



National Highways

M6 J20A-21A LIGHTING RENEWAL

TA 501 Findings Report





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TA 501 Findings Report

TYPE OF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 604423

DATE: MARCH 2025

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	P01			
Date	31/03/2025			
Prepared by				
Signature				
Checked by				
Signature				
Authorised by				
Signature				
Project number	NH604423			
Report number	NH604423-WSP- HLG-M6- J20A_J21A-RP- EO-0001			
File reference	NH604423-WSP- HLG-M6- J20A_J21A-RP- EO-0001			

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INTRODUCTION



1 INTRODUCTION

1.1 BACKGROUND

- 1.1.1. A Highway Authority has a power, not a duty, under the Highways Act 1980 (or in Scotland the Roads (Scotland) Act 1984) to provide and maintain road lighting. Similarly, the local lighting authority, usually the Parish, Town, District or Borough Council has the power to provide and maintain footway lighting.
- 1.1.2. In exercising its powers regarding the extent, operation and maintenance of its road lighting, a Highway Authority should act reasonably. If it acts in a way that no reasonable Authority would act, then the decision of that Authority could be subject to review in the Courts.
- 1.1.3. National Highways requires the application of The Design Manual for Roads and Bridges (DMRB) and, in particular for road lighting, the use of TA 501 'Road Lighting Appraisal'.
- 1.1.4. TA 501 relates to the requirements for the appraisal of new and replacement road lighting on motorways and all-purpose trunk roads, which specifically addresses the high-level approach for lighting requirements and determines whether lighting should be provided. TA 501 also refers to the implementation of GG 101 'Introduction to the Design Manual for Roads and Bridges'.
- 1.1.5. TA 501 (Background) states that *"the primary purpose of road lighting for motorways and all-purpose trunk roads is to reduce personal injury collisions (PIC). This is a quantifiable benefit. Consequently, the most important consideration is the predicted accident cost saving, which should be greater than the lighting scheme cost in order to provide economic justification for road lighting"*.
- 1.1.6. The Road Safety Engineer plays a significant role in the road lighting appraisal and shall undertake an evaluation and full accident analysis of the scheme to produce a report to provide justification for not replacing the lighting on the scheme.
- 1.1.7. The scope of TA 501 refers to the assessment of life-expired road lighting in the context of the M6 from Junction 20a to Junction 21a, M56 Junction 9 Lymm Interchange and M62 Junction 8 to Junction 11, the lighting and associated infrastructure shall be new or replaced due to its age, as the existing lighting is circa 34 years old and therefore past its life expiry (30 years). Due to the lack of the latest inventory, it is assumed that lighting columns that are replaced with LEDs are life expired. The principles of TA 501 have been followed for the appraisal of the replacement road lighting. The TA501 assessment is not carried out for the new section of M6 J21a Smart Motorway (SMA) works.
- 1.1.8. The primary purpose of this report is to consider the safety aspects and the economic justification of new or replacing the existing lighting.

1.2 PROJECT BRIEF

- 1.2.1. The purpose of this report is to identify whether a proposed lighting scheme would be beneficial following an economic assessment in accordance with National Highways DMRB (Design Manual for Roads and Bridges) Technical Advice Note TA 501 and recommendations presented by the Road Safety Engineer (RSE).
- 1.2.2. The assessment considers the road lighting applicable to the M6 from Junction 20a to Junction 21a, M56 Junction 9 Lymm Interchange and M62 Junction 8 to Junction 11 mainline only which is inclusive of both entry and exit slips beyond the 5 second rule as per the Institution of Lighting Professionals (ILP) Professional Lighting Guide (PLG 02) – 'The Application of Conflict Area on the Highway' at each junction. Any junctions and conflict areas were excluded from the TA501 assessment and were considered to be left illuminated.

1.3 SCHEME DESCRIPTION

- 1.3.1. The length of the road considered for the renewal of street lighting is that of M6 motorway, between Junction 20a to Junction 21a, M56 Junction 9 Lymm Interchange and of M62 motorway, Junction 8 to Junction 11.
- 1.3.2. Within the study area forms part of National Highways motorway network in the Northwest of England and takes the generally form of a dual carriageway arrangement. The lane arrangement varies between junctions as follows:
 - There are three mainline running lanes from M6 Junction 20a to M6/ J20a/M56 J9 Lymm Interchange, at M62 running eastbound and westbound to M6 J20a/M56 J9 Lymm Interchange and at sections of M62 J8 to M62 J9.
 - Carriageway A at a section of M6 from Junction 20a to Junction 20, at a section of M6 J21a to M6 J21a/M62 J10 Croft Interchange and M62 Junction 8 to Junction 9 has a lane arrangement while carriageway B has four mainline running lines.
 - The section of M6 Junction 20 to Junction 21a, at the west side of M62 from Junction 9 to Junction 10 and at east side of M62 from M62 J10 to J11 has four lanes running in each direction.
- 1.3.3. Road M6 from Junction 20a to Junction 21a, M62 and M56 are subjected to variable speed limits (VSL), controlled electronically.
- 1.3.4. The scheme extents are demonstrated in Figure 1.1 overleaf:

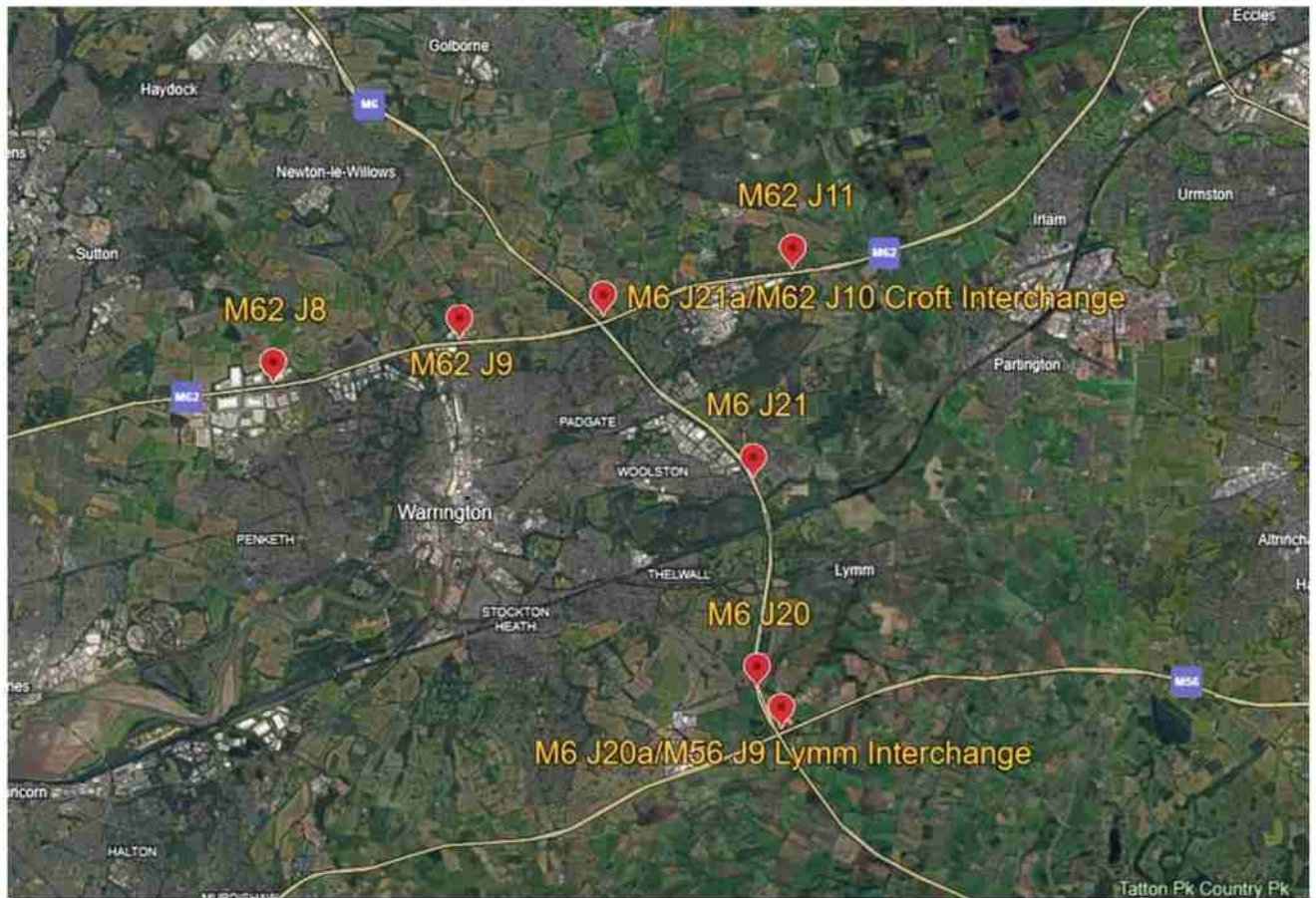


Figure 1-1 – M6 Junctions 20a to 21a Scheme Location

1.3.5. The scheme area has been divided into seven assessment zones from junction centre to junction centre. The Assessment Zones (AZ) are as follows:

- AZ 1 – M6 J20a/M56 J9 Lymm Interchange
- AZ 2 – M6 J20 to M6 J21
- AZ 3 – M6 J21 to M6 J21a
- AZ 4 – M6 J21a/M62 J10 Croft Interchange
- AZ 5 – M62 J10 Croft Interchange to M62 J11
- AZ 6 – M62 J9 to M62 J10 Croft Interchange
- AZ 7 – M62 J8 to M62 J9

1.3.6. The assessment zones are detailed in Figure 1-2 overleaf.



Figure 1-2 – Assessment Zones

- 1.3.7. As confirmed by National Highways, assessment zones are inclusive of the link roads and slip roads. The rationale for dividing assessment zones is detailed below.
- **Assessment Zone 1 – M6 J20a/M56 J9 Lymm Interchange**
The assessment zone starts from near marker post 296/0 at the southbound carriageway and 206/0 at the northbound carriageway of M6, where the existing lighting ends until Junction 20 (marker post 299/0) and slip roads that connect to M56. The assessment zone also covers M56 (marker post 31/0) at the west side of the M6 J20a/ M56 J9 Lymm Interchange until the east side of the Interchange where the existing lighting extent stops (marker post 27/0).
 - **Assessment Zone 2 – M6 Junction 20 to M6 Junction 21**
The assessment zone extends from the centre of Junction 20 (marker post 299/0) to the centre of Junction 21 (marker post 302/0) and consists of M6 mainline and slip roads that connect M6 to A50 and A57.
 - **Assessment Zone 3 – M6 Junction 21 to M6 Junction 21a**

The assessment zone extends from the centre of Junction 21 (marker post 302/0) to the centre of Junction 21a (marker post 305/0) and consists of M6 mainline and slip roads that connect M6 to A57.

- **Assessment Zone 4 – M6 J21a/M62 J10 Croft Interchange**
The assessment zone starts from M6 Junction 21a (marker post 305/0) to the start of SMA works at M6, as instructed by National Highways (marker post 6ZD37). The assessment does not include newly constructed SMA works. The assessment zone also covers M62 at the west side of the M6 J21a/ M62 J10 Croft Interchange(marker post 28/0) until the east side of the Interchange where the existing lighting extent stops(marker post 31/0).
- **Assessment Zone 5 – M62 J10 Croft Interchange to M62 Junction 11**
Assessment zone begins at M6/J21a M62/J10 Croft Interchange (marker post 31/0) to M62 Junction 11 (marker post 34/0). The zone also includes a slip road that connects M62 to A574.
- **Assessment Zone 6 – M62 Junction 9 to M62 J10 Croft Interchange**
Assessment zone starts at M6/J21a M62/J10 Croft Interchange (marker post 28/0) to the centre of M62 Junction 9 (marker post 26/0). The zone also includes slip roads that connect M62 to A49.
- **Assessment Zone 7 – M62 Junction 9 to M62 Junction 8**
This assessment zone begins at the centre of M62 Junction 9 (marker post 26/0) to M62 Junction 8 (marker post 23/0), where existing lighting stops.

1.3.8. Table 1-1 details the criteria considered for determining the zone extents and provides commentary on factors for any potential collisions:

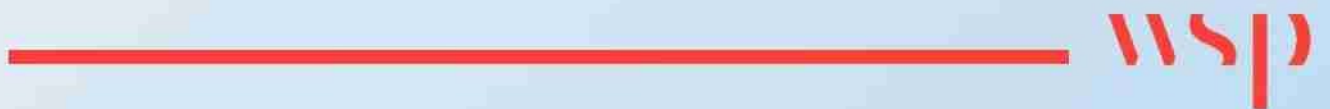
Table 1-1 – Assessment Zone Justification

Assessment Zone	Junction / Access / Link	Higher potential for weaving / queuing	Assessment Zone Considered to ILP PLG 02 distances
AZ 1 – M6 J20a/M56 J9 Lymm Interchange	Junction and Link	Yes	Yes
AZ 2 – M6 J20 to M6 J21	Junction	Yes	Yes
AZ 3 – M6 J21 to M6 J21a	Junction	Yes	Yes
AZ 4 – M6 J21a/M62 J10 Croft Interchange	Junction and Link	Yes	Yes
AZ 5 – M62 J10 Croft Interchange to M62 J11	Junction and Link	Yes	Yes
AZ 6 – M62 J9 to M62 J10 Croft Interchange	Junction and Link	Yes	Yes
AZ 7 – M62 J8 to M62 J9	Junction	Yes	Yes

- 1.3.9. In the absence of guidance within TA 501, the assessment zones were determined following instruction from the client to consider junction centre to junction centre and using the design logic of ILP PLG 02. Assessment zones are considered at diverge/merge locations (in junctions) for a minimum of 156m (SSD for 70mph road) at all locations where there is potential to join or leave the main carriageway, which enabled a closer look at the potential for Personal Injury Collision (PIC) clusters where vehicle weaving/queuing may occur. There is one PIC cluster with 8 collisions (4 darkness collisions and 4 daylight collisions), as detailed in section 2.2.14 of the RSE report found in assessment zone 2. It is to be noted that the collisions are caused mainly due to driver errors or the presence of an animal/object on the carriageway.

2

EXISTING LIGHTING



2 EXISTING LIGHTING

2.1 EXISTING LIGHTING ARRANGEMENT

The mainline and slip road within the scheme area are currently illuminated throughout its extent, and there are no unlit gaps present between sections. Table 2-1 below details the existing extents within the scheme area:

Table 2-1 – Existing Lighting Extents

Assessment Zone	Extent	Existing Mainline Lighting	Comments
1	M6 J20a/M56 J9 Lymm Interchange	A combination of opposite arrangement of lighting columns along verges of M6 and M56 and twin arm columns within the central reserve in the dual carriageways. Single-sided column arrangement is used at single carriageways.	-
2	M6 J20 to M6 J21	Opposite arrangement of lighting columns along the verges of M6 in the dual carriageway. A combination of opposite and single sided arrangements of lighting columns is used in the single carriageways.	-
3	M6 J21 to M6 J21a	Opposite arrangement of lighting columns along the verges of M6 in the dual carriageway. A combination of opposite and single sided arrangements of	

		lighting columns is used in the single carriageways.	
4	M6 J21a/M62 J10 Croft Interchange	Combination of opposite arrangement of lighting columns along verges of M6 and M62 and twin arm columns in the central reserve in the dual carriageways. Single-sided column arrangement is used at single carriageways.	
5	M62 J10 Croft Interchange to M62 J11	Opposite arrangement of lighting columns along the verge	
6	M62 J9 to M62 J10 Croft Interchange	Opposite arrangement of lighting columns along the verges of M62 and twin arm columns in the central reserve in the dual carriageway. Single sided arrangements of lighting columns are used in the single carriageways.	
7	M62 J8 to M62 J9	Opposite arrangement of lighting columns along the verges of M62 and twin arm columns in the central reserve in the dual carriageway. Single sided arrangements of lighting columns are used in the single carriageways.	

- 2.1.1. Across the scheme extents, the existing lighting arrangement varies, with a combination of existing double bracket arm columns located within the centre reserve and single arm lighting columns located within the verge being the most common. Single arm lighting columns in an opposite arrangement are located within the verge from M6 J20a to M6 J21a, M56 and M62 J8 to M62 J11. The entry and exit slips to the mainline are generally lit with single-sided arrangement of lighting columns located in the verges.
- 2.1.2. The vast majority of the existing lighting was installed in the 1990s, and columns are a mixture of standard hexagonal and tubular steel columns lit mainly with HPS (High Pressure Sodium) lanterns that have been manufactured by either Urbis Schreder, Philips Lighting or WRTL.
- 2.1.3. The age of the lighting and the electrical infrastructure is circa 34 years old, and both infrastructures have exceeded their expected life design.
- 2.1.4. For this report, only the M6, M56 and M62 mainline have been assessed. The slip roads beyond the 5 seconds rule lighting are considered as part of the mainline.

Table 2-2 – Existing Lighting Arrangement

Assessment Zone	Luminaire Quantity	Arrangement*
AZ 1	608	Lighting columns of height that vary from 12m to 15m with twin bracket arm or single bracket arm are used. Wall mounted units are installed at a height of 5m. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 150W, 250W, 400W and 600W are utilised.
AZ 2	274	Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm are used. Wall mounted units are installed at a height of 5m. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 150W, 250W, 400W and 600W are utilised.
AZ 3	183*	Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm are used. Wall mounted units are installed at a height of 5m. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 150W, 250W, 400W and 600W are utilised.
AZ 4	525*	Lighting columns of height that vary from 12m to 15m with twin bracket arm or single bracket arm are used. Wall mounted units are installed at a height of 5m. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 135W, 141W, 150W, 250W, 400W and 600W are utilised.
AZ 5	111	Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm are used. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 250W and 400W are utilised.
AZ 6	82	Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm or twin bracket arm are used. Luminaires

		incorporating High Pressure Sodium (SON-T) with a power output of 179W, 400W and 600W are utilised.
AZ 7	253	Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm or twin bracket arm are used. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 250W, 400W and 600W are utilised.

**Based on Google Street View dated June 2024, there are LED units used within the scheme extent. Due to the lack of updated inventory information, it is considered that SON luminaries are used within this extent throughout the assessment.*

2.2 CONDITION OF EXISTING ASSETS

- 2.2.1. Based on desktop assessment, the majority of the scheme is barrier-protected, and the re-use of existing barriers to protect any new lighting columns will need to be assessed on an individual basis during the next stage of design.
- 2.2.2. No electrical or structural testing information has been used for this report, and the condition is derived from an existing lighting asset inventory.
- 2.2.3. It is unclear what the age of cable is, however, it is assumed that the cable is the same age as the original installation and past its operational life.
- 2.2.4. This lighting assessment has limitations with respect to the assets, such as illuminated signs. The condition of these sign units is to be evaluated at a later design stage

2.3 SCHEME LENGTH

- 2.3.1. A statistical overview of the assessment zone carriageway lengths at present is provided in Table 2-2 below:

Table 2-3 – Overview of the Scheme Area

Assessment Zone	Length (km)
1	11.7km
2	4.24km
3	2.89km
4	13.73km
5	2.87km
6	1.43km
7	4.6km

3

CONCEPT LIGHTING DESIGN PRINCIPLES AND APPROACH



3 CONCEPT LIGHTING DESIGN PRINCIPLES AND APPROACH

3.1 OVERVIEW

- 3.1.1. To deliver an economic assessment of the lighting, it is necessary to develop a basic concept lighting arrangement, which will enable the evaluation of both the Capital (CAPEX) and Operational costs (OPEX).

3.2 SELECTION OF LIGHTING CLASSES

- 3.2.1. British Standard (BS) European Standards (EN) 5489-1:2020 'Code of Practice for the Design of Road Lighting – Part 1: Lighting of Roads and Public Amenity Areas' provides guidance on the selection parameters for an appropriate lighting class based on the following criteria and risk assessment approach:
- Road Type
 - Annual Average Daily Traffic (AADT) Flow
 - Road Speed
 - Junction Density
- 3.2.2. The lighting shall be designed in accordance with DMRB document TD 501 – Road Lighting Design'
- 3.2.3. The M6, M56 and M62 mainlines are defined as strategic traffic routes, "roads where the predominant users are motorised vehicles" BS5489-1 item 7.1 advises that traffic routes are lit to the appropriate M classification.
- 3.2.4. The M6, M56 and M62 are deemed to be strategic traffic routes with the national speed limit of 70mph applied throughout the scheme area and have several entries, exit slip roads, link roads and junctions connecting to them. The Annual Average Daily Traffic (AADT) is assumed to be high to very high (AADT>40,000) mainline and for slip roads, it is assumed to be low to moderate (7000<AADT<40,000).
- 3.2.5. WSP can determine the appropriate 'M' lighting class for each link using Table A.2 of BS5489-1 as shown in Figure 3.1 below

Table A.2 — Lighting classes for traffic routes ($v > 40$ mph)

Traffic flow	Lighting class		
	Dual carriageway		Single carriageway
	Junction density: high	Junction density: low	
High to very high ^{A)}	M2	M3	M2
Low to moderate ^{B)}	M3	M4	M3
Very low ^{C)}	M4	M5	M4

NOTE 1 High junction density would be junction centres spaced < 3 km apart.

NOTE 2 Where a single carriageway has a high density of junctions, a risk assessment can determine whether some of the junctions constitute conflict areas (see [4.3.2](#)).

NOTE 3 Grey highlighting indicates situations that would not usually occur in the UK.

^{A)} High to very high traffic flow might be defined as either having an average daily traffic (ADT) $> 40\,000$, or where the flow exceeds 65% of the lane maximum capacity for dual or multi-lane carriageways or 45% for single carriageways.

^{B)} Low to moderate traffic flow might be defined as either having an ADT of between 7 000 and 40 000, or where the flow is between 35% and 65% for dual or multi-lane carriageways or between 15% and 45% for single carriageways.

^{C)} Very low traffic flow might be defined as either having an ADT of $< 7\,000$, or where the flow is $< 35\%$ for dual or multi-lane carriageways or $< 15\%$ for single carriageways.

Figure 3-1 - BS5489-1:2020 - Table A.2

- 3.2.6. Using the collated/assumed information on the carriageways M6, M56 and M62 within the scheme extents, the lighting class for each assessment zone/link based on road type, traffic, road speed and junction density is detailed in Table 3-1 below:

Table 3-1 – Lighting Level Requirements

Assessment Zone	Road Name	Road Type	Assumed Traffic Flow	Junction density	Road Speed Limit	Determining Class
1	M6	Dual Carriageway	High to Very High	High	70mph	M2
	M56	Dual Carriageway	High to Very High	Low	70 mph	M3
	M6	Single Carriageway	Low to Moderate	-	70mph	M3
	M6/M56 Slip Roads	Single Carriageway	Low to Moderate	-	70mph	M3
2	M6	Dual Carriageway	High to Very High	Low	70mph	M3
	M6	Single Carriageway	Low to Moderate	-	70mph	M3
	M6/Lymm Interchange Slip Roads	Single Carriageway	Low to Moderate	-	70mph	M3

	M6/ Manchester Road Slip roads	Single Carriageway	Low to Moderate	-	70mph	M3
3	M6	Dual Carriageway	High to Very High	Low	70mph	M3
	M6	Single Carriageway	Low to Moderate	-	70mph	M3
	M6/ A57 Manchester Road Slip roads	Single Carriageway	Low to Moderate	-	70mph	M3
4	M6	Dual Carriageway	High to Very High	High	70mph	M2
	M62	Dual Carriageway	High to Very High	High	70 mph	M2
	M6/M62	Single Carriageway	Low to Moderate	-	70mph	M3
	M6/M62 Slip Roads	Single Carriageway	Low to Moderate	-	70mph	M3
5	M62	Dual Carriageway	High to Very High	High	70mph	M2
	M62	Single Carriageway	Low to Moderate	-	70mph	M3
	M62/Birchwood Way Slip Roads	Single Carriageway	Low to Moderate	-	70mph	M3
6	M62	Dual Carriageway	High to Very High	High	70mph	M2
	M62	Single Carriageway	Low to Moderate	-	70mph	M3
	M62/A49 Slip Roads	Single Carriageway	Low to Moderate	-	70mph	M3
7	M62	Dual Carriageway	High to Very High	Low	70mph	M3
	M6	Single Carriageway	Low to Moderate	-	70mph	M3
	M62/A49 Slip Roads	Single Carriageway	Low to Moderate	-	70mph	M3
	M62/Burtonwood Road Slip Roads	Single Carriageway	Low to Moderate	-	70mph	M3

Table 3-2– Lighting Level Requirements for Lighting Class M2

Parameter	Value
Lav in cd/m sq (Min Mtd)	1.50 cd/m2 min
Uo (min.)	0.40 min
Ui (min.)	0.70 min
fTI	10% max
Rei	0.35 min

Table 3-3– Lighting Level Requirements for Lighting Class M3

Parameter	Value
Lav in cd/m sq (Min Mtd)	1.0 cd/m2 min
Uo (min.)	0.40 min
Ui (min.)	0.60 min
fTI	15% max
Rei	0.30 min

- 3.2.7. An alternative approach could be considered in accordance TD 501 whereby the mainline is unlit to an appropriate tie-in location. The standard advises that there should not be an unlit gap of less than four times the stopping site distance (SSD) as detailed in CD 109 'Highway Link Design' between lit areas. Table 3-4 below details the required SSD for some typical road speeds:

Table 3-4– Stopping Sight Distances (SSD)

Measurement	Scenario 1	Scenario 2	Scenario 3
Design Speed (mph)	70	60	50
Stopping Distance (m)	295	215	160
Stopping Distance x1.5 (m)	442.5	322.5	240
Stopping Distance x4.0 (m)	1180	860	640

- 3.2.8. The design road speed limit throughout the scheme area is 70mph, therefore if TD 501 and CD 109 were applied there would need to be a minimum of 1,180m of unlit section between the last columns at each junction, however a drop of one step (road speed) is acceptable and therefore reduces extent to 860m, as per CD 109 and TD 501.

- 3.2.9. There are no unlit gaps in the mainline throughout the scheme. Entry slip roads are lit to a length of 156m based on ILP PLG02 to light for 5 seconds of driving distance at the speed limit for the road of 70mph.
- 3.2.10. Note that with any future speed reductions, the extent can be reduced.

3.3 DETERMINING THE PROPOSED LIGHTING ARRANGEMENT

- 3.3.1. For the purpose of this appraisal, a like-for-like replacement of existing lighting columns in sections where there is existing lighting has been undertaken.
- 3.3.2. The mainline carriageways within the scheme area can be illuminated through three different lighting arrangement options to achieve the required lighting levels. The options are as follows:
- Opposite arrangement with columns located within the verge.
 - Twin Central arrangement with lighting columns located within the centre reserve.
 - A combination of both verge and twin central lighting.
- 3.3.3. The slip roads within the scheme area can be illuminated through a single-sided arrangement located within the verge.
- 3.3.4. The underpass lighting units shall be mounted in the structure. A like-for-like replacement is considered at this stage of design.
- 3.3.5. The adopted lighting arrangement will need to satisfy the requirements stipulated in both TD 501 and the maintenance agents' specifications for the scheme. These are as follows:
- Maximum column height of 15m
 - A maximum bracket outreach of 1.5m
 - Luminaire luminous intensity rating of G4 or above (BS EN 13201-2 – Table A.1)
- 3.3.6. A central reserve arrangement is comparable with a verge arrangement in terms of column spacing; however, typically, a central reserve arrangement entails a significant reduction in the total number of columns, cabling and associated trenching required. A reduction in columns, cabling and trenching will provide capital cost savings however, this will be offset by the potential requirement to upgrade the vehicle restraint system, which would protect the columns from impact.
- 3.3.7. There has been a steer in recent years to remove highway furniture from the central reserve due to the costs and impact associated with the traffic management required to maintain any equipment located within the central reserve. This is to be evaluated during the next stage of design.
- 3.3.8. For the purpose of this appraisal, the proposed concept lighting design has been based on the existing arrangement (like for like). It should be noted that the final design solution may be subject to change or indeed be unlit subject to the outcome of the assessment.
- 3.3.9. Overhead Power Lines (OHL) are present adjacent to street lighting columns within this scheme. Safety clearance of lighting columns from OHLs as required on Guidance Note GS6 – Avoidance of danger from overhead electric power lines has not been considered while determining column locations. Safety clearance of street lighting columns to OHLs shall be ensured during the next stage of design.

3.4 COLUMN HEIGHTS

- 3.4.1. The existing lighting installation has been used to establish suitable proposed column heights, with either a 10m, 12m or 15m solution provided at the mainline and 12m or 10m at the slip roads.
- 3.4.2. The wall-mounted units within the scheme are considered to be mounted at a 5m height for the purpose of assessment. The mounting height is to be confirmed based on the headroom clearance of the structure at a later stage of design.
- 3.4.3. Typically, lighting column heights for similar roads would not exceed 15m unless there were special circumstances which may determine otherwise.

3.5 LUMINAIRE WATTAGE

- 3.5.1. Typically, when using HPS lamps similarly to the existing lighting installation, adopting higher wattage lamps permits a greater spacing between columns and will minimise the capital cost of the scheme. The issue with HPS lamps is that a considerable amount of energy is radiated as heat, however, through the introduction of Light Emitting Diode (LED) luminaires, more energy is converted to light and less is radiated as heat, which makes them a far more energy efficient.
- 3.5.2. Whilst the existing lighting installation consists of several different lanterns and wattages ranging from 50W to 600W for HPS lamps, the proposed lighting design utilises LED luminaires with a wattage half of the existing lantern e.g. existing 400W HPS luminaire would be replaced with a 200W LED luminaire on a like for like basis with luminaire power outputs ranging from 75W to 300W. This will significantly reduce the overall energy consumption of the lighting installation and subsequently provide a greater reduction in energy.
- 3.5.3. LED luminaires also allow for instant switch on and more efficient switch regimes such as 20 Lux on and 20 Lux off in comparison to HPS lamps, which further increases the potential for energy savings. The integration of a Central Management System (CMS) would enable dimming in hours of low traffic to enhance savings further. It is to be noted that HPS units can't implement a CMS.

3.6 PROPOSED LIGHTING DESIGN

- 3.6.1. A design solution for the road lighting was selected against the following criteria:
 - The requirement for compliance with the latest design standards specified within DMRB.
 - Selection of the most cost-effective replacement option based on initial capital investment costs and life cycle maintenance.
- 3.6.2. For the purpose of this appraisal, the proposed concept lighting design has been based on the existing arrangement (like for like) with either 10m, 12m or 15m lighting columns, complete with LED luminaires. This satisfies the requirements of BS EN 13201 lighting classes M2 and M3.
- 3.6.3. Table 3-6 provides details on the proposed lighting column and luminaire assets:

Table 3-6 – Proposed Lighting Column and Luminaire Schedule

Assessment Zone	Columns	Luminaires	Description
1	568	608	10m, 12m and 15m nominal height road lighting columns with a twin bracket arm or single bracket arm and wall mounted units incorporating 75W, 125W, 200W and 300W LED luminaires.
2	267	273	12m and 15m nominal height road lighting columns with a single bracket arm and wall mounted units incorporating 75W, 125W, 200W and 300W LED luminaires.
3	173	183	12m and 15m nominal height road lighting columns with a single bracket arm and wall mounted units incorporating 75W, 125W, 200W and 300W LED luminaires
4	509	525	10m, 12m and 15m nominal height road lighting columns with a twin bracket arm or single bracket arm and wall mounted units incorporating 75W, 125W, 200W and 300W LED luminaires.
5	111	111	12m and 15m nominal height road lighting columns with a single bracket arm incorporating 125W and 200W LED luminaires.
6	82	82	10m and 15m nominal height road lighting columns of single bracket arm incorporating 89.5W, 200W and 300W LED luminaire
7	179	253	10m, 12m and 15m nominal height road lighting columns with a twin bracket arm or single bracket incorporating 125W, 200W and 300W LED luminaires.

- 3.6.4. This table considers only the mainline lighting columns. The slip roads beyond the 5 seconds rule lighting are considered as part of the mainline.

4

ECONOMIC ASSESSMENT



CONFIDENTIAL

4 ECONOMIC ASSESSMENT

4.1 TA 501 DESCRIPTION

- 4.1.1. This standard sets out the procedure for the appraisal of new and replacement lighting on the strategic motorway and all-purpose trunk road network.
- 4.1.2. This standard should be read in conjunction with the National Highways Scheme Appraisal Report (SAR) or an equivalent appraisal process complying with the Transport Analysis Guidance issued by the Department for Transport (DfT).

4.2 SCHEME APPRAISAL REPORT(SAR) DESCRIPTION

- 4.2.1. A Microsoft Excel spreadsheet has been used for the SAR, where recent darkness PIC data and proposed scheme costs are inputted to determine whether the proposed scheme costs are beneficial in comparison to the predicted darkness PIC savings over the scheme lifecycle.
- 4.2.2. In order to determine whether a scheme is viable, the designer must have the following information:
 - Quantifiable lighting design
 - AADT
 - PIC data from the previous 3 years
 - Capital costs (CAPEX)
 - Operating costs (OPEX)
 - PIC's saved in opening year.
- 4.2.3. The above information has been collated from the overseeing organisation utilising TA 501 guidance to extract the necessary values for insertion in the SAR.
- 4.2.4. When the SAR is completed, the scheme is provided with a BCR (Benefit Cost Ratio). If the BCR is greater than 1.0 then the scheme benefits outweigh the scheme costs. Therefore, if the BCR is less than 1.0, then the scheme costs outweigh the scheme benefits.
- 4.2.5. As part of this appraisal, it is advised that a RSR (Road Safety Review) is carried out by a RSE (Road Safety Engineer) to provide an independent view of the proposed lighting scheme from a safety aspect.
- 4.2.6. A risk allowance of 10% has been added to the scheme in accordance with the SAR guidance notes Table C.1 Conception scheme stage without a risk assessment.
- 4.2.7. For the purpose of the SAR, the scheme area was divided into seven assessment zones which as detailed in Section 1.3.6

4.3 CAPITAL (CAPEX) COSTS

- 4.3.1. The main cost components for the proposed lighting design are as follows:
 - Lighting Columns

- Feeder Pillars
- Luminaires
- Cabling/Trenching/Ducting
- Central Management System
- Auxiliary Items

4.3.2. Within the assessment, we have provided indicative quantities of the lighting equipment with an overarching capital cost of £46,000 utilised, which is inclusive of all required works such as feeder pillars, ducting and cabling etc. The overarching capital cost of £46,000 derives from the clients PSC (Professional Services Contract) work brief. Table 4-1 details the design approach and assumptions made to determine quantities:

Table 4-1 – Lighting Design Approach

Item	Approach/Assumption
Lighting Columns	It is considered that standard planted base lighting columns are used. The use of standard lighting columns is deemed to be the most economical and can be accommodated within the highway verges and central reserve (where like for like).
Luminaires	It is considered that the proposed LED luminaires are of half the wattage of existing luminaires (75W to 300W). LED luminaires shall have a glare rating of G4 or above, and maintenance factor is considered as 0.83.
Feeder Pillars	A budgetary allowance has been made within the overarching capital cost of £46,000 for new replacement feeder pillars and associated DNO (Distribution Network Operator) new connection and transfer of supply costs. It should be noted however that the cost of a new power supply from the DNO can vary significantly in price should a transfer of supply not be achievable.

4.4 OPERATING COSTS(OPEX)

4.4.1. The revenue costs associated with the lighting design have been assessed over a 30-year period.

- Energy Consumption
- Maintenance (luminaire cleaning/replacement and column inspections)
- Electrical Testing
- Fault Rectification
- Remedial Works

4.4.2. Table 4-2 details the criteria and assumptions have been applied in relation to the operation and maintenance of the lighting assets:

Table 4-2 – Revenue Cost Criteria and Assumptions

Item	Criteria/Assumption
Electrical Inspection and Testing	Every 6 years
Luminaire Clean and Replacement	Every 6 years
Opening Year Energy Cost	28p/kWhr
Annual Burning Hours (20/20 Lux)	4087
Decommissioning Costs	20% of total capital works costs

- 4.4.3. Historically for HPS lamps, the cleaning and replacement on trunk roads and motorways typically took place every 3 to 4 years, however, due to the introduction of LED luminaires and more comprehensive research into LED luminaire depreciation has meant that undertaking a clean and replacement of luminaires has increased to 6 years which coincides with the electrical testing and inspection requirements. Through undertaking these activities at the same time under routine maintenance will result in reduced costs, particularly associated with traffic management.
- 4.4.4. For the purpose of this assessment, a 6-year routine maintenance cycle (inclusive of electrical testing) has been applied and is considered to be an efficient approach in terms of minimising cost.
- 4.4.5. Refer to Appendix A for the total scheme costs associated with the renewal of the M6, M56 and M62 mainline. Table 4-3 summarises the BCR calculation findings based on the mainline assessment.
- 4.4.6. This report offers options for the lighting within the conclusions, and based on these options, there will be a variation to the costs; these will be subject to the mainline lighting provision and the adjoining slip/merge lighting, which is unaccounted for in the SAR.

4.5 PERSONAL INJURY COLLISION COST

- 4.5.1. The cost applied to PIC responses is £188,780 as determined from 'Table A 4.1.4 – Average Value of prevention per road accident by severity and road class of the DfT TAG Data Book May 2024.

4.6 SAR RESULTS

The SAR was undertaken in accordance with TA 501. A summary of the SAR is detailed within Table 4-3:

Table 4-3 – SAR Summary

Assessment Zone	Dark PIC saved in Y1.	Capital Cost (Installation Only, 30yr)	PVC (Present Value Costs)	PVB (Present Value Benefits)	BCR (Benefit Cost Ratio)
AZ 1	0.074	£27,146,992.00	£1,268,792.32	£13,214.60	0.01
AZ 2	0.137	£12,760,998.00	£579,254.48	£28,317.00	0.06
AZ 3	0.084	£8,268,362.00	£385,345.77	£15,102.40	0.05
AZ 4	0.074	£24,518,322.00	£1,109,128.58	£15,102.40	0.02
AZ 5	0.011	£5,305,134.00	£236,784.56	£3,775.60	0.02
AZ 6	0.011	£3,919,108.00	£177,124.52	£7,551.20	0.05
AZ 7	0.042	£9,282,188.20	£33,612.37	£9,439.00	0.03
All Assessment Zone Average	0.061	£13,028,729.17	£541,434.66	£15,372.09	0.032

* Dark PIC saved in Year 1, BCR for All assessment zones is the average value of assessment zones, Capital Cost, Present Value Cost and Present Value Benefits is the sum of the costs of assessment zones.

- 4.6.1. Please refer to Appendix B for individual assessment zone's SAR results.
- 4.6.2. The SAR Summary detailed within Table 4-3 above shows that none of the assessment zones has a BCR value that is greater than 1, with the overall average BCR of all assessment zones calculated at 0.032. This indicates that the scheme cost outweighs the scheme and, therefore, the lighting is not deemed to be justifiable. An investigation was undertaken to establish the total number of darkness PICs and their severity. A total of 52 darkness PICs occurred within the scheme's extent, six of which were attributed to [REDACTED].
- 4.6.3. Under previous guidance documents it was advised that a 10% PIC saving may be offered by the provision of lighting, however, a 5% PIC saving has been adopted by the Road Safety Engineer. Using this value, an average yearly saving of 0.061 darkness PICs could be made across the scheme, as demonstrated in table 4-4. Ongoing studies on the network are pointing towards minimal savings (if any) by the provision of lighting on the network. It is thought that the improved visibility of

signals, vehicle brake lights and emergency vehicle lights in dark conditions are a factor in this. Similar PICs in the future would not necessarily be aided by the provision of lighting, as the non-provision of lighting can make drivers more cautious by driving slower in darkness and poor weather conditions, reducing the potential for PICs. Further contributory factors, such as the road surface, should be considered behind the higher PICs in this throughout the scheme extents, and other safety mitigations could be considered if deemed necessary.

- 4.6.4. In consideration of the above, it is not considered that the provision of lighting is truly justified when considering all assessment zones are not economically justifiable. As all assessment zones have a BCR value that is less than 1.0, this indicates that the overall scheme costs outweigh the scheme benefits, and the provision of lighting would not be justifiable.
- 4.6.5. The SAR summary has been derived by inputting the relevant scheme data as outlined within 4.2.2. and does not include any PICs in which [REDACTED] was a major factor. TA 501 6.10 states, '*the PICs shall be rationalised to exclude anywhere [REDACTED] was a significant contributory factor*'. Reference has been made to the STATS19 data (2019 – 2023), and it is deemed that six darkness collisions can be attributed to [REDACTED]. Table 4-4 below details the scheme darkness PICs that were attributed to [REDACTED].

Table 4-4 – Darkness PICs attributed to [REDACTED]

Darkness PIC Reference	Assessment Zone	Contributory Factors
20000032641	4	[REDACTED]
20000081367	4	
20000738810	7	
21000600884	4	
23000115257	7	
23000518345	2	

- 4.6.6. Further information on the PICs recorded within the scheme area can be found in the RSE Report within Appendix C.

5

ROAD SAFETY ENGINEERS REPORT



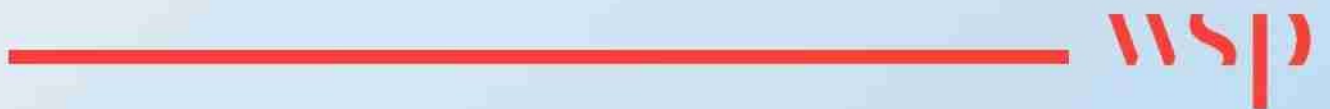
5 ROAD SAFETY ENGINEERS REPORT

5.1 GENERAL

- 5.1.1. The Road Safety Review has been undertaken by an RSE (Road Safety Engineer) who complies with the requirements given in GG 119 Road Safety Audit.
- 5.1.2. The analysis of the collision data is an essential part of the TA 501 process, particularly in the justification of not replacing the lighting.
- 5.1.3. The finding of the RSE report was that lighting was not justifiable throughout the mainline. Following an assessment by the RSE, using TA 501 and a sensitivity test of a 5% PIC saving, they concluded that the provision of street lighting would only provide a modest collision saving.
- 5.1.4. The RSE report is detailed within Appendix C.

6

NON-QUANTIFIABLE BENEFITS



6 NON-QUANTIFIABLE BENEFITS

6.1 LANDSCAPE, TOWNSCAPE, HERITAGE, AND BIODIVERSITY

- 6.1.1. The presence of lighting within the scheme area offers a disbenefit as there would be a negative impact on the landscape and biodiversity (flora and fauna) through light pollution and from an aesthetic point of view. Although there are no known heritage sites within the scheme area between M6 Junction 20a to Junction 21a, M62 and M56, there are a few Grade 2 listed buildings such as Barley Castle Farmhouse and Bradley Hall. The carriageways in this assessment connect several villages and towns. The effect of lighting removal shall be assessed by National Highways during the full light switch-off period.
- 6.1.2. Towns and villages that are near to the scheme include:
- Knutsford
 - Woolston
 - Lymm
 - Newton-le-Willows
 - Irlam
- 6.1.3. There is the presence of a Site of Scientific Interest (SSSI), Woolston Moss, within the extent of the scheme. An Environmental Impact Assessment (EIA) and Environmental Alert Form (EAF) are not available for this scheme. The effect of lighting in this area should be assessed by an ecologist.
- 6.1.4. The removal of existing lighting may be of concern to residents and road users, and consultation shall be required if the lighting is not to be replaced.
- 6.1.5. The removal of lighting would require a full switch-off to be implemented, which should last usually for a year, during which time collision and casualty rates shall be monitored to determine whether the removal of lighting is still safe and justifiable.
- 6.1.6. A WCHAR(Walking, Cycling, Horse Riding Assessment and Review) assessment has not been carried out for this scheme. It is required to carry out a WCHAR assessment during the next stage of design.

6.2 JOURNEY AMBIENCE

- 6.2.1. The lighting offers a neutral benefit to the overall journey ambience as lighting makes driving in the hours of darkness less stressful and more bearable. However, the visible presence of lighting columns and associated equipment in the daytime may distract the road users from their surrounding areas.

6.3 ACCIDENTS

- 6.3.1. Liaison is required with local stakeholders to consider both their needs and requirements on the potential impact the removal of the lighting from M6 Junction 20a to 21a, M56 and M62 may have. Table 6-1 details the list of local stakeholders who may be considered by the overseeing organisation for consultation.

Table 6-1 – Stakeholder Engagement

Stakeholder	Typical Considerations
Emergency Services (Ambulance)	Incident response times Lighting removals impacts
Emergency Services (Fire and Rescue)	Incident response times Lighting removals impacts
Emergency Services (Police/ Incident Response)	Incident response times Lighting removals impacts
National Highways Traffic Officers	Road closures / alternative routes/mobilisation and reopening for traffic Weather Conditions Safe Refuge Lighting removal impact
National Highways Traffic Officers	Road closures / alternative routes / mobilisation and reopening for traffic Weather Conditions Safe Refuge Lighting removal impact
SES (Safety Engineering Standards) Lighting	Lighting removal impact

- 6.3.2. It should be noted that lighting should not be considered as a benefit for maintenance of other highway equipment or technology, due to the maintenance disbenefit that is introduced to the lighting asset maintainer. Task lighting shall be provided for other maintenance works in darkness hours, or they shall be undertaken in daylight conditions.

6.4 PROMOTE ACTIVE TRANSPORT

- 6.4.1. The provision of lighting would not have an impact on the promotion of active transport, either through walking or cycling, as the extent of M6, M56 and M62 mainline within the scheme is not accessible for either walking or cycling.

6.5 GOVERNMENT POLICY

- 6.5.1. The government policy is to reduce energy in line with NetZero requirements for National Highways 2030 / 2040 / 2050 Targets. The existing assets are life-expired therefore, the reputational impact of removing equipment that has not been recently installed is low. It should also be noted that much of

the scheme area road network is a standard carriageway with mostly straight lines of visibility, however, M6 Junction 21a/M62 Junction J10 Croft Interchange and M6 Junction 20a/M56 J9 Lymm Interchange may be considered as complex, due to the road geometry alignment with varying lines of visibility and this may be considered for lighting.

- 6.5.2. Subject to the chosen option for the scheme, there will be a saving made due to the more energy-efficient LED luminaires and operating regimes being used. However, a greater saving is made by the removal of lighting, meaning the less proposed lighting installed will have a greater saving towards NetZero. Table 6-2 details the total CO₂e emissions for each of the lighting options, which are covered in more detail under the conclusions section of this report.

Table 6-2 - Summary of CO₂e Emissions

Assessment Zone	Mainline CO ₂ e Rate* (tonnes/CO ₂ e)	Slip / Merge CO ₂ e Rate** (tonnes/CO ₂ e)	Total CO ₂ e Rate (tonnes/CO ₂ e)
Option 1 – Provision of lighting in Assessment Zone 1 to 10 (Full Renewal)	207.878 tCO ₂ e	5.764 tCO ₂ e	213.642 tCO ₂ e
Option 2 – Provision of lighting not required (Switch Off)	0 tCO ₂ e	5.764 tCO ₂ e	5.764 tCO ₂ e

* - Excludes entry and exit slip road lighting columns within the sight stopping distance at each junction however includes entry and exit slip road lighting columns outside the sight stopping distance at each junction only.

** - Inclusive of entry and exit slip road lighting columns within the sight stopping distance at each junction only.

- 6.5.3. These figures have been based on the condensed GHG conversion factors 2024 and trading carbon costs for 2024, sourced from the UK government website.

6.6 SEVERANCE

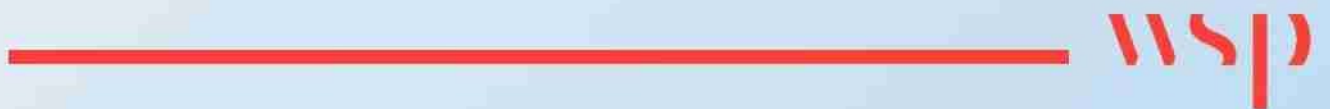
- 6.6.1. Severance in the context of the M6, M56, and M62 mainlines is not relevant, given the lack of local roads that pass through the scheme area. There are several clusters of residential properties located sporadically on the outskirts of the scheme area, which the removal of lighting would not impact.

6.7 SECURITY

- 6.7.1. The presence of lighting offers a neutral benefit towards security on this route. If installed, it may discourage the theft of highway equipment or make it easier for assets to be stolen. Its provision also provides lighting assets to be stolen, e.g. copper cabling.

7

CONCLUSIONS



7 CONCLUSIONS

7.1 CONCLUSIONS

- 7.1.1. Overall, seven assessment zones had a $BCR < 1.0$ meaning the full lighting renewal of the scheme area between M6 J20a to 21a could not be justified from the TA 501 assessment when considering the darkness PIC savings against the cost i.e., $BCR < 1.0$ meaning that the costs associated with the lighting renewal outweighs the benefits lighting would provide. The average BCR value for the scheme was calculated at 0.032.
- 7.1.2. It is considered that there would not be any non-quantifiable impacts that may justify lighting provision if considered for removal. However, stakeholder engagement is sought to clarify any unknown impacts. Noting the consideration of alternatives to lighting should be considered to mitigate any concerns around lighting removal as the first action.
- 7.1.3. Following the completion results of the scheme road lighting appraisal, there are two viable options that should be considered, and these are detailed in Table 7-1.

Table 7-1 – Summary of Options and Costs over scheme lifecycle

Assessment Zone	Mainline Cost *	Slip / Merge Cost **	Total Cost
Option 1 – Provision of lighting in AZ 1 to 7 (Full Renewal)	£119,009,172.00	£3,408,514.35	£122,417,686.35
Option 2 – Provision of lighting in AZ 1 to 7 not required (Switch Off)	£0	£3,408,514.35	£3,408,514.35

* - Excludes entry and exit slip road lighting columns within the sight stopping distance at each junction, however, includes entry and exit slip road lighting columns outside the sight stopping distance at each junction only.

** - Inclusive of entry and exit slip road lighting columns within the sight stopping distance at each junction only.

- 7.1.4. Option 1 (Full Renewal) is not economically justifiable in accordance with TA 501, whilst there is no requirement to light this route under current guidance. However, there are potentially other unknown benefits that Stakeholders may wish to put forward to justify lighting provision along the full route. It should be noted that there would need to be significant justification for this approach.
- 7.1.5. Option 2 (Switch Off) considers the removal of all lighting and is economically justifiable in accordance with TA 501, whilst there is no requirement to light this route under current guidance. A switch off report would be required to progress this approach unless agreed otherwise with the overseeing organisation.

- 7.1.6. Whilst there is no requirement to light this route in accordance with TA 501, it should be noted that the two options provided ensure a compliant solution with TD 501, as there are no unlit gaps, as detailed within Section 3.2.8 of this report.
- 7.1.7. The conclusion reached is that a negative BCR indicates that the replacement of the lighting will not offer value for money when compared to the benefits. Whilst based on applying the National Accident Rate and the economical assessment, the justification for lighting is not valid.
- 7.1.8. There are environmental savings that are to be considered, and whilst it does not impact the outcome of the assessment, it should be noted that if less lighting is provided along this route, it will have a positive environmental benefit, which is a consideration under the non-quantifiable impacts of this assessment.
- 7.1.9. It is suggested that Option 2 (Switch Off) is the preferred option, as it is the most cost and energy-efficient, whilst it reduces road worker exposure for construction and maintenance work. Noting that the RSE estimates an average of 0.061 per year darkness PIC saving if lighting was provided. Road workers will be less exposed to accidents if this option is adopted. Option 1, which offers a full lighting renewal on the mainline, would be contrary to this approach, and this option would be less cost and energy efficient. Whilst it would increase the road worker exposure and although there may be a small darkness PIC saving by the provision of lighting within the lit areas, it would not be economically justified for Option 1.
- 7.1.10. Further liaison between the National Highways communications team and local external stakeholders shall be undertaken to discuss any operational or safety concerns before any decision is made to remove the lighting. Any concerns should be documented in accordance with TA 501 requirements and a switch-off assessment should be produced for areas where lighting is to be considered for removal, unless agreed otherwise with the overseeing organisation. It is important that local external stakeholders are sought for liaison as their knowledge of the area may impact the final solution.
- 7.1.11. Prior to any switch off trials, the views of responding stakeholders shall be considered within the final proposals. These proposals shall be subject to a GG104 Risk Assessment and shall be communicated to all relevant stakeholders.
- 7.1.12. An assessment of existing road studs and road markings shall be undertaken to ensure they are compliant and will meet the requirements for an unlit section of road. If these are found to be sub-standard these shall be renewed prior to any lighting removal/switch off.
- 7.1.13. An assessment of all the existing illuminated traffic signs and their requirement to remain illuminated shall be completed with reflectorised traffic signs and a consideration for improvement works.
- 7.1.14. An assessment of all the existing road restraint systems and their requirements for removal / remain / upgrade (where new lighting is provided) shall be completed with removal a consideration for improvement works.
- 7.1.15. Whilst there are not any active travel routes within the scheme extents, consideration should be made to potential improvements for both cyclists and pedestrians and vegetation clearance required throughout to improve both the visibility and usability of these areas, which would be required whether or not lighting is provided.

Appendix A

SCHEME COSTS

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M6 LIGHTING RENEWAL - COST BREAKDOWN SUMMARY

Running Cost Assessment Zone 1

Description	M6
Length (Km)	14.2
Type	Motorway
Class	M3
Assesment Period (yrs)	30

GOV - Small Scheme appraisal toolkit

User input

User Inputs values into column

Description	Detailed Description	Interval of maintenance Cycle	Cycles (30yr assessment period)	No of Cycles	Qty per Cycle	Quantity attend per shift	Number of shifts	Unit	Rate	Work Cycle Cost
Replacement of Luminaire with LED Unit	Replacement of luminaire at end of life with replacement LED luminaire. Cost make up 12 x £1000 item price + 1 x £935 shift price	12 Years	@ 12yrs & 24yrs	2	608	12	51	each	£1,077.92	£655,375.36
Luminaire Clean	Cleaning internal and external surfaces	at electrical testing	@ 6,12,18 & 24 yrs	5	608	60	11	each	£41.00	£24,928.00
Visual Inspection of luminaire	Cleaning, adjustment and visual inspection of mechanical components, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	608	60	11	each	£18.70	£11,369.60
Visual Inspection of column	Visual inspection of condition of column, door and fixings, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	568	60	10	each	£18.70	£10,621.60
Visual Inspection of feeder pillar	Visual inspection of condition of enclosure and support systems, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	4	5	1	each	£0.00	£0.00
Electrical Testing: column and cables	Complete electrical test and inspection Every 6 years (maximum)	6 Years (max)	@ 6,12,18 & 24 yrs	5	568	60	10	each	£112.00	£63,616.00
Electrical Testing: feeder pillar	Complete electrical test and inspection Every 6 years (maximum) expiry of fatigue design life	6 Years (max)	@ 6,12,18 & 24 yrs	5	4	2	2	each	£0.00	£0.00
Structural Testing of column	rigorous column inspection/testing, especially after	6 Years (max)	@ 15, 21 , 27yrs	3	568	50	12	each	£156.00	£88,608.00
Remedial Works	Allowance for attendance at non-routine repairs, e.g. door off, lantern cover off, solitary lamp outage.	As required	nominal 3 @ 15, 21 & 27yrs	3	48.64	1	49	8% Of Cycle Costs	£500.00	£24,320.00

Notes From TA501 National annex: E/2.11 The average annual costs for remedial damage and fault repairs shall be derived by examining the total costs for the past 3 years.
E/2.12 Average annual maintenance costs shall be derived by examining planned maintenance activities between present and when the road lighting scheme is 25 years old.

Description	TM rate per shift	TM cost per cycle	Additional costs per cycle	Total Works cost per cycle	Total Works cost over installation life	Total TM cost over installation life	Total Additional costs over	Total cost over Installation	Total cost per annum
Replacement of luminaire with LED unit	£1,000	£51,000	-	£655,375	£1,310,751	£102,000	-	£1,412,751	£47,091.691
Luminaire Clean	£1,000	£11,000	-	£24,928	£124,640	£55,000	-	£179,640	£5,988.000
Visual Inspection of luminaire	inc. above	-	-	£11,370	£56,848	0	-	£56,848	£1,894.933
Visual Inspection of column	inc. above	£0	-	£10,622	£53,108	0	-	£53,108	£1,770.267
Visual Inspection of feeder pillar	inc. below	£0	-	£0	£0	£0	-	£0	£0.000
Electrical Testing: column and cables	£1,000	£10,000	-	£63,616	£318,080	£50,000	-	£368,080	£12,269.333
Electrical Testing: feeder pillar	£0	£0	-	£0	£0	£0	-	£0	£0.000
Structural Testing of column	£0	£0	-	£88,608	£265,824	£0	-	£265,824	£8,860.800
Remedial Works	£1,000	£48,640	-	£24,320	£72,960	£145,920	-	£218,880	£7,296.000
Sub-Totals					£2,202,211	£352,920		£2,555,131	£85,171

Total Works Cost over installation Life	£2,202,211
Total Traffic Management Cost over installation Life	£352,920
Total Additional Costs over installation Life	0
Total Maintenance Cost over installation Life	£2,555,131
RPI 3.90%	£99,650
Grand Total Maintenance Cost over installation Life	£2,654,781
Appraisal Period (years)	30
Average Maintenance cost per annum	£88,492.69

	Cost per Annum	Total cost over installation life (incl RPI)
Construction	£ 870,933.33	£ 27,146,992.00
Energy	£ 6,966.96	£ 217,160.14
CCL (Carbon)	£ 192.84	£ 6,010.68
Decomissioning (20% of Construction Costs)	£ 174,186.67	£ 5,429,398.40
RPI @ 3.9% (Maintenance)	£ 3,037.13	£ 91,113.78
RPI @ 3.9% (Remedial Works)	£ 284.54	£ 8,536.32
OYMC (energy component)	£ 27,771	
OYMC (maintenance component)	£ 85,455.57	
PVC Total Inc Factors	£ 1,268,792.32	
Scheme Lifetime Total Costs		£ 32,899,211.32

PVC (maintenance) = OYMC x CF x DF x GTF	£ 1,268,792.32
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Yearly Estimated Maintenance Cost = OYMC	£ 85,455.57
CF (Capitalisation Factor maintenance)	22.4
DF - (Discount Factor - to 2027 prices)	0.557
GTF - (General Taxation Figure)	1.19
CFE (Capitalisation factor for energy)	89.29

Table c.3b of SAR User notes 2020

Table c.3a of SAR User notes 2020

Indirect Taxation Factor, TAG Data Book A1.3.1 May 2024

8% of Link quantity totals e.g. 100 cols + 8 columns for remedial works

M6 LIGHTING RENEWAL - COST BREAKDOWN SUMMARY

Running Cost Assessment Zone 2

Description	M6
Length (Km)	4.22
Type	Motorway
Class	M3
Assesment Period (yrs)	30

GOV - Small Scheme appraisal toolkit

User input

User Inputs values into column

Description	Detailed Description	Interval of maintenance Cycle	Cycles (30yr assessment period)	No of Cycles	Qty per Cycle	Quantity attend per shift	Number of shifts	Unit	Rate	Work Cycle Cost
Replacement of Luminaire with LED Unit	Replacement of luminaire at end of life with replacement LED luminaire. Cost make up 12 x £1000 item price + 1 x £935 shift price	12 Years	@ 12yrs & 24yrs	2	274	12	23	each	£1,077.92	£295,350.08
Luminaire Clean	Cleaning internal and external surfaces	at electrical testing	@ 6,12,18 & 24 yrs	5	274	60	5	each	£41.00	£11,234.00
Visual Inspection of luminaire	Cleaning, adjustment and visual inspection of mechanical components, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	274	60	5	each	£18.70	£5,123.80
Visual Inspection of column	Visual inspection of condition of column, door and fixings, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	267	60	5	each	£18.70	£4,992.90
Visual Inspection of feeder pillar	Visual inspection of condition of enclosure and support systems, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	7	5	2	each	£0.00	£0.00
Electrical Testing: column and cables	Complete electrical test and inspection Every 6 years (maximum)	6 Years (max)	@ 6,12,18 & 24 yrs	5	267	60	5	each	£112.00	£29,904.00
Electrical Testing: feeder pillar	Complete electrical test and inspection Every 6 years (maximum) expiry of fatigue design life	6 Years (max)	@ 6,12,18 & 24 yrs	5	7	2	4	each	£0.00	£0.00
Structural Testing of column	rigorous column inspection/testing, especially after	6 Years (max)	@ 15, 21 , 27yrs	3	267	50	6	each	£156.00	£41,652.00
Remedial Works	Allowance for attendance at non-routine repairs, e.g. door off, lantern cover off, solitary lamp outage.	As required	nominal 3 @ 15, 21 & 27yrs	3	21.92	1	22	8% Of Cycle Costs	£500.00	£10,960.00

Notes From TA501 National annex: E/2.11 The average annual costs for remedial damage and fault repairs shall be derived by examining the total costs for the past 3 years.
E/2.12 Average annual maintenance costs shall be derived by examining planned maintenance activities between present and when the road lighting scheme is 25 years old.

Description	TM rate per shift	TM cost per cycle	Additional costs per cycle	Total Works cost per cycle	Total Works cost over installation life	Total TM cost over installation life	Total Additional costs over	Total cost over Installation	Total cost per annum
Replacement of luminaire with LED unit	£1,000	£23,000	-	£295,350	£590,700	£46,000	-	£636,700	£21,223.338
Luminaire Clean	£1,000	£5,000	-	£11,234	£56,170	£25,000	-	£81,170	£2,705.667
Visual Inspection of luminaire	inc. above	-	-	£5,124	£25,619	0	-	£25,619	£853.967
Visual Inspection of column	inc. above	£0	-	£4,993	£24,965	0	-	£24,965	£832.150
Visual Inspection of feeder pillar	inc. below	£0	-	£0	£0	£0	-	£0	£0.000
Electrical Testing: column and cables	£1,000	£5,000	-	£29,904	£149,520	£25,000	-	£174,520	£5,817.333
Electrical Testing: feeder pillar	£0	£0	-	£0	£0	£0	-	£0	£0.000
Structural Testing of column	£0	£0	-	£41,652	£124,956	£0	-	£124,956	£4,165.200
Remedial Works	£1,000	£21,920	-	£10,960	£32,880	£65,760	-	£98,640	£3,288.000
Sub-Totals					£1,004,810	£161,760		£1,166,570	£38,886

Total Works Cost over installation Life	£1,004,810
Total Traffic Management Cost over installation Life	£161,760
Total Additional Costs over installation Life	0
Total Maintenance Cost over installation Life	£1,166,570
RPI 3.90%	£45,496
Grand Total Maintenance Cost over installation Life	£1,212,066
Appraisal Period (years)	30
Average Maintenance cost per annum	£40,402.20

	Cost per Annum	Total cost over installation life (incl RPI)
Construction	£ 409,400.00	£ 12,760,998.00
Energy	£ 52,194.14	£ 1,626,891.41
CCL (Carbon)	£ 1,444.66	£ 45,030.03
Decomissioning (20% of Construction Costs)	£ 81,880.00	£ 2,552,199.60
RPI @ 12.73% (Maintenance)	£ 1,388.31	£ 41,649.26
RPI @ 12.73% (Remedial Works)	£ 128.23	£ 3,846.96
OYMC (energy component)	£ 208,054	
OYMC (maintenance component)	£ 39,013.89	
PVC Total Inc Factors	£ 579,254.48	
Scheme Lifetime Total Costs		£ 17,030,615.25

PVC (maintenance) = OYMC x CF x DF x GTF	£ 579,254.48
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Yearly Estimated Maintenance Cost = OYMC	£ 39,013.89
CF (Capitalisation Factor maintenance)	22.4
DF - (Discount Factor - to 2027 prices)	0.557
GTF - (General Taxation Figure)	1.19
CFE (Capitalisation factor for energy)	89.29

Table c.3b of SAR User notes 2020

Table c.3a of SAR User notes 2020

Indirect Taxation Factor, TAG Data Book A1.3.1 May 2024

8% of Link quantity totals e.g. 100 cols + 8 columns for remedial works

M6 LIGHTING RENEWAL - COST BREAKDOWN SUMMARY

Running Cost Assessment Zone 3

Description	M6
Length (Km)	2.89
Type	Motorway
Class	M2
Assesment Period (yrs)	30

GOV - Small Scheme appraisal toolkit

User input

User Inputs values into column

Description	Detailed Description	Interval of maintenance Cycle	Cycles (30yr assessment period)	No of Cycles	Qty per Cycle	Quantity attend per shift	Number of shifts	Unit	Rate	Work Cycle Cost
Replacement of Luminaire with LED Unit	Replacement of luminaire at end of life with replacement LED luminaire. Cost make up 12 x £1000 item price + 1 x £935 shift price	12 Years	@ 12yrs & 24yrs	2	183	12	16	each	£1,077.92	£197,259.36
Luminaire Clean	Cleaning internal and external surfaces	at electrical testing	@ 6,12,18 & 24 yrs	5	183	60	4	each	£41.00	£7,503.00
Visual Inspection of luminaire	Cleaning, adjustment and visual inspection of mechanical components, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	183	60	4	each	£18.70	£3,422.10
Visual Inspection of column	Visual inspection of condition of column, door and fixings, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	173	60	3	each	£18.70	£3,235.10
Visual Inspection of feeder pillar	Visual inspection of condition of enclosure and support systems, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	9	5	2	each	£0.00	£0.00
Electrical Testing: column and cables	Complete electrical test and inspection Every 6 years (maximum)	6 Years (max)	@ 6,12,18 & 24 yrs	5	173	60	3	each	£112.00	£19,376.00
Electrical Testing: feeder pillar	Complete electrical test and inspection Every 6 years (maximum) expiry of fatigue design life	6 Years (max)	@ 6,12,18 & 24 yrs	5	9	2	5	each	£0.00	£0.00
Structural Testing of column	rigorous column inspection/testing, especially after	6 Years (max)	@ 15, 21 , 27yrs	3	173	50	4	each	£156.00	£26,988.00
Remedial Works	Allowance for attendance at non-routine repairs, e.g. door off, lantern cover off, solitary lamp outage.	As required	nominal 3 @ 15, 21 & 27yrs	3	14.64	1	15	8% Of Cycle Costs	£500.00	£7,320.00

Notes From TA501 National annex: E/2.11 The average annual costs for remedial damage and fault repairs shall be derived by examining the total costs for the past 3 years.
E/2.12 Average annual maintenance costs shall be derived by examining planned maintenance activities between present and when the road lighting scheme is 25 years old.

Description	TM rate per shift	TM cost per cycle	Additional costs per cycle	Total Works cost per cycle	Total Works cost over installation life	Total TM cost over installation life	Total Addition al costs over	Total cost over Installation	Total cost per annum
Replacement of luminaire with LED unit	£1,000	£16,000	-	£197,259	£394,519	£32,000	-	£426,519	£14,217.291
Luminaire Clean	£1,000	£4,000	-	£7,503	£37,515	£20,000	-	£57,515	£1,917.167
Visual Inspection of luminaire	inc. above	-	-	£3,422	£17,111	0	-	£17,111	£570.350
Visual Inspection of column	inc. above	£0	-	£3,235	£16,176	0	-	£16,176	£539.183
Visual Inspection of feeder pillar	inc. below	£0	-	£0	£0	£0	-	£0	£0.000
Electrical Testing: column and cables	£1,000	£3,000	-	£19,376	£96,880	£15,000	-	£111,880	£3,729.333
Electrical Testing: feeder pillar	£0	£0	-	£0	£0	£0	-	£0	£0.000
Structural Testing of column	£0	£0	-	£26,988	£80,964	£0	-	£80,964	£2,698.800
Remedial Works	£1,000	£14,640	-	£7,320	£21,960	£43,920	-	£65,880	£2,196.000
Sub-Totals					£665,124	£110,920		£776,044	£25,868

Total Works Cost over installation Life	£665,124
Total Traffic Management Cost over installation Life	£110,920
Total Additional Costs over installation Life	0
Total Maintenance Cost over installation Life	£776,044
RPI 3.90%	£30,266
Grand Total Maintenance Cost over installation Life	£806,309
Appraisal Period (years)	30
Average Maintenance cost per annum	£26,876.98

	Cost per Annum	Total cost over installation life (incl RPI)
Construction	£ 265,266.67	£ 8,268,362.00
Energy	£ 26,358.33	£ 821,589.21
CCL (Carbon)	£ 729.56	£ 22,740.42
Decomissioning (20% of Construction Costs)	£ 53,053.33	£ 1,653,672.40
RPI @ 3.9% (Maintenance)	£ 923.21	£ 27,696.39
RPI @ 3.9% (Remedial Works)	£ 85.64	£ 2,569.32
OYMC (energy component)	£ 105,069	
OYMC (maintenance component)	£ 25,953.77	
PVC Total Inc Factors	£ 385,345.77	
Scheme Lifetime Total Costs		£ 10,796,629.73

PVC (maintenance) = OYMC x CF x DF x GTF	£ 385,345.77
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Yearly Estimated Maintenance Cost = OYMC	£ 25,953.77
CF (Capitalisation Factor maintenance)	22.4
DF - (Discount Factor - to 2027 prices)	0.557
GTF - (General Taxation Figure)	1.19
CFE (Capitalisation factor for energy)	89.29

Table c.3b of SAR User notes 2020

Table c.3a of SAR User notes 2020

Indirect Taxation Factor, TAG Data Book A1.3.1 May 2024

8% of Link quantity totals e.g. 100 cols + 8 columns for remedial works

M6 LIGHTING RENEWAL - COST BREAKDOWN SUMMARY

Running Cost Assessment Zone 4

Description	M6
Length (Km)	3.24
Type	Motorway
Class	M3
Assesment Period (yrs)	30

GOV - Small Scheme appraisal toolkit

User input

User Inputs values into column

Description	Detailed Description	Interval of maintenance Cycle	Cycles (30yr assessment period)	No of Cycles	Qty per Cycle	Quantity attend per shift	Number of shifts	Unit	Rate	Work Cycle Cost
Replacement of Luminaire with LED Unit	Replacement of luminaire at end of life with replacement LED luminaire. Cost make up 12 x £1000 item price + 1 x £935 shift price	12 Years	@ 12yrs & 24yrs	2	526	12	44	each	£1,077.92	£566,985.92
Luminaire Clean	Cleaning internal and external surfaces	at electrical testing	@ 6,12,18 & 24 yrs	5	526	60	9	each	£41.00	£21,566.00
Visual Inspection of luminaire	Cleaning, adjustment and visual inspection of mechanical components, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	526	60	9	each	£18.70	£9,836.20
Visual Inspection of column	Visual inspection of condition of column, door and fixings, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	513	60	9	each	£18.70	£9,593.10
Visual Inspection of feeder pillar	Visual inspection of condition of enclosure and support systems, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	3	5	1	each	£0.00	£0.00
Electrical Testing: column and cables	Complete electrical test and inspection Every 6 years (maximum)	6 Years (max)	@ 6,12,18 & 24 yrs	5	513	60	9	each	£112.00	£57,456.00
Electrical Testing: feeder pillar	Complete electrical test and inspection Every 6 years (maximum) expiry of fatigue design life	6 Years (max)	@ 6,12,18 & 24 yrs	5	3	2	2	each	£0.00	£0.00
Structural Testing of column	rigorous column inspection/testing, especially after	6 Years (max)	@ 15, 21 , 27yrs	3	513	50	11	each	£156.00	£80,028.00
Remedial Works	Allowance for attendance at non-routine repairs, e.g. door off, lantern cover off, solitary lamp outage.	As required	nominal 3 @ 15, 21 & 27yrs	3	42.08	1	42	8% Of Cycle Costs	£500.00	£21,040.00

Notes From TA501 National annex: E/2.11 The average annual costs for remedial damage and fault repairs shall be derived by examining the total costs for the past 3 years.
E/2.12 Average annual maintenance costs shall be derived by examining planned maintenance activities between present and when the road lighting scheme is 25 years old.

Description	TM rate per shift	TM cost per cycle	Additional costs per cycle	Total Works cost per cycle	Total Works cost over installation life	Total TM cost over installation life	Total Addition al costs over	Total cost over Installation	Total cost per annum
Replacement of luminaire with LED unit	£1,000	£44,000	-	£566,986	£1,133,972	£88,000	-	£1,221,972	£40,732.396
Luminaire Clean	£1,000	£9,000	-	£21,566	£107,830	£45,000	-	£152,830	£5,094.333
Visual Inspection of luminaire	inc. above	-	-	£9,836	£49,181	0	-	£49,181	£1,639.367
Visual Inspection of column	inc. above	£0	-	£9,593	£47,966	0	-	£47,966	£1,598.850
Visual Inspection of feeder pillar	inc. below	£0	-	£0	£0	£0	-	£0	£0.000
Electrical Testing: column and cables	£1,000	£9,000	-	£57,456	£287,280	£45,000	-	£332,280	£11,076.000
Electrical Testing: feeder pillar	£0	£0	-	£0	£0	£0	-	£0	£0.000
Structural Testing of column	£0	£0	-	£80,028	£240,084	£0	-	£240,084	£8,002.800
Remedial Works	£1,000	£42,080	-	£21,040	£63,120	£126,240	-	£189,360	£6,312.000
Sub-Totals					£1,929,432	£304,240		£2,233,672	£74,456

Total Works Cost over installation Life	£1,929,432
Total Traffic Management Cost over installation Life	£304,240
Total Additional Costs over installation Life	0
Total Maintenance Cost over installation Life	£2,233,672
RPI 3.90%	£87,113
Grand Total Maintenance Cost over installation Life	£2,320,786
Appraisal Period (years)	30
Average Maintenance cost per annum	£77,359.52

	Cost per Annum	Total cost over installation life (incl RPI)
Construction	£ 786,600.00	£ 24,518,322.00
Energy	£ 93,084.39	£ 2,901,440.48
CCL (Carbon)	£ 2,576.44	£ 80,307.73
Decomissioning (20% of Construction Costs)	£ 157,320.00	£ 4,903,664.40
RPI @ 3.9% (Maintenance)	£ 2,657.61	£ 79,728.18
RPI @ 3.9% (Remedial Works)	£ 246.17	£ 7,385.04
OYMC (energy component)	£ 371,049	
OYMC (maintenance component)	£ 74,701.91	
PVC Total Inc Factors	£ 1,109,128.58	
Scheme Lifetime Total Costs		£ 32,490,847.83

PVC (maintenance) = OYMC x CF x DF x GTF	£ 1,109,128.58
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Yearly Estimated Maintenance Cost = OYMC	£ 74,701.91
CF (Capitalisation Factor maintenance)	22.4
DF - (Discount Factor - to 2027 prices)	0.557
GTF - (General Taxation Figure)	1.19
CFE (Capitalisation factor for energy)	89.29

Table c.3b of SAR User notes 2020

Table c.3a of SAR User notes 2020

Indirect Taxation Factor, TAG Data Book A1.3.1 May 2024

8% of Link quantity totals e.g. 100 cols + 8 columns for remedial works

M6 LIGHTING RENEWAL - COST BREAKDOWN SUMMARY

Running Cost Assessment Zone 5

Description	M6
Length (Km)	3.24
Type	Motorway
Class	M3
Assesment Period (yrs)	30

GOV - Small Scheme appraisal toolkit

User input

User Inputs values into column

Description	Detailed Description	Interval of maintenance Cycle	Cycles (30yr assessment period)	No of Cycles	Qty per Cycle	Quantity attend per shift	Number of shifts	Unit	Rate	Work Cycle Cost
Replacement of Luminaire with LED Unit	Replacement of luminaire at end of life with replacement LED luminaire. Cost make up 12 x £1000 item price + 1 x £935 shift price	12 Years	@ 12yrs & 24yrs	2	111	12	10	each	£1,077.92	£119,649.12
Luminaire Clean	Cleaning internal and external surfaces	at electrical testing	@ 6,12,18 & 24 yrs	5	111	60	2	each	£41.00	£4,551.00
Visual Inspection of luminaire	Cleaning, adjustment and visual inspection of mechanical components, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	111	60	2	each	£18.70	£2,075.70
Visual Inspection of column	Visual inspection of condition of column, door and fixings, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	111	60	2	each	£18.70	£2,075.70
Visual Inspection of feeder pillar	Visual inspection of condition of enclosure and support systems, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	4	5	1	each	£0.00	£0.00
Electrical Testing: column and cables	Complete electrical test and inspection Every 6 years (maximum)	6 Years (max)	@ 6,12,18 & 24 yrs	5	111	60	2	each	£112.00	£12,432.00
Electrical Testing: feeder pillar	Complete electrical test and inspection Every 6 years (maximum) expiry of fatigue design life	6 Years (max)	@ 6,12,18 & 24 yrs	5	4	2	2	each	£0.00	£0.00
Structural Testing of column	rigorous column inspection/testing, especially after	6 Years (max)	@ 15, 21 , 27yrs	3	111	50	3	each	£156.00	£17,316.00
Remedial Works	Allowance for attendance at non-routine repairs, e.g. door off, lantern cover off, solitary lamp outage.	As required	nominal 3 @ 15, 21 & 27yrs	3	8.88	1	9	8% Of Cycle Costs	£500.00	£4,440.00

Notes From TA501 National annex: E/2.11 The average annual costs for remedial damage and fault repairs shall be derived by examining the total costs for the past 3 years.
E/2.12 Average annual maintenance costs shall be derived by examining planned maintenance activities between present and when the road lighting scheme is 25 years old.

Description	TM rate per shift	TM cost per cycle	Additional costs per cycle	Total Works cost per cycle	Total Works cost over installation life	Total TM cost over installation life	Total Additional costs over	Total cost over Installation	Total cost per annum
Replacement of luminaire with LED unit	£1,000	£10,000	-	£119,649	£239,298	£20,000	-	£259,298	£8,643.275
Luminaire Clean	£1,000	£2,000	-	£4,551	£22,755	£10,000	-	£32,755	£1,091.833
Visual Inspection of luminaire	inc. above	-	-	£2,076	£10,379	0	-	£10,379	£345.950
Visual Inspection of column	inc. above	£0	-	£2,076	£10,379	0	-	£10,379	£345.950
Visual Inspection of feeder pillar	inc. below	£0	-	£0	£0	£0	-	£0	£0.000
Electrical Testing: column and cables	£1,000	£2,000	-	£12,432	£62,160	£10,000	-	£72,160	£2,405.333
Electrical Testing: feeder pillar	£0	£0	-	£0	£0	£0	-	£0	£0.000
Structural Testing of column	£0	£0	-	£17,316	£51,948	£0	-	£51,948	£1,731.600
Remedial Works	£1,000	£8,880	-	£4,440	£13,320	£26,640	-	£39,960	£1,332.000
Sub-Totals					£410,238	£66,640		£476,878	£15,896

Total Works Cost over installation Life	£410,238
Total Traffic Management Cost over installation Life	£66,640
Total Additional Costs over installation Life	0
Total Maintenance Cost over installation Life	£476,878
RPI 3.90%	£18,598
Grand Total Maintenance Cost over installation Life	£495,476
Appraisal Period (years)	30
Average Maintenance cost per annum	£16,515.88

	Cost per Annum	Total cost over installation life (incl RPI)
Construction	£ 170,200.00	£ 5,305,134.00
Energy	£ 25,168.14	£ 784,491.02
CCL (Carbon)	£ 696.62	£ 21,713.59
Decomissioning (20% of Construction Costs)	£ 34,040.00	£ 1,061,026.80
RPI @ 3.9% (Maintenance)	£ 567.99	£ 17,039.81
RPI @ 3.9% (Remedial Works)	£ 51.95	£ 1,558.44
OYMC (energy component)	£ 100,324	
OYMC (maintenance component)	£ 15,947.89	
PVC Total Inc Factors	£ 236,784.56	
Scheme Lifetime Total Costs		£ 7,190,963.66

PVC (maintenance) = OYMC x CF x DF x GTF	£ 236,784.56
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Yearly Estimated Maintenance Cost = OYMC	£ 15,947.89
CF (Capitalisation Factor maintenance)	22.4
DF - (Discount Factor - to 2027 prices)	0.557
GTF - (General Taxation Figure)	1.19
CFE (Capitalisation factor for energy)	89.29

Table c.3b of SAR User notes 2020

Table c.3a of SAR User notes 2020

Indirect Taxation Factor, TAG Data Book A1.3.1 May 2024

8% of Link quantity totals e.g. 100 cols + 8 columns for remedial works

M6 LIGHTING RENEWAL - COST BREAKDOWN SUMMARY

Running Cost Assessment Zone 6

Description	M6
Length (Km)	3.24
Type	Motorway
Class	M3
Assesment Period (yrs)	30

GOV - Small Scheme appraisal toolkit

User input

User Inputs values into column

Description	Detailed Description	Interval of maintenance Cycle	Cycles (30yr assessment period)	No of Cycles	Qty per Cycle	Quantity attend per shift	Number of shifts	Unit	Rate	Work Cycle Cost
Replacement of Luminaire with LED Unit	Replacement of luminaire at end of life with replacement LED luminaire. Cost make up 12 x £1000 item price + 1 x £935 shift price	12 Years	@ 12yrs & 24yrs	2	82	12	7	each	£1,077.92	£88,389.44
Luminaire Clean	Cleaning internal and external surfaces	at electrical testing	@ 6,12,18 & 24 yrs	5	82	60	2	each	£41.00	£3,362.00
Visual Inspection of luminaire	Cleaning, adjustment and visual inspection of mechanical components, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	82	60	2	each	£18.70	£1,533.40
Visual Inspection of column	Visual inspection of condition of column, door and fixings, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	82	60	2	each	£18.70	£1,533.40
Visual Inspection of feeder pillar	Visual inspection of condition of enclosure and support systems, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	2	5	1	each	£0.00	£0.00
Electrical Testing: column and cables	Complete electrical test and inspection Every 6 years (maximum)	6 Years (max)	@ 6,12,18 & 24 yrs	5	82	60	2	each	£112.00	£9,184.00
Electrical Testing: feeder pillar	Complete electrical test and inspection Every 6 years (maximum) expiry of fatigue design life	6 Years (max)	@ 6,12,18 & 24 yrs	5	2	2	1	each	£0.00	£0.00
Structural Testing of column	rigorous column inspection/testing, especially after	6 Years (max)	@ 15, 21 , 27yrs	3	82	50	2	each	£156.00	£12,792.00
Remedial Works	Allowance for attendance at non-routine repairs, e.g. door off, lantern cover off, solitary lamp outage.	As required	nominal 3 @ 15, 21 & 27yrs	3	6.56	1	7	8% Of Cycle Costs	£500.00	£3,280.00

Notes From TA501 National annex: E/2.11 The average annual costs for remedial damage and fault repairs shall be derived by examining the total costs for the past 3 years.
E/2.12 Average annual maintenance costs shall be derived by examining planned maintenance activities between present and when the road lighting scheme is 25 years old.

Description	TM rate per shift	TM cost per cycle	Additional costs per cycle	Total Works cost per cycle	Total Works cost over installation life	Total TM cost over installation life	Total Addition al costs over	Total cost over Installation	Total cost per annum
Replacement of luminaire with LED unit	£1,000	£7,000	-	£88,389	£176,779	£14,000	-	£190,779	£6,359,296
Luminaire Clean	£1,000	£2,000	-	£3,362	£16,810	£10,000	-	£26,810	£893.667
Visual Inspection of luminaire	inc. above	-	-	£1,533	£7,667	0	-	£7,667	£255.567
Visual Inspection of column	inc. above	£0	-	£1,533	£7,667	0	-	£7,667	£255.567
Visual Inspection of feeder pillar	inc. below	£0	-	£0	£0	£0	-	£0	£0.000
Electrical Testing: column and cables	£1,000	£2,000	-	£9,184	£45,920	£10,000	-	£55,920	£1,864,000
Electrical Testing: feeder pillar	£0	£0	-	£0	£0	£0	-	£0	£0.000
Structural Testing of column	£0	£0	-	£12,792	£38,376	£0	-	£38,376	£1,279,200
Remedial Works	£1,000	£6,560	-	£3,280	£9,840	£19,680	-	£29,520	£984,000
Sub-Totals					£303,059	£53,680		£356,739	£11,891,000

Total Works Cost over installation Life	£303,059
Total Traffic Management Cost over installation Life	£53,680
Total Additional Costs over installation Life	0
Total Maintenance Cost over installation Life	£356,739
RPI 3.90%	£13,913
Grand Total Maintenance Cost over installation Life	£370,652
Appraisal Period (years)	30
Average Maintenance cost per annum	£12,355.06

	Cost per Annum	Total cost over installation life (incl RPI)
Construction	£ 125,733.33	£ 3,919,108.00
Energy	£ 25,588.48	£ 797,593.01
CCL (Carbon)	£ 708.25	£ 22,076.24
Decomissioning (20% of Construction Costs)	£ 25,146.67	£ 783,821.60
RPI @ 3.9% (Maintenance)	£ 425.38	£ 12,761.54
RPI @ 3.9% (Remedial Works)	£ 38.38	£ 1,151.28
OYMC (energy component)	£ 102,000	
OYMC (maintenance component)	£ 11,929.67	
PVC Total Inc Factors	£ 177,124.52	
Scheme Lifetime Total Costs		£ 5,536,511.66

PVC (maintenance) = OYMC x CF x DF x GTF	£ 177,124.52
--	--------------

Yearly Estimated Maintenance Cost = OYMC	£ 11,929.67
CF (Capitalisation Factor maintenance)	22.4
DF - (Discount Factor - to 2027 prices)	0.557
GTF - (General Taxation Figure)	1.19
CFE (Capitalisation factor for energy)	89.29

Table c.3b of SAR User notes 2020

Table c.3a of SAR User notes 2020

Indirect Taxation Factor, TAG Data Book A1.3.1 May 2024

8% of Link quantity totals e.g. 100 cols + 8 columns for remedial works

M6 LIGHTING RENEWAL - COST BREAKDOWN SUMMARY

Running Cost Assessment Zone 7

Description	M6
Length (Km)	4.08km
Type	Motorway
Class	M3
Assesment Period (yrs)	30

GOV - Small Scheme appraisal toolkit

User input

User Inputs values into column

Description	Detailed Description	Interval of maintenance Cycle	Cycles (30yr assessment period)	No of Cycles	Qty per Cycle	Quantity attend per shift	Number of shifts	Unit	Rate	Work Cycle Cost
Replacement of Luminaire with LED Unit	Replacement of luminaire at end of life with replacement LED luminaire. Cost make up 12 x £1000 item price + 1 x £935 shift price	12 Years	@ 12yrs & 24yrs	2	253	12	22	each	£1,077.92	£272,713.76
Luminaire Clean	Cleaning internal and external surfaces	at electrical testing	@ 6,12,18 & 24 yrs	5	253	60	5	each	£41.00	£10,373.00
Visual Inspection of luminaire	Cleaning, adjustment and visual inspection of mechanical components, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	253	60	5	each	£18.70	£4,731.10
Visual Inspection of column	Visual inspection of condition of column, door and fixings, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	179	60	3	each	£18.70	£3,347.30
Visual Inspection of feeder pillar	Visual inspection of condition of enclosure and support systems, electrical components and wiring	at electrical testing	@ 6,12,18 & 24 yrs	5	4	5	1	each	£0.00	£0.00
Electrical Testing: column and cables	Complete electrical test and inspection Every 6 years (maximum)	6 Years (max)	@ 6,12,18 & 24 yrs	5	179	60	3	each	£112.00	£20,048.00
Electrical Testing: feeder pillar	Complete electrical test and inspection Every 6 years (maximum) expiry of fatigue design life	6 Years (max)	@ 6,12,18 & 24 yrs	5	4	2	2	each	£0.00	£0.00
Structural Testing of column	rigorous column inspection/testing, especially after	6 Years (max)	@ 15, 21 , 27yrs	3	179	50	4	each	£156.00	£27,924.00
Remedial Works	Allowance for attendance at non-routine repairs, e.g. door off, lantern cover off, solitary lamp outage.	As required	nominal 3 @ 15, 21 & 27yrs	3	20.24	1	20	8% Of Cycle Costs	£500.00	£10,120.00

Notes From TA501 National annex: E/2.11 The average annual costs for remedial damage and fault repairs shall be derived by examining the total costs for the past 3 years.
E/2.12 Average annual maintenance costs shall be derived by examining planned maintenance activities between present and when the road lighting scheme is 25 years old.

Description	TM rate per shift	TM cost per cycle	Additional costs per cycle	Total Works cost per cycle	Total Works cost over installation life	Total TM cost over installation life	Total Addition al costs over	Total cost over Installation	Total cost per annum
Replacement of luminaire with LED unit	£1,000	£22,000	-	£272,714	£545,428	£44,000	-	£589,428	£19,647.584
Luminaire Clean	£1,000	£5,000	-	£10,373	£51,865	£25,000	-	£76,865	£2,562.167
Visual Inspection of luminaire	inc. above	-	-	£4,731	£23,656	0	-	£23,656	£788.517
Visual Inspection of column	inc. above	£0	-	£3,347	£16,737	0	-	£16,737	£557.883
Visual Inspection of feeder pillar	inc. below	£0	-	£0	£0	£0	-	£0	£0.000
Electrical Testing: column and cables	£1,000	£3,000	-	£20,048	£100,240	£15,000	-	£115,240	£3,841.333
Electrical Testing: feeder pillar	£0	£0	-	£0	£0	£0	-	£0	£0.000
Structural Testing of column	£0	£0	-	£27,924	£83,772	£0	-	£83,772	£2,792.400
Remedial Works	£1,000	£20,240	-	£10,120	£30,360	£60,720	-	£91,080	£3,036.000
Sub-Totals					£852,057	£144,720		£996,777	£33,226

Total Works Cost over installation Life	£852,057
Total Traffic Management Cost over installation Life	£144,720
Total Additional Costs over installation Life	0
Total Maintenance Cost over installation Life	£996,777
RPI 12.73%	£128,890
Grand Total Maintenance Cost over installation Life	£1,123,666
Appraisal Period (years)	30
Average Maintenance cost per annum	£37,455.54

	Cost per Annum	Total cost over installation life (incl RPI)
Construction	£ 274,466.67	£ 9,282,188.20
Energy	£ 51,758.71	£ 1,750,427.71
CCL (Carbon)	£ 1,432.61	£ 48,449.34
Decomissioning (20% of Construction Costs)	£ 54,893.33	£ 1,856,437.64
RPI @ 12.73% (Maintenance)	£ 3,843.17	£ 115,295.17
RPI @ 12.73% (Remedial Works)	£ 386.48	£ 11,594.48
OYMC (energy component)	£ 206,319	
OYMC (maintenance component)	£ 33,612.37	
PVC Total Inc Factors	£ 499,055.99	
Scheme Lifetime Total Costs		£ 13,064,392.54

PVC (maintenance) = OYMC x CF x DF x GTF	£ 499,055.99
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Yearly Estimated Maintenance Cost = OYMC	£ 33,612.37
CF (Capitalisation Factor maintenance)	22.4
DF - (Discount Factor - to 2027 prices)	0.557
GTF - (General Taxation Figure)	1.19
CFE (Capitalisation factor for energy)	89.29

Table c.3b of SAR User notes 2020

Table c.3a of SAR User notes 2020

Indirect Taxation Factor, TAG Data Book A1.3.1 May 2024

8% of Link quantity totals e.g. 100 cols + 8 columns for remedial works

Appendix B

SAR RESULTS

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M6 LIGHTING RENEWAL

AZ 1- BCR CALCULATION

Guidance Figures for potential Lighting Scheme Full Switch Off

Section:	AZ 1	M6 Main line Junction 21 -21a	Annual Costs	£	963,264.15
Length:	14.2 km		Annual Benefits	£	13,214.60
Type:	Verge Lighting Main Carriageway		Benefit Cost Ratio		0.01
Class:	M3				

Costs (per annum)		
Construction	£	870,933.33
Energy	£	6,966.96
Maintenance	£	77,875.02
Repairs	£	7,296.00
CCL Costs	£	192.84
Decommission cost(20%)	£	174,186.67
Total	£	963,264.15

Energy Calculation

608	Lanterns
184	W per lantern
11.38 hours burn per night	
365.26 days	
24882 kW·hrs per annum	
£	6,966.96 cost @28p/kW·h
5.152 tonnes of CO2	
£	192.84 CCL Cost

Routine Maintenance Calculation

a) Replacement of luminaire with LED unit;	£	47,091.69
b) Luminaire Clean;	£	5,988.00
c) Visual Inspection of luminaire;	£	1,894.93
d) Visual Inspection of column;	£	1,770.27
e) Visual Inspection of feeder pillar	£	-
f) Electrical Testing: column and cables	£	12,269.33
g) Electrical Testing: feeder pillar	£	-
h) Structural Testing of column	£	8,860.80
Maintenance costs =	£	77,875.02

Remedial Works

Total repair costs =	£	7,296.00
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Benefits	
No. of PICs in past 5 yrs:	7
minus DGNs:	0
Annual accident rate:	1.40
5% of PICs=	0.070
value of acc. savings	£ 13,214.60
	£ 188,780.00

Existing W per lantern 250 W

(1 kW·h causes 0.20705kg of CO2 2024 Rates)
(2024 CCL Rate 0.00775)

M6 LIGHTING RENEWAL

AZ 2 - BCR CALCULATION

Guidance Figures for potential Lighting Scheme Full Switch Off

Section:	AZ 2	M6 Main line Junction 20 -21	Annual Costs	£	501,924.46
Length:	4.22 km		Annual Benefits	£	26,429.20
Type:	Verge Lighting Main Carriageway		Benefit Cost Ratio		0.05
Class:	M3				

Costs (per annum)		
Construction	£	409,400.00
Energy	£	52,194.14
Maintenance	£	35,597.66
Repairs	£	3,288.00
CCL Costs	£	1,444.66
Decommission cost(20%)	£	81,880.00
Total	£	501,924.46

Energy Calculation

274	Lanterns
164	W per lantern
11.38 hours burn per night	
365.26 days	
186407.65 kW·hrs per annum	
£	52,194.14 cost @28p/kW·h
38.596 tonnes of CO2	
£	1,444.66 CCL Cost

Routine Maintenance Calculation

a) Replacement of luminaire with LED unit;	£	21,223.34
b) Luminaire Clean;	£	2,705.67
c) Visual Inspection of luminaire;	£	853.97
d) Visual Inspection of column;	£	832.15
e) Visual Inspection of feeder pillar	£	-
f) Electrical Testing: column and cables	£	5,817.33
g) Electrical Testing: feeder pillar	£	-
h) Structural Testing of column	£	4,165.20
Maintenance costs =	£	35,597.66

Remedial Works

Total repair costs =	£	3,288.00
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Benefits	
No. of PICs in past 5 yrs:	14
minus DGNs:	1
Annual accident rate:	2.80
5% of PICs=	0.14
value of acc. savings	£ 26,429.20
	£ 188,780.00

Existing W per lantern 250 W

(1 kW·h causes 0.20705kg of CO2 2024 Rates)
(2024 CCL Rate 0.00775)

M6 LIGHTING RENEWAL

AZ 3- BCR CALCULATION

Guidance Figures for potential Lighting Scheme Full Switch Off

Section:	AZ 3	M6 Main line Junction 21 -21a	Annual Costs	£	318,222.68
Length:	2.89 km		Annual Benefits	£	15,102.40
Type:	Verge Lighting Main Carriageway		Benefit Cost Ratio		0.05
Class:	M2				

Costs (per annum)

Construction	£	265,266.67
Energy	£	26,358.33
Maintenance	£	23,672.12
Repairs	£	2,196.00
CCL Costs	£	729.56
Decommission cost(20%)	£	53,053.33
Total	£	318,222.68

Energy Calculation

183	Lanterns
124	W per lantern
11.38	hours burn per night
365.26	days
94136.9	kW·hrs per annum
£ 26,358.33	cost @28p/kW·h
19.491	tonnes of CO2
£ 729.56	CCL Cost

Routine Maintenance Calculation

a) Replacement of luminaire with LED unit;	£	14,217.29
b) Luminaire Clean;	£	1,917.17
c) Visual Inspection of luminaire;	£	570.35
d) Visual Inspection of column;	£	539.18
e) Visual Inspection of feeder pillar	£	-
f) Electrical Testing: column and cables	£	3,729.33
g) Electrical Testing: feeder pillar	£	-
h) Structural Testing of column	£	2,698.80
Maintenance costs =	£	23,672.12

Remedial Works

Total repair costs =	£	2,196.00
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Benefits

No. of PICs in past 5 yrs:	8
minus DGNs:	0
Annual accident rate:	1.60
5% of PICs=	0.08
value of acc. savings	£ 15,102.40

£ 188,780.00

(1 kW·h causes 0.20705kg of CO2 2024 Rates)
(2024 CCL Rate 0.00775)

M6 LIGHTING RENEWAL

AZ 4- BCR CALCULATION

Guidance Figures for potential Lighting Scheme Full Switch Off

Section:	AZ 4	M6 J21/M62 -J10 Interchange	Annual Costs	£	956,716.58
Length:	2.89 km		Annual Benefits	£	15,102.40
Type:	Verge Lighting Main Carriageway		Benefit Cost Ratio		0.02
Class:	M3				

Costs (per annum)		
Construction	£	786,600.00
Energy	£	93,084.39
Maintenance	£	68,143.74
Repairs	£	6,312.00
CCL Costs	£	2,576.44
Decommission cost(20%)	£	157,320.00
Total	£	956,716.58

Energy Calculation

526	Lanterns
152	W per lantern
11.38 hours burn per night	
365.26 days	
332444.255 kW-hrs per annum	
£	93,084.39 cost @28p/kW-h
68.833 tonnes of CO2	
£	2,576.44 CCL Cost

Routine Maintenance Calculation

a) Replacement of luminaire with LED unit;	£	40,732.39
b) Luminaire Clean;	£	5,094.33
c) Visual Inspection of luminaire;	£	1,639.37
d) Visual Inspection of column;	£	1,598.85
e) Visual Inspection of feeder pillar	£	-
f) Electrical Testing: column and cables	£	11,076.00
g) Electrical Testing: feeder pillar	£	-
h) Structural Testing of column	£	8,002.80
Maintenance costs =	£	68,143.74

Remedial Works

Total repair costs =	£	6,312.00
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Benefits	
No. of PICs in past 5 yrs:	8
minus DGNs:	3
Annual accident rate:	1.60
5% of PICs=	0.08
value of acc. savings	£ 15,102.40
	£ 188,780.00

Existing W per lantern 250 W

(1 kW-h causes 0.20705kg of CO2 2024 Rates)
(2024 CCL Rate 0.00775)

M6 LIGHTING RENEWAL

AZ 5- BCR CALCULATION

Guidance Figures for potential Lighting Scheme Full Switch Off

Section:	AZ 5	M62 J10 interchange to J11	Annual Costs	£	211,960.70
Length:	2.89 km		Annual Benefits	£	3,775.60
Type:	Verge Lighting Main Carriageway		Benefit Cost Ratio		0.02
Class:	M3				

Costs (per annum)		
Construction	£	170,200.00
Energy	£	25,168.14
Maintenance	£	14,563.94
Repairs	£	1,332.00
CCL Costs	£	696.62
Decommission cost(20%)	£	34,040.00
Total	£	211,960.70

Energy Calculation

111	Lanterns
195	W per lantern
11.38 hours burn per night	
365.26 days	
89886.225 kW·hrs per annum	
£	25,168.14 cost @28p/kW·h
18.611 tonnes of CO2	
£	696.62 CCL Cost

Routine Maintenance Calculation

a) Replacement of luminaire with LED unit;	£	8,643.27
b) Luminaire Clean;	£	1,091.83
c) Visual Inspection of luminaire;	£	345.95
d) Visual Inspection of column;	£	345.95
e) Visual Inspection of feeder pillar	£	-
f) Electrical Testing: column and cables	£	2,405.33
g) Electrical Testing: feeder pillar	£	-
h) Structural Testing of column	£	1,731.60
Maintenance costs =	£	14,563.94

Remedial Works

Total repair costs =	£	1,332.00
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Benefits	
No. of PICs in past 5 yrs:	2
minus DGNs:	0
Annual accident rate:	0.40
5% of PICs=	0.02
value of acc. savings	£ 3,775.60
	£ 188,780.00

(1 kW·h causes 0.20705kg of CO2 2024 Rates)
(2024 CCL Rate 0.00775)

M6 LIGHTING RENEWAL

AZ 6- BCR CALCULATION

Guidance Figures for potential Lighting Scheme Full Switch Off

Section:	AZ 6	M62 J9 interchange to J10	Annual Costs	£	163,921.36
Length:	2.89 km		Annual Benefits	£	1,887.80
Type:	Verge Lighting Main Carriageway		Benefit Cost Ratio		0.01
Class:	M3				

Costs (per annum)		
Construction	£	125,733.33
Energy	£	25,588.48
Maintenance	£	10,907.30
Repairs	£	984.00
CCL Costs	£	708.25
Decommission cost(20%)	£	25,146.67
Total	£	163,921.36
Energy Calculation		
82 Lanterns		
269 W per lantern		
11.38 hours burn per night		
365.26 days		
91387.439 kW·hrs per annum		
£ 25,588.48 cost @28p/kW·h		
18.922 tonnes of CO2		
£ 708.25 CCL Cost		
Routine Maintenance Calculation		
a) Replacement of luminaire with LED unit;	£	6,359.30
b) Luminaire Clean;	£	893.67
c) Visual Inspection of luminaire;	£	255.57
d) Visual Inspection of column;	£	255.57
e) Visual Inspection of feeder pillar	£	-
f) Electrical Testing: column and cables	£	1,864.00
g) Electrical Testing: feeder pillar	£	-
h) Structural Testing of column	£	1,279.20
Maintenance costs =	£	10,907.30
Remedial Works		
Total repair costs =	£	984.00

Benefits	
No. of PICs in past 5 yrs:	1
minus DGNs:	0
Annual accident rate:	0.20
5% of PICs=	0.01
value of acc. savings	£ 1,887.80
	£ 188,780.00

Existing W per lantern 250 W

(1 kW·h causes 0.20705kg of CO2 2024 Rates)
(2024 CCL Rate 0.00775

M6 LIGHTING RENEWAL

AZ 7- BCR CALCULATION

Guidance Figures for potential Lighting Scheme Full Switch Off

Section:	AZ 7	M62 J8 interchange to J9	Annual Costs	£	360,883.86
Length:	2.89 km		Annual Benefits	£	11,326.80
Type:	Verge and Central Reserve Lighting Main Carriageway		Benefit Cost Ratio		0.03
Class:	M3				

Costs (per annum)		
Construction	£	274,466.67
Energy	£	51,758.71
Maintenance	£	30,189.88
Repairs	£	3,036.00
CCL Costs	£	1,432.61
Decommission cost(20%)	£	54,893.33
Total	£	360,883.86
Energy Calculation		
253	Lanterns	
176	W per lantern	
11.38	hours burn per night	
365.26	days	
184852.525	kW·hrs per annum	
£ 51,758.71	cost @28p/kW·h	
38.274	tonnes of CO2	
£ 1,432.61	CCL Cost	
Routine Maintenance Calculation		
a) Replacement of luminaire with LED unit;	£	19,647.58
b) Luminaire Clean;	£	2,562.17
c) Visual Inspection of luminaire;	£	788.52
d) Visual Inspection of column;	£	557.88
e) Visual Inspection of feeder pillar	£	-
f) Electrical Testing: column and cables	£	3,841.33
g) Electrical Testing: feeder pillar	£	-
h) Structural Testing of column	£	2,792.40
Maintenance costs =	£	30,189.88
Remedial Works		
Total repair costs =	£	3,036.00

Benefits	
No. of PICs in past 5 yrs:	6
minus DGNs:	2
Annual accident rate:	1.20
5% of PICs=	0.06
value of acc. savings	£ 11,326.80
	£ 188,780.00

(1 kW·h causes 0.20705kg of CO2 2024 Rates)
(2024 CCL Rate 0.00775)

Appendix C

RSE REPORT

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National Highways

DMRB TA 501 ROAD SAFETY ENGINEER REPORT

M6 Junction 20a to 21a





National Highways

DMRB TA 501 ROAD SAFETY ENGINEER REPORT

M6 Junction 20a to 21a

CONFIDENTIAL

PROJECT NO. NH604423

OUR REF. NO. NH604423-WSP-HLG-M6-J20A_J21A -RP-OS-0001-P01

DATE: MARCH 2025

WSP

First Floor

3 Wellington Place

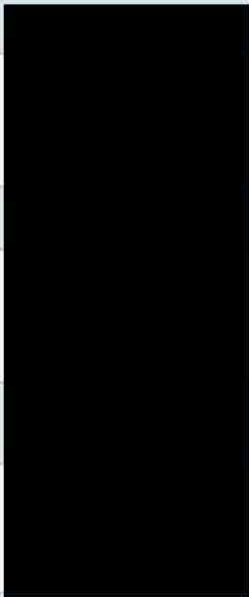
Leeds

LS1 3AP

WSP.com



QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Confidential			
Date	25 th March 2025			
Prepared by				
Signature				
Checked by				
Signature				
Authorised by				
Signature				
Project number	NH604423			
Report number	NH604423-WSP-HLG-M6-J20A_J21A -RP-OS-0001-P01			
File reference	As Above			

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SUMMARY OF PIC DATA FOR THE STUDY AREA

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PIC LOCATION PLAN

APPENDIX C

ROAD SAFETY EVALUATION OF LIGHTING SCHEMES (NOVEMBER 2022)

1

INTRODUCTION



1 INTRODUCTION

1.1 GENERAL

- 1.1.1. This Road Safety Engineer (RSE) report sets out the findings and recommendations arising from analysis and evaluation of Personal Injury Collisions (PICs), that have occurred on a 12 km long section of the M6 Motorway (including a short overbridge section of the M56) along with a 10 km section of the M62 Motorway.
- 1.1.2. The scope of this report includes:
- The M6 mainline carriageway running between J20a and J21a, which includes both entry and exit slip roads, beyond the minimum distance required by the "5-second rule," as defined in the Institution of Lighting Professionals (ILP) Professional Lighting Guide (PLG 02),
 - The M62 mainline carriageway from J8 to J11 (also defined by the ILP PLG02 5-second rule) and
 - The 3.7km long section of M56 that spans across Junction 20a of M6.
- 1.1.3. For clarity, it should be noted that the grade separated circulatory carriageways of all interchanges and conflict areas, fall outside of this study.
- 1.1.4. The scope of this report has been agreed in advance with National Highways (NH) who maintain and manage the country's Motorway network.
- 1.1.5. This report has been prepared in accordance with the requirements and advice contained within the Design Manual for Roads and Bridges (DMRB) document TA 501 'Road Lighting Appraisal'. The purpose of this report is to quantify the potential road safety impacts of removing street lighting from the defined sections / links of the M6, M62 and M56 Motorway.
- 1.1.6. The engineers undertaking this assessment have the appropriate training, skills and experience in road safety engineering and collision investigation. This report has been approved by practicing Road Safety Auditor(s) who have undertaken and successfully completed the recognised RoSPA training in road safety.
- 1.1.7. A site visit has not been undertaken to assist with the preparation of this report, and as such, any views expressed within are caveated on that basis.
- 1.1.8. This report supplements the DMRB Road Safety Audit process and therefore the full Road Safety Audit process should be undertaken in accordance with GG 119 'Road Safety Audit'.

1.2 SCHEME DESCRIPTION

- 1.2.1. The length of road considered for the analysis is that of the M6 Motorway, from J20a with the M56 in High Legh, Knutsford to J21a in Birchwood, Warrington. The scheme also encompasses a section of the M62 from J8 with Burtonwood Road to J11 with Birchwood Road.
- 1.2.2. Additionally, this assessment covers the elevated section of the M56 at J20a of M6 (extending from the A50 overhead bridge located towards east of M6 to Arley Road overhead bridge located towards the west of M6).

1.2.3. The study area, forms part of the Strategic Road Network (SRN) and takes the form of a multi lane, dual carriageway type arrangement with a central reserve and a hard shoulder. The lanes arrangement varies within the scheme area as follows:

- The M6 takes the geometric form of four mainline running lanes in both directions between J20a and J21a,
- A M62 takes the geometric form of four mainline running lanes in each direction between J8 and J11, and
- The section of M56 within scheme area takes the geometric form of three mainline running lanes in both directions.

1.2.4. It is understood that all the motorways within scheme area are subjected to Variable Speed Limit (VSL) for all carriageways. In the absence of the network being under VSL, it is assumed that the SRN is subject to the National Speed Limit of 70mph.

1.2.5. The scheme extents for the study area are demonstrated in **Figure 1-1**. For ease of reference, the network has been categorised into seven assessment zones:

- Assessment Zone 1 – M6 J20a to J20 (including the elevated section of M56),
- Assessment Zone 2 – M6 J20 to J21,
- Assessment Zone 3 – M6 J21 to J21a,
- Assessment Zone 4 – M6 J21a / M62 J10 Croft Interchange,
- Assessment Zone 5 – M62 J10 Interchange to M62 J11,
- Assessment Zone 6 – M62 J9 to M62 J10 Interchange, and
- Assessment Zone 7 – M62 J8 to M62 J9.

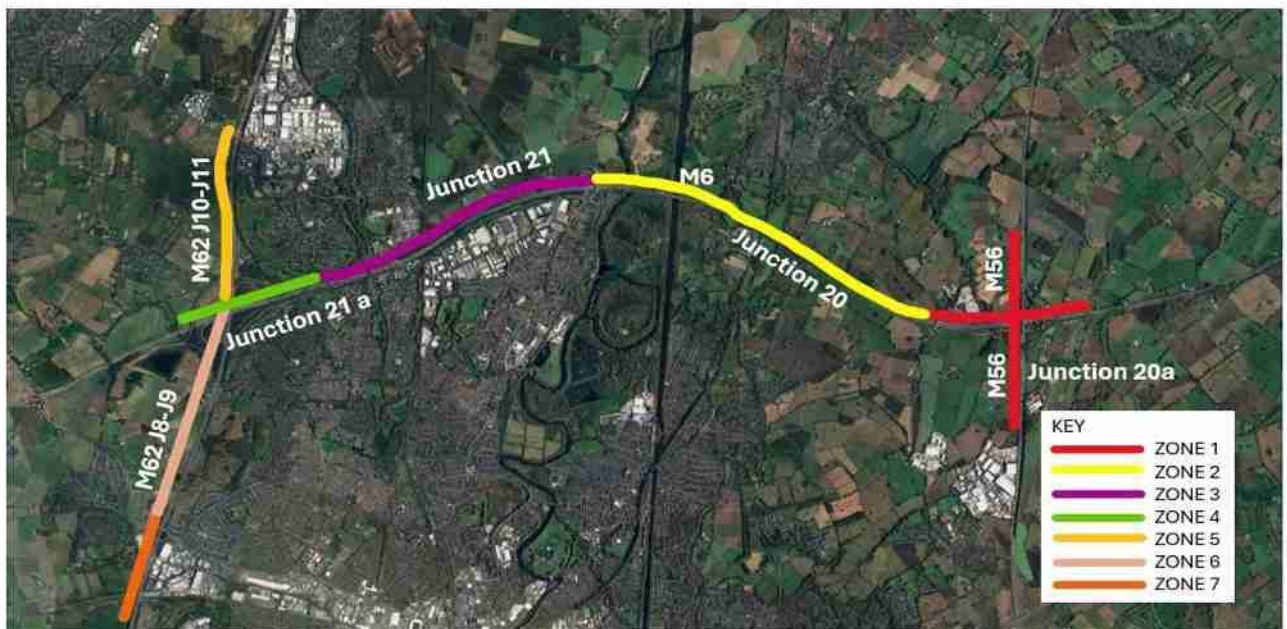


Figure 1-1 – M6 J20-J21A Scheme Extents

1.2.6. The study area is fully lit (with the exception of the M62 Motorway beyond J11) and includes the following lighting related highway assets within the study area:

- 608no. of Lighting columns having a height that vary from 12m to 15m with twin bracket arm or single bracket arm are used. Wall mounted units are installed at a height of 5m. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 150W, 250W, 400W and 600W are utilised within Assessment Zone 1,
- 274no. of Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm are used. Wall mounted units are installed at a height of 5m. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 150W, 250W, 400W and 600W are utilised within Assessment Zone 2,
- 183no. of Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm are used. Wall mounted units are installed at a height of 5m. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 150W, 250W, 400W and 600W are utilised within Assessment Zone 3,
- 525no. of Lighting columns of height that vary from 12m to 15m with twin bracket arm or single bracket arm are used. Wall mounted units are installed at a height of 5m. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 135W, 141W, 150W, 250W, 400W and 600W are utilised within Assessment Zone 4,
- 111no. of Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm are used. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 250W and 400W are utilised within Assessment Zone 5,
- 82no. of Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm or twin bracket arm are used. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 179W, 400W and 600W are utilised within Assessment Zone 6, and
- 253no. of Lighting columns of height that vary from 10m, 12m and 15m with single bracket arm or twin bracket arm are used. Luminaires incorporating High Pressure Sodium (SON-T) with a power output of 250W, 400W and 600W are utilised within Assessment Zone 7.

1.2.7. The above-mentioned lighting assets are life-expired and have failed the statutory testing hence, their renewal / removal is required.

1.3 PROPOSALS UNDER CONSIDERATION

1.3.1. NH want to consider the road safety impacts of removing historic street lighting within the extents of the scheme area, as detailed in sections above.

2

PERSONAL INJURY COLLISION ANALYSIS



2 PERSONAL INJURY COLLISION ANALYSIS

2.1 GENERAL

- 2.1.1. The following assessment follows the suggested approach as detailed within DMRB guidance document TA 501.
- 2.1.2. Full STATS19 PIC data was provided to the RSEs by the scheme designer, for the 5-year period between January 2019 to December 2023. It should be noted that years affected by the COVID19 Pandemic (between March 2020 to 2021) have been included as part of this assessment.
- 2.1.3. The adopted dataset complies with the last 5-year period (3-year minimum) requirement as defined by paragraph 3.1.1 of guidance document TA 501.
- 2.1.4. Within the extents of the study area, a total of 192no. of PICs were recorded within the period from January 2019 to December 2023.
- 2.1.5. Of the 192no. of recorded PICs:
- 158no. of PICs were recorded as 'slight' in severity (Category 3 from STATS19),
 - 27no. of PICs were recorded as 'serious' (Category 2 from STATS19) and,
 - 7no. of PICs was recorded as 'fatal' (Category 1 from STATS19).
- 2.1.6. A table summarising the recorded PIC incidents is attached at **Appendix A** of this report. The fatal incidents are highlighted as red text.
- 2.1.7. This assessment does not include the consideration of 'damage only' collision data.

2.2 STUDY AREA – PERSONAL INJURY COLLISIONS

- 2.2.1. The 192no. PICs that occurred within the scheme area are summarised in table below by, incident severity and by zones.

Table 2-1 - PICs (by severity) occurring on different zones within scheme area.

Severity Condition	No. of PICs						
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
Slight	30	47	19	23	15	10	14
Serious	3	8	4	5	2	1	4
Fatal	0	1	3	2	0	0	1
Total	33	56	26	30	17	11	19

- 2.2.2. Findings from the review of the contribution factors of all the 192no. of the recorded PICs show that the majority of collisions (some 83.3%) occurred due to 'driver error' rather than any evident geometric issues with the layout of the motorway network. The STATS19 data sheet attributes factors such as:
- Poor turn / manoeuvre (STATS19 contribution factor code: 403),
 - Failure to look properly (STATS19 contribution factor code: 802),
 - Careless, reckless or in a hurry (STATS19 contribution factor code: 602),
 - Failure to judge other persons path or speed (STATS19 contribution factor code: 403),
 - Following too close (STATS19 contribution factor code: 403),
 - Exceeding speed limit (STATS19 contribution factor code: 306),
 - Failure to signal/misleading signal (STATS19 contribution factor code: 404),
 - Driver being nervous/uncertain or panic (STATS19 contribution factor code: 603),
 - Distraction in vehicle (STATS19 contribution factor code: 509), and
 - Travelling too fast for conditions (STATS19 contribution factor code: 408).
- 2.2.3. It should be noted that for 189no. of the recorded PICs, the STATS19 data as provided does not provide a clear description or narrative to how the incidents occurred, and as such it is not possible to comment on these collisions in significant detail.
- 2.2.4. With respect to the Killed or Seriously Injured (KSI) incidents, 7no. collisions were recorded as fatal in severity with the remaining 27no. collisions recorded as serious in nature. These 34no. KSI incidents are discussed below.
- 2.2.5. The 7no. of the fatal PICs can be categorised as:
- The first recorded fatal collision (ref: 22000837044) occurred within the Zone 2, on 15th of November 2022, during hours of darkness with streetlights present and lit. The incidents occurred during temporary road works. The contribution factors recorded in the STATS19 data for this incident are [REDACTED]
 - The second recorded fatal collision (ref: 20000438464) occurred within Zone 3 on 24th of July 2020, during hours of darkness with streetlights present and lit. The contribution factors recorded in the STATS19 data for this incident are [REDACTED]
 - The third recorded fatal collision (ref: 21000414644) occurred within the Zone 3, on 14th of June 2021, during hours of darkness with streetlights present and lit. The contributory factors recorded in the STATS19 data for this incident are [REDACTED]
 - The fourth recorded fatal collision (ref: 23000766615) occurred within Zone 3, on 17th of August 2023, during hours of darkness with streetlights present and lit. [REDACTED]
 - The fifth recorded fatal collision (ref: 23000088879) occurred within Zone 4, on 31st of Jan 2023, during hours of darkness with streetlights present and lit. This section of motorway was affected by temporary road works at the time of incident. The contributory

factors recorded in the STATS19 data for this incident are [REDACTED]

- The sixth recorded fatal collision (ref: 23000360265) occurred within Zone 4, on 29th of April 2023, during hours of darkness with streetlights present and lit. The contributory factors recorded in the STATS19 data for this incident are [REDACTED]
- The last recorded fatal collision (ref: 23000234181) occurred within Zone 7, on 19th of March 2023, during hours of darkness with streetlights present and lit. The contributory factors recorded in the STATS19 data for this incident are [REDACTED]

2.2.6. With respect to the 27no. of serious PICs, majority of the incidents occurred due to the driver errors that can be aligned with the factors mentioned in the section 2.2.2 of this report.

2.2.7. Additionally, 01no. of incident among these 27no. of serious incidents (ref: 22000811463) as indicated by the STATS19 data, includes road environment factors [REDACTED]

[REDACTED] as a primary contributory factor of the incident. The other factor reported for this incident is [REDACTED]

2.2.8. Another 2no. of incidents (Ref: 20000307263 and 21000733719) as indicated in the STATS19 data, included medical conditions of the driver for which the contributory factors stated are [REDACTED]

2.2.9. Also, 2no. of incidents among these 27no. of serious incidents (Ref: 20000016106 and 23000925253) as stated in the STATS19 data included factors related to vehicular defects. For the first incident contributory factors reported in STATS19 data is [REDACTED]. While the second incident included vehicle as part of crime. The contributory factors reported against the incidents are [REDACTED]

2.2.10. Another 2no. of incidents (Ref: 21000805682 and 23000930508) as stated in the STATS19 data included cyclist who were entering the road from the pavements. The contributory factors reported in STATS19 data for these incidents are [REDACTED]

2.2.11. Reference is also made to the 14no. of incidents (ref: 22000783251, 20000307263, 22000837044, 23000518345, 23000877591, 19100563036, 20000073963, 20000009255, 23000088879, 19100071452, 19100714052, 19100629652, 22000814928 and 19100433535), some of which are described above.

2.2.12. The STATS19 data states that these PICs occurred on motorway sections which were affected by temporary road works. The contribution factors of these incidents indicates that the driver either lost control, failed to slow/stop for traffic ahead or drivers did not respond to a sudden braking. Among these 14no. of total incidents, 8no. of incidents occurred during the hours of darkness with street lighting present and lit. With respect to severity, among

these 14no. of incidents, 6no. of incidents are related to KSI incidents including two fatalities.

COLLISION HOTSPOT ANALYSIS

2.2.13. In addition to analysis of individual PICs, this RSE report also considers any 'hotspots' on the road network through collision cluster identification. For the purposes of this report, a collision cluster is defined as:

- Six or more injury collisions (any severity) within 100m of each other or at a junction, in the most recent 3 calendar year period; or,
- Three or more higher severity injury collisions (fatal or serious injuries) within 100m of each other or at a junction, in the most recent 3 calendar year period.

2.2.14. As noted by the PICs plan attached at **Appendix B**, a single cluster sites including 8no. of incidents (Ref: 20000049989, 23001025610, 19100325240, 19100563036, 19100725449, 23001254697, 21000089289, 21000808214) have been identified in the Zone 2 of the study area.

2.2.15. The review of these 8no. of incidents shows that these incidents occurred mainly due to driver errors that can be aligned with those mentioned in section 2.2.2 of this report. While the last two incident occurred due to special circumstances i.e. presence of animal or object on carriageway and medical illness / disability of driver.

DARKNESS HOURS COLLISION ANALYSIS.

2.2.16. With respect to the total number of recorded PICs, some 52no. of PICs out of the total 192no. of PICs are recorded to have occurred during darkness hours. This equates to 27% of all recorded incidents. The darkness hours PICs are listed in Table below.

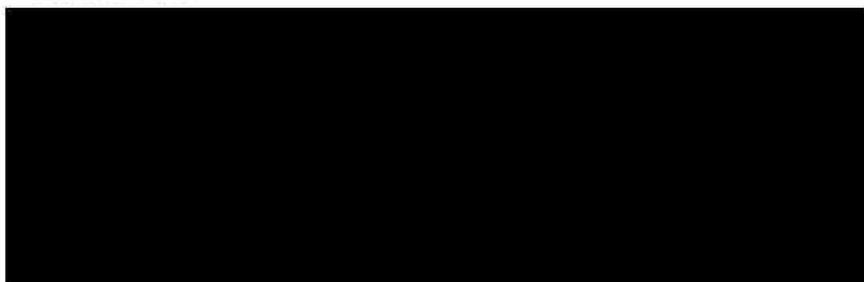
Table 2-2 - PICs (by Ref) Occurring in Darkness Hours

Darkness: Streetlights present and lit	Darkness: Streetlights present and unlit	Darkness: No street lighting	Darkness: Street lighting unknown
Assessment Zone 1			
19100457978	N/A	20000717702	N/A
20000012878			
20000748151			
21000831468			
22000783251			
22000811463			
Assessment Zone 2			
20000014953	22000743812	N/A	21000089289
20000049989			

Darkness: Streetlights present and lit	Darkness: Streetlights present and unlit	Darkness: No street lighting	Darkness: Street lighting unknown
21000762431			
21000808214			
21000866533			
22000766485			
22000837044			
22000866086			
23000076595			
23000133554			
23000518345			
23000877591			
23001025610			
Assessment Zone 3			
20000073963	N/A	22000509051	N/A
20000438464			
21000414644			
22000085734			
22000864304			
23000766615			
23000766651			
Assessment Zone 4			
20000009255	N/A	19100743171	22000022245
20000081367		21000474881	
21000600884			
23000088879			
23000360265			

Darkness: Streetlights present and lit	Darkness: Streetlights present and unlit	Darkness: No street lighting	Darkness: Street lighting unknown
19000006103			
20000032641			
23000190258			
Assessment Zone 5			
21000313071	N/A	21000730120	N/A
Assessment Zone 6			
1910757	N/A	N/A	N/A
Assessment Zone 7			
20000738810	23000115257	22000741931	21000840124
2200063	23000234181	23000077949	22000018133

- 2.2.17. It should be noted that the 6no. PICS (Ref: 20000717702, 22000509051, 19100743171, 21000474881, 22000741931 and 23000077949) are recorded to have occurred on parts of the M6 / M62 network which were unlit, i.e. during darkness conditions with no streetlights present. Despite this, it is the understanding of the RSEs that these areas of the network have been lit since 1990. This matter has been confirmed by the scheme designer and as such, it is reasonable to assume that the STATS19 data is recorded in error.
- 2.2.18. As detailed within the introduction (para 1.2.6), the lighting provision on the M62 Motorway (beyond J11) has been removed in Aug 2019 and this section has remained unlit to date. This section of the network falls within the Assessment zone 5 of the study area.
- 2.2.19. Among these 52no. of total darkness PICs, 14no. of PICs are related to KSI incidents including 7no. of fatal incidents.
- 2.2.20. DMRB Standard TA 501 states that '*...the PICs shall be rationalised to exclude anywhere [REDACTED] was a significant contributory factor*'. For the purposes of this report, [REDACTED] are classified as:



- 2.2.21. Reference has again been made to the STATS19 data, and it is considered that out of the 192no. of total PICs that occurred within the scheme area, 15no. of recorded incidents occurred due to [REDACTED]
- 2.2.22. Twelve of the recorded [REDACTED] collisions (ref: 23000518345 ,21000333800, 21000856449, 23000817037, 22000394830, 20000081367, 20000032641, 21000600884, 23000528143, 23000699736, 23000115257 and 20000738810) can be attributed to [REDACTED]
[REDACTED] These collisions occurred independent of each other (with respect to location).
- 2.2.23. The remaining three incidents (Ref: 20000016106, 22000517315 and 23000925253) can be attributed [REDACTED] as primary cause of the incident. The primary contributory factors recorded in STATS19 data for the incidents are:
- [REDACTED]
 - [REDACTED]
 - [REDACTED]
- 2.2.24. Of the 15no. of incidents, 5no. of incidents occurred in darkness with streetlights present and lit, while 1no. of PIC occurred in darkness with streetlights present but unlit.
- 2.2.25. It is considered therefore that the 15no. of identified [REDACTED] PICs (of which 6no. PICs occurred during the hours of darkness) should be discounted for the purposes of this assessment.

SUMMARY

- 2.2.26. If the 15no. of the identified [REDACTED] incidents are excluded, out of the total of 192no. PICs within the extents of the study area, this leaves 177no. of PICs which were not considered to be attributable to [REDACTED]
- 2.2.27. Of the remaining 177no. of PICs, a total of 46no. of PICs occurred during the hours of darkness (i.e. 52no. total darkness incidents minus those evaluated as being [REDACTED]). This equates to some 25.99% of all PICs.

The 177no. PICs are further divided for each individual link by lighting conditions, as shown in the table below:

Table 2-3 - Summary of PICs with lighting conditions, across seven zones of scheme area

Lighting Condition	Assessment Zones						
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
Daylight	26	36	18	19	12	9	11
Darkness- Streetlights present and lit	7	12	8	7	1	1	3
Darkness- street lights present but not lit	0	1	0	0	0	0	1

Darkness-No street lighting	0	0	0	0	1	0	0
Darkness-Streetlighting unknown	0	1	0	1	0	0	2
Total no. of PICs	33	50	26	27	14	10	17

2.3 NATIONAL DATA

'Reported road casualties in Great Britain: Annual report'

- 2.3.1. The DfT document 'Reported Road casualties in Great Britain: annual report' has been adopted for this RSE. This is the most up to date available data set from the DfT (at the time of writing) and it indicates that on UK all-purpose dual carriageways (including both unlit and lit roads), 68% of PICs occurred during daylight hours.
- 2.3.2. Some 32% of PICs on all-purpose dual carriageways occurred during the hours of darkness (of which 23% occurred on lit roads with the lights on, 1% occurred on lit roads with the lighting unlit, 6% occurred on unlit roads and 2% occurred on roads where the lighting provision was unknown). The DfT data is summarised in Table 2-4.

Table 2-4 – 'Reported road casualties in Great Britain annual report' for collisions occurring in different light Conditions

Lighting conditions	Reported road accident in Great Britain – Dual Carriageways	
Daylight	68%	
Darkness - lights lit	23%	32%
Darkness - lights unlit	1%	
Darkness - no lighting	6%	
Darkness - unknown lighting provision	2%	
Total		100%

The comparison between the rate of collisions that have occurred within the scheme area and the national average, is shown in the table overleaf.

Table 2-5 - Scheme area collision rate comparison with National average

Lighting conditions	RRC GB: Dual Carriage ways	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
Daylight	68%	79%	72%	69%	70%	86%	90%	65%
Darkness - lights lit	23%	21%	24%	31%	26%	7%	10%	18%
Darkness - lights unlit	1%	0%	2%	0%	0%	0%	0%	5%
Darkness - no lighting	6%	0%	0%	0%	0%	7%	0%	0%
Darkness - unknown lighting provision	2%	0%	2%	0%	4%	0%	0%	12%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Note: Values rounded.

2.3.3. The comparison shows that the darkness collisions that have occurred in Zone 3 and Zone 4 in the presence of lighting are significantly higher when compared to the national average rate. Also, the darkness collisions that have occurred in Zone 4 and zone 7 in darkness with streetlights present but not lit and under unknown lighting provision are higher when compared to the national average rate. However, it is acknowledged that the study area had a limited sample size of recorded PICs, when categorised into links making a direct comparison between the two data sets of limited value. Reference should be made to Table 2-3 which summarises 'true' number of PICs which have occurred within the study area.

2.3.4. Unfortunately, it is not possible to obtain a percentage darkness PIC saving from the 'Reported Road casualties in Great Britain annual report' as this document does not include details of the lengths of road and traffic flows subject to collisions. An additional comparison is therefore required.

TA 49/07 - Appraisal of New and Replacement Lighting on the Strategic Motorway and All-Purpose Trunk Road Network

2.3.5. As it is not possible to estimate a PIC saving using the 'Reported road casualties in Great Britain annual report' document, a sensitivity test has been undertaken. Firstly, this report adopts the assumption that the street lighting within the study area is currently providing a 10% saving in PICs. The 10% figure has been based on the figure for 'All Purpose Dual Carriageway links' identified in Table 1 in the now superseded DMRB Advice Note TA 49/07.

Mott MacDonald Report 'Road Safety Evaluation of Lighting Schemes' (November 2022)

2.3.6. Secondly, this report refers to the Mott MacDonald (MM) study (Doc ref: 406395GB-TPN-HTS-190-B) undertaken in November 2022. The MM study evaluated the road safety

performance of six ‘...road lighting switch-off schemes’ on motorway mainline sections of the Connect Plus Services (CPS) network. The MM study is attached at **Appendix C**.

- 2.3.7. Based on the analysis of data at the 6 sites, the MM study concludes that the lighting switch-off schemes did not result in an increase, in the rate of night-time collisions. Furthermore, for the majority of the scheme sites, the MM study states that there was also little evidence to suggest that lighting switch-off increased the severity of casualties occurring at night, based on KSI and FWI rates.
- 2.3.8. Following a review of this study, an average 5% darkness PIC saving for renewing road lighting on a link / junction has been adopted. This is based upon an average value of the TA 49/07 estimate (10%) and the MM Study estimate (0%).

PREDICTED PIC SAVING CALCULATIONS:

- 2.3.9. Clause 6.6 provides the following method for calculating the predicted PIC saving in the opening year for renewing lighting on an unlit link or junction:

‘...The predicted PIC saving shall be calculated by multiplying the number of opening year darkness PICs by the appropriate percentage determined by the road safety engineer’.

- 2.3.10. Also, Clause 6.15 provides the following method for calculating the predicted PIC saving in the opening year for renewing lighting on a lit link or junction:

‘...The predicted PIC saving shall be calculated by multiplying the number of opening year darkness PICs by Equation 6.15, where A is the appropriate percentage determined by the road safety engineer’.

Equation 6.15 (Predicted PIC Savings)

$$A / (100\% - A)$$

The resultant PIC figure relates to lit conditions and, therefore, it can be assumed that the collision savings determined by the road safety engineer are already being achieved. The formula takes account of this fact’.

- 2.3.11. Using the sensitivity test figure of a 5% PIC saving for dual carriageway links and the opening year average darkness PIC values, the Predicted PIC savings can be calculated in accordance with Clauses 6.6 and 6.15 of the TA501 document as:

Table 2-6 – Calculation of Predicted PIC Savings.

Lighting condition (Streetlights present)	Darkness PICs	Study Period (Years)	Avg. Darkness PICs per Year	Adopted PIC Saving Value	Calculated PIC Savings per Year.
Assessment Zone 1	7	5	1.4	5%	0.074
Assessment Zone 2	13	5	2.6	5%	0.137
Assessment Zone 3	8	5	1.6	5%	0.084

Assessment Zone 4	7	5	1.4	5%	0.074
Assessment Zone 5	1	5	0.2	5%	0.011
Assessment Zone 6	1	5	0.2	5%	0.011
Assessment Zone 7	4	5	0.8	5%	0.042
Lighting condition (Streetlights not present)	Darkness PICs	Study Period (Years)	Avg. Darkness PICs per Year	Adopted PIC Saving Value	Calculated PIC Savings per Year.
Assessment Zone 5	1	5	0.2	5%	0.01

2.3.12. Based on the TA 501 methods as mentioned in Clause 6.15, and assuming a 5% PIC reduction due to street lighting, the presence of lighting is estimated to prevent approximately:

- Assessment Zone 1 and Zone 4 is calculated at 0.074 PICs per year. This equates to 1 darkness PICs every 14 years,
- Assessment Zone 2, lighting is expected to reduce PICs by approximately 0.137 per year. This equates to 1 darkness PICs every 7 years,
- Assessment Zone 3, lighting is expected to reduce PICs by approximately 0.084 per year. This equates to 1 darkness PICs every 12 years,
- Assessment Zones 5 and Zone 6, lighting is expected to reduce PICs by approximately 0.011 per year for each zone. This equates to 1 darkness PICs every 95 years, and
- Assessment Zone 7, lighting is expected to reduce PICs by approximately 0.042 per year. This equates to 1 darkness PICs every 24 years.

2.3.13. Additionally, based on the TA 501 methods as mentioned in Clause 6.6, and assuming a 5% PIC reduction due to street lighting, the presence of lighting is estimated to prevent approximately 0.01 PICs per year for unlit section of Assessment Zone 5. This equates to 1 darkness PICs every 100 years.

3

SUMMARY



3 SUMMARY

3.1.1. In summary:

- There was a total of 192 PICs recorded within the M6 (M56) and M62 study area,
- The analysed data set was for a 5-year period between January 2019 to December 2023 (including COVID years),
- Of the 192 recorded PICs, 158 PICs were recorded as 'slight' in severity (Category 3 from STATS19), 27 PICs were recorded as 'serious' (Category 2 from STATS19) and, 07 PICs were recorded as 'fatal' (Category 1 from STATS19) during the 4-year adopted,
- Study area is divided into seven zones i.e. Assessment Zone 1 (M6 J20a/M65 J9), Assessment Zone 2 (M60 J20-J21), Assessment Zone 3 (M6 J21-21a), Assessment Zone 4 (M6 J21a/M62 J10 Croft Interchange), Assessment Zone 5 (M62 J10 Interchange-M62 J11), Assessment Zone 6 (M62 J9-M62 J10 Interchange) and Assessment Zone 7 (M62 J8-M62 J9),
- Of the 192no total incidents which were recorded:
 - 33no PICs occurred in Assessment Zone 1,
 - 56no PICs occurred in Assessment Zone 2,
 - 26no PICs occurred in Assessment Zone 3,
 - 30no PICs occurred in Assessment Zone 4,
 - 17no PICs occurred in Assessment Zone 5,
 - 11no PICs occurred in Assessment Zone 6, and
 - 19no PICs occurred in Assessment Zone 7,
- The majority of collisions among these 192 incidents (83.3% of total) are considered to be the result of driver error, such as 'following to close, reckless / in a hurry, failure to look properly or failure to judge other persons path or speed, failure to stop at time, poor turn or manoeuvres, careless, reckless or in a hurry, exceeding speed limit and distraction in vehicle,
- With respect to potential Collision Clusters, a single hotspot has been spotted within the study area with 8no. incidents,
- With respect to the total number of recorded PICs, a total of 52 out of 192 incidents, are recorded to have occurred during darkness hours. This equates to 27% of all recorded incidents,
- For the six recorded incidents within the study area that were listed as occurring in unlit conditions, review of the network indicates that those sections have been lit since 1990. This is likely a data error, and the incidents (for the purposes of a robust assessment) have been categorized as occurring under street lighting,
- A total of 15no. collisions were considered to be the result of [REDACTED] and have been discounted / removed from the dataset. Of the 15no. of [REDACTED] incidents, 06no. of incidents occurred during the hours of darkness,
- This leaves 177no. non DGN PICs, of which a total of 46no. PICs occurred during the hours of darkness. This equates to some 25.99% of all PICs,

- Based on the TA 501 methods as mentioned in Clause 6.15, and assuming a 5% PIC reduction due to street lighting, the presence of lighting is estimated to prevent approximately:
 - Assessment Zone 1 and Zone 4 is calculated at 0.074 PICs per year. This equates to 1 darkness PICs every 14 years,
 - Assessment Zone 2, lighting is expected to reduce PICs by approximately 0.137 per year. This equates to 1 darkness PICs every 7 years,
 - Assessment Zone 3, lighting is expected to reduce PICs by approximately 0.084 per year. This equates to 1 darkness PICs every 12 years,
 - Assessment Zones 5 and Zone 6, lighting is expected to reduce PICs by approximately 0.011 per year for each zone. This equates to 1 darkness PICs every 95 years, and
 - Assessment Zone 7, lighting is expected to reduce PICs by approximately 0.042 per year. This equates to 1 darkness PICs every 24 years.
- Also, following the approach outlined in the Clause 6.6 of the TA501 standard document, street lighting is estimated to save 0.01 PICs per year in unlit section of Assessment Zone 5 (broadly 1 PIC every 100 years).

Appendix A

SUMMARY OF PIC DATA FOR THE STUDY AREA



Table 1 - Summary of PIC Data

Assessment Zone 1				
No.	Ref. No.	Accident Severity	Accident Date	Lighting Conditions
1	23000195111	Slight	07-03-2023	Daylight
2	22000811463	Serious	04-11-2022	Dark: streetlights present and lit
3	22000783251	Slight	24-10-2022	Dark: streetlights present and lit
4	22000773288	Slight	20-10-2022	Daylight
5	22000735805	Slight	05-10-2022	Daylight
6	22000672763	Slight	08-09-2022	Daylight
7	22000541065	Slight	27-07-2022	Daylight
8	22000200557	Slight	23-03-2022	Daylight
9	22000154696	Slight	04-03-2022	Daylight
10	21000831468	Slight	30-11-2021	Dark: streetlights present and lit
11	21000686648	Serious	03-10-2021	Daylight
12	21000478938	Slight	09-07-2021	Daylight
13	21000342469	Slight	27-05-2021	Daylight
14	21000328716	Slight	22-05-2021	Daylight
15	20000748151	Slight	09-12-2020	Dark: streetlights present and lit
16	20000717702	Slight	25-11-2020	Dark: no street lighting
17	20000647078	Slight	25-10-2020	Daylight
18	20000611551	Slight	09-10-2020	Daylight
19	20000518498	Slight	28-08-2020	Daylight
20	20000453552	Slight	31-07-2020	Daylight
21	20000307263	Serious	28-05-2020	Daylight
22	20000168268	Slight	18-03-2020	Daylight
23	20000062325	Slight	26-01-2020	Daylight
24	20000048884	Slight	23-01-2020	Daylight
25	20000042999	Slight	20-01-2020	Daylight
26	20000012878	Slight	06-01-2020	Dark: streetlights present and lit
27	19100470134	Slight	22-08-2019	Daylight

28	19100463693	Slight	19-08-2019	Daylight
29	19100457978	Slight	16-08-2019	Dark: streetlights present and lit
30	19100411265	Slight	27-07-2019	Daylight
31	19100186980	Slight	18-04-2019	Daylight
32	19100082887	Slight	01-03-2019	Daylight
33	19000022488	Slight	22-01-2019	Daylight
Assessment Zone 2				
No.	Ref. No.	Accident Severity	Accident Date	Lighting Conditions
1	23001301026	Slight	21-12-2023	Daylight
2	23001254697	Serious	11-12-2023	Daylight
3	23001254952	Slight	11-12-2023	Daylight
4	23001025610	Slight	18-10-2023	Dark: streetlights present and lit
5	23000877591	Serious	13-09-2023	Dark: streetlights present and lit
6	23000817037	Slight	29-08-2023	Daylight
7	23000518345	Slight	14-06-2023	Dark: streetlights present and lit
8	23000364162	Slight	30-04-2023	Daylight
9	23000364338	Slight	30-04-2023	Daylight
10	23000282338	Serious	03-04-2023	Daylight
11	23000133554	Serious	15-02-2023	Dark: streetlights present and lit
12	23000076595	Slight	26-01-2023	Dark: streetlights present and lit
13	23000101741	Slight	25-01-2023	Daylight
14	23000045617	Slight	16-01-2023	Daylight
15	22000953209	Serious	26-12-2022	Daylight
16	22000866086	Slight	24-11-2022	Dark: streetlights present and lit
17	22000837044	Fatal	15-11-2022	Dark: streetlights present and lit
18	22000774233	Slight	21-10-2022	Daylight
19	22000766485	Slight	18-10-2022	Dark: streetlights present and lit
20	22000743812	Slight	08-10-2022	Dark: streetlights present but unlit
21	22000680828	Slight	12-09-2022	Daylight
22	22000582787	Slight	10-08-2022	Daylight
23	22000646836	Slight	04-08-2022	Daylight

24	22000532249	Slight	24-07-2022	Daylight
25	22000508222	Slight	16-07-2022	Daylight
26	22000394830	Serious	08-06-2022	Daylight
27	22000378086	Slight	31-05-2022	Daylight
28	22000275742	Slight	22-04-2022	Daylight
29	21000866533	Slight	15-12-2021	Dark: streetlights present and lit
30	21000856449	Slight	11-12-2021	Daylight
31	21000808214	Slight	20-11-2021	Dark: streetlights present and lit
32	21000762431	Slight	02-11-2021	Dark: streetlights present and lit
33	21000733719	Serious	22-10-2021	Daylight
34	21000635466	Slight	12-09-2021	Daylight
35	21000599509	Slight	28-08-2021	Daylight
36	21000544456	Slight	05-08-2021	Daylight
37	21000333800	Slight	24-05-2021	Daylight
38	21000174601	Slight	19-03-2021	Daylight
39	21000089289	Slight	09-02-2021	Dark: street lighting unknown
40	20000717276	Slight	25-11-2020	Daylight
41	20000178196	Slight	23-03-2020	Daylight
42	20000054047	Slight	25-01-2020	Daylight
43	20000049989	Slight	23-01-2020	Dark: streetlights present and lit
44	20000016106	Serious	08-01-2020	Daylight
45	20000014953	Slight	07-01-2020	Dark: streetlights present and lit
46	19100725449	Slight	12-12-2019	Daylight
47	19100647380	Slight	06-11-2019	Daylight
48	19100563036	Slight	29-09-2019	Daylight
49	19100472307	Slight	23-08-2019	Daylight
50	19100325240	Slight	21-06-2019	Daylight
51	19100307190	Slight	13-06-2019	Daylight
52	19100128364	Slight	22-03-2019	Daylight
53	19100093599	Slight	06-03-2019	Daylight
54	19000029827	Slight	29-01-2019	Daylight

55	19000030001	Slight	29-01-2019	Daylight
56	19000016555	Slight	17-01-2019	Daylight
Assessment Zone 3				
No.	Ref. No.	Accident Severity	Accident Date	Lighting Conditions
1	23001079416	Slight	31-10-2023	Daylight
2	23000803613	Slight	26-08-2023	Daylight
3	23000795108	Slight	24-08-2023	Daylight
4	23000766615	Fatal	17-08-2023	Dark: streetlights present and lit
5	23000766651	Slight	17-08-2023	Dark: streetlights present and lit
6	23000685270	Slight	28-07-2023	Daylight
7	22000864304	Slight	24-11-2022	Dark: streetlights present and lit
8	22000682370	Slight	13-09-2022	Daylight
9	22000509051	Slight	16-07-2022	Dark: no street lighting
10	22000255305	Serious	14-04-2022	Daylight
11	22000085734	Slight	04-02-2022	Dark: streetlights present and lit
12	21000748548	Serious	28-10-2021	Daylight
13	21000696176	Slight	07-10-2021	Daylight
14	21000678706	Slight	30-09-2021	Daylight
15	21000639916	Serious	14-09-2021	Daylight
16	21000433211	Slight	21-06-2021	Daylight
17	21000414644	Fatal	14-06-2021	Dark: streetlights present and lit
18	21000306372	Slight	29-05-2021	Daylight
19	20000438464	Fatal	24-07-2020	Dark: streetlights present and lit
20	20000433401	Slight	22-07-2020	Daylight
21	20000168915	Slight	18-03-2020	Daylight
22	20000073963	Serious	03-02-2020	Dark: streetlights present and lit
23	19100548266	Slight	23-09-2019	Daylight
24	19100509783	Slight	09-09-2019	Daylight
25	19100341668	Slight	28-06-2019	Daylight
26	19100275554	Slight	29-05-2019	Daylight
Assessment Zone 4				

No.	Ref. No.	Accident Severity	Accident Date	Lighting Conditions
1	23000360265	Fatal	29-04-2023	Dark: streetlights present and lit
2	23000190258	Slight	05-03-2023	Dark: streetlights present and lit
3	23000088879	Fatal	31-01-2023	Dark: streetlights present and lit
4	22000022245	Slight	10-01-2022	Dark: street lighting unknown
5	21000600884	Slight	29-08-2021	Dark: streetlights present and lit
6	21000474881	Serious	08-07-2021	Dark: no street lighting
7	20000081367	Slight	07-02-2020	Dark: streetlights present and lit
8	20000032641	Slight	15-01-2020	Dark: streetlights present and lit
9	20000009255	Slight	04-01-2020	Dark: streetlights present and lit
10	19100743171	Slight	21-11-2019	Dark: no street lighting
11	19000006103	Slight	07-01-2019	Dark: streetlights present and lit

Assessment Zone 5

No.	Ref. No.	Accident Severity	Accident Date	Lighting Conditions
1	23000925253	Serious	24-09-2023	Daylight
2	23000528143	Slight	17-06-2023	Daylight
3	23000418188	Slight	17-05-2023	Daylight
4	22000932734	Slight	19-12-2022	Daylight
5	22000872381	Slight	27-11-2022	Daylight
6	22000855036	Slight	21-11-2022	Daylight
7	22000855519	Slight	21-11-2022	Daylight
8	22000814928	Slight	06-11-2022	Daylight
9	22000578872	Slight	09-08-2022	Daylight
10	22000517315	Slight	19-07-2022	Daylight
11	21000730120	Slight	20-10-2021	Dark: no street lighting
12	21000584557	Serious	22-08-2021	Daylight
13	21000426171	Slight	18-06-2021	Daylight
14	21000313071	Slight	15-05-2021	Dark: streetlights present and lit
15	19100629652	Slight	29-10-2019	Daylight
16	19100594772	Slight	11-10-2019	Daylight

17	19100049894	Slight	14-02-2019	Daylight
Assessment Zone 6				
No.	Ref. No.	Accident Severity	Accident Date	Lighting Conditions
1	23001052813	Slight	25-10-2023	Daylight
2	23001003521	Slight	13-10-2023	Daylight
3	23000699736	Slight	01-08-2023	Daylight
4	23000102060	Slight	04-02-2023	Daylight
5	22000582609	Slight	10-08-2022	Daylight
6	22000384412	Slight	04-06-2022	Daylight
7	21000805682	Serious	19-11-2021	Daylight
8	21000656650	Slight	21-09-2021	Daylight
9	21000563558	Slight	13-08-2021	Daylight
10	19100277891	Slight	30-05-2019	Daylight
11	1910757	Slight	15-03-2019	Dark: streetlights present and lit
Assessment Zone 7				
No.	Ref. No.	Accident Severity	Accident Date	Lighting Conditions
1	23000930508	Serious	25-09-2023	Daylight
2	23000795255	Slight	24-08-2023	Daylight
3	23000234181	Fatal	19-03-2023	Dark: streetlights present but unlit
4	23000170041	Slight	26-02-2023	Daylight
5	23000115257	Serious	09-02-2023	Dark: streetlights present but unlit
6	23000077949	Slight	27-01-2023	Dark: no street lighting
7	22000741931	Slight	07-10-2022	Dark: no street lighting
8	22000579289	Slight	09-08-2022	Daylight
9	2200063	Slight	10-01-2022	Dark: streetlights present and lit
10	22000018133	Slight	08-01-2022	Dark: street lighting unknown
11	21000840124	Serious	04-12-2021	Dark: street lighting unknown
12	21000518114	Slight	25-07-2021	Daylight
13	20000738810	Slight	05-12-2020	Dark: streetlights present and lit
14	20000586943	Slight	28-09-2020	Daylight



15	20000082277	Serious	07-02-2020	Daylight
16	20000044128	Slight	21-01-2020	Daylight
17	19100725365	Slight	12-12-2019	Daylight
18	1913016	Slight	18-11-2019	Daylight
19	19100433535	Slight	06-08-2019	Daylight

Appendix B

PIC LOCATION PLAN

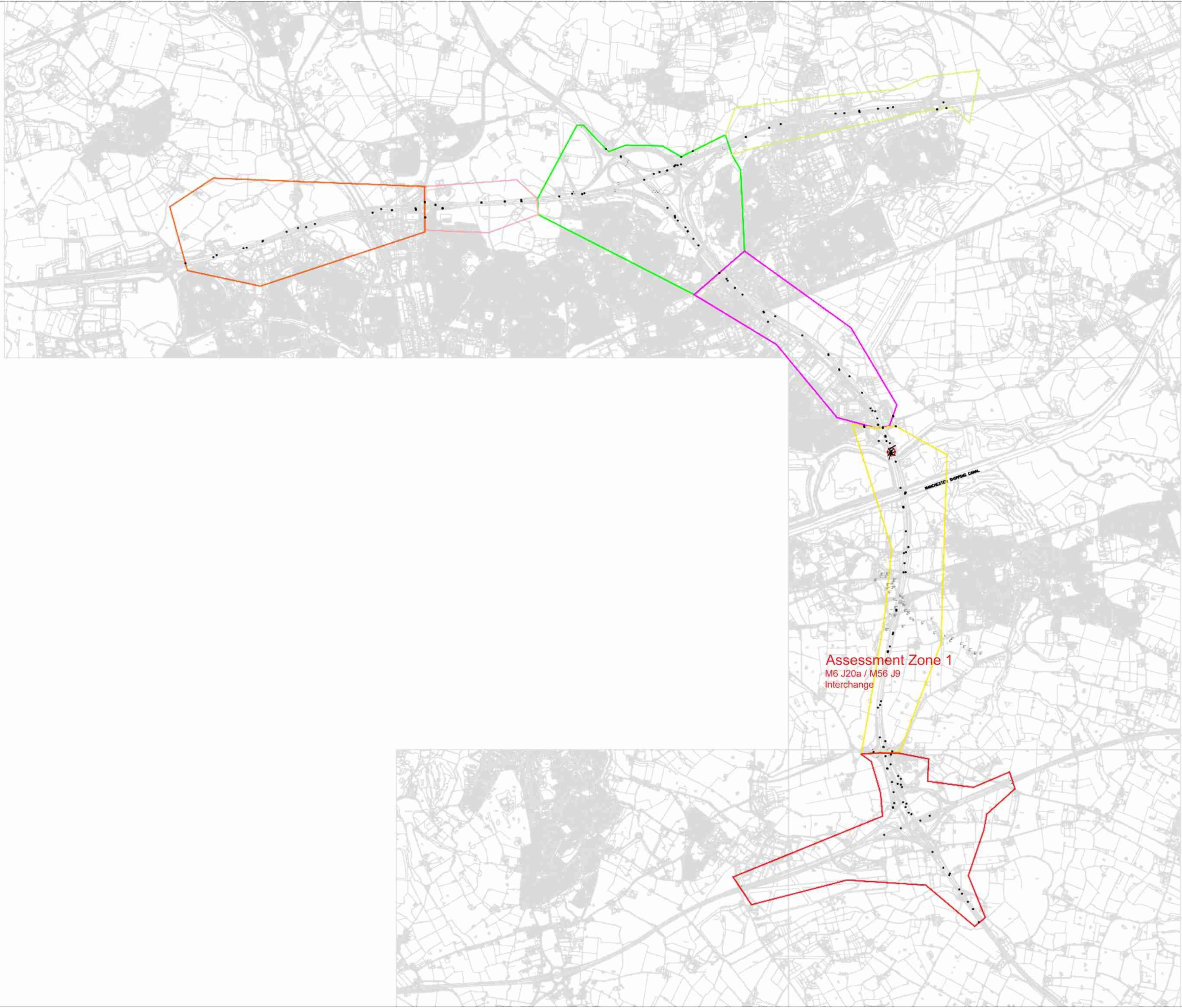


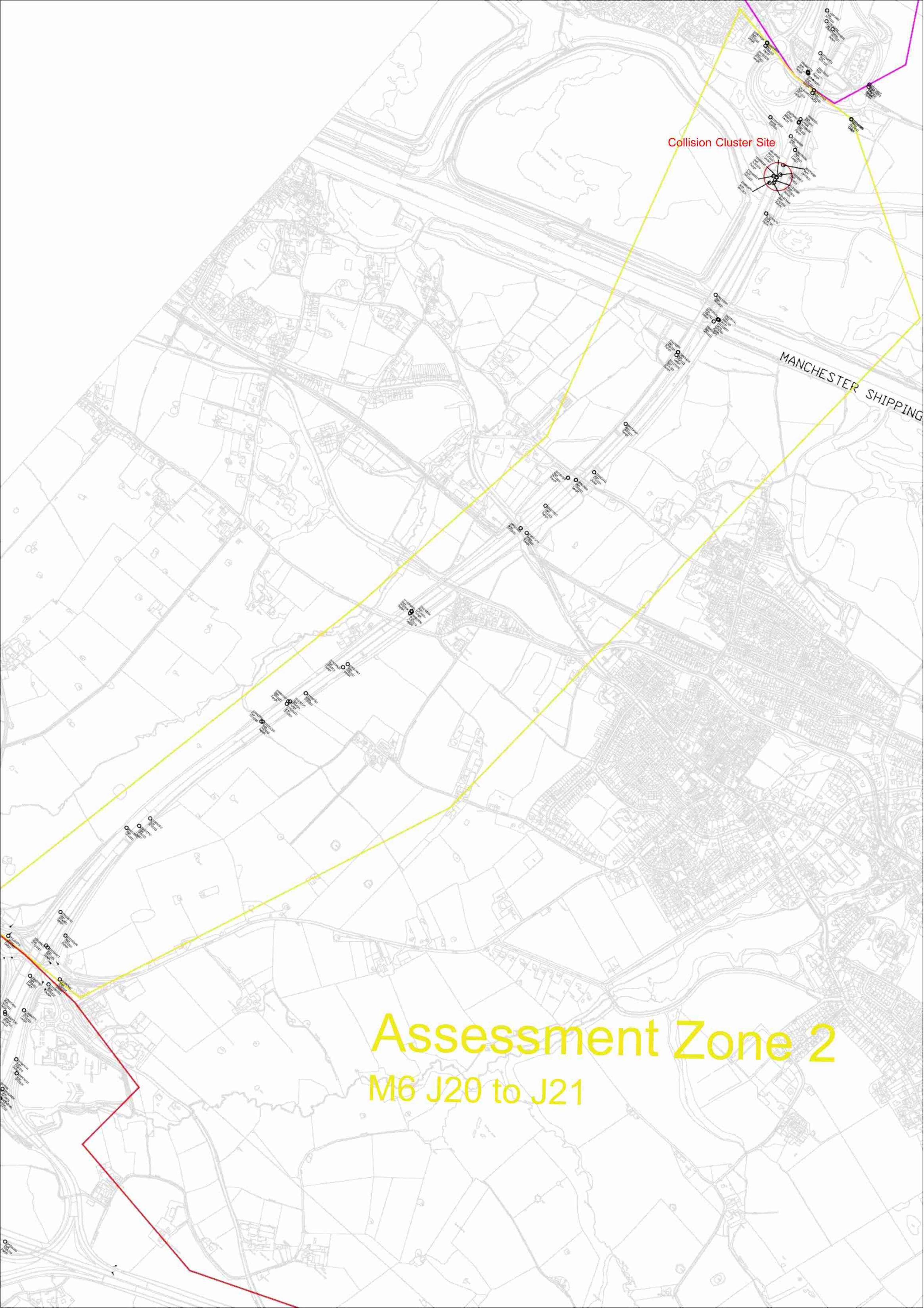


PIC LOCATION PLAN

(Assessment Zones

Identification)





Collision Cluster Site

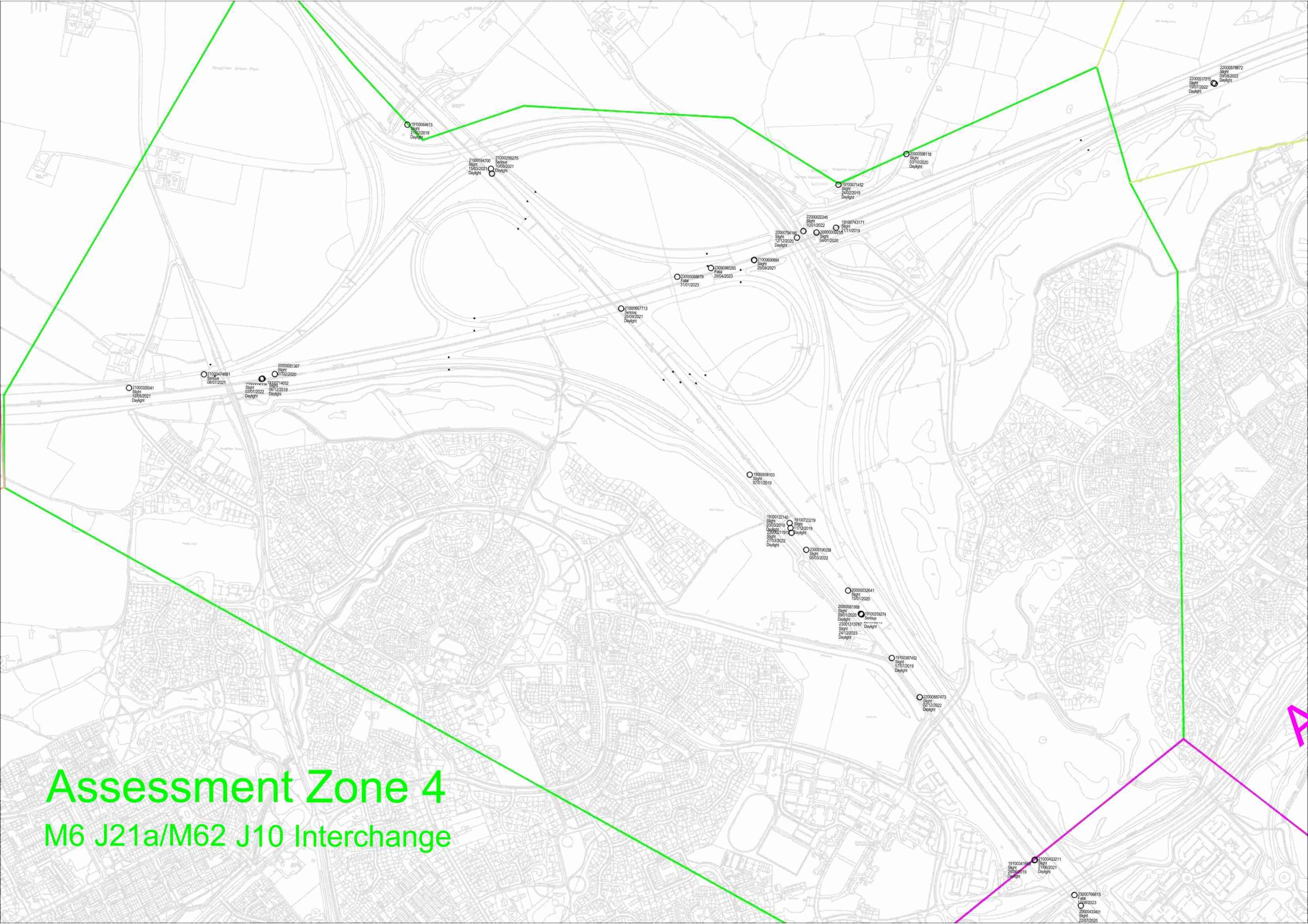
MANCHESTER SHIPPING

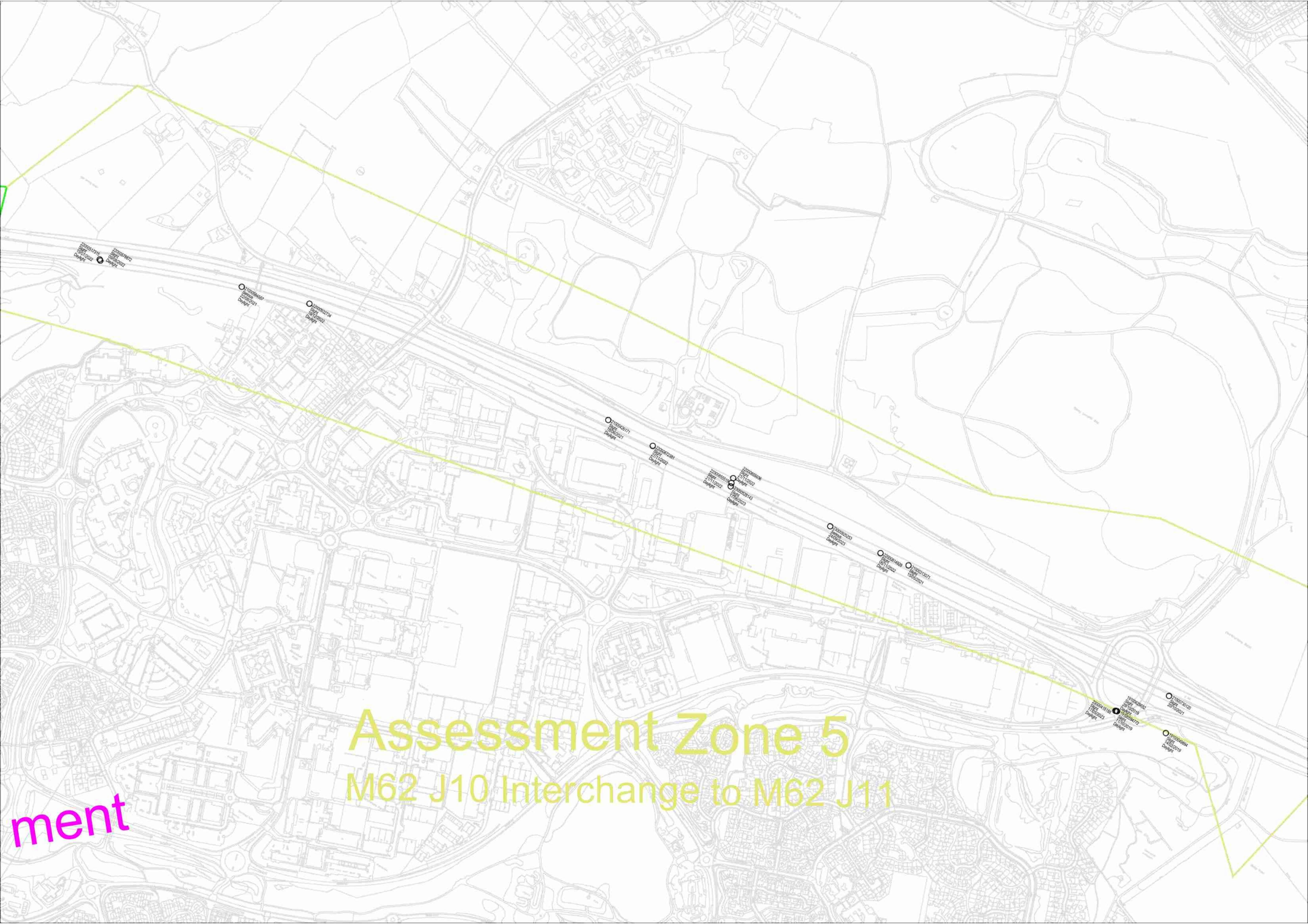
Assessment Zone 2

M6 J20 to J21

Assessment Zone 4

M6 J21a/M62 J10 Interchange





Assessment Zone 5

M62 J10 Interchange to M62 J11

ment



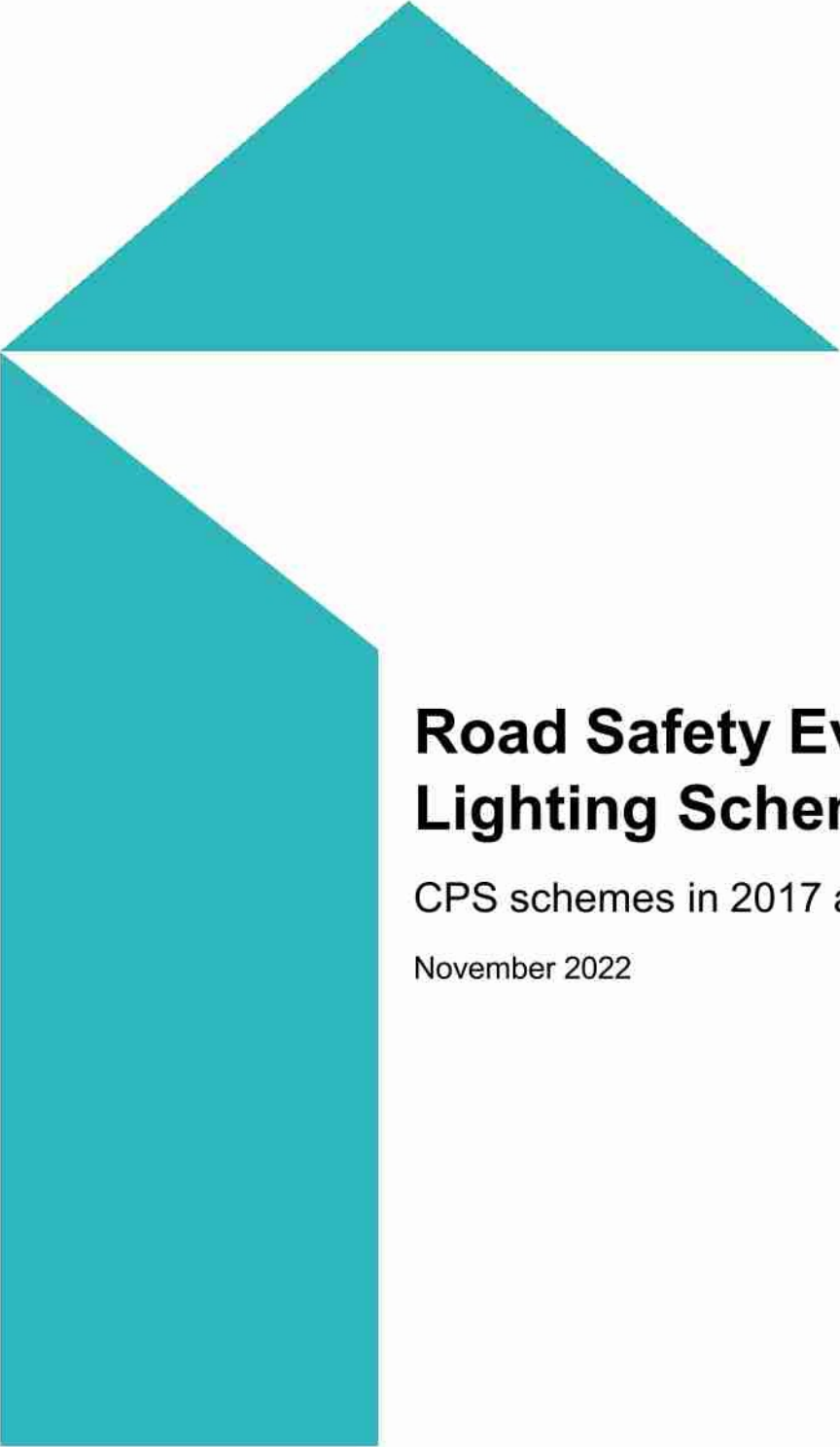
Assessment Zone 6

M62 J9 to M62 J10 Interchange

M62 J8 to M62 J9

Appendix C

ROAD SAFETY EVALUATION OF LIGHTING SCHEMES (NOVEMBER 2022)



Road Safety Evaluation of Lighting Schemes

CPS schemes in 2017 and 2018

November 2022

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Road Safety Evaluation of Lighting Schemes

CPS schemes in 2017 and 2018

November 2022

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	28/10/2022				First Issue
B	16/11/2022				Second Issue

Document reference: 406395GB | TPN | HTS | 190 | B |

Information class: Standard

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Executive Summary

Mott MacDonald has been commissioned by Connect Plus Services (CPS) to undertake a road safety evaluation of a number of road lighting switch-off schemes, in order to determine the effect on recorded personal injury collision (PIC) occurrences, before and after switch-off.

Traditionally, it has been assumed that road lighting schemes on motorways may reduce night-time collisions by up to 10%, as stated in previous design standards and national guidance, which are now withdrawn (**Chapter 1**).

Six sites have been identified by CPS for this road safety evaluation. It is understood that all of the schemes identified, this involved the switch-off of road lighting, throughout their extents, on mainline carriageway sections only (**Chapter 2**).

PIC and traffic flow data has been used to calculate night-time collision, fatal and weighted injury (FWI) and killed or seriously injured (KSI) casualty rates, for periods spanning three years before and after the schemes were implemented (**Chapter 3**).

Based on the analysis of data at these sites, it is concluded that the lighting switch-off schemes have not resulted in an increase in the rate of night-time collisions. Furthermore, for the majority of the scheme sites, there was also little evidence to suggest that lighting switch-off has increased the severity of casualties occurring at night, based on KSI and FWI rates (**Chapter 4**).

However, it should be noted that the analysis calculations do not take into account any other mitigation measures, such the installation of temporary traffic signing to advise motorists that there is no road lighting, improvements to road markings, replacement of road studs etc.

Due to the small sample size of the data for each site and the fact that the 'after' period spans the period of the Covid-19 pandemic, it is recommended that further validation and analysis of these and other lighting scheme sites is undertaken, once a five-year dataset becomes available.

1 Introduction

Mott MacDonald has been commissioned by Connect Plus Services (CPS) to undertake a road safety evaluation of a number of road lighting switch-off schemes, in order to determine the effect on recorded personal injury collision (PIC) occurrences, before and after switch-off.

1.1 Background

This road safety evaluation has been undertaken in order to assist CPS and its suppliers, when conducting future Road Lighting Appraisals (in accordance with DMRB TA 501) for similar projects, specifically, when having to apply estimated collision savings that road lighting switch-off may provide following completion.

Traditionally, it has been assumed that road lighting schemes on motorways may reduce night-time collisions by up to 10% as last stated in previous design standards¹ and national guidance², which are now withdrawn. It is understood that the safety benefit of lighting switch-off schemes is currently under review in the road lighting industry, principally through an update of the Design Manual for Roads and Bridges (DMRB) TA 501 Road lighting appraisal document.

1.2 Outline of report

The report is divided into the following chapters:

- **Chapter 2** explains the methodology used to analyse the collision data and traffic statistics.
- **Chapter 3** presents the results of the PIC data and traffic count data analysis for each site.
- **Chapter 4** evaluates and provides conclusions about the road safety performance of each scheme site.
- **Chapter 5** contains a glossary of terms used in the report.
- **Chapter 6** lists the references to information relating to the evaluation.
- **Appendix A** contains the data used for calculations.
- **Appendix B** contains location key plans showing each area analysed.

¹ TA 49/07 (Withdrawn) Appraisal of New and Replacement Lighting

² IAN 167/12 (Withdrawn) Guidance for the Removal of Road Lighting

2 Methodology

2.1 Site selection

Six sites have been selected by CPS for this road safety evaluation. It is understood that all of the schemes involved the switch-off of road lighting, throughout their extents, on mainline carriageway sections only. The details of each site location have been summarised in **Table 2.1** below:

Table 2.1: Lighting switch-off scheme site details

Site ref	Location	Type	Extents (MP)	Scheme date	Description
001	A1(M) J2 to J3	D2M	MP 28-9 to MP 31-2	01/10/2018	Road lighting switch-off (mainline only) + temporary traffic signing installed to advise motorists of no lighting while lighting was switched-off and kept in place until lighting was removed.
002	M1 J3 to J4	D3M	MP 19-2 to MP 22-0	01/10/2018	Road lighting switch-off (mainline only) + temporary traffic signing installed to advise motorists of no lighting while lighting was switched-off and kept in place until lighting was removed.
003	M1 J4 to J5	D3M	MP 22-2 to MP 25-5	01/10/2018	Road lighting switch-off (mainline only) + temporary traffic signing installed to advise motorists of no lighting while lighting was switched-off and kept in place until lighting was removed.
004	M1 J5 to J6a	D3M	MP 29-0 to MP 33-0	01/10/2018	Road lighting switch-off (mainline only) + temporary traffic signing installed to advise motorists of no lighting while lighting was switched-off and kept in place until lighting was removed.
005	A2 (A2018 to M25)	D3AP	MP 23-2 to MP 28-5	01/09/2017	Road lighting switch-off (mainline only) + temporary traffic signing installed to advise motorists of no lighting while lighting was switched-off and kept in place until lighting was removed.
006	M3 J1	D3M	MP 24-0 to MP 25-2	01/09/2017	Road lighting switch-off (mainline only) + temporary traffic signing installed to advise motorists of no lighting while lighting was switched-off and kept in place until lighting was removed.

Source: Scheme details provided by CPS

2.2 Collision data source

'STATS19' Personal Injury Collision (PIC) data has been obtained and analysed for this report.

These statistics refer to collisions on public roads which became known to the police. Figures for deaths refer to people who sustained injuries which caused death less than 30 days after the road collision.

The PIC data for the evaluation of the six scheme sites has been provided by CPS. It is understood that, as network operator, CPS are provided with a copy of the relevant police data for their own analysis and road safety monitoring purposes.

2.3 Collision data analysis

This evaluation report presents the results of the analysis for the latest three-years of PIC data, 'before' and 'after' the switch off of each road lighting scheme.

The scheme switch-off dates vary between each site, as indicated by CPS, previously listed in **Table 2.1**. It is understood that for Site refs: 001, 002, 003 and 004, road lighting switch-off was undertaken during September 2018, but for the purposes of this analysis the three-year 'after' period starts from 01/10/2018.

Table 2.2, below, shows the three-year 'before' and 'after' lighting switch-off analysis period, by scheme:

Table 2.2: 'Before' and 'After' lighting switch-off analysis periods, by site

Site refs	3-year period 'before'		3-year period 'after'	
	From	To	From	To
001, 002, 003 & 004	01/10/2015	30/09/2018	01/10/2018	30/09/2021
005 & 006	01/09/2014	31/08/2017	01/09/2017	31/08/2020

Source: Based on scheme implementation dates provided by CPS

The PIC analysis of each site has been completed using the KeyACCIDENT (v7.11) software package. The PIC data searches have been conducted within defined analysis areas, which represent each individual scheme site, provided as a marker post range.

Using OS mapping, an area has been drawn around the scheme site for the mainline carriageway only (typically, an offset polygon by 25m on each side of a drawn centreline). Records that were not considered to be within the extents of the lighting switch-off scheme (i.e., those recorded on slip roads, local roads, roundabouts and interchanges etc) have been manually removed from the dataset.

PIC records where 'driver gross negligence' (DGN) has been indicated have also been removed from the datasets. DGN records are considered to be collisions listed with one or more of the following data fields:

- Accident: Impaired by alcohol (Driver / Rider – Impairment) [Contributory Factor 501]
- Accident: Impaired by drugs (Driver / Rider – Impairment) [Contributory Factor 502]
- Accident: Vehicle in course of crime (Special codes) [Contributory Factor 902]
- Vehicle: Breath Test = 1 Positive
- Vehicle: Stolen = 1 Stolen

Only collisions occurring at night-time have been used for the analysis. The PIC data has been filtered by lighting conditions (Accident: Lighting Conditions IN LIST 4,5,6,7) to determine the collisions that occurred during the hours of darkness.

2.4 Traffic flow information

Traffic flow information has been obtained from the 'WebTRIS' Traffic Information database website (National Highways, 2022) at <http://webtris.highwaysengland.co.uk/>

Annual average daily traffic (AADT) volumes from counters (in both carriageway directions) located at each scheme site have been extracted, using a three-year period 'before' and 'after' scheme completion, based on whole calendar years.

For all sites, the following rationale has been used when retrieving traffic count data:

- 'Before' lighting switch-off: Average daily flows between 01/01/2015 and 31/12/2017
- 'After' lighting switch-off: Average daily flows between 01/01/2019 and 31/12/2021

Using the 'Daily report' function, average night-time traffic counts (between 22:00hrs and 06:00hrs) have been determined for both the 'before' and 'after' scheme implementation periods.

2.5 Collision rate calculations

Using the appropriate three years of 'before' and 'after' PIC data and traffic flow datasets, it has been possible to calculate annual collision rates for each scheme.

Collision rates have been calculated by dividing the number of dark PICs by the annual total vehicle miles travelled (between 22:00hrs and 06:00hrs) at each site. This is expressed as units of PICs per hundred million vehicle miles travelled (PICs / hmv).

2.6 Killed or seriously injured (KSI) rate calculations

In order to determine any changes in the severity of injuries that occurred following switch-off for each scheme, dark 'killed or seriously injured' (KSI) casualties have been analysed.

A KSI rate has been calculated for each scheme site by dividing the number of dark KSI casualties by the annual total vehicle miles travelled (between 22:00hrs and 06:00hrs). This is expressed as units of KSI per hundred million vehicle miles travelled (KSI / hmv).

2.7 Fatal and weighted injury (FWI) rate calculations

Using the 'fatal and weighted injury' (FWI) method, a value has also been applied to each reported casualty, according to their severity classification. FWI is defined as: (number of fatalities) + 0.1 x (number of serious casualties) + 0.01 x (number of slight casualties).

By dividing the number of dark FWI casualties by the annual total vehicle miles travelled (between 22:00hrs and 06:00hrs) at each site, a night-time FWI rate is calculated. This is expressed as units of FWI per hundred million vehicle miles travelled (FWI / hmv).

2.8 Impact of travel restrictions during 2020 and 2021

It should be noted that the Covid-19 pandemic, and associated travel restrictions imposed by the UK Government, impacted on the national 2020 and 2021 road safety statistics. Overall, it is recognised that there were significantly less traffic volumes and road traffic collisions reported during these periods:

“Motor vehicle traffic on Great Britain motorways did increase by 14.4% between 2020 and 2021. However, traffic in 2021 was 14.5% lower compared to 2019 pre-pandemic levels³.”

“As the first half of 2021 also had a lockdown, the overall figures for 2021 remain lower than pre-pandemic levels. Over the second half of the year, both casualties and traffic returned to levels similar to those in 2019. Monthly changes in casualties during 2021 generally showed a similar trend to changes in motor vehicle traffic levels⁴.”

Similar variations in the total number of collisions reported have been seen in the datasets analysed for this evaluation. As a consequence, the focus of this study has been limited to rates (collision rate, KSI rate and FWI rate), rather than totals of PICs and casualties, in order to provide comparable statistics for the 'before' and 'after' road lighting switch-off periods, which are based on the amount of traffic recorded at the time (as described previously in **Chapter 2.4**).

³ Road Traffic Estimates: Great Britain 2021

⁴ Reported road casualties Great Britain, annual report: 2021

3 Analysis

3.1 Site 001 – A1(M) J2 to J3

This scheme involved the switch-off of existing road lighting throughout the mainline carriageway between MP 28-9 to MP 31-2 on 01/10/2018.

In total, there were nine collisions reported at the site in the six-year analysis period. These PICs resulted in 18 casualties, all of which were recorded as slight in severity.

A summary of the 'before' and 'after' scheme analysis is provided in **Table 3.1** below:

Table 3.1: Analysis of night-time collisions at Site 001

A1(M) J2 to J3 D2M	Dark PICs and casualties		Traffic	Length	Collision rate	KSI casualty rate	FWI rate
	Dark PICs	Dark KSI casualties	Night time ave traffic	(miles)	Night time PICs / hmvvm	Night time KSIs / hmvvm	Night time FWI / hmvvm
Before	2	0	6,800	1.4	19.2	0.0	0.6
After	1	0	5,583	1.4	11.7	0.0	0.1
diff (+/-)	-1	-	-1,217	-	-7.5 (↓39.1%)	-	-0.5

Source: Mott MacDonald

For the three-year period 'before' the lighting switch-off scheme, there were two collisions that had occurred during the hours of darkness, accounting for 40% of the total PICs recorded before lighting was switched-off. Night-time traffic accounted for approximately 9% of the total AADT.

In the three years 'after' the scheme was implemented, the number of recorded PICs decreased from two to one, which represents 25% of the total collisions. Night-time traffic also decreased to approximately 8% of the total daily volume.

The calculated collision rates indicate that there was a **39% decrease** in night-time PICs / hmvvm at this site since the lighting was switched-off on the mainline carriageway.

There were no fatal or seriously injured casualties reported 'before' or 'after' the completion of the scheme, and therefore the KSI rate has remained unchanged at 0.0.

The calculated FWI rate has also seen a decrease from 0.6 to 0.1 after the scheme was implemented.

3.2 Site 002 – M1 J3 to J4

This scheme involved the switch-off of existing road lighting throughout the mainline carriageway between MP 19-2 to MP 22-0 on 01/10/2018.

In total, there were 13 collisions reported at the site in the six-year analysis period. These resulted in 18 casualties, of which two were recorded as serious and 16 slight in severity. No fatalities were reported.

A summary of the 'before' and 'after' scheme analysis is provided in **Table 3.2** below:

Table 3.2: Analysis of night-time collisions at Site 002

M1 J3 to J4 D3M	Dark PICs and casualties		Traffic	Length	Collision rate	KSI casualty rate	FWI rate
	Dark PICs	Dark KSI casualties	Night time ave traffic	(miles)	Night time PICs / hmvvm	Night time KSIs / hmvvm	Night time FWI / hmvvm
Before	3	1	9,173	1.7	17.6	5.9	0.8
After	2	0	8,131	1.7	13.2	0.0	0.1
diff (+/-)	-1	-1	-1,043	-	-4.4 (↓24.8%)	-5.9	-0.6

Source: Mott MacDonald

For the three-year period 'before' the lighting switch-off scheme, there were three collisions that had occurred during the hours of darkness, accounting for 30% of the total PICs recorded before lighting was switched-off. Night-time traffic accounted for approximately 12% of the total AADT.

In the three years 'after' the scheme was implemented, the number of recorded collisions decreased from three to two PICs, which represented 67% of the total. Night-time traffic also decreased to approximately 12% of the daily total.

The calculated collision rates indicate that there was a **25% decrease** in night-time PICs / hmvvm at this site following the lighting switched-off on the mainline carriageway.

The severity rate reduced from 5.9 to 0.0 KSIs / hmvvm. Only one serious casualty was reported in the 'before' period.

The calculated FWI rate has also seen a decrease from 0.8 to 0.1, following scheme switch off.

3.3 Site 003 – M1 J4 to J5

This scheme involved the switch-off of existing road lighting throughout the mainline carriageway between MP 22-2 to MP 25-5 on 01/10/2018.

In total, there were 22 collisions reported at the site in the six-year analysis period. These resulted in 44 casualties, of which four were recorded as serious and 40 of slight severity. No fatalities were reported.

A summary of the 'before' and 'after' scheme analysis is provided in **Table 3.3** below:

Table 3.3: Analysis of night-time collisions at Site 003

M1 J4 to J5 D3M	Dark PICs and casualties		Traffic	Length	Collision rate	KSI casualty rate	FWI rate
	Dark PICs	Dark KSI casualties	Night time ave traffic	(miles)	Night time PICs / hmvvm	Night time KSIs / hmvvm	Night time FWI / hmvvm
Before	6	1	13,586	2.1	19.2	3.2	0.7
After	4	0	11,241	2.1	16.0	0.0	0.4
diff (+/-)	-2	-1	-2,345	-	-3.2 (↓16.6%)	-3.2	-0.3

Source: Mott MacDonald

For the three-year period 'before' the lighting switch-off scheme, there were six collisions that had occurred during the hours of darkness, accounting for 43% of the total PICs recorded before lighting was switched-off. Night-time traffic accounted for approximately 14% of the total AADT.

In the three years 'after' the scheme was implemented, the number of recorded collisions decreased from six to four PIC, which represented 50% of the total. Night-time traffic also decreased to approximately 12% of the total.

The calculated collision rates indicate a **17% decrease** in night-time PICs / hmvvm at this site, following the lighting switch-off on the mainline carriageway.

The KSI rate reduced from 5.9 to 0.0. Only one serious casualty was reported in the 'before' period. However, there were no fatalities recorded, and only one seriously injured casualty reported in the 'before' period.

The calculated FWI rate has also seen a decrease from 0.7 to 0.4 after lighting was switched off.

3.4 Site 004 – M1 J5 to J6a

This scheme involved the switch-off of existing road lighting throughout the mainline carriageway between MP 29-0 to MP 33-0 on 01/10/2018.

In total, there were 47 collisions reported at the site in the six-year analysis period. These resulted in 75 casualties, of which 10 were recorded as serious and 65 slight in severity. No fatalities were reported.

A summary of the 'before' and 'after' scheme analysis is provided in **Table 3.4** below:

Table 3.4: Analysis of night-time collisions at Site 004

M1 J5 to J6a D3M	Dark PICs and casualties		Traffic	Length	Collision rate	KSI casualty rate	FWI rate
	Dark PICs	Dark KSI casualties	Night time ave traffic	(miles)	Night time PICs / hmvvm	Night time KSIs / hmvvm	Night time FWI / hmvvm
Before	7	2	9,793	2.5	26.1	7.5	1.0
After	5	0	9,087	2.5	20.1	0.0	0.3
diff (+/-)	-2	-2	-706	-	6.0 (↓23.0%)	-7.5	0.7

Source: Mott MacDonald

For the three-year period 'before' the lighting switch-off scheme, there were seven collisions that had occurred during the hours of darkness, accounting for 28% of the total PICs recorded before lighting was switched-off. Night-time traffic accounted for approximately 12% of the total AADT.

In the three years 'after' lighting was switched off, the number of recorded collisions decreased from seven to five PICs, which represents 23% of the total. Night-time traffic also decreased to approximately 13% of the total.

The calculated collision rates indicate that there was a **23% decrease** in night-time PICs / hmvvm at this site, following the lighting switch-off on the mainline carriageway.

The severity rate reduced from 7.5 to 0.0 KSIs / hmvvm. Only one serious casualty was reported in the 'before' period. However, it should be noted that there were no fatalities recorded and only two seriously injured casualties reported in the 'before' period.

The calculated FWI rate has also seen a decrease from 1.0 to 0.3 after the scheme was implemented.

3.5 Site 005 – A2 (A2018 to M25)

This scheme involved the switch-off of existing road lighting throughout the mainline carriageway between MP 23-2 to MP 28-5 on 01/09/2017.

In total, there were 118 collisions reported at the site in the six-year analysis period. These resulted in 168 casualties, of which two were fatal, 15 serious and 151 slight in severity.

A summary of the 'before' and 'after' scheme analysis is provided in **Table 3.5** below:

Table 3.5: Analysis of night-time collisions at Site 005

A2 (A2018 to M25) D3AP	Dark PICs and casualties		Traffic	Length	Collision rate	KSI casualty rate	FWI rate
	Dark PICs	Dark KSI casualties	Night time ave traffic	(miles)	Night time PICs / hmv	Night time KSIs / hmv	Night time FWI / hmv
Before	26	5	12,379	3.3	58.1	11.2	3.8
After	15	1	10,702	3.3	38.8	2.6	3.2
diff (+/-)	-11	-4	-1,676	-	-19.3 (↓33.3%)	-8.6	0.6

Source: Mott MacDonald

For the three-year period 'before' the lighting switch-off scheme, there were 26 collisions that had occurred during the hours of darkness, accounting for 34% of the total PICs recorded before lighting was switched-off. Night-time traffic accounted for approximately 11% of the total AADT.

In the three years 'after' the scheme was implemented, the number of recorded collisions decreased from 26 to 15 PICs, which represents 56% of the total. Night-time traffic also decreased to approximately 10% of the total daily volume.

The calculated collision rates indicate that there was a **33% decrease** in night-time PICs / hmv at this site following lighting switch-off on the mainline carriageway.

The KSI rate reduced from 11.2 to 2.6. There was one fatality recorded in both the 'before' and 'after' scheme periods. Four serious casualties were reported in the 'before' period, but none were recorded in the 'after' period.

The calculated FWI rate has also seen a decrease from 3.8 to 3.2 after lighting was switched off.

3.6 Site 006 – M3 J1

This scheme involved the switch-off of existing road lighting throughout the mainline carriageway between MP 24-0 to MP 25-2 on 01/09/2017.

In total, there were three collisions reported at the site in the three-year period 'before' and 'after' the scheme was implemented. No killed or seriously injured (KSI) casualties were recorded in the six-year period.

A summary of the 'before' and 'after' scheme analysis is provided in **Table 3.6** below:

Table 3.6: Analysis of night-time collisions at Site 006

M3 J1 D3M	Dark PICs and casualties		Traffic	Length	Collision rate	KSI casualty rate	FWI rate
	Dark PICs	Dark KSI casualties	Night time ave traffic	(miles)	Night time PICs / hmvvm	Night time KSIs / hmvvm	Night time FWI / hmvvm
Before	0	0	4,576	0.7	0	0.0	0
After	1	0	3,237	0.7	40.3	0.0	0.4
diff (+/-)	+1	-	-1,339	-	+40.3 (↑100%)	-	0.4

Source: Mott MacDonald

For the three-year period 'before' the lighting switch-off scheme, there were no collisions recorded during the hours of darkness. Night-time traffic accounted for approximately 7% of the total AADT.

In the three years 'after' the scheme was implemented, one slight collision was recorded. The night-time traffic also decreased, representing approximately 6% of the daily total.

The calculated collision rates indicate that there was a **100% increase** in night-time PICs / hmvvm at this site since the lighting was switched-off on the mainline carriageway; as there were no previous dark collisions recorded during the 'before' period.

There were no fatal or seriously injured casualties reported 'before' or 'after' the completion of the scheme, and therefore the KSI rate has remained unchanged at 0.0.

The calculated FWI rate has therefore also seen an increase from 0 to 0.4 after lighting was switched off.

4 Evaluation

4.1 Summary of analysis

The change to collision and FWI rates for each lighting switch-off scheme, following implementation are summarised by site, in **Table 4.1** below.

Table 4.1: Scheme evaluation summary, by site

Site ref	Type	Collision rate	KSI rate	FWI rate
		Night time PICs / hmvm	Night time KSIs / hmvm	Night time FWI / hmvm
001	D2M	Decrease (↓39.1%)	No change	Decrease
002	D3M	Decrease (↓24.8%)	Decrease	Decrease
003	D3M	Decrease (↓16.6%)	Decrease	Decrease
004	D3M	Decrease (↓23.0%)	Decrease	Decrease
005	D3AP	Decrease (↓33.3%)	Decrease	Decrease
006	D3M	Increase (↑100%)	No change	Increase

Source: Mott MacDonald

Only one site (Site 006) exhibits an increase in the night-time collision and FWI rates following switch off. However, it should be noted that there were no dark collisions recorded in the 'before' analysis period.

The analysis of the road lighting switch-off scheme sites has shown that:

- The lighting switch-off scheme undertaken on the D2M motorway (Site 001) has resulted in a **39% reduction** in night-time collisions. There was no increase in the severity of casualties reported.
- On average, the lighting switch-off schemes implemented on D3M motorways (Sites 002, 003 and 004) has resulted in a **22% reduction** in night-time collisions. One scheme (Site 006) did exhibit an increase in the severity of casualties following lighting switch-off.
- The lighting switch-off scheme undertaken on the D3AP trunk A-road (Site 005) has resulted in a **33% reduction** in night-time collisions. The severity of reported casualties has also reduced.

4.2 Conclusion

Based on the analysis of data at these sites, it is concluded that the lighting switch-off schemes have not resulted in an increase to the rate of night-time collisions.

Furthermore, for the majority of the scheme sites, there was also little evidence to suggest that lighting switch-off has increased the severity of casualties occurring at night, based on KSI and FWI rates.

However, it should be noted that the analysis calculations do not take into account any other mitigation measures, such the installation of new temporary traffic signing to advise motorists that there is no road lighting, improvements to road markings, replacement of road studs etc.

Due to the small sample size of the data for each site and the fact that the 'after' period spans the period of the Covid-19 pandemic, it is recommended that further validation and analysis of these and other lighting scheme sites is undertaken, once a five-year dataset becomes available.

5 Glossary of Terms

AADT	Annual average daily traffic
Cas	Casualty
CPS	Connect Plus Services
D2M	Dualled two-lane motorway with hard shoulder
D3M	Dualled three-lane motorway with hard shoulder
D3AP	Dualled three-lane all-purpose trunk A road
DfT	Department for Transport
DGN	Driver gross negligence
diff (+/-)	Difference (above or below)
DMRB	Design Manual for Roads and Bridges
FWI	Fatal and weighted injury
hmv	Hundred million (100,000,000) vehicle miles travelled
hrs	Hours (time)
KSI	Killed or seriously injured (casualty)
MP	Marker post
OS	Ordnance Survey [mapping]
OSGR	Ordnance Survey grid reference
PIC	Personal injury collision
ref	Reference
SRN	Strategic Road Network
STATS19	Statement of administrative sources (Police collision reporting form)

6 References

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A. Calculations

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A.1 Collision (PIC) and casualty (Cas) data, by site

PICs	Before (DGNs removed)			After (DGNs removed)		
	Total PICs	PICs in dark	% dark PICs	Total PICs	PICs in dark	% dark PICs
Site 001	5	2	40.0%	4	1	25.0%
Site 002	10	3	30.0%	3	2	66.7%
Site 003	14	6	42.9%	8	4	50.0%
Site 004	25	7	28.0%	22	5	22.7%
Site 005	76	26	34.2%	27	15	55.6%
Site 006	2	0	0.0%	1	1	100.0%

Cas	Before (DGNs removed)			After (DGNs removed)			Six year period
	Total Cas	Cas in dark	% dark Cas	Total Cas	Cas in dark	% dark Cas	Total Cas
Site 001	13	6	46.2%	5	1	20.0%	18
Site 002	14	4	28.6%	5	2	40.0%	19
Site 003	23	12	52.2%	21	10	47.6%	44
Site 004	40	10	25.0%	35	8	22.9%	75
Site 005	103	35	34.0%	65	25	38.5%	168
Site 006	2	0	0.0%	1	1	100.0%	3

Source: Mott MacDonald

A.2 Dark KSI casualties, by site

Killed or Seriously Injured Casualties (KSIs) in the dark

	Before (DGNs removed)							After (DGNs removed)							Difference (Before to After)	
	Fatal	Serious	Slight	KSI total	Total	KSI %	FWI*	Fatal	Serious	Slight	KSI total	Total	KSI %	FWI*	% change	Ratio change (%)
Site 001	0	0	6	0	6	0.0%	0.06	0	0	1	0	1	0.0%	0.01	0.0	-83.3
Site 002	0	1	3	1	4	25.0%	0.13	0	0	2	0	2	0.0%	0.02	-100.0	-84.6
Site 003	0	1	11	1	12	8.3%	0.21	0	0	10	0	10	0.0%	0.1	-100.0	-52.4
Site 004	0	2	8	2	10	20.0%	0.28	0	0	8	0	8	0.0%	0.08	-100.0	-71.4
Site 005	1	4	30	5	35	14.3%	1.7	1	0	24	1	25	4.0%	1.24	-72.0	-27.1
Site 006	0	0	0	0	0	0.0%	0	0	0	1	0	1	0.0%	0.01	0.0	0.0

*Fatal and weighted injury (FWI) casualties is defined as: (number of fatalities) + 0.1 x (number of serious casualties) + 0.01 x (number of slight casualties)

Source: Mott MacDonald

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A.3 Site 001 calculation data – A1(M) J2 to J3

Site 001	PICs			Casualties							Traffic data			Route length	Collision rate	KSI casualty rate	FWI rate
				Cas	Dark Cas						Northbound count site: 30360676 Southbound count site: 118012201						
	ALL PICs	Dark PICs	% dark PICs		ALL Cas	Fa	Se	SI	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic				
D2M	ALL PICs	Dark PICs	% dark PICs	ALL Cas	Fa	Se	SI	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic	% Night time traffic	(miles)	Night time PICs/HMVM	Night time KSIs/HMVM	Night time FWI/HMVM
Total (6yr periods)	9	3	33%	18	0	0	7	7	0	0.07	146503	12383	8.5%	1.4			
Before (3yr periods)	5	2	40%	13	0	0	6	6	0	0.06	79236	6800	8.6%	1.4	19.19	0.00	0.58
After (3yr periods)	4	1	25%	5	0	0	1	1	0	0.01	67267	5583	8.3%	1.4	11.68	0.00	0.12
Difference (No.)		-1									-11970	-1217	-0.003		-7.50	0.00	-0.46
Difference (%)		50.0									15.1	17.9	3.5		39.10	0.00	79.70

Source: Mott MacDonald

A.4 Site 002 calculation data – M1 J3 to J4

Site 002	PICs			Casualties							Traffic data			Route length	Collision rate	KSI casualty rate	FWI rate
				Cas	Dark Cas						Northbound count site: 199111903 Southbound count site: 123013101						
	ALL PICs	Dark PICs	% dark PICs		ALL Cas	Fa	Se	SI	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic	% Night time traffic	(miles)	Night time PICs/HMVM	Night time KSIs/HMVM
D3M	ALL PICs	Dark PICs	% dark PICs	ALL Cas	Fa	Se	SI	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic	% Night time traffic	(miles)	Night time PICs/HMVM	Night time KSIs/HMVM	Night time FWI/HMVM
Total (6yr periods)	13	5	38%	19	0	1	5	6	1	0.15	146489	17304	11.8%	1.7			
Before (3yr periods)	10	3	30%	14	0	1	3	4	1	0.13	77052	9173	11.9%	1.7	17.57	5.86	0.76
After (3yr periods)	3	2	67%	5	0	0	2	2	0	0.02	69437	8131	11.7%	1.7	13.21	0.00	0.13
Difference (No.)		-1									-7616	-1043	-0.002		-4.35	-5.86	-0.63
Difference (%)		33.3									9.9	11.4	1.6		24.79	100.00	82.64

Source: Mott MacDonald

A.5 Site 003 calculation data – M1 J4 to J5

Site 003	PICs			Casualties							Traffic data			Route length	Collision rate		KSI casualty rate	FWI rate
				Cas	Dark Cas						Northbound count site: 108024801 Southbound count site: 199111802							
	ALL PICs	Dark PICs	% dark PICs		ALL Cas	Fa	Se	SI	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic	% Night time traffic	(miles)	Night time PICs/HMVM	Night time KSIs/HMVM	Night time FWI/HMVM
D3M																		
Total (6yr periods)	22	10	45%	44	0	1	21	22	1	0.31	190023	24826	13.1%	2.1				
Before (3yr periods)	14	6	43%	23	0	1	11	12	1	0.21	97185	13586	14.0%	2.1	19.21	3.20	0.67	
After (3yr periods)	8	4	50%	21	0	0	10	10	0	0.1	92838	11241	12.1%	2.1	16.01	0.00	0.40	
Difference (No.)		-2									-4348	-2345	-0.019		-3.19	-3.20	-0.27	
Difference (%)		33.3									4.5	17.3	13.4		16.63	100.00	40.45	

Source: Mott MacDonald

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A.6 Site 004 calculation data – M1 J5 to J6a

Site 004	PICs & Casualties			Casualties							Traffic data			Route length	Collision rate	KSI casualty rate	FWI rate
				Cas	Dark Cas						Northbound count site: 108024602 Southbound count site: 108023701						
	ALL PICs	Dark PICs	% dark PICs		ALL Cas	Fa	Se	SI	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic				
D3M																	
Total (6yr periods)	47	12	26%	75	0	2	16	18	2	0.36	150327	18880	12.6%	2.5			
Before (3yr periods)	25	7	28%	40	0	2	8	10	2	0.28	79468	9793	12.3%	2.5	26.11	7.46	1.04
After (3yr periods)	22	5	23%	35	0	0	8	8	0	0.08	70859	9087	12.8%	2.5	20.10	0.00	0.32
Difference (No.)		-2									-8608	-706	0.005		-6.01	-7.46	-0.72
Difference (%)		28.6									10.8	7.2	-4.1		23.02	100.00	69.21

Source: Mott MacDonald

A.7 Site 005 calculation data – A2 (A2018 to M25)

Site 005	PICs & Casualties			Casualties							Traffic data			Route length	Collision rate	KSI casualty rate	FWI rate
				Cas	Dark Cas						Northbound count site: 30360515 Southbound count site: 30360514						
	ALL PICs	Dark PICs	% dark PICs		ALL Cas	Fa	Se	Sl	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic				
D3AP	ALL PICs	Dark PICs	% dark PICs	ALL Cas	Fa	Se	Sl	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic	% Night time traffic	(miles)	Night time PICs/HMVM	Night time KSIs/HMVM	Night time FWI/HMVM
Total (6yr periods)	118	41	35%	168	2	4	54	60	6	2.94	218742	23081	10.6%	3.3			
Before (3yr periods)	76	26	34%	103	1	4	30	35	5	1.7	113932	12379	10.9%	3.3	58.13	11.18	3.80
After (3yr periods)	42	15	36%	65	1	0	24	25	1	1.24	104810	10702	10.2%	3.3	38.79	2.59	3.21
Difference (No.)		-11									-9122	-1676	-0.007		-19.34	-8.59	-0.59
Difference (%)		42.3									8.0	13.5	6.0		33.27	76.87	15.63

Source: Mott MacDonald

A.8 Site 006 calculation data – M3 J1

Site 006	PICs & Casualties			Casualties							Traffic data			Route length	Collision rate	KSI casualty rate	FWI rate
				Cas	Dark Cas						Northbound count site: 30360590 Southbound count site: 30360589						
	ALL PICs	Dark PICs	% dark PICs		ALL Cas	Fa	Se	SI	Total	KSI cas	FWI Cas	ALL AADT	Night time ave traffic	% Night time traffic	(miles)	Night time PICs/HMVM	Night time KSIs/HMVM
D3M																	
Total (6yr periods)	3	1	33%	3	0	0	1	1	0	0.01	114255	7814	6.8%	0.7			
Before (3yr periods)	2	0	0%	2	0	0	0	0	0	0	63271	4576	7.2%	0.7	0.00	0.00	0.00
After (3yr periods)	1	1	100%	1	0	0	1	1	0	0.01	50984	3237	6.3%	0.7	40.30	0.00	0.40
Difference (No.)		1									-12287	-1339	-0.009		40.30	0.00	0.40
Difference (%)		100.0									-24.1	-41.4	-13.9		100.00	0.00	100.00

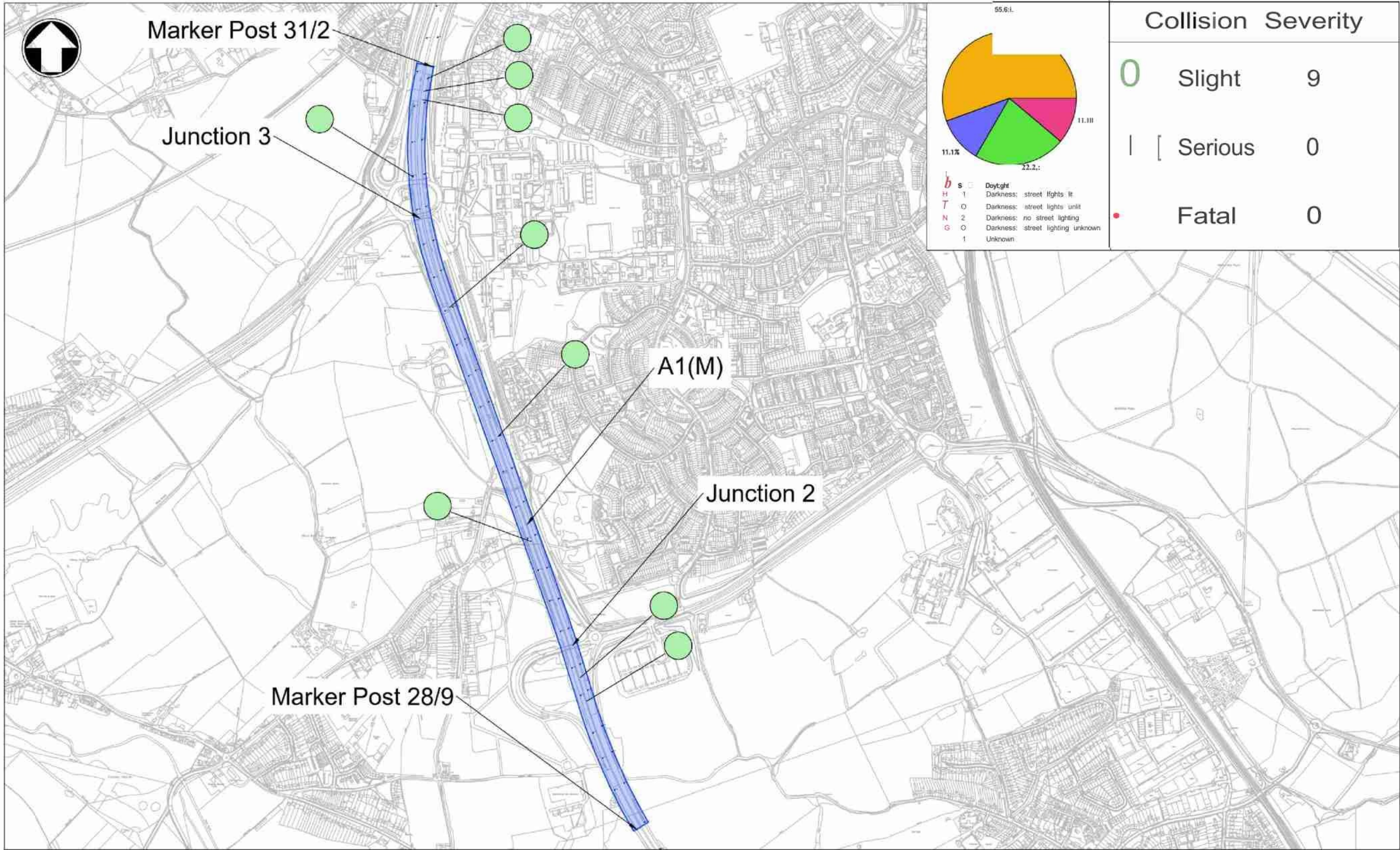
Source: Mott MacDonald

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B. Location Plots

B.1	Site 001 location plot – A1(M) J2 to J3	25
B.2	Site 002 location plot – M1 J3 to J4	27
B.3	Site 003 location plot – M1 J4 to J5	29
B.4	Site 004 location plot – M1 J5 to J6a	31
B.5	Site 005 location plot – A2 (A2018 to M25)	33
B.6	Site 006 location plot – M3 J1	35

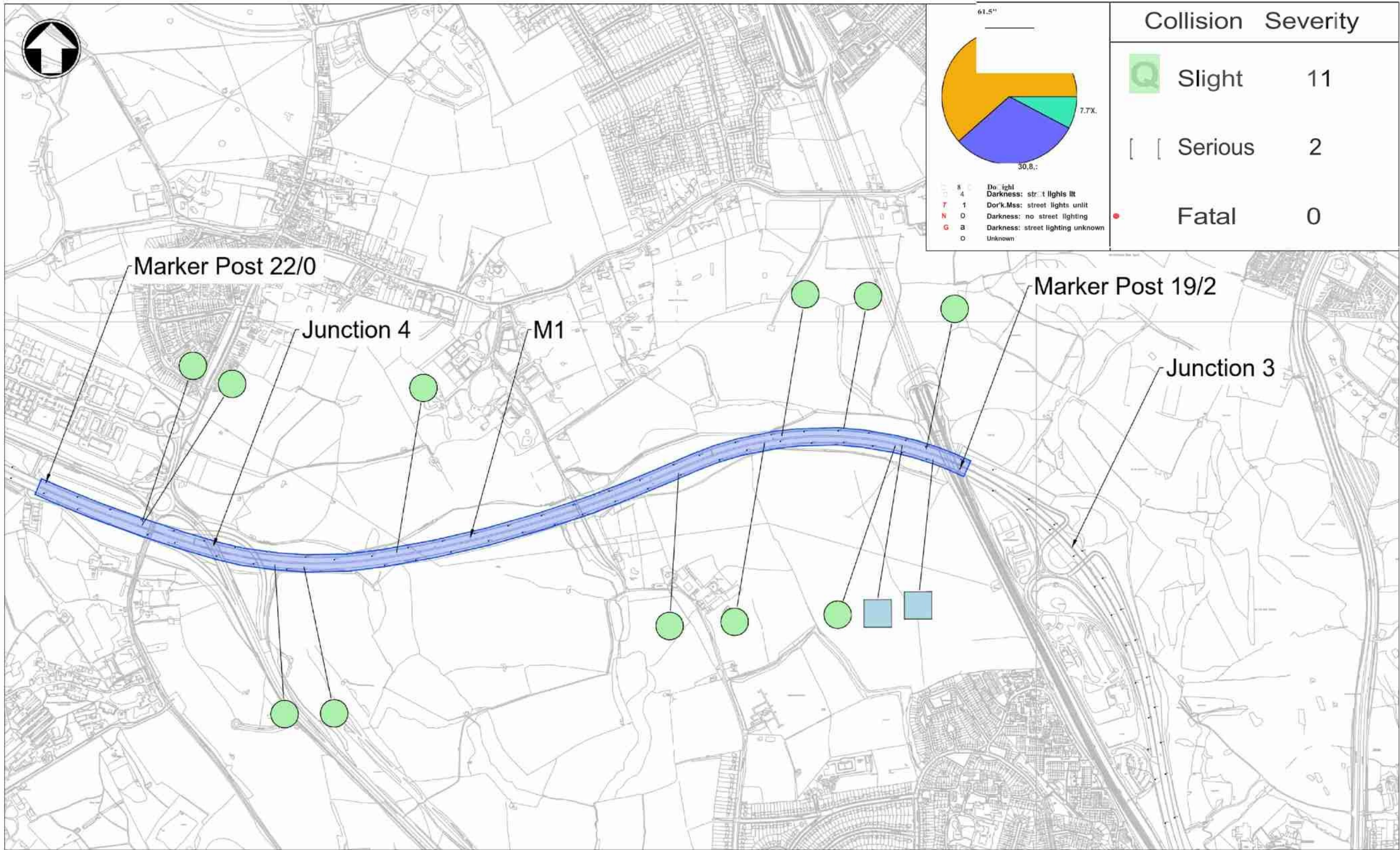
B.1 Site 001 location plot – A1(M) J2 to J3



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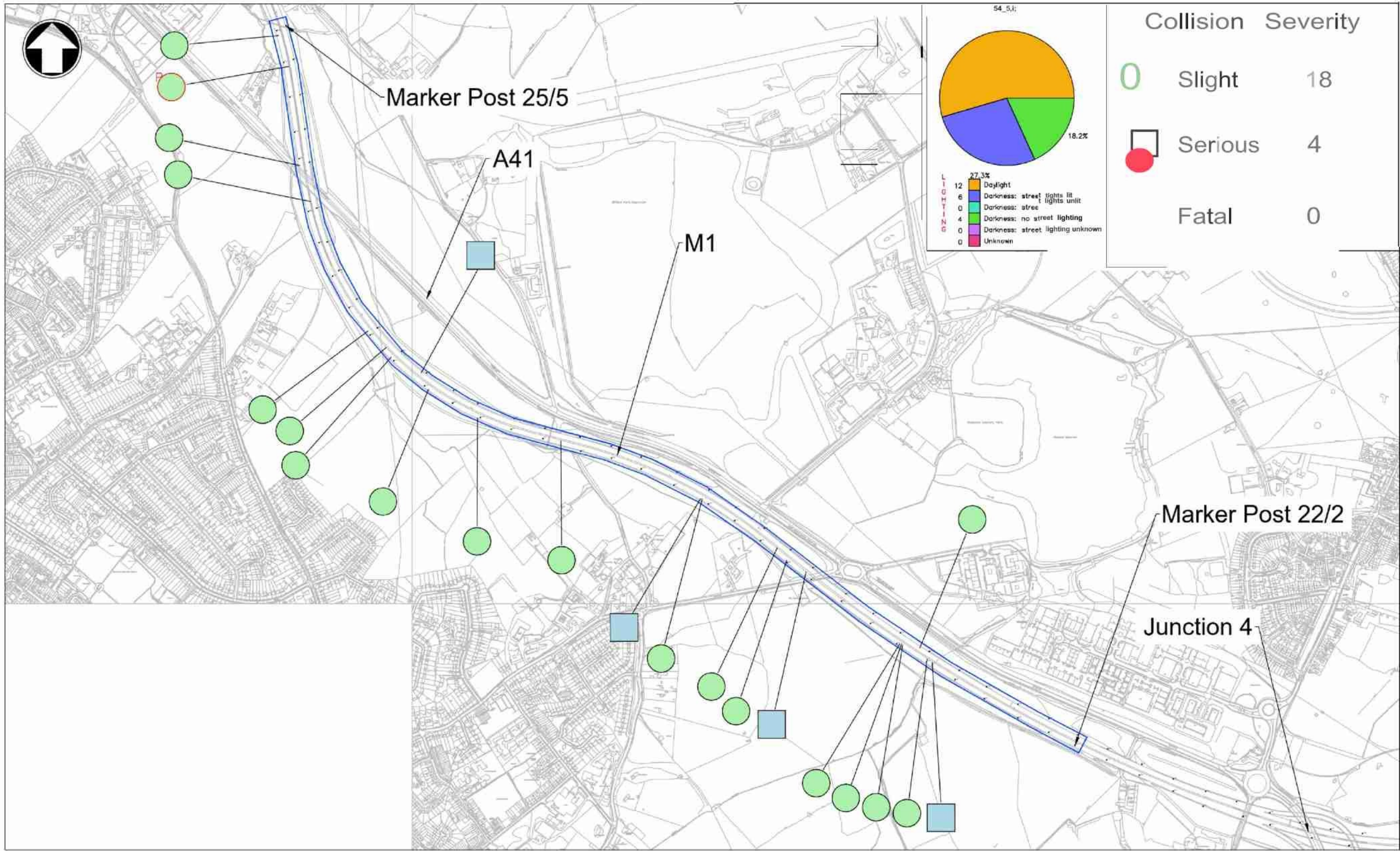
B.2 Site 002 location plot – M1 J3 to J4



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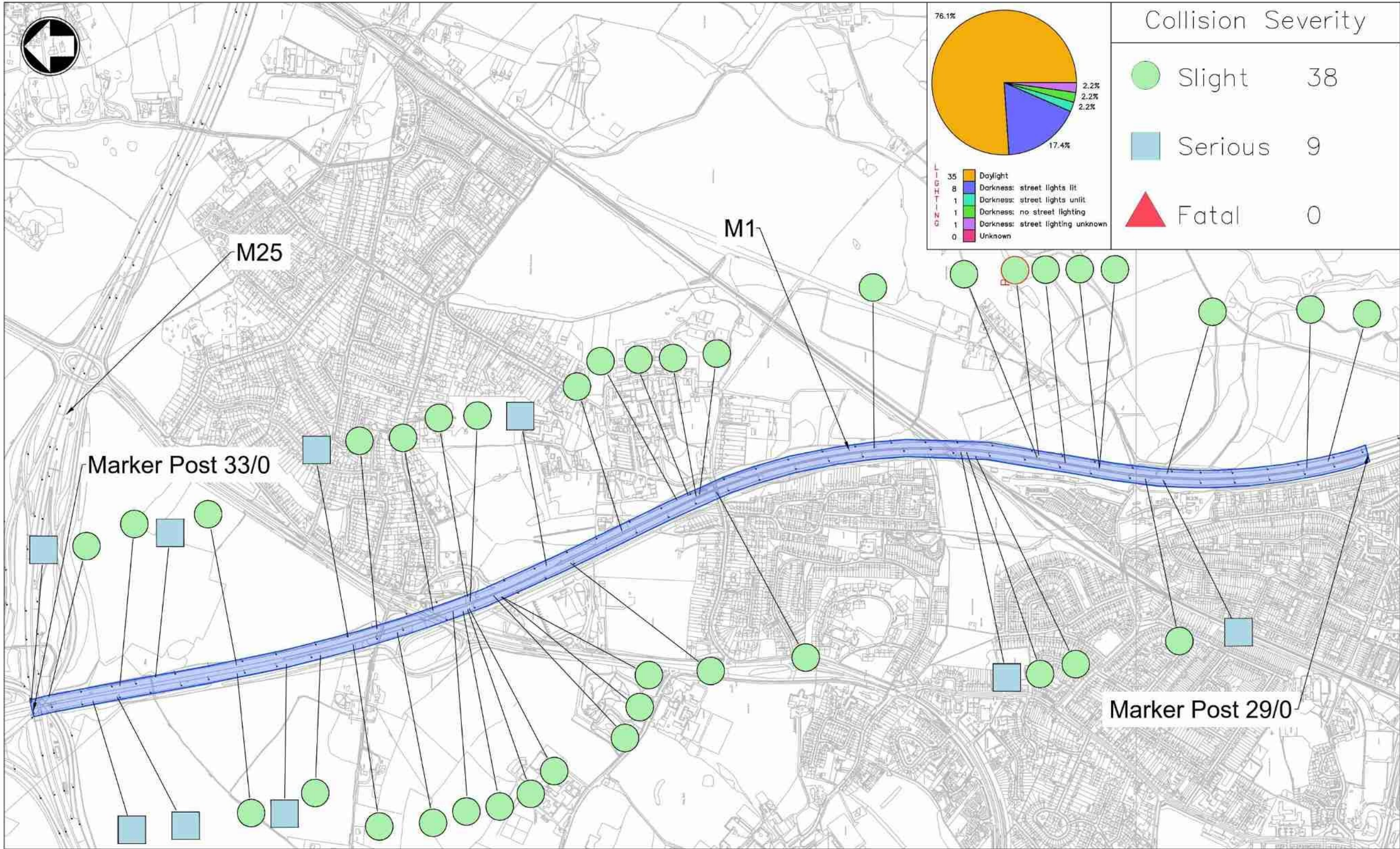
B.3 Site 003 location plot – M1 J4 to J5



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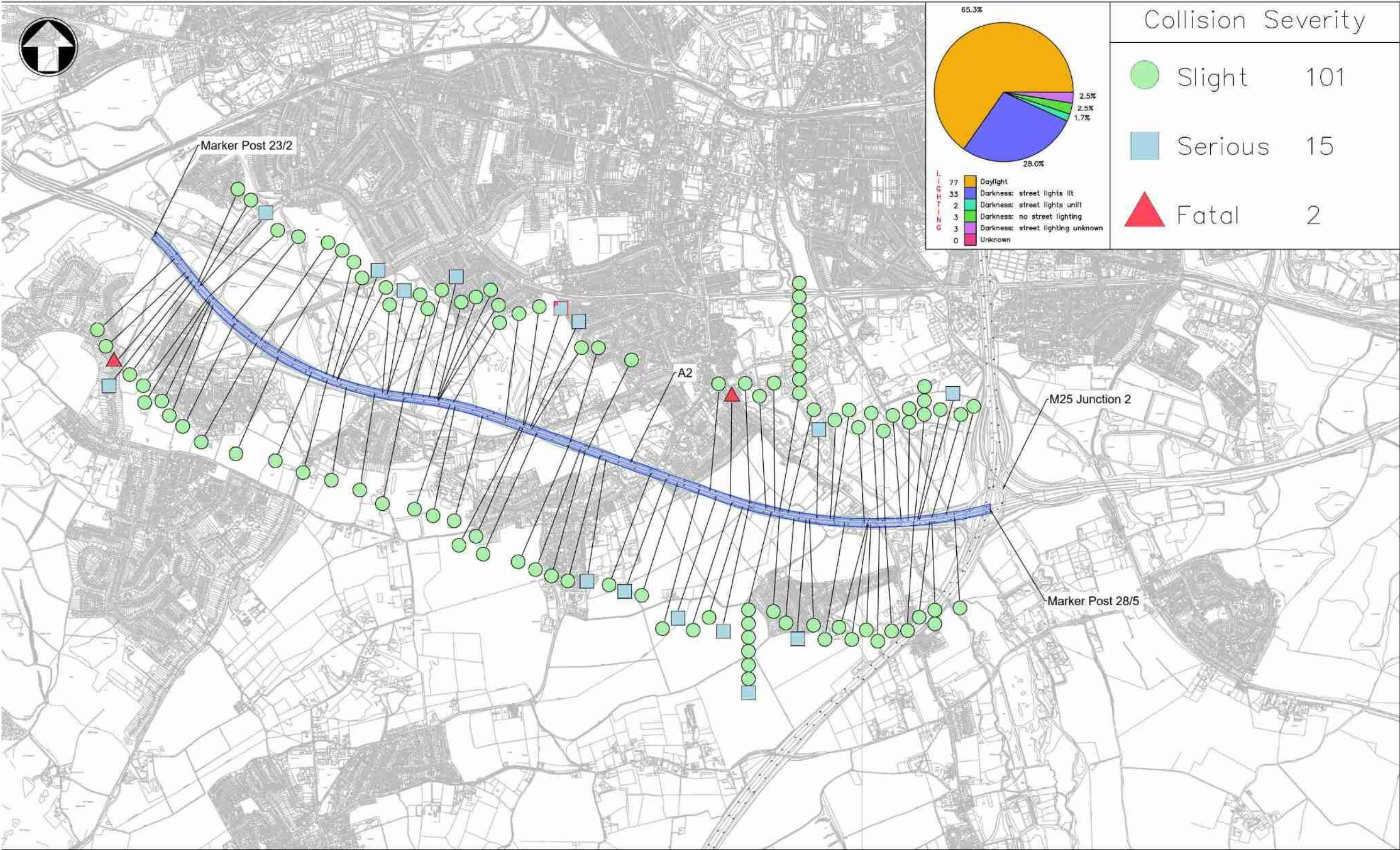
B.4 Site 004 location plot – M1 J5 to J6a



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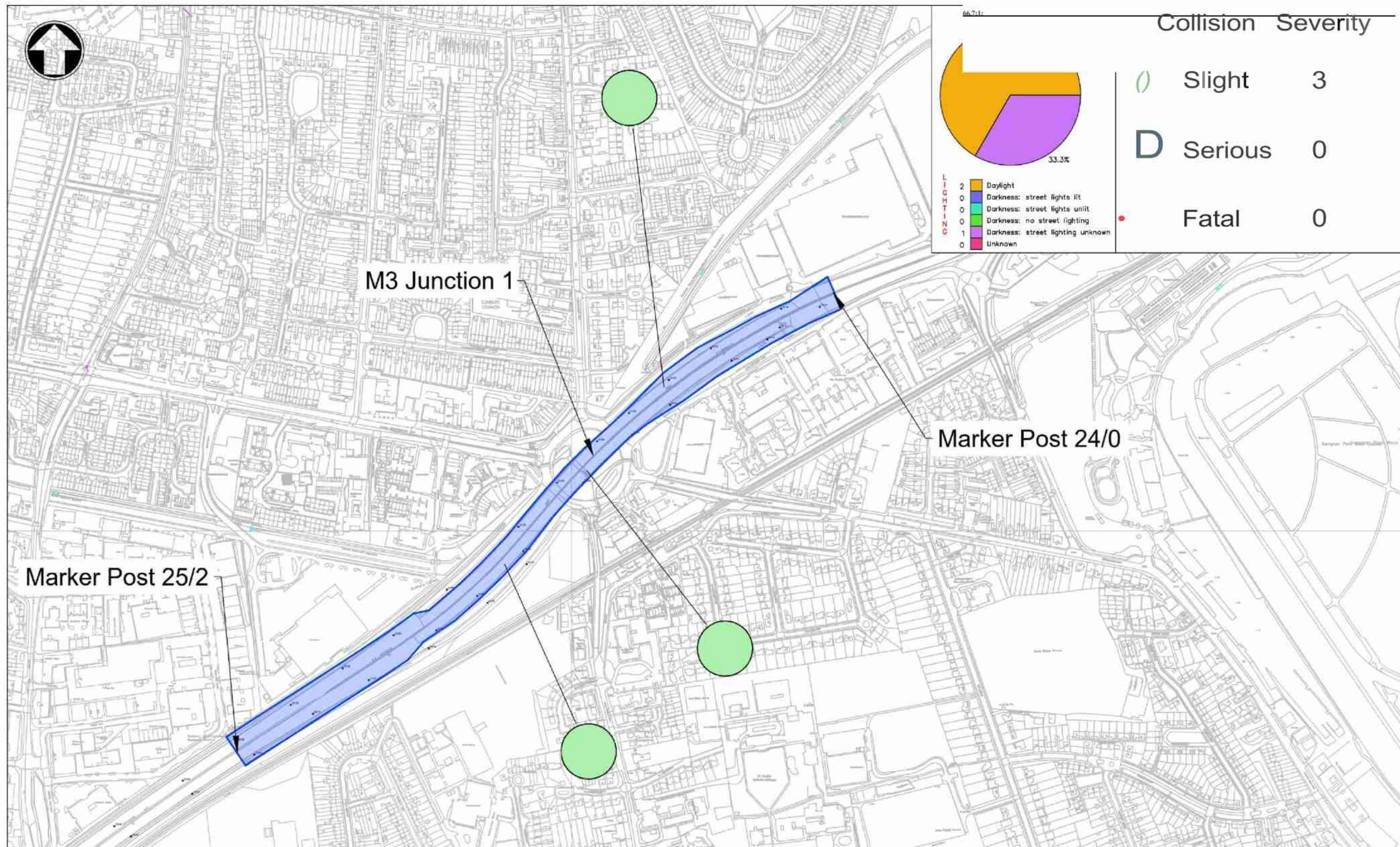
B.5 Site 005 location plot – A2 (A2018 to M25)



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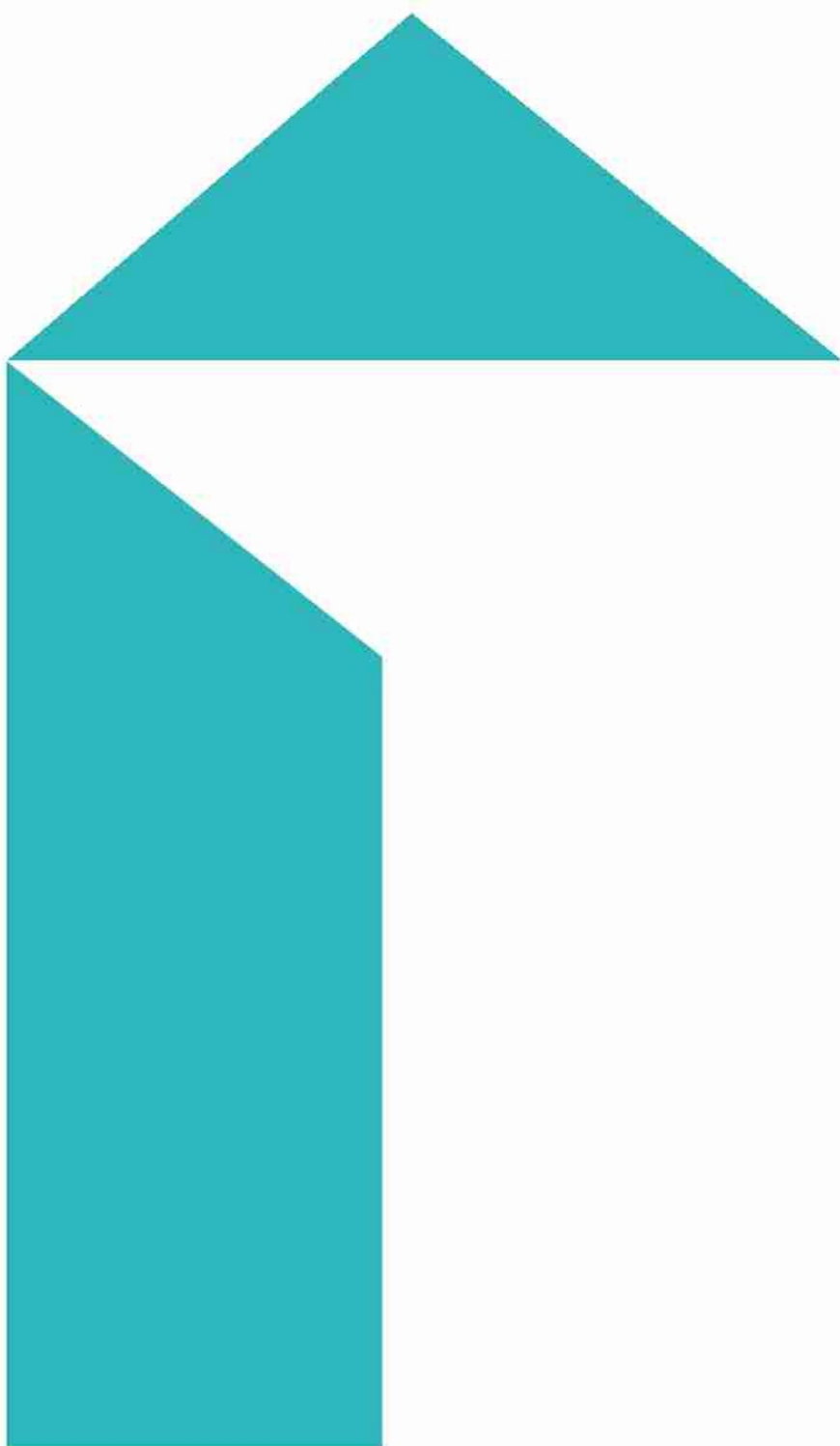
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B.6 Site 006 location plot – M3 J1



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