The queues can still be accommodated on the slip road and therefore mitigation is not required.

### **Junction 4: Stroudwater Roundabout**

The percentage impact on Junction 4 is expected to be high in both peak periods.

There is already a committed mitigation scheme for Junction 4 and therefore no mitigation is proposed as part of this study.

### **Junction 5: A419 / B4008 Ebley Road Roundabout**

There is already a committed mitigation scheme for Junction 5 and therefore no mitigation is proposed as part of this study.

### **Junction 6: A419 / Toadsmoor Road**

The level of delay and queuing in the AM and PM peak is projected to increase moderately as a result of the forecast development traffic. The percentage impact on the junction is expected to be 8% and does not require mitigation as it is still forecast to operate within capacity.

### **Junction 7: A38 / St John's Roundabout**

Junction 7 is currently operating within capacity. Although the forecast development does significantly increase the level of traffic at the junction, the level of delay and queuing in the AM and PM peak is only projected to increase slightly. In the future year of 2031 with the Local Plan development traffic, the junction operates well within capacity and does not require mitigation.

### **Junction 8: B4066 / Alkington Lane**

Junction 8 is modelled to be operating well within capacity in the 2014 baseline. The percentage impact of the Local Plan development traffic on the junction is expected to be very high in both peak periods with the greatest impact in the AM peak period. However, the junction operates well within capacity and does not require mitigation. The level of delay and queuing in the AM and PM peak is projected to increase slightly but remain very low.

### **Junction 9: Actrees Farm**

The level of delay and queuing in the AM and PM peak is projected to increase significantly as a result of the forecast development. The percentage impact on the junction is expected to be high in both peak periods. However, the junction operates within capacity and does not require mitigation.

### **Junction 10: M5 J13 Roundabout**

The percentage impact on the junction is expected to be high in both peak periods but the junction still operates well within capacity and therefore mitigation is not required.

### **Junction A: St Barnabus Roundabout**

The percentage impact at the junction is less than 5% and therefore not considered to be significant and therefore has not been considered further.

### **Junction B: A419 / A46 Dudbridge Road Roundabout**

Junction B is operating close to capacity in 2014. The level of delay and queuing in the AM and PM peak is projected to increase as a result of the forecast development. The percentage impact is expected to be high and the junction is expected to operate over capacity in both peak periods therefore mitigation is required.

### **Junction C: A419 / A46 Bath Road Roundabout**

The level of delay and queuing in the AM and PM peak is projected to increase moderately as a result of the forecast development. While the percentage impact on the junction is expected to be high in both peak periods, the junction still operates within capacity and mitigation is not required.

### **Junction D: Field Road Roundabout**

Junction D is currently operating over capacity in the AM peak and in the PM peak and is forecast to be operating over capacity in 2031 with development traffic. The percentage impact of the forecast development traffic is expected to be significant in both peak period and the level of delay and queuing very high, particularly in the AM peak therefore mitigation is required.

### **Junction E: A46 / A4171 Stratford Road Roundabout**

The percentage impact on the junction is below 5% and therefore no further assessment is required.

### **Junction F: A38 / B4066 Berkeley Road (East)**

Junction F is currently operating within capacity. The percentage impact of the forecast development traffic is expected to be high in both peak periods and is predicted to result in the junction operating over capacity. The level of delay and queuing in the AM and PM peak is projected to increase significantly as a result of the forecast development and mitigation will be required.

### **Junction G: A38 / B4066 (West)**

Junction G is currently operating well within capacity but the percentage impact on the junction is expected to be very high with more than 100% increases in both peak periods. The level of delay and queuing in the AM and PM peak is projected to increase significantly as a result of the forecast development and mitigation is required.

### **Junction H1: A4135 / B4060 Woodfield Road Roundabout**

Junction H1 is currently operating slightly over capacity and with the forecast development traffic it is predicted to be over capacity in 2031. The level of delay and queuing in the AM and PM peak is projected to increase significantly as a result of the forecast development. The percentage impact on the junction is expected to be high in both peak periods with mitigation required.

### **Junction H2: A4135 / B4066 Dursley Road Roundabout**

Junction H2 junction is already operating over capacity. With the forecast development traffic the level of delay and queuing in the AM and PM peak is projected to increase significantly and mitigation is required.

### **Junction I: A419 / Cirencester Road Roundabout**

The percentage impact on the junction is expected to be moderate in both peak periods but as the junction operates well within capacity, no mitigation is required.

### **Junction J: A4135 Bull Pitch / B4066 Lister Street**

Junction J is currently operating within capacity but is forecast to be operating near capacity in 2031 with development traffic due to a high percentage impact over the period. As this junction is not forecast to be operating over capacity, mitigation will not be required at this junction.

### **Junction K: B4066 / Canonbury Street Roundabout**

The junction is forecast to work well within capacity despite a significant development impact and therefore mitigation is not required.

### **Junction L: A419 / Grove Lane Roundabout**

There is already a committed mitigation scheme for Junction 5 and therefore no mitigation is proposed as part of this study.

### **Junction M: M5 Junction 14 / B4509**

Junction M is currently operating over capacity in the AM peak and near capacity in the PM peak and is forecast to be operating over capacity in 2031 with development traffic. Therefore mitigation is required.

### **Junction N: Caincross Roundabout**

Junction N is currently operating close to capacity, and with the forecast development traffic it is expected to be over capacity. The percentage impact on the junction is expected to be relatively low in both peak periods. However, the Local Plan development traffic is predicted to result in increased queues and delays and cause the junction to exceed capacity therefore mitigation is required.

### **Junction R: A46 Bath Road / Dudbridge Hill**

Junction R is currently operating near capacity and with the forecast development traffic it is predicted to be over capacity in 2031. The level of delay and queuing in the AM and PM peak is projected to increase significantly as a result of the forecast development. Therefore mitigation is required.



## 4. Mitigation Results

The following junctions have been identified as having at least one arm which is projected to be operating over capacity in 2031 (excluding those with committed mitigation proposals):

- Junction 1: A38/A430 and A430/Goodridge Avenue
- Junction B: A419 / A46 Dudbridge Road Roundabout
- Junction D: A419 London Road / Dr Newton's Way
- Junction F: A38 / B4066 Berkeley Road (East)
- Junction G: A38 / B4066 (West)
- Junction H1: A4135 / B4060 Woodfield Road Roundabout
- Junction H2: A4135 / B4066 Dursley Road Roundabout
- Junction M: M5 Junction 14 / B4509
- Junction N: Caincross Roundabout
- Junction R: A46 Bath Road / Dudbridge Hill

Mitigation measures were identified for the junctions that were projected to be operating over capacity in 2031. Each mitigated junction has been modelled (using ARCADY, PICADY or LinSig software) to include the proposed alterations to the junction geometries. The results for all arms of each mitigated junction are shown in this section. The detailed modelling outputs and the mitigation designs for each junction are shown in the **Technical Annex**.

A summary of the junction capacity before and after mitigation is summarised in

**Table 4-1.** The junction capacity analysis results have been colour coded to show junctions operating within capacity as green, approaching capacity in amber and exceeding capacity in red.

**Table 4-1 Summary of Mitigation Capacity Assessment Junctions**

Junction No.	Junction Name	AM				PM			
		Impact on Junction (%)	Existing 2014 Capacity	Forecast 2031 Capacity	With Mitigation	Impact on Junction (%)	Existing 2014 Capacity	Forecast 2031 Capacity	With Mitigation
			RFC unless stated				RFC unless stated		
1	A38 / A430 / B4008 Junction	12	98.2.1% (DoS)	102.1% (DoS)	93.2% (DoS)	11	91.1% (DoS)	94.9% (DoS)	82.9% (DoS)
	A430 / Goodridge Avenue	-				-			
B	A419 / A46 Dudbridge Road Roundabout	55	0.84	1.01	0.82	50	0.84	1.07	0.87
D	Field Road Roundabout	14	1.04	1.14	0.72	14	1.07	1.27	0.80
F	A38 / B4066 Berkeley Road Junction (East)	48	0.69	1.11	0.79	33	0.77	1.48	0.79
G	A38 / B4066 Junction (West)	154	0.35	1.34	0.85	130	0.66	1.36	0.83
H1	A4135 / B4060 Woodfield Roundabout	51	0.80	1.40	0.50	39	1.03	1.60	0.67
H2	A4135 / B4066 Dursley Road Roundabout	28	1.01	1.40	87.3% (DoS)	22	1.03	1.21	88.8% (DoS)
M	M5 J14 (East and West)	13	87.6% (DoS)	100.8% (DoS)	89.5% (DoS)	11	76.2% (DoS)	88.8% (DoS)	84.2% (DoS)
N	Cainscross Roundabout	11	0.82	0.94	0.87	10	0.85	1.02	0.83
R	A46 Bath Road / Dudbridge Hill	6	81.9% (DoS)	90.7% (DoS)	82.5% (DoS)	6	91.8% (DoS)	101.7% (DoS)	88.7% (DoS)

The proposed mitigation designs for each junction are shown in **Appendix C**. A summary of the mitigation measures required for each junction and the impact on the capacity is provided below.

### Junction 1: A38/A430 and A430 / Goodridge Avenue

The B4008 arm (Arm 3) of Junction 1 has been forecast as operating with Degree of Saturation (DoS) of 102.1% in the 2031 AM peak with Local Plan development traffic assigned to the network (no mitigation) – increasing from 98.2% in existing 2014 AM peak period traffic. The junction also experiences DoS of 100.1% on Arm 1 (Cole Avenue) in the 2031 AM peak period.

To improve capacity at Junction 1, the following mitigation measures are required:

- Widening of Arm 1 (A430) to create an additional ahead lane; and
- Widening of Arm 4 (B4008) to create two dedicated left turn lanes.

The results show that all arms will operate with a Degree of Saturation of less than 100% with 2031 Local Plan development traffic.

### **Junction B: A419 / A46 Dudbridge Road Roundabout**

Arm 3 (A419 South) of Junction B has been forecast as operating with a RFC of 1.07 in the 2031 PM peak with Local Plan development traffic assigned to the network (no mitigation) – increasing from 0.84 in existing 2014 PM peak period traffic.

To improve capacity at Junction B, the following mitigation measures are required:

- Widening of Arm 3 (A419 South) to create three approach lanes and realignment of road markings.

The results show that all arms will operate with a RFC less than 1 with 2031 Local Plan development traffic.

### **Junction D: Field Road Roundabout**

Arm 2 (A419 Dr Newton's Way) of Junction D has been forecast as operating with a RFC of 1.27 in the 2031 PM peak with Local Plan development traffic assigned to the network (no mitigation) – increasing from 1.07 in existing 2014 PM peak period traffic.

To improve capacity at Junction D, the following mitigation measures are required:

- Increasing the existing mini-roundabout size to a standard roundabout; and
- Creation of 2 defined entry lanes on the A419 Arms 1 and 2.

The results show that all arms will operate with a RFC less than 1 with 2031 Local Plan development traffic.

### **Junction F: A38 / B4066 Berkeley Road (East)**

The B4066 to A38 South movement (Stream B-C) at Junction F has been forecast as operating with a RFC of 1.11 in the 2031 AM peak with Local Plan development traffic assigned to the network (no mitigation) – increasing from 0.69 in existing 2014 PM peak period traffic. Stream C-AB (A38 South turning right into B4066) has been forecast as operating with a RFC of 1.48 in the AM peak with 2031 Local Plan development traffic – increasing from 0.77 in existing 2014 PM peak period traffic.

To improve capacity at Junction F, the following mitigation measures are required:

- Creation of a roundabout;
- Additional entry lanes created on the A38 Arms 1 and 3;
- An additional exit lane created on A38 Arm 1 and 3; and
- Relocation of bus stop.

The results show that all arms will operate with a Degree of Saturation of less than 100% with 2031 Local Plan development traffic.

### **Junction G: A38 / B4066 (West)**

Arm 2 (A38 South) of Junction G has been forecast as operating with a RFC of 1.36 in the 2031 PM peak with Local Plan development traffic assigned to the network – increasing from 0.66 in existing 2014 PM peak period traffic.

To improve capacity at Junction G, the following mitigation measures are required:

- Creation of a roundabout;
- Widening and increased flare of the A38 Arms 1 and 2;
- An additional entry lane created on Arms 1 and 2; and
- Retention of a right turn lane (for a separate junction) on Arm 1.

The results show that all arms will operate with a RFC less than 1 with 2031 Local Plan development traffic.

### **Junction H1: A4135 / B4060 Woodfield Road Roundabout**

Arm 1 (A4135 Cam Pitch) of Junction H1 has been forecast as operating with a RFC of 1.60 in the 2031 PM peak with Local Plan development traffic assigned to the network – increasing from 0.76 in existing 2014 PM peak period traffic.

To improve capacity at Junction H1, the following mitigation measures are required:

- Increasing the roundabout size from a mini-roundabout to a compact standard roundabout;
- Widening of the carriageway on Arm 1 (Cam Pitch);
- The creation of an additional entry lane on Arm 1;
- The creation of an additional exit lane on Arm 1;
- Widening of the carriageway on Arm 2 (Tiltdown);
- The creation of an additional entry lane on Arm 2;
- The creation of an additional exit lane on Arm 2; and
- Realignment and widening of Arm 3 (Woodfield Road).

The results show that all arms will operate with a RFC less than 1 with 2031 Local Plan development traffic.

### **Junction H2: A4135 / B4066 Dursley Road Roundabout**

Arm 2 (A4135 Tiltdown) of Junction H2 has been forecast as operating with a RFC of 1.40 in the 2031 AM peak with Local Plan development traffic assigned to the network – increasing from 1.01 in existing 2014 PM peak period traffic.

To improve capacity at Junction H2, the following mitigation measures are required:

- Modification of the junction from mini-roundabout to a signal controlled junction;
- Widening of Arm 1 (Tiltdown);
- Creation of right turn lane from Arm 1 to Arm 3 (Dursley Rd);
- Widening of Arm 2 (Kingsmill Road);
- Creation of additional lane on Arm 2; and
- Creation of a signalised pedestrian crossing on each arm.

The results show that all arms will operate with a RFC less than 1 with 2031 Local Plan development traffic.

### **Junction M: Field Road Roundabout**

The signalised movements on the bridge section of the B4509 Eastbound (Stream 6/1+6/2 of Junction M) has been forecast as operating with a Degree of Saturation of 100.8% in the 2031 PM peak with Local Plan development traffic assigned to the network (no mitigation) – increasing from 100.4% in existing 2014 AM peak period traffic.

To improve capacity at Junction M, the following mitigation measures are required:

- Widening of M5 Offslips to 3 lane approaches; and
- Increased the lengths of 2 lane approaches on B4509 arms.

The results show that all arms will operate with a Degree of Saturation of less than 100% with 2031 Local Plan development traffic.

### **Junction N: Caincross Roundabout**

Arm 2 (A419 Dudbridge Rd) of Junction N has been forecast as operating with an RFC of 1.02 in the 2031 PM peak with Local Plan development traffic assigned to the network – increasing from 0.82 in existing 2014 PM peak period traffic.

To improve capacity at Junction N, the following mitigation measures are required:

- Widening of the carriageway on Arm 2 (A419 Dudbridge Rd);
- The creation of additional lane to provide three approach lanes on Arm 2; and
- Removal of hatched area on circulatory carriageway adjacent to Arm 3.

The results show that all arms will operate with a RFC less than 1 with 2031 Local Plan development traffic.

### **Junction R: A46 Bath Road / Dudbridge Hill**

The Dudbridge Hill approaches to Junction R (Stream 4/1+4/2) have been forecast as operating with a Degree of Saturation of 101.7 in the 2031 PM peak with Local Plan development traffic assigned to the network – increasing from 91% in existing 2014 PM peak period traffic.

To improve capacity at Junction R, the following mitigation measures are required:

- Widening of Arm 4 (Dudbridge Hill) to create three approach lanes and realignment of road markings.

The results show that all arms will operate with a Degree of Saturation of less than 100% with 2031 Local Plan development traffic.

## 5. Scheme Cost Estimates

Budget estimates have been calculated for the required mitigation schemes. The budget estimates include the following costs:

- Site clearance;
- Construction work;
- Traffic management;
- New road signage;
- Main contractor preliminaries (25%);
- Site investigation (1.5%);
- Detailed design (8%); and
- Contingency (20%).

At this stage the cost of statutory undertakers diversions or reinforcement is unknown and an assumption of an additional 50% of the scheme cost has been included in the total cost. These total costs are therefore provisional and will need to be considered further by a cost consultant to obtain detailed costs.

Site Reference	Junction	Estimated Total Cost
1	A38 / A430 / B4008 Junction	£245,000
B	A419 / A46 Dudbridge Road Roundabout	£125,000
D	Field Road Roundabout	£255,000
F	A38 / B4066 Berkeley Road Junction (East)	£840,000
G	A38 / B4066 Junction (West)	£820,000
H1	A4135 / B4060 Woodfield Roundabout	£745,000
H2	A4135 / B4066 Dursley Road Roundabout	£410,000
M	M5 J14 (East and West)	£1,145,000
N	Cainscross Roundabout	£125,000
R	A46 Bath Road / Dudbridge Hill	£215,000
Total		£4,925,000

The total budget estimate for providing the required mitigation to accommodate the Stroud local plan development is therefore £4,925,000.

## 6. Summary and Conclusions

### 6.1. Summary

Traffic generation as a result of the Local Plan developments has been assessed on the highway network. Junctions where impact exceeds 5% have been identified and junction capacity analysed. For junctions where existing committed and funded mitigation schemes are already proposed no further assessment was considered. Where the junctions are forecast to exceed capacity as a result of the Local Plan development, mitigation measures have been identified.

Where existing committed mitigation schemes are already proposed, no further analysis was required. The remaining junctions have been considered further and preliminary mitigation schemes designed. The mitigation schemes have been assessed for capacity and found to work within acceptable thresholds of capacity, queuing and delay. Budget cost estimates have been produced for each of the mitigation schemes to identify the cost of mitigating the Local plan development traffic. The total budget cost of the required mitigation measures is £4,925,000.

### 6.2. Conclusion

The analysis demonstrates that the proposed Local Plan development can be accommodated on the highway network when the identified mitigation schemes are provided. The proposed developments will need to fund the cost of the mitigation schemes in order for the highway network to accommodate the development.

Each development site will also need to undertake a Transport Assessment and Travel Plan to consider specific issues relating to each site.

# Appendices





# **Appendix A. Meeting Minutes (SDC, GCC, HA and Atkins)**



NOTES OF MEETING BETWEEN

**Stroud District Council & Glos. County Council & Highways Agency Representatives.**

ON

**10.07.14 in BB1 Meeting Room.**

WITH

**Mark Russell (SDC-MR), Conrad Moore (SDC-CM), , Andrew Ball (CH2M HILL-AB), James Purkiss (CH2M HILL - JP), Ben Watts (GCC), Michael Glaze (GCC) & Sean Walsh (H. Agency).**

FROM

**14:00 TO 16:30**

### **Apologies**

Neil Troughton (GCC-NT)

### **Round Table Introductions**

All.

### **Agenda :**

MR suggested the agenda should be:

- 1) Actions from previous Meeting
- 2) SDC Work Programme and Timescales
- 3) Suggested changes to the Brief circulated on Tuesday
- 4) Budgetary Implications
- 5) DoNM.

1) CM circulated notes of last meeting. Actions were underway. The Inspector's conclusions were driving this work and SDC did not want to be in an awkward position on co-operation matters with the representatives here. JP asked what option were SDC taking as the Inspector had given 3 options? CM confirmed (a). This was to hold the Local Plan examination in abeyance for 6 months. A programme and timetable for the 6 month period were now available on the web-site. (Available at <http://www.stroud.gov.uk/docs/localplan/localplanexamination.asp>, See docs PSE01 and PSE02).

2) Discussion took place on actions which were either completed or underway. BW and AB asked that the draft notes be circulated electronically so any revisions could be incorporated.

**ACTION:** CM to circulate last notes for agreement. *This was done 11.07.14.*

3) MR introduced the timetable for the transport assessment work. It was recognised that this was quite demanding. BW circulated the draft brief to be issued Atkins by email on Tuesday.

Paper copies of brief and MR response were provided. BW talked through the brief and the following issues were raised.

### **Trip Rates**

- 4) It was noted that in the JCS area, and in cases where GCC and the HA had already agreed trip rates with developers for identified allocated sites, these trip rates would be adopted from that respective development in the assessment of cumulative transport impact .
- 5) It was agreed that this was an approach that should be used for Stroud where applicable (e.g. Hunt's Grove). For the other sites, all thought it appropriate to consider trip rates on a site by site basis depending on level of likely sustainable access given the public transport funding situation.

### **Traffic Growth**

- 6) There was a discussion on the appropriateness of using TEMPro growth assumptions. It was noted that in some cases there is a data lag and reliance placed on historic data. However, TEMPro is an approach taken elsewhere.
- 7) AB thought it not appropriate to use a simple urban/rural split for growth assumptions, as was used in previous traffic impact assessment. At this level needed to be more robust assessment reflecting the location of proposed development sites and the opportunity for modal shift towards more sustainable modes. There was a discussion about the right geography to use.
- 8) MR noted that SDC held information on the dwellings forecast to come forward on 'other (smaller) sites' and windfalls. Hence there was a discussion on whether, within the District, actual data should be used as opposed to TEMPro. This would be more robust. It was agreed that MR/CM would consider ways to define the areas.
- 9) **ACTION:** MR/CM to circulate a diagram of the District split into growth and non-growth areas, and taking account of major transport routes, for comment.
- 10) JP thought care needed as Cam and Dursley would be an island of growth in context of surrounding parishes where little growth was planned. This should inform the areas chosen for traffic growth assumptions.

### **Traffic distribution**

- 11) AB asked about trip distribution and how to agree a robust trip distribution? MG said that census travel to work data was supposed to be available July 2014. In the absence of this, MG thought could use developments already in existence such as Kingsway to heath check assumptions. Research for the Kingsway area Travel Plan shows that 50% of residents work in Bristol, despite ready access to Gloucester employment. JP reiterated that at end July travel to work data should become available. The principles of the trip distribution pattern should outlined in the brief given to Atkins.

- 12) AB & SW thought the consideration of trip distribution may assist trip rates. BW content. CM queried what was to be modelled – traffic source or destinations? AB noted that different approaches to the assessment of trip distribution would give different results. That is, a gravity model approach would give different answers and would take account of commute draws such as Bristol, Bath, Swindon, Gloucester and Cheltenham. Atkins considered this approach for the previous work, but concluded that the draw of major settlements was too strong when compared to 2001 census data and, without evidence to the contrary, resulted in too many long distance trips. Hence, there is a need to identify suitable evidence to agree an appropriate base trip distribution from Stroud District, perhaps dependent in part in the proximity to the M5.
- 13) More locally, AB noted the need to take account of the future capacity of local roads in the network, primarily those between Stroud/Stonehouse and Gloucester. If these were found to be at capacity, the alternative routes for new trips could involve greater use of the M5. Hence, it was agreed that there was a need to assess capacity of these roads to accommodate growth and a) take account of the findings of his assessment in the consideration of future trip distribution and b) consider what mitigation could be implemented to increase the capacity of the more local roads. BW concern was absence of data. MG thought looking at permanent ATC's used until 2010 could be sufficient. SW thought use County traffic flow maps.
- 14) AB noted that for a robust approach the trip distribution should reflect today's situation and not base this on historic patterns of movement. This would take account of cultural shifts on the length of commuting and the capacity of alternative routes available.
- 15) At next meeting would need to discuss trip rates and trip generation assumptions. Map would facilitate this.

**ACTION:** All to keep data availability under review.

**ACTION:** BW to review data and maps.

**ACTION:** BW to have worked up brief for next meeting at end July.

- 16) SW wanted a story board for the calculation of trips and then assessment of impacts and proposed mitigation. AB thought model now and 2031 and asked if blocks of 5 year growth was reasonable? MR stated that the housing trajectory produced on a parish-by-parish basis allowed development to be estimated per year, so any aggregation was possible.

#### **Data collection**

- 17) MG asked if use of a developer's Paramics model (built to assess the West of Stonehouse proposed development, but did not include M5 J13) data would help as the model was 'signed off' by GCC. SW thought yes as a similar situation arose when considering the JCS area at M5 Junction 9. BW will check any copyrights on use of data. MR needed to think about the sensitivity of using developer data other than for approved schemes.

**ACTION:** MG to go back to PFA. MR to consider whether SDC is able to use such data.

18) SW observed that previous study had potential of 24 traffic count points but this had been reduced to 14 including junctions 12, 13 and 14.

19) BW stated that the existing Central Severn Vale (CSV) SATURN model included junction 12 and potentially this model could be extended to Stroud Town Centre. This could mean that more data was available, but would require considerable more data to inform the model network and matrix.

**ACTION:** BW to check model use and what count data they have. SW to check also in next few days other models and data and provide feedback to BW.

**ACTION:** BW to produce a list of junctions requiring counts. BW added this could provide a shopping list for necessary mitigation works. AB thought this was important for soundness and an essential part of the IDP

### **Infrastructure**

20) CM asked about recent LEP road infrastructure announcements and the emerging LTP3. Discussion was then based on how this may influence the selection of specific site allocations because of the enhanced network capacity that would be realised and hence the potential of co-funding the LEP scheme proposals.

**ACTION:** CM to circulate GANTT chart submitted to the Inspector.

### **The Transport Evaluation**

21) There was a discussion as to the scope and nature of a transport evaluation to support allocations in a Local Plan and when site specific TIAs funded by developers were required. How far did this work to develop mitigation have to go for the Plan to be found sound or robust? It was agreed not to refer to this study as a TIA which may allow local authorities to argue that promoters of allocated sites would still need to carry out a TIA at application stage. [post-meeting note: Transport Evaluation is term used in Agency's spatial planning advice note entitled 'Local Plans – Evaluating Transport Impacts']

22) MR queried if developers could do this work? All thought not as this needed to be a strategic overview and not a series of work on smaller junctions with inconsistent assumptions. BW asked about timescales. MR showed GANTT chart submitted with September 15th milestone with traffic counts commencing, draft outputs in week commencing 20th October and finalising data survey.

23) MR reported that growth scenarios had been developed looking at development levels during the plan period of between 10,500 dwellings and over 13,400 dwellings and queried how these would feature in the transport assessment. It was agreed that it was not practical to assess all growth scenarios but that the transport model should test the preferred scenario(s) once these had been determined in September.

**ACTION:** MR to circulate potential growth scenarios following limited discussion with Councillors. This will be CONFIDENTIAL information.

24) MR asked how the transport evaluation would inform option selection if only the preferred scenario(s) were to be tested. The HA stated that an early input into the transport criteria used in the SA update to assess the alternative scenarios would be sufficient.

**ACTION:** MR to discuss with our SA consultants how HA/GCC could have an input in respect of transport/accessibility criteria. Matter could then be reviewed on 31<sup>st</sup> July meeting and agreed.

#### **Other issues**

25) MR wanted to understand study costs and what was achievable within timescales if greater housing requirements were identified. SW stated there were no funds from the HA to support additional study work.

26) CM stated only want indicative costs for mitigation measures to show that they were viable, reasonable and practicable and to feed into IDP.

27) CM asked about implications of today on brief timetable? BW state brief would now be issued in August and not mid July.

28) AB questioned what mode share assumptions would be used?

29) AB also questioned what assumptions should be made in relation to peak traffic spreading? This was where people got up earlier or left later to avoid congestion. West Midlands and Worcestershire studies had used 2-3 hours. Do we accept a certain amount of queuing extension? (lifestyle change)

**ACTION:** Atkins should provide a steer on evidence such as this. 1 hour peak or 90 minutes?

**ACTION:** Ben to circulate revised draft brief to Atkins for cost estimates.

**ACTION:** Actions will be exchanged via e-mail wherever possible. CM to add MG and NT to mailing lists.

#### **DONM**

31 July 2014. Ebley Mill Council Offices. 2.00 in same Meeting Room as this (Meeting Room – Bodley Block 1).



NOTES OF MEETING BETWEEN

**Stroud District Council & Glos. County Council & Highways Agency Representatives.**

ON

**31.07.14 in BB1 Meeting Room.**

WITH

**Mark Russell (SDC), Conrad Moore (SDC), Andrew Ball (CH2M HILL), James Purkiss (CH2M HILL), Neil Troughton (GCC), Michael Glaze (GCC) & Sean Walsh (HA).**

FROM

**14:00 TO 16:30**

### **Apologies**

Ben Watts (GCC)

### **Notes of Last Meeting**

- 1) The notes of the meeting, as amended by JP, were agreed.

### **Trip Rates**

- 2) There was a discussion about what trip rates to use for the Stroud transport evaluation. It was agreed to use data from approved schemes / permissions where possible and to be consistent with the JCS approach where practicable.
- 3) After a discussion, the following rates were agreed:

#### Housing

(i) Hunts Grove - use Kingsway rates (suburban)

(ii) Stroud/Stonehouse or Eastington/Cam - should be considered together (edge of town, calculated from TRICS)

(iii) Sharpness – a rural rate, calculated from TRICS

(iv) Windfall – use TEMPro

#### Employment

Use 50/25/25 B1/B2/B8 split, with B1 assuming 1.5 storeys – consistent with JCS

Use Shires outside London trip rates, calculated from TRICS

- 4) **ACTION:** SW/NT to check parameters for employment splits with Atkins.

### **Traffic Growth**

- 5) It was agreed that growth areas would use the TEMPro defined areas with strategic allocations added to the nearest town grouping:
  - (i) Hunts Grove to Gloucester

- (ii) West of Stonehouse to Stonehouse
  - (iii) Stroud/Brimscombe to Stroud
  - (iv) North East Cam to Dursley
  - (v) Sharpness to Stroud rural
- 6) **ACTION:** AB to provide a list of parishes within each TEMPro area. MR/CM to provide a spreadsheet allocating all housing planning permissions and allocations to the relevant TEMPro area from now to 2031 (excluding windfall to avoid double counting).

#### **Traffic distribution**

- 7) JP reported that travel to work data from the Census was now available via NOMIS for super output areas. It was agreed to use this data to assist with traffic distribution.
- 8) There was a discussion about whether the traffic growth should be distributed solely to the main strategic routes or to alternative local roads currently used. It was agreed that a policy-on approach should generally be taken, loading the growth onto the main routes to identify the worst case scenario for the purposes of identifying mitigation measures. However, journeys where it would be nonsensical to take the main routes should be stripped out, but the numbers of trips removed would be recorded. It was acknowledged that there would be an expectation of limited growth on the B4008/A4173 alternative routes from Stroud/Stonehouse to Gloucester. Atkins would be asked to test the major routes only.
- 9) **ACTION:** SW agreed to provide resources for the traffic distribution exercise. AB to arrange for colleague to manipulate travel to work data into a format that can be used for the TEMPro geographic areas.

#### **Data collection / Mitigation / Other issues**

- 10) There was a discussion about the number of junctions to be modelled. It was agreed that Atkins would provide an initial spreadsheet of anticipated traffic levels at each junction. It would then be for the Project Team to decide which junctions to model based upon those likely to be at or above capacity. This initial spreadsheet could be produced before September, to allow for the Project team to agree the junctions to be surveyed from 15 September.
- 11) The Project Team would decide what impacts might be severe on a case by case basis. Atkins would then need to agree to this.
- 12) **ACTION:** NT to ask BW to modify Project Brief to allow for this two stage approach.
- 13) NT asked whether the HA would be happy with a single snapshot manual count or would they require a longer time? SW/AB stated that single counts had been used before but not necessarily for plan making.
- 14) **ACTION:** SW/AB to confirm the HA is happy with single snapshot manual counts.

- 15) There was a discussion around viability. It was agreed that the evaluation would need to provide indicative costs for mitigation measures. There should be further consideration as to the extent to which land assembly as well as construction costs should be included.
- 16) It was agreed that the Local Plan would need to indicate the major transport improvements required for allocations but that individual TIAs would still be required from developers and “tweaks” to the infrastructure required was OK at application stage (provided the Local Plan wording provides for flexibility).
- 17) All agreed that modal share and peak traffic spreading would be considered by the Project Team at the end of stage 1 to assess the junctions requiring further examination.

#### **The Transport Evaluation Project Brief**

- 18) The Brief would need amending to refer to the stage 1 and stage 2 assessment work (see 10 above).
- 19) The Project Outcomes section would need amending to state that the definition of severe impact would be determined initially by the Project Team on a case by case basis. The final sentence of Project Outcomes bullet point 3 should be deleted.
- 20) **ACTION:** NT to discuss necessary changes with BW. BW to circulate the amended Project Brief for any final comments. MR to send final brief to Atkins by end of w/c 8 August to allow for Atkins to do stage 1 work by the time of the next Project meeting on 20 August 2014.

#### **Other issues**

- 21) It was noted that AB is in touch with the SA consultants URS regarding transport criteria to be used to assess growth scenarios. A discussion was taking place on 5 August.
- 22) NT enquired whether we should not only look at asking Atkins to examine the mitigation measures required to address growth from the Stroud Local Plan allocations, but at mitigation measures required to improve the existing problems. NT stated that GCC would pay for this additional work as it wasn't directly related to the Stroud Local Plan. Others considered that a separate exercise would be more appropriate.
- 23) **ACTION:** NT to consider further and report back to the Group.
- 24) JP reported that he would be taking up a new position with another consultancy but would make arrangements for a colleague to come to future meetings. The Group wished him well for the future.

#### **Date of Next Meeting**

21 August 2014. Ebley Mill Council Offices – to consider Atkins stage 1 work.

# Appendix B. Junction Reference Table



Junction No.	Junction Name	Junction Type	Arm 1	Arm 2	Arm 3	Arm 4	Arm 5
1A	A38 / A430 Junctions	4 Arm Signal	A430	A38 Cole Ave	A38	B4008 Bristol Road	
1B	A430 / Goodbridge Avenue	4 Arm Priority	A430	Bristol Road	A430	Goodbridge Avenue	
2	Cross Keys Roundabout	5 Arm Roundabout	A38 (North)	B4008 (North)	B4008 (South)	Services	A38 (South)
3A	M5 J12 Junctions (North)	3 Arm Part Signal	B4008 (North)	M5 Bridge	M5 EB off-slip		
3B	M5 J12 Junctions (South)	3 Arm Part Signal	M5 Bridge	M5 EB off-slip	B4008 (South)		
4	Stroudwater Roundabout	5 Arm Roundabout	Oldends Lane	A419 Bristol Road	Bond's Mill Business Park	Stonehouse Business Park	A419
5	A419 / B4008 Ebley Road Roundabout	4 Arm Roundabout	B4008 Bath Road	B4008 Ebley Road	A419 (South)	A419 Bristol Road	
6	A419 / Toadsmoor Road Junction	3 Arm Priority	Toadsmoor Road	A419 (East)	A419 (West)		
7	A38 / St Johns Roundabout	4 Arm Roundabout	A38 Bristol Road (North)	A4135	A38 Bristol Road (South)	St John's Road	
8	B4066 / Alkington Lane Junction	3 Arm Priority	B4066 (East)	Alkington Lane	B4066 (West)		
9	Actrees Farm Junction	3 Arm Priority	A38 (North)	Alkington Lane	A38 (South)		
10	M5 J13 Roundabout	4 Arm Roundabout	A419	M5 WB off-slip	A419	M5 EB off-slip	
A	St. Barnabus Roundabout	5 Arm Roundabout	A38 Finlay Road	Reservoir Road	A4173 Stroud Road	A38 Southern Ave	B4072 Stroud Road
B	A419 / A46 Dudbridge Road Roundabout	4 Arm Roundabout	A419 Dudbridge Road	Dudbridge Hill	A419 (South)	Golden Jubilee Way	
C	A419 / A46 Bath Road Roundabout	3 Arm Roundabout	A419 (North)	A419 Dr Newton's Way	A46 Bath Road		
D	Field Road Roundabout	3 Arm Roundabout	A419 (London Road E)	A419 (Dr Newton's Way)	London Road W		
E	A46 / A4171 Stratford Road Roundabout	3 Arm Roundabout	A46 Painswick Road	A46 Beeches Green	A4171 Stratford Road		
F	A38 / B4066 Berkeley Road Junction (East)	3 Arm Priority with Slip	A38 (North)	B4066 Berkeley Road	A38 (South)		
G	A38 / B4066 Junction (West)	3 Arm Priority	A38 (North)	A38 (South)	B4066		
H1	A4135 / B4060 Woodfield Roundabout	3 Arm Roundabout	A4135 Cam Pitch	A4135 Tilsdown	Woodfield Road		

H2	A4135 / B4066 Dursley Road Roundabout	3 Arm Roundabout	A4135 Tiltdown	A4135 Kingshill Road	Dursley Road		
I	A419 / Cirencester Road Roundabout	3 Arm Roundabout	A419 Cowcombe Hill	A419 (East)	Cirencester Road		
J	A4135 / B4066 Lister Street Roundabout	3 Arm Roundabout	B4066 Lister Street	A4135 Woodmanco te	A4135 Bull Pitch		
K	B4066 / Canonbury Street Roundabout	3 Arm Roundabout	B4066 (North)	B4066 (East)	Canonbury Street		
L	A419 / Grove Lane Roundabout	4 Arm Roundabout	Grove Lane	A419 (East)	Spring Hill	A419 (West)	
MA	M5 J14 Roundabout (East)	3 Arm Signal	B4509	M5 SB off- slip	B4509		
MB	M5 J14 Roundabout (West)	3 Arm Signal	B4509	M5 NB off- slip	B4509		
N	Cainscross Roundabout	4 Arm Roundabout	A419 Cainscross Road	A419 Dudbridge Road	B4008 Westward Road	A4171 Paganhill Lane	
P	Whitminster Roundabout	3 Arm Roundabout	A38 (North)	A419	A38 (South)		
Q	A38 Claypits Hill / Bath Road	4 Arm Priority	A38 Claypits Hill	Bath Road	A38 Roman Road	Restaurant Access	
R	A46 Bath Road / Dudbridge Hill	4 Arm Signal	A46 Bath Road (North)	Walkley Hill	A46 Bath Road South	Dudbridge Hill	






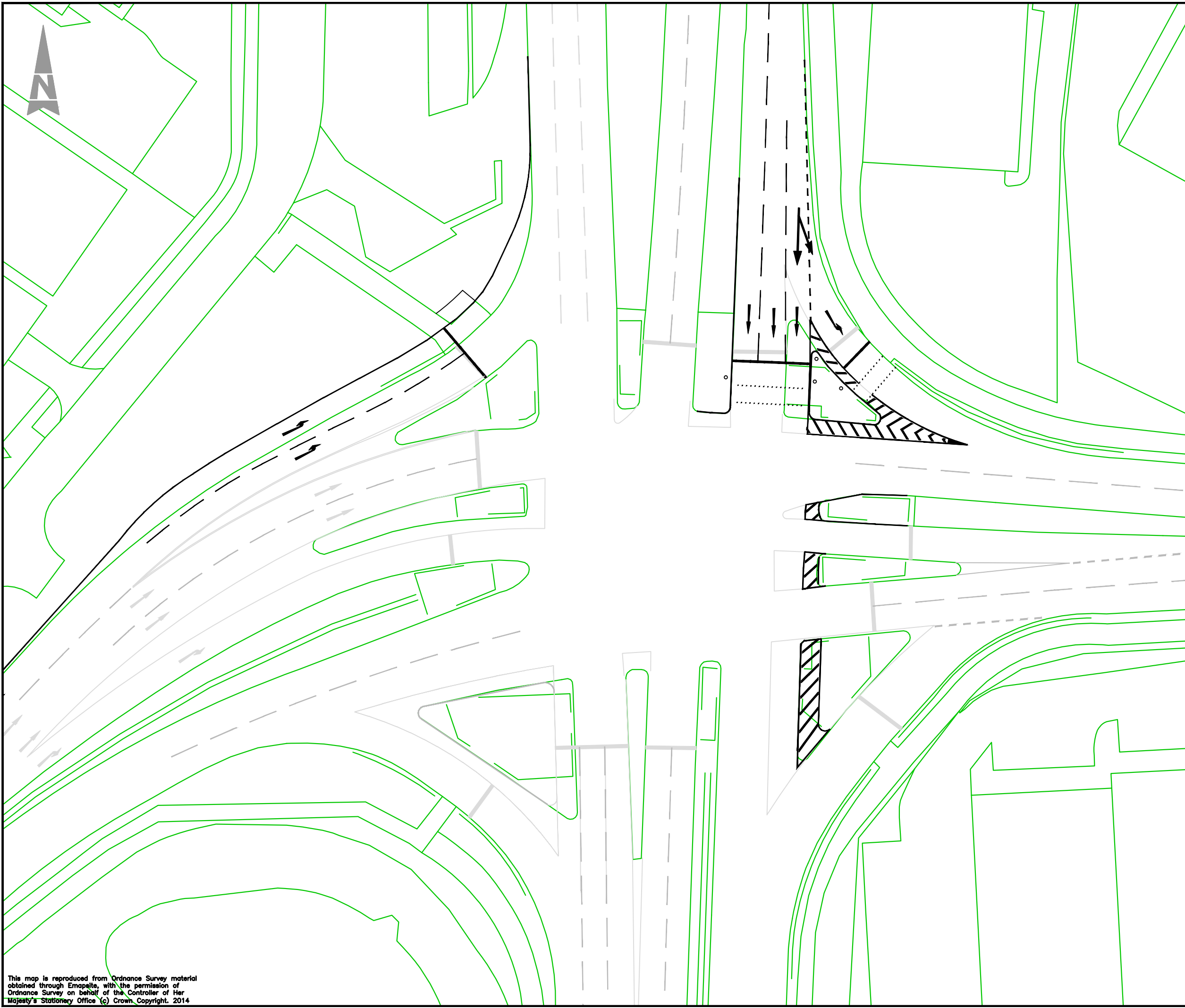


# Appendix C. Mitigation Scheme Drawings



Key

	Existing Layout
	Existing road markings
	Proposed Layout



Rev	
Status	

50  
10  
0  
**A3**

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 Date: Dec 09, 2014 - 9:07am  
 Plotted by: Trev4122

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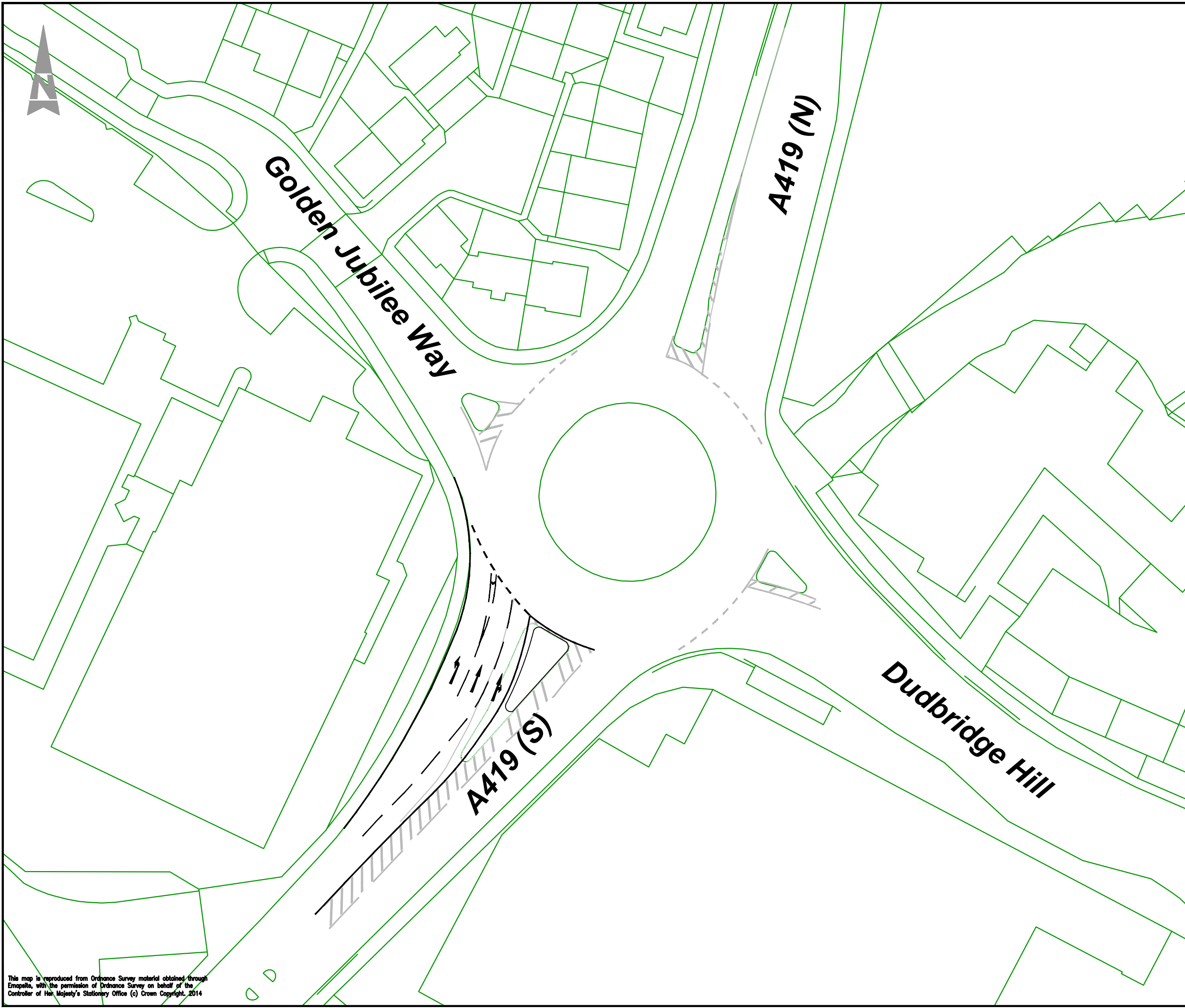
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Client Stroud District Council	
Project Stroud Junction Assessment	
Title Junction 1 – Potential Mitigation A38/ A430/ B4008/ Cole Avenue	
Sheet Size <b>A3</b>	Original Scale 1:500
Designed/Drawn MT	Reviewed TC
Date 08/12/14	Date 08/12/14
Status	Drawing Number 5134537-MT JcR
	Rev

Rev  
Status



Key

	Existing Layout
	Existing road markings
	Proposed Layout



50  
10  
0  
A3

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Date: Nov 25, 2014 - 10:34am  
Plotted by: Trew122



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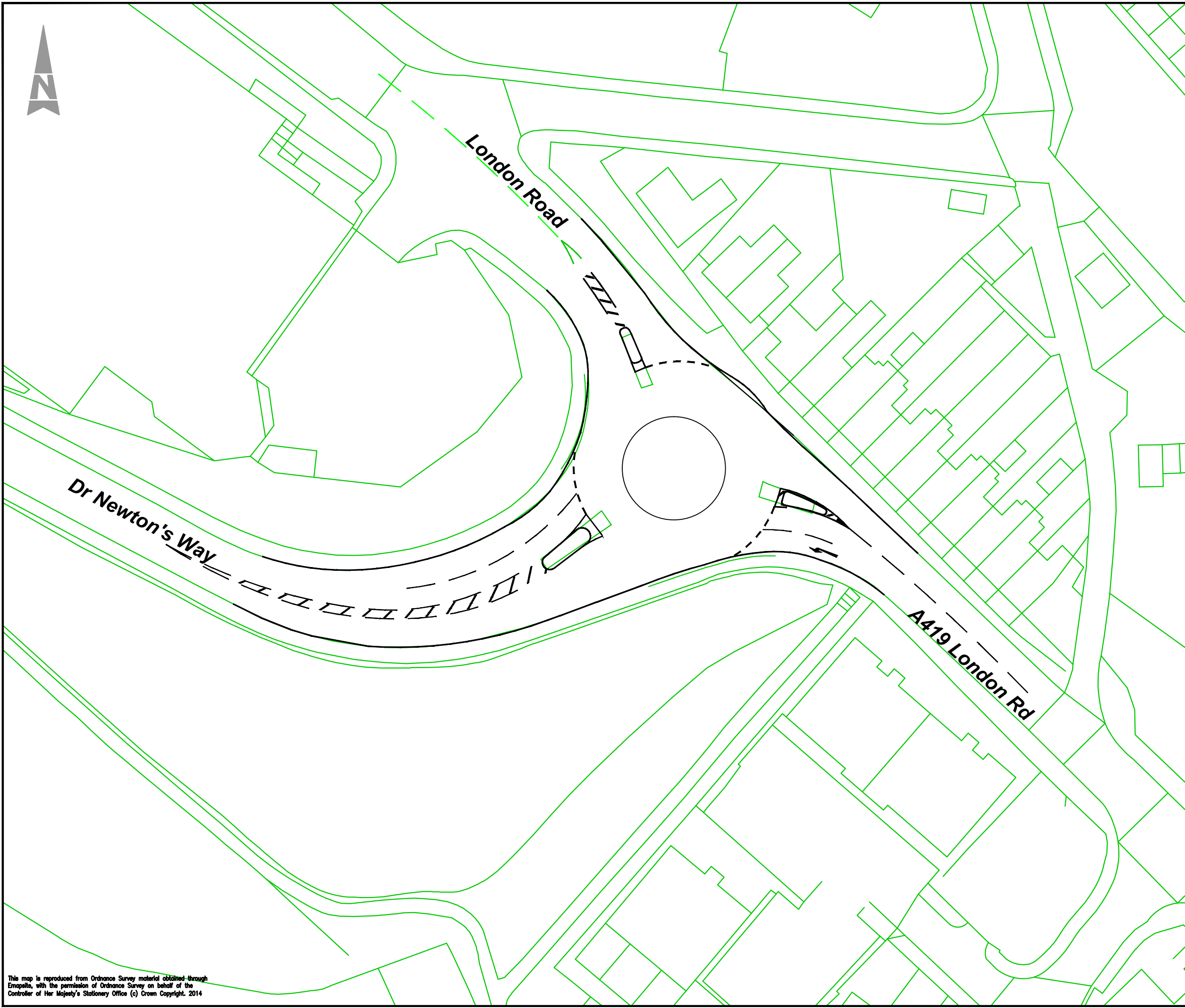
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Project Stroud Junction Assessment			
Title Junction B – Potential Mitigation (A419–A46)Dudbridge Roundabout			
Sheet Size <b>A3</b>	Original Scale 1:500	Designed/Drawn MT Date 11/11/14	Reviewed TC Date XX/14
Status	Drawing Number 5134537–MT JcB	Rev	

Rev  
Status



**ATKINS**<sup>TM</sup>

Key  
 Existing Layout  
 Proposed Layout



50  
10  
0  
A3  
recovery.dwg

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 Date: Dec 09, 2014 - 12:24pm  
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 Project  
 Stroud Junction Assessment  
 Title  
 Junction D – Potential Mitigation  
 A419 London Road/Dr Newton Way




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			Rev

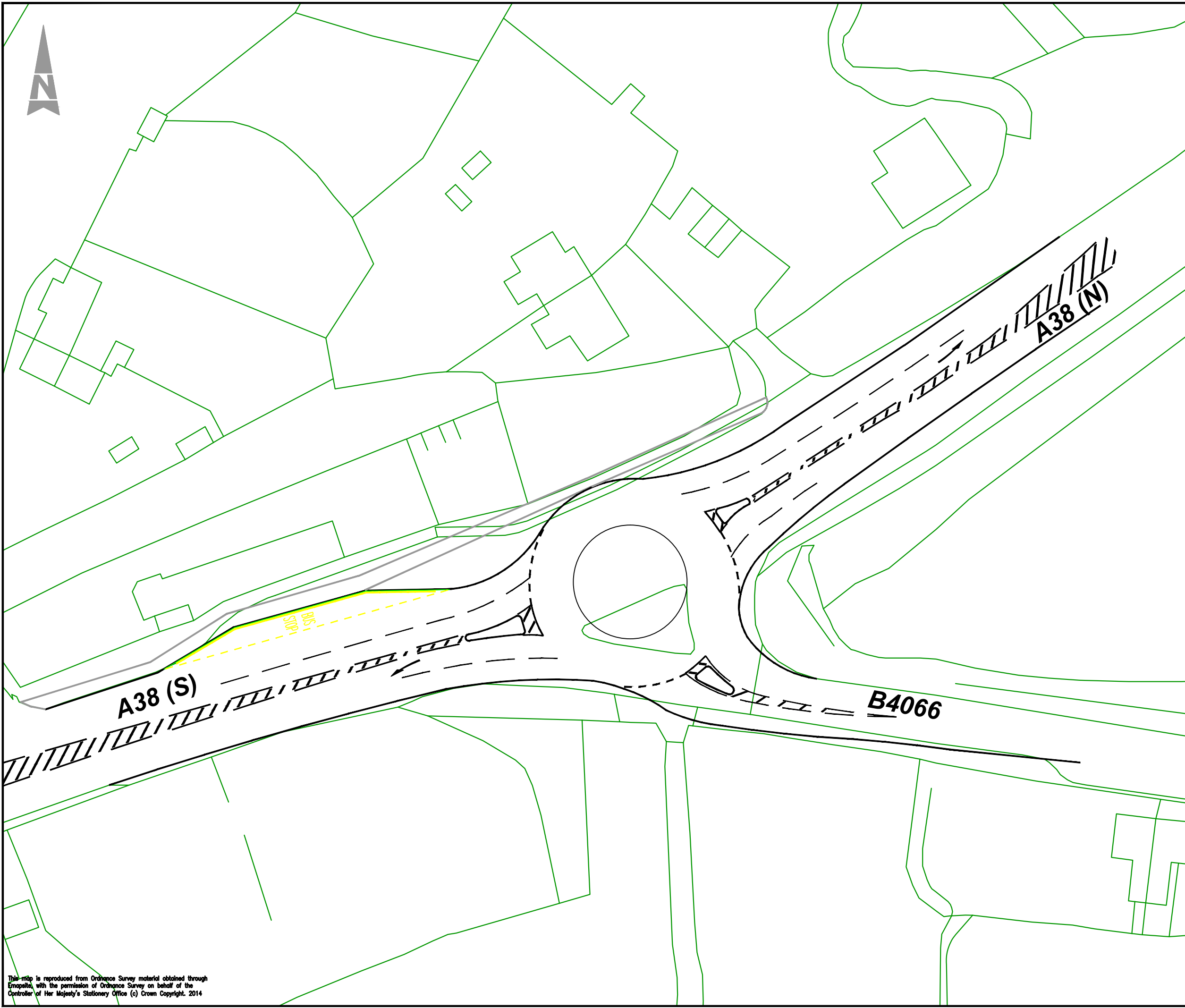
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Rev  
Status



Key

-  Existing Layout
-  Proposed Layout
-  Footway



File: \\atkins.com\project\GBBMA\Hand\CS\Projects\5134537-Stroud Junction Assessment\20\_CAD\COSTINGS\Stroud Junction Mitigation - Cost Calculation 2.dwg  
 Date: Dec 02, 2014 - 10:07am  
 Plotted by: trew4122

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Project Stroud Junction Assessment			
Title Junction F – Potential Mitigation A38/B4066 Berkeley Road			
Sheet Size <b>A3</b>	Original Scale 1:500	Designed/Drawn MT	Reviewed TC
Status	Drawing Number 5134537-MT JcF	Date 14/11/14	Date XX/14
			Rev

Rev  
Status



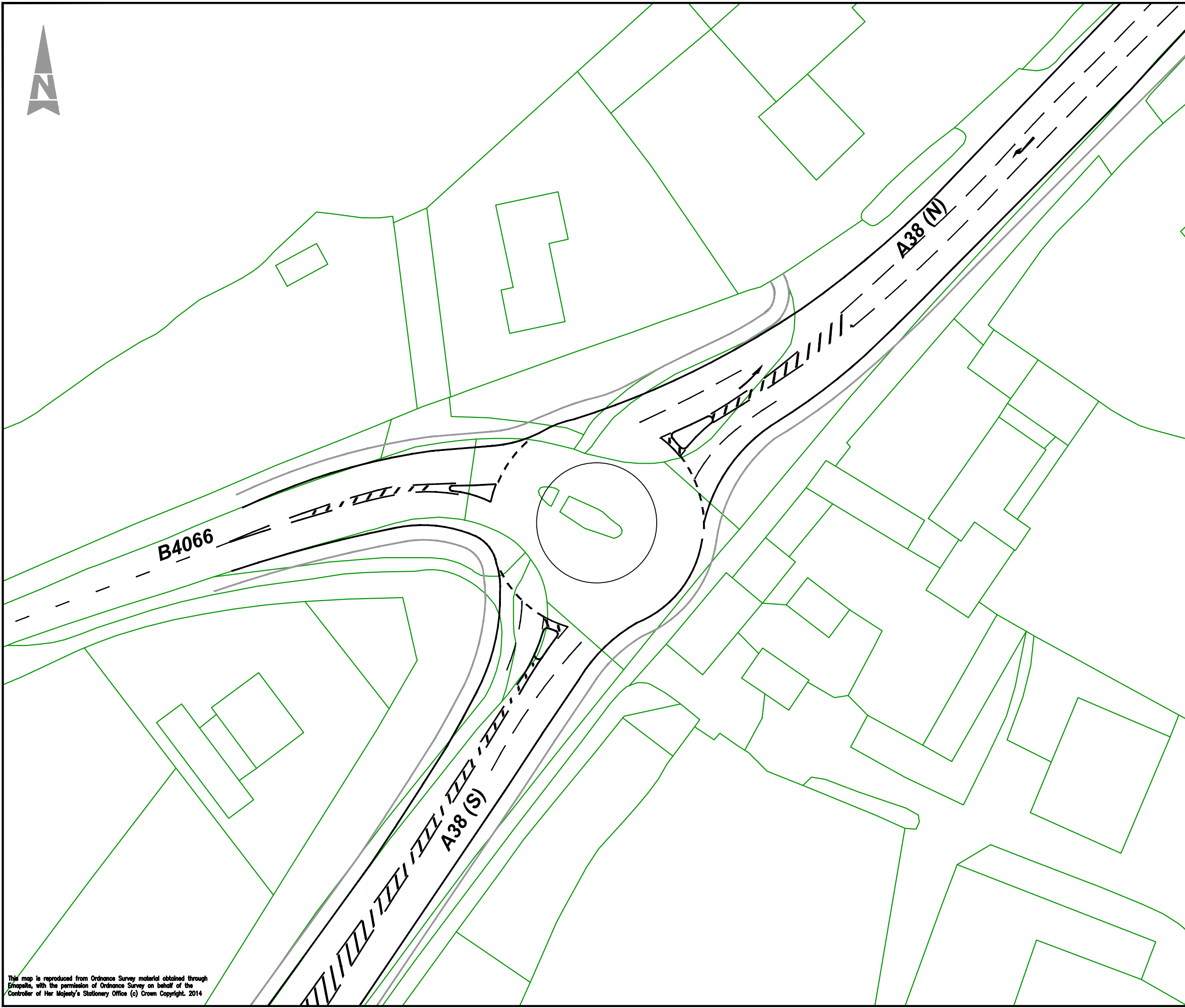
**ATKINS**<sup>TM</sup>

Key

	Existing Layout
	Existing road markings
	Proposed Layout

50  
A3  
Stroud Junction Mitigation - Cost Calculation 2.dwg

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Date: Dec 02, 2014 - 10:09am  
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


Client  
Stroud District Council

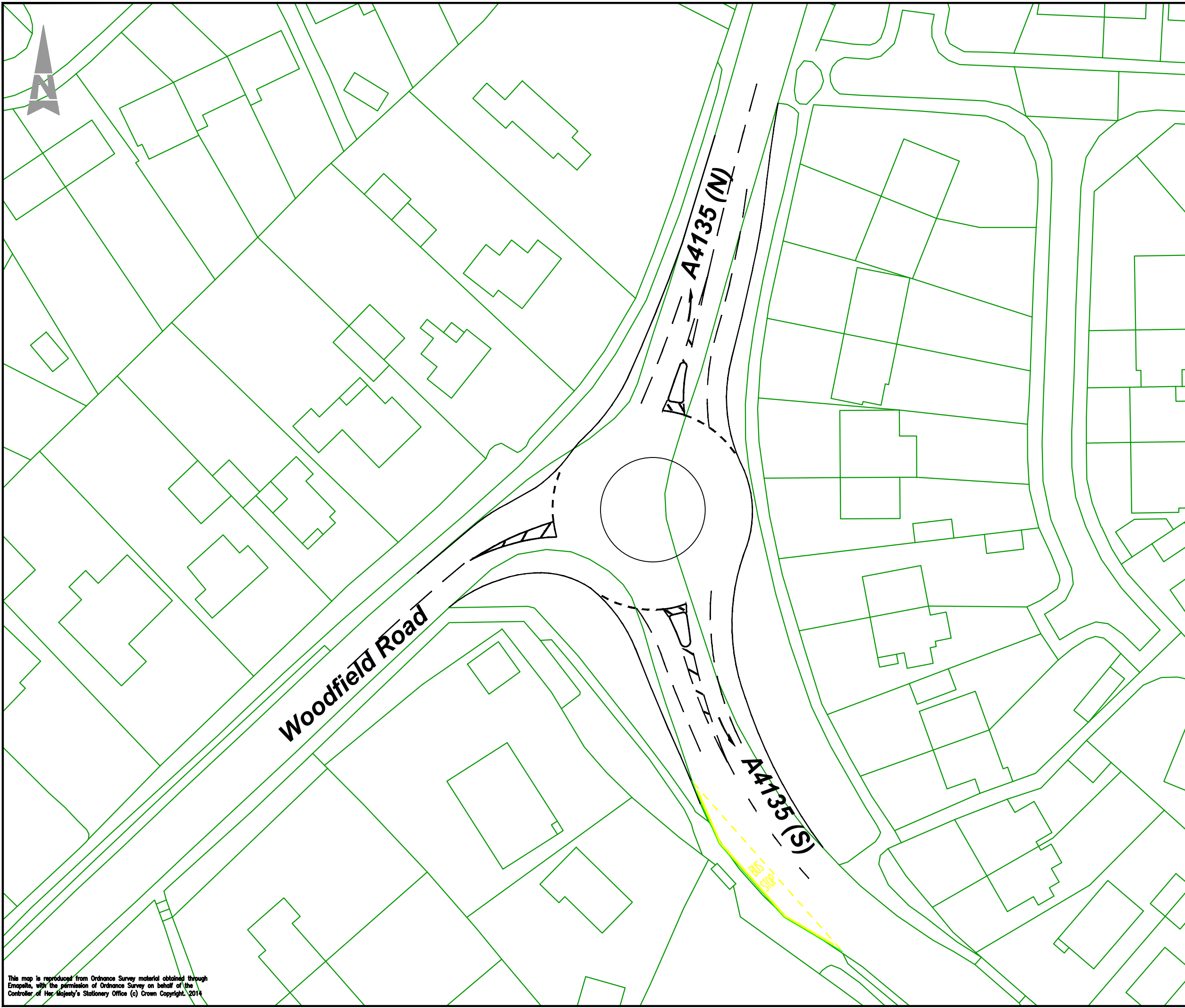
Project  
Stroud Junction Assessment

Title  
Junction G - Potential Mitigation  
A38/B4066 Junction(Berkeley Side)

Sheet Size	Original Scale	Designed/Drawn	Reviewed
A3	1:500	MT	TC
Status	Drawing Number	Date	Date
	5134537-MT JcG	28/11/14	02/12/14

Key

	Existing Layout
	Existing road markings
	Proposed Layout



Rev	
Status	

50
0
10
20
30
40
50

A3

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 Date: Dec 02, 2014 - 10:12am  
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Stroud District Council




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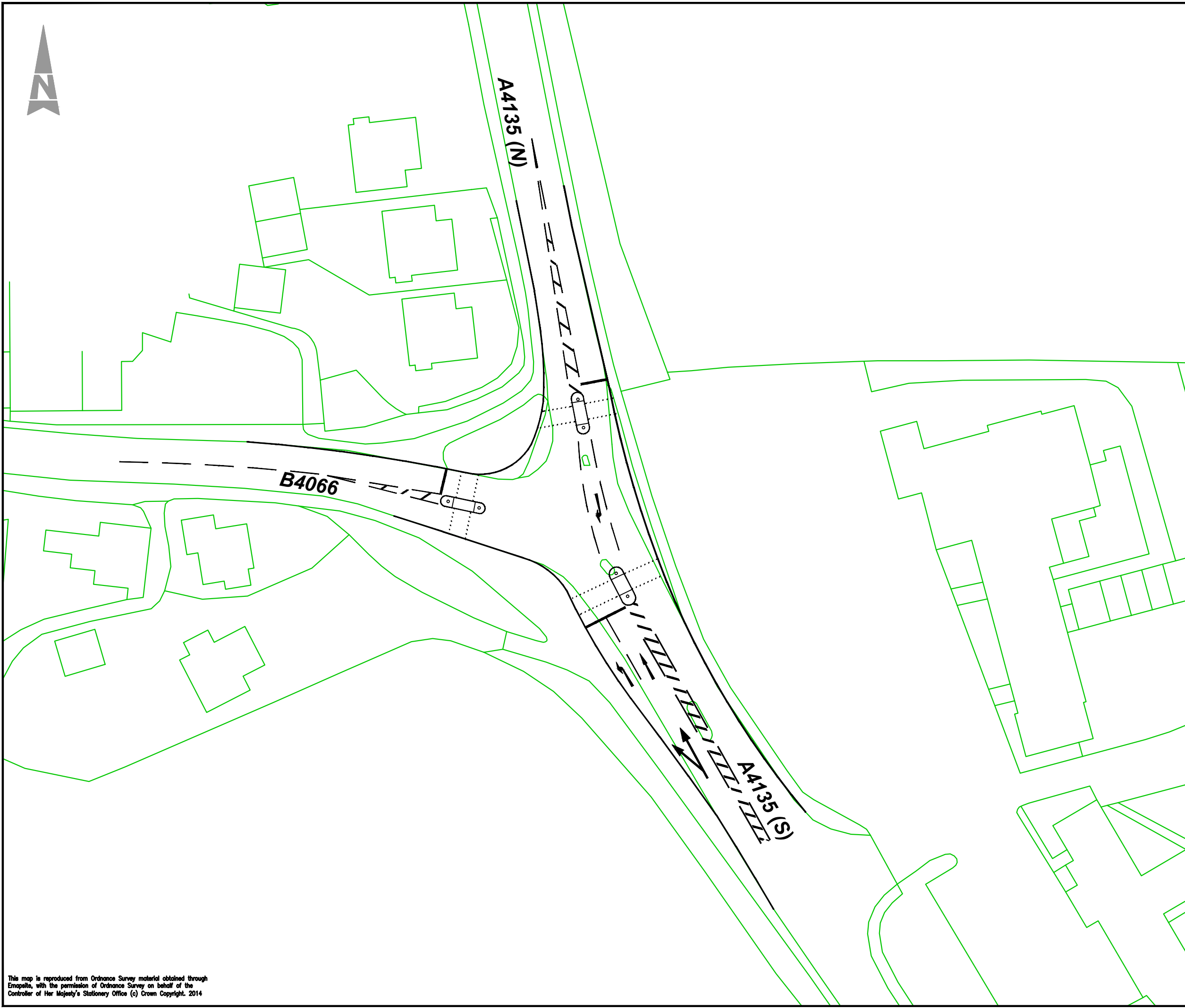
Title  
 Junction H1 - Potential Mitigation

Sheet Size	Original Scale	Designed/Drawn	Reviewed
<b>A3</b>		MT	TC
Status	Drawing Number	Date	Date
	5134537-MT Jch1	28/11/14	02/12/14
			Rev



Key

	Existing Layout
	Existing road markings
	Proposed Layout



Rev	
Status	

50	
10	
0	
A3	

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 Date: Dec 08, 2014 - 5:32pm  
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


Client  
 Stroud District Council

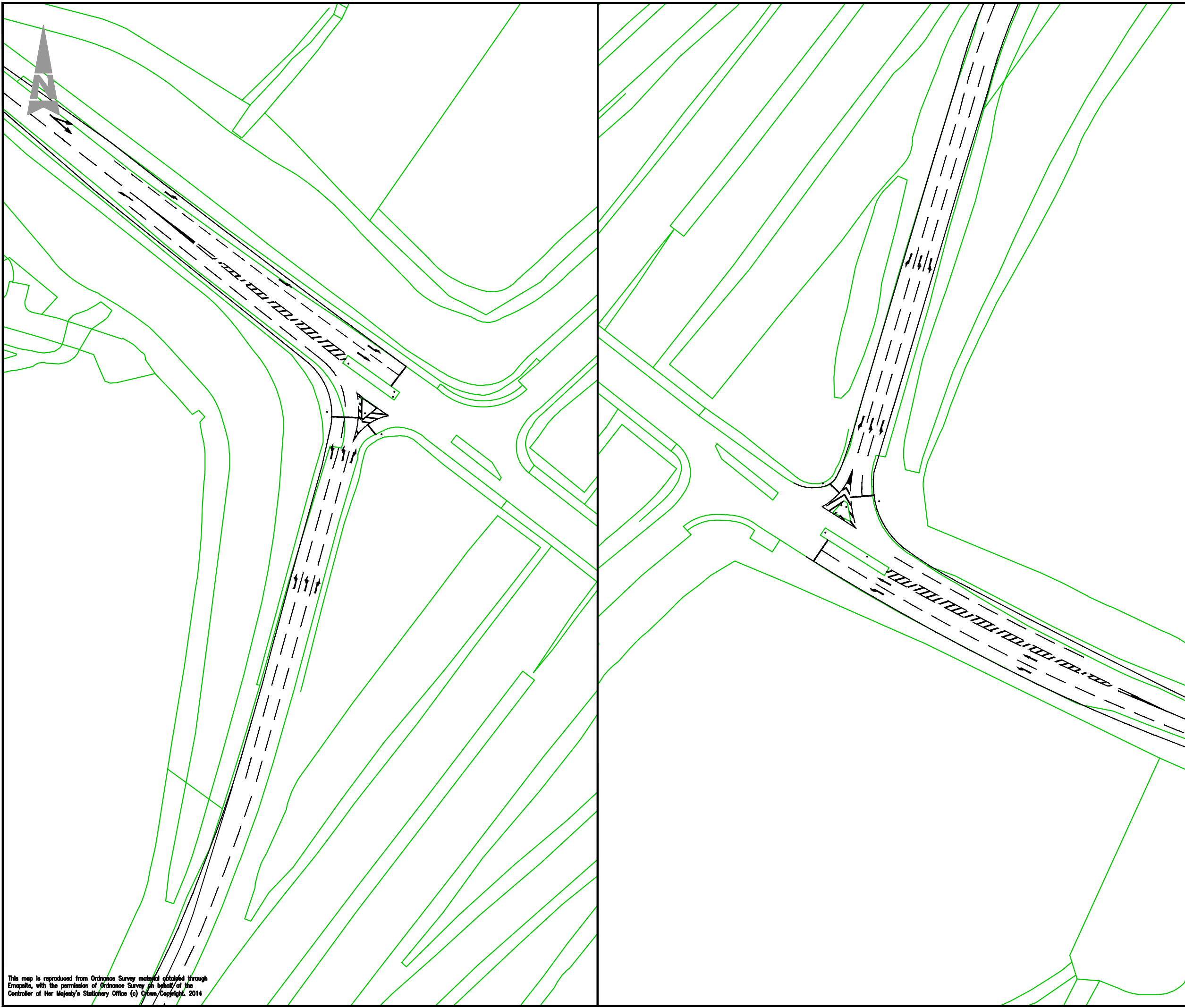
Project  
 Stroud Junction Assessment

Title  
 Junction H2 - Potential Mitigation

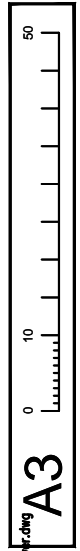
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Status	Drawing Number	Date	Date
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			Rev

**Key**

	Existing Layout
	Existing road markings
	Proposed Layout



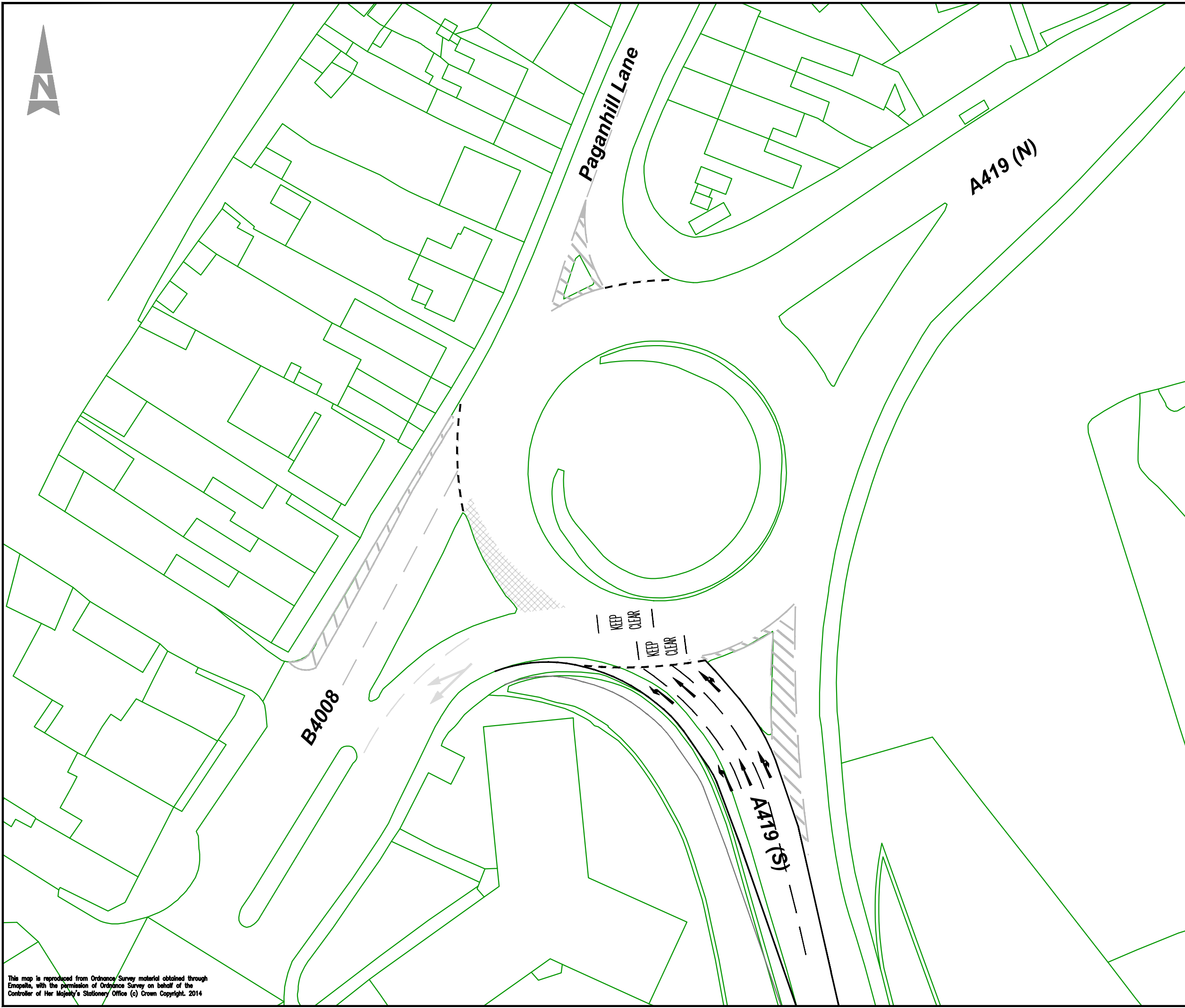
Rev	
Status	



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 Date: Dec 08, 2014 - 5:27pm  
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Project Stroud Junction Assessment			
Title Junction M – Potential Mitigation M5 Junction 14 / B4509			
Sheet Size <b>A3</b>	Original Scale 1:1000	Designed/Drawn MT	Reviewed TC
Status	Drawing Number 5134537-MT JcM	Date 28/11/14	Date 03/12/14
			Rev



Key

	Existing Layout
	Existing road markings
	Proposed Layout
	Removed Hatched Area

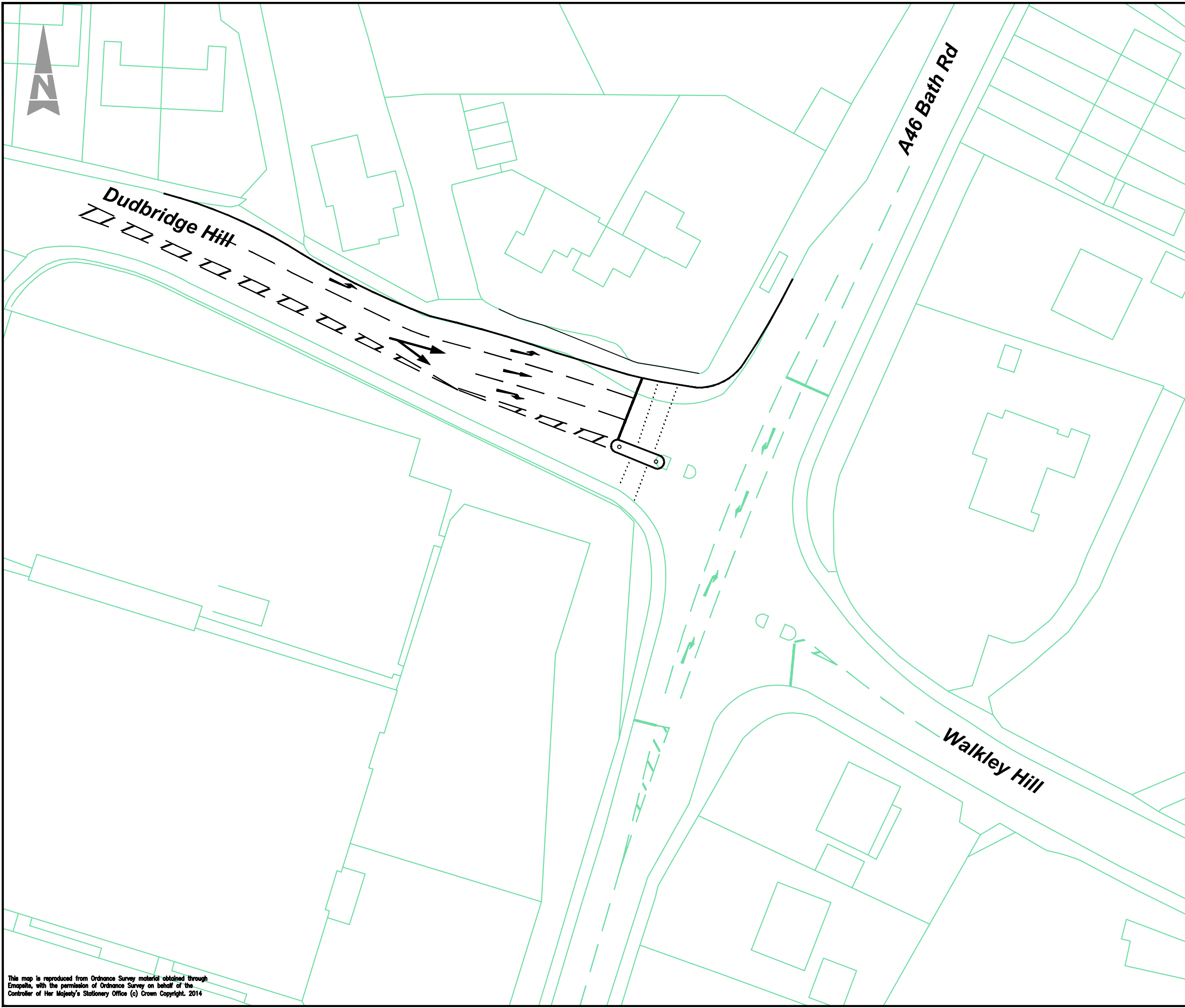
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Client Stroud District Council			
Project Stroud Junction Assessment			
Title Junction N – Potential Mitigation Caincross Roundabout			
Sheet Size <b>A3</b>	Original Scale 1:500	Designed/Drawn MT Date 27/11/14	Reviewed TC Date 02/12/14
Status	Drawing Number 5134537-MT JcN	Rev	

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Rev  
Status

A3  
0 10 50

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Date: Dec 08, 2014 - 5:15pm  
Plotted by: tre4122



Key

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	Existing road markings
	Proposed Layout

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Client  
Stroud District Council

Project  
Stroud Junction Assessment

Title  
Junction R – Potential Mitigation  
Dudbridge Hill/Bath Rd/Walkley Hill

Sheet Size <b>A3</b>	Original Scale 1:500	Designed/Drawn MT	Reviewed TC
Status	Drawing Number 5134537-MT JcR	Date 05/12/14	Date 08/12/14
			Rev

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**Tim Colles**

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