PROOF OF EVIDENCE PROVIDED BY

PAUL MANAMIKE BSc Eng Hons MBA CEng MICE FZwIE

OF JACOBS UK LTD

PUBLIC INQUIRIES INTO:

THE ESSEX COUNTY COUNCIL (GILDEN WAY/SHEERING ROAD (B183) IMPROVEMENT/WIDENING/REALIGNMENT, A1025 NEW LINK ROAD FROM B183 TO M11 AND GRADE SEPARATED JUNCTION/ROUNDABOUTS AT M11 JUNCTION 7A SCHEME) (PHASE 1) COMPULSORY PURCHASE ORDER ("CPO")

and

THE ESSEX COUNTY COUNCIL (GILDEN WAY/SHEERING ROAD (B183) IMPROVEMENT/WIDENING/REALIGNMENT, A1025 NEW LINK ROAD FROM B183 TO M11) SCHEME) (CLASSIFIED ROAD) (SIDE ROADS) ORDER ("SRO")

and

THE HIGHWAYS ENGLAND COMPANY LIMITED (M11 HARLOW NORTH JUNCTION (7A) (SLIP ROADS, SPECIAL ROADS) SCHEME 2018 ("SPECIAL ROADS SCHEME")

National Transport Casework Team reference: NATTRAN/E/LAO

Contents

1. Introduction ... 3
2. Scope of evidence ... 4
2.1 Scope of Evidence ... 4
2.2 Structure of Evidence. ... 4
3. Scheme Design Background ... 6
4. The need for the M11 Junction 7A ... 7
5. Options Identification and Development ... 9
5.1 Option Stages during the development of the M11J7A ... 9
5.2 Narrowing down the range of high-level options ... 11
6. M11 J7A Consultation and impact on design of the scheme ... 19
7. The Design ... 20
7.1 Existing conditions ... 20
7.2 Scheme Proposals ... 21
7.3 Operational Assessment and Junction Design ... 27
7.4 Grade Separated Junction and Slip Roads ... 33
7.5 Section 16 ... 40
7.6 Drainage Design ... 41
7.7 Table 2.1 summarises the design return periods adopted at this stage. ... 42
8. Development of the CPO Process ... 43
9. Scheme Constructability ... 48
9.1 General Construction methodology ... 48
9.2 Site compounds ... 50
9.3 Lay down areas for top soil and haul routes ... 50
9.4 Earthworks management ... 51
9.5 Traffic Management ... 51
10. Objections ... 52
11. Construction costs, funding and financial viability. ... 54
11.1 Funding Source ... 54
11.2 Construction costs ... 54
12. Conclusion ... 56

SEE Appendices documents for the list of appendices ... 57

1. Introduction

1.1 My Name Paul Manamike and I am a Divisional Director at the Croydon office of Jacobs UK LTD, a multidisciplinary, engineering consultancy.

1.2. I am a Chartered Engineer (CEng) registered with the Engineering Council of the United Kingdom and a member of the Institution of Civil Engineers (MICE) as well as a Fellow of the Institution of the Zimbabwean Institute of Engineers (FZwIE).

1.3. I have 27 years of civil engineering experience, 13 of which has been spent in the design delivery and construction of large major highways projects in the United Kingdom.

1.4 Jacobs, through the Ringway Jacobs Framework contract was appointed in 2013 to develop the M11 J7A and Gilden Way Widening Improvement and I took the responsibility of the scheme delivery in September 2014 as Project Manager.

1.8 As the Project Manager, I am responsible for providing advice to Essex County Council regarding the design and the delivery of the scheme.

1.9 I have been asked to produce a Proof of Evidence in respect of the design of the project, the Compulsory Purchase Order development and other elements of the scheme for the Public Inquiry in respect of the Essex County Council (Gilden Way/Sheering Road (B183) Improvement/Widening/Realignment, A1025 New Link Road from B183 to M11 and Grade Separated Junction/Roundabouts at M11 Junction 7a Scheme) (Phase 1) Compulsory Purchase and Side Road Orders 2018 ("the Scheme")

2. Scope of evidence

2.1 Scope of Evidence.

2.1.1.1 My evidence will cover the following;

- I will outline the background to the scheme development considering ECC objectives and the need for the scheme.
- I will outline the options assessment, the number of options considered and their appraisal to arrive at the preferred option.
- I will also outline the development of the CPO plans, how the land take has been optimised and the influence of landowners' views.
- I will provide an overview as to how the M11 J7A design meets the required industry standards, particularly in relation to Design Manual for Roads and Bridges (DMRB), British standards where applicable, and any other highways standards used.
- I will also outline in principle how the design is expected to work in operation considering future connectivity, access to developments and the future proofing of future infrastructure development.
- I will also show how the design has considered minimal disruption and environmental impact during construction.
- I will also present a consideration of the objections, where these relate to concerns about the design of the proposed scheme and its operations.

2.2 Structure of Evidence.

2.2.1 My evidence is provided in sections, as follows:-

- Section 3: Scheme background information
- Section 4: The need for the M11 Junction 7A
- Section 5: Options identification and development
- Section 6: Test Parameters and consultations for the scheme
- Section 7: The design
- Section 8: Developing the CPO plans
- Section 9: The Scheme Constructability

- Section 10: Objections
- Section 11: Construction costs, funding and viability
-

3. Scheme Design Background

The proposed M11 Junction 7A (M11 J7A) is located between Junction 7 and 8 of the M11 motorway and includes a grade separated junction and a link road joining the M11 to the B183 Gilden Way east of Harlow. The scheme design includes two lanes in a westerly direction into Harlow and one lane in an outbound direction onto the M11 Motorway for Gilden Way. The link road connects the Motorway to the new Campions roundabout with the realigned Gilden Way, re-classified as A1025. This Link is the phased design subject of an alternative planning application. It combines the operations of Phase 2b and Phase 2a into one in terms of adequately channelling traffic between M11J7A and the Campions Roundabout, as Phase 2b will only be required if a Northern Bypass is built.

3..2.2 Since the consultations, in the options stage, the design has been adjusted and elaborated to show the potential to develop a future Northern Bypass resulting in the Northern link (Phase 2b) and the southern link (Phase 2a) which are the merge and diverge for the future bypass in the planning application design. This was made possible by incorporating a new roundabout between the motorway and the Campions roundabout to allow the eastbound link to merge onto the future northern bypass via a grade separated crossing. Gilden Way was also widened to include two lanes westbound into Harlow and one lane outbound from Harlow. This is to accommodate the increase of traffic coming through the new junction of the Motorway.

4. The need for the M11 Junction 7A

4.1.1 The drivers for the M11 J7A scheme are to decongest Harlow town, especially the A414, facilitate economic growth in Harlow, deliver housing targets and to ensure the infrastructure would be of an appropriate scale. These objectives come from the ECC policy derived from national, regional and local policies. The polices can be condensed into the following statements;

- To provide connectivity to and within urban areas to support self-contained employment and housing growth and regeneration;
- To provide good connectivity within Essex and with adjacent major areas, maximising benefit to the local economy of international gateways and strategic links to London, the East and South East;
- To address network infrastructure capacity issues and improve network resilience;
- To reduce congestion and improve traffic management within Harlow and along the A414 corridor and at M11 J7;
- To enable housing and employment growth and regeneration;
- To unlock development land.

In addition to the above objectives the scheme will also meet operational and safety objectives as defined in the DMRB and the scheme safety report.

The policies capture the performance parameters recognised by both the Highways England and ECC's performance specification as below:

- User satisfaction
- Traffic flow
- Economic growth
- Efficiency

In addition to the above objectives the scheme will also meet operational and safety objectives as defined in the DMRB and the scheme safety report

4.1.2 Harlow is strategically located, being close to the M11 and M25, on the West Anglia mainline and close to Stansted Airport. Access to Harlow is, however, somewhat restricted with only one link to the strategic road network (via Junction 7 of the M11) and two railway stations located on the edge of the town.

4.1.3 There are several factors that contribute towards the traffic conditions in Harlow, especially during weekday and weekend peak periods. As well as the limited access routes into and out of the town, the 2011 Census data indicates that 16,000 outbound and 16,500 inbound travel to work trips are made each day. In addition to the demand placed on the strategic road network from these work-related trips, adjacent towns and villages have limited access to the M11 and so tend to travel through Harlow in order to reach Junction 7. The A414 as it passes through the town is also mainly single carriageway.

Access to the M11 itself is also restricted within Epping Forest District to the south of Harlow, with J5 having only south-facing slip roads, and J4 at the southern end of the motorway is some 12 miles distance from J7.

It is recognised in the emerging HDLP that congestion on the strategic and local road network is severe at peak times and a number of junctions are operating close to capacity or in excess of their original design thresholds. The local road network within Harlow is based on a grid system, with limited east:west routes which experience delays as a consequence. The north:south situation is worse as there are only two links from the north (A414 and A1184), and a single exit to the south (A414), and so all traffic entering or leaving Harlow in this direction is routed through J7. This situation leads to a tendency for local or regular drivers to use less suitable minor routes to the north-east (B183) and south (B181) of the town.

The key current transport problems relate to the configuration of the existing J7, which is already at capacity during peak periods, and which provides the only access to the strategic road network. The resilience of the A414 is also compromised by its routeing through J7, as well as the existing and future capacity issues at some of its junctions through Harlow, where peak period congestion already leads to traffic routeing along less appropriate roads, particularly the town centre.

Existing growth in Harlow is already constrained by the lack of capacity at Junction 7; the 2010 Local Development Order (LDO) for the Enterprise Zone sets out the Highways England requirement for the EZ occupation to be capped until additional network capacity is realised. This situation was recognised by Highways England within the RIS, and a preliminary study to identify possible junction capacity improvement at Junction 7 was undertaken on their behalf.

4.1.5 An Area Action Plan is being developed for the town centre to enable regeneration and economic growth, which is expected to go to Regulation 19 consultation later this year. Harlow has a designated Enterprise Zone, located on two sites in the east of Harlow, and the central government policy for housing growth will result in more than 16,000 new homes being built by 2033, within Harlow, Epping Forest and East Herts Districts.

4.1.6 In order to facilitate and support this growth, it is essential to improve access to the M11 and improve the transport flows in and around Harlow. The M11 J7A will not only relieve the congestion at Junction 7 but also improve traffic flows in and around Harlow by providing an alternative route to the north of the town.

4.1.7 The solution is the provision of a new Junction 7A on the M11 between Junctions 7 and 8, which is supported by the proposed widening of Gilden Way.

4.1.8 The current vehicular traffic access to the strategic network from Harlow, the M11 J7, is now at capacity. The objectives stated in 4.1.1 cannot be met without an increase in road network capacity and the improved link to the motorway.

5. Options Identification and Development

5.1 Option Stages during the development of the M11J7A

To outline the options, it is necessary to state that the development of the M11 J7A scheme is aligned to the Highways England project control framework, generally regarded as best practice for large major highways projects. The four main stages in the Project Control Framework are;

- the pre-project,
- options,
- scheme development, and
- scheme construction.

During the pre-project and the options stages of the M11 J7A scheme development, the project team and ECC undertook the process to identify and prioritise the potential transport issues, shaping, investigating and assessing the viability of road scheme solutions to the problem. The process also involved the generation of high-level options and their assessment. This process was captured in the Options Assessment Report appended in Appendix A. Though the report was produced in November 2015, it was documenting the process undertaken over a period of more than 20 years. This work is referred to in the web based DfT Transport Analysis Guidance (WebTAG) and is required at early stages of the scheme development called Stage 1

Six options were identified that could fulfil some or all of the scheme objectives. These were identified as follows;

Option 1: New M11 junction to the east of Harlow, J7A, with a local link to B183 Gilden Way;

Option 2: Improved M11 J7;

Option 3: Both Option 1 and Option 2;

Option 4: 'Northern Bypass', which includes a dual carriageway link from J7A through to the A414 at Eastwick, and an additional single carriageway access into Harlow via River Way;

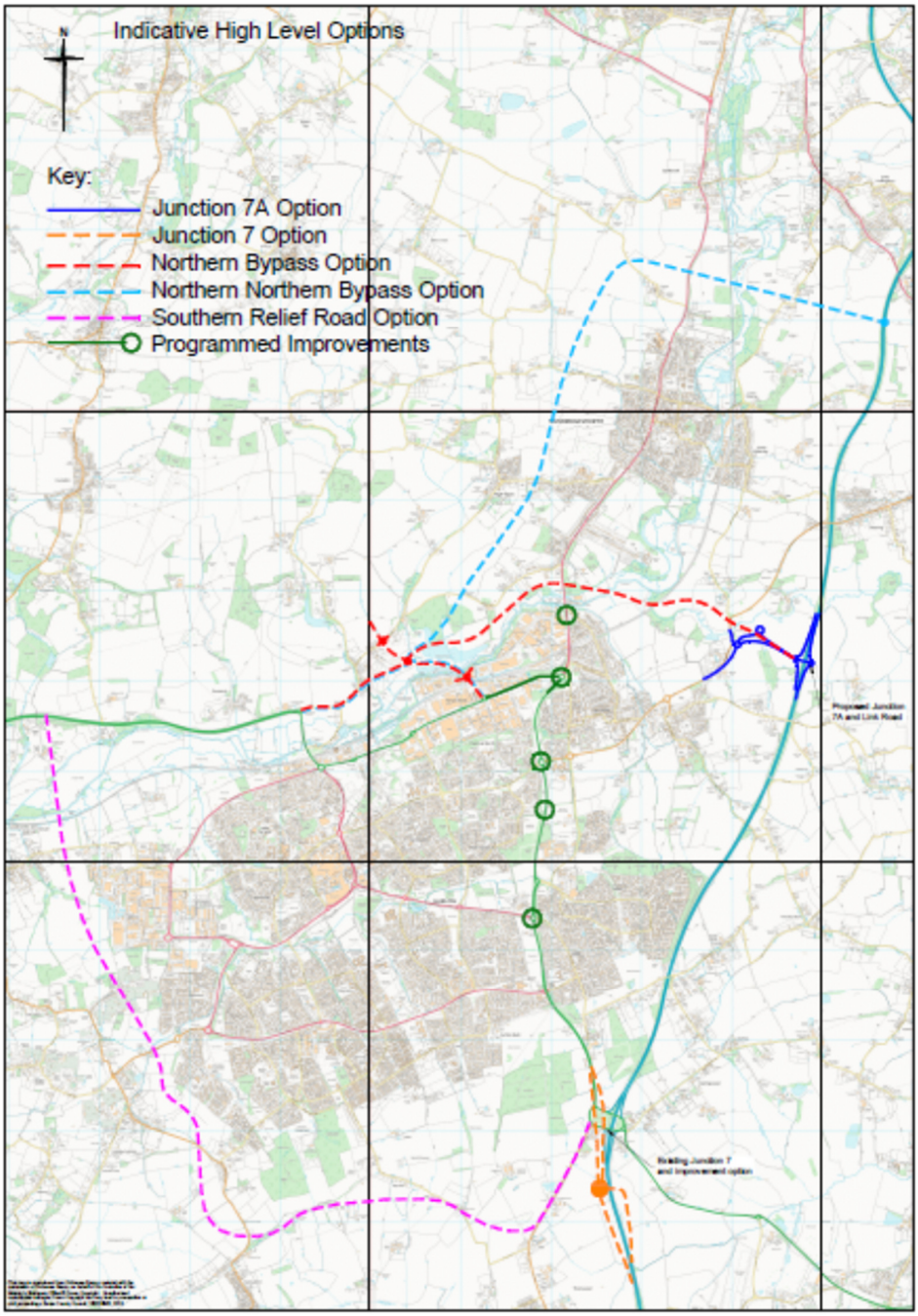
Option 5: 'Northern Northern Bypass', which comprises a dual carriageway link from the A414 at Eastwick, aligned to the South of Gilston, and then to the West of Sawbridgeworth, connecting with the M11 via a new junction South of Little Hallingbury;

Option 6: 'Southern Relief Road', which comprises a dual carriageway link from the A414 east of Roydon, skirting the western and southern edges of Harlow, and connecting with J7 via the B1393.

The bypass options were developed to conceptual stages only as very little design was undertaken compared to the other options such as junction 7A and Junction 7. Also, the options concepts were

developed from previous work by others. Under the WebTAG guidelines the initial appraisal of options is expected to utilise readily available data.

Figure 5.1



5.2 Narrowing down the range of high-level options

The range of high-level options were narrowed down by using the highways assignment modelling output assessment, economic appraisal and the DfT's Early Assessment and Sifting Tool (East). All these were assessed against the objectives set out in 4.1.1.

5.2.1 Highways Assignment Model

The benefits of each option were extracted from the strategic model as total vehicle hours for the full model area. Results showed that the M11J7A option resulted in the highest reduction of the total vehicle hours.

For the details of the highway assignment modelling process, refer to Chris MacDonald s proof of evidence appended to this proof. Appendix A

5.2.2 Economic Appraisal

Table 5.1

Options	PVB	PVC	NPV	BCR	VfM
M11 J7A	£288,484,020	£70,331,705	£218,152,316	4.1	Very High
M11 J7	£241,696,376	£73,119,378	£168,576,998	3.3	High
M11 J7 & J7A	£438,107,289	£143,451,083	£294,656,206	3.1	High
Northern Bypass	£714,465,552	£359,837,668	£354,627,884	2.0	Medium
Northern Northern Bypass	£570,129,757	£272,573,997	£297,555,760	2.1	High
Southern Relief Road	£268,671,711	£259,834,862	£8,836,849	1.0	Low

The high-level options were also ranked in terms of the Benefits Costs Ratio derived from high level monetised benefits compared to the order of magnitude costs as shown in Table 1.

5.2.3 Early Assessment and Sifting Tool (EAST)

Table 5.2 The high-level Sifting Table

	Scheme Weighted Scores						
Business Case Element	**Junction 7a**	**Junction 7**	**Junctions 7 & 7a**	**Northern Bypass**	**Northern Northern Bypass**	**Southern Relief Road**	***Case Weighting Total***
Strategic Case	12.3	1.7	11.9	9.5	-1.0	0.2	*20.7*
Economic Case	23.2	5.4	18.2	17.0	3.2	1.2	*35.7*
Commercial Case	3.7	3.7	3.7	3.7	3.7	3.7	*11.7*
Financial Case	9.5	6.7	4.2	2.5	2.5	2.5	*18.3*
Management Case	10.8	7.7	6.5	5.7	4.1	4.1	*13.7*
Weighted Total	58.5	25.1	44.5	38.4	12.5	11.7	*100.0*

The results of the option assessment were summarised as follows.

Table 5.3

	Option description	Assessment results
Option 1	New M11 junction east of Harlow, Junction 7A, with local link to Gilden Way	• Less traffic on route through villages around Harlow; • Improved accessibility for Harlow-related trips; and • Likely to improve network resilience particularly on the A414 north of Junction 7 with additional potential peak period traffic on M11 north and south of Harlow, on Gilden Way and along the A414 around the north of Harlow.
Option 2	Improved M11 Junction 7	• Travel time reductions, but less than Option 1; • Likely to increase flow on M11 south of Junction 7 as well as approaches to the junction; and • Less likely to result in improved accessibility on the local road network within Harlow with any additional

	Option description	Assessment results
		traffic on the A414 not improving the network resilience.
Option 3	Both Option 1 and Option 2	• Greater travel time savings than Options 1 and 2 alone; • Improved accessibility for Harlow related trips and could improve network resilience on the A414 and through the town; and • Changes in traffic flows are broadly the same as Option 1 and 2, with increases in traffic on the M11 north and south of the town.
Option 4	'Northern Bypass', which includes a dual carriageway link from Junction 7A through to A414 at Eastwick, and an additional single carriageway access into Harlow via River Way.	• Higher levels of traffic on the M11 than for Junction 7A in isolation leading to greater use by strategic traffic rather than Harlow-related traffic; • Traffic reduced on less suitable rural route east of Harlow but there are indications that traffic could increase on rural routes to the northwest of the town; and • Key benefit of the Proposed Scheme is achieved through Junction 7A section with the bypass element itself likely to provide network resilience benefits.
Option 5	'Northern Northern Bypass', which comprises a dual carriageway link from A414 at Eastwick, aligned to the south of Gilston, and then to the west of Sawbridgeworth, connecting with the M11 via a new junction south of Little Hallingbury	• Lower time savings than Option 4 in almost all time periods and years; • Attraction of more strategic traffic from the A10 and A120 particularly to the north of its connection to the M11 than other options; • Key beneficial areas would be in Bishop's Stortford and Sawbridgeworth; and • Less likely to improve accessibility to Harlow, although could provide strategic network resilience.
Option 6	'Southern Relief Road', comprising a dual carriageway link from the A414 east of Roydon, skirting the western and southern	• Performed less well than both Option 4 and Option 5 in terms of time savings;

	Option description	Assessment results
	edges of Harlow, and connecting with Junction 7 via the B1393	• Little impact to the level of traffic on M11 but flows along the A414 west of Harlow would be likely to increase; and • Least overall effect on the traffic within Harlow and therefore would not improve accessibility within the town.

The high-level options assessment resulted in options 1-4 being considered with the priority being the MI1 J7A.

5.2.4 M11 J7A Options

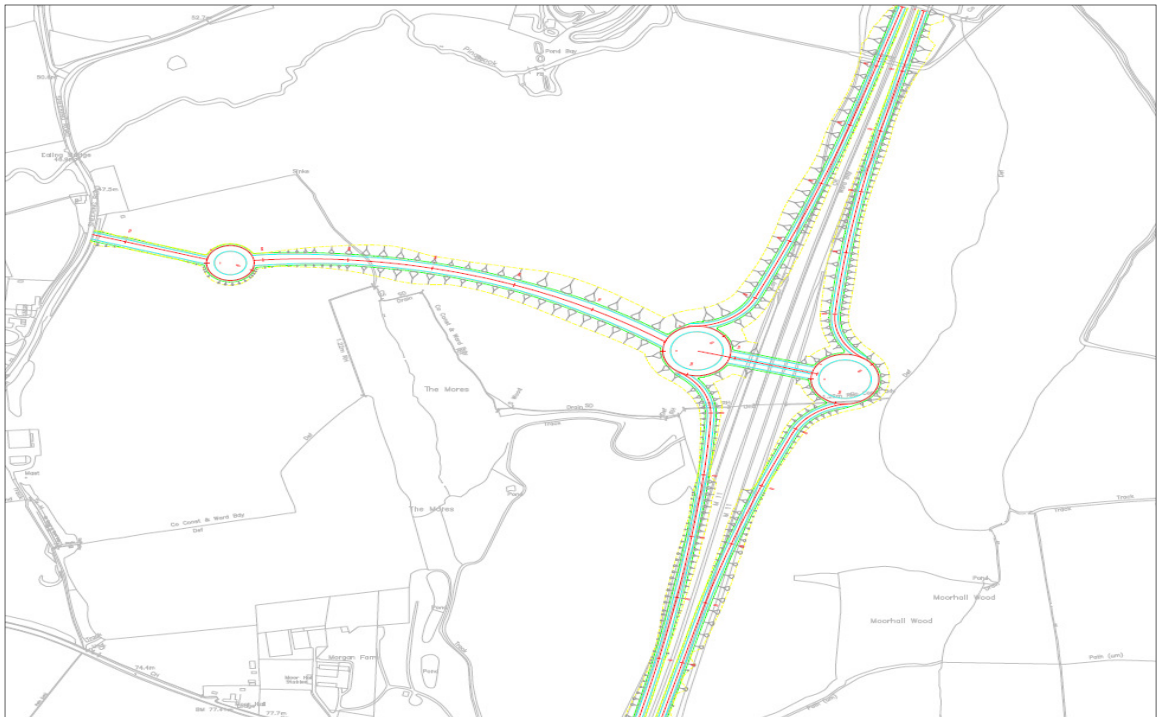
Earlier on from October 2013, three M11 J7A variants had been considered and presented to a Public Information Exhibition (PIE) event in January 2014.

Option 1

Figure 5.2

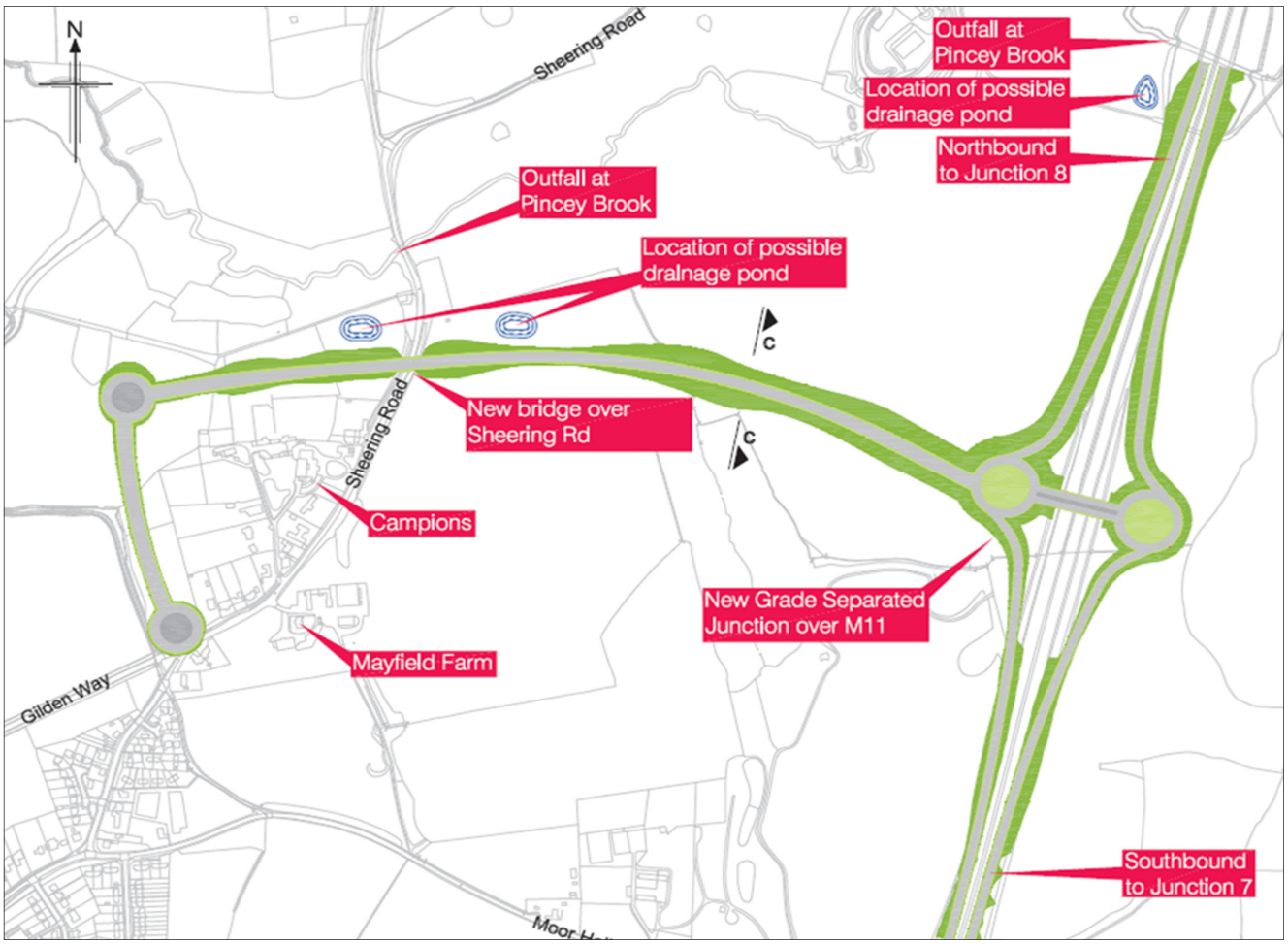
A new grade separated junction at M11 and an upgradable link to B183 Gilden Way

Figure 5.3 Option 2



A new grade separated junction at M11 and a link road connected to B183 Sheering Road via a T-Junction

Figure 5.4 Option 3



A new grade separated junction at M11 and a link from the grade separated junction over B183 Sheering Road on a structure, located behind The Campions to the north, then ties into B183 Gilden Way to the west of The Campions.

5.2.5 Stakeholders Engagement Impact

Feedback from the Public Information Exhibition (PIE) in 2014 and further public stakeholders' engagements indicated that a more strategic scheme, which would not preclude delivery of a Northern Bypass at some point in the future was preferred. This resulted in the earlier version of the current scheme, showing a more northerly alignment, and future proofed for a Northern Bypass. This preferred

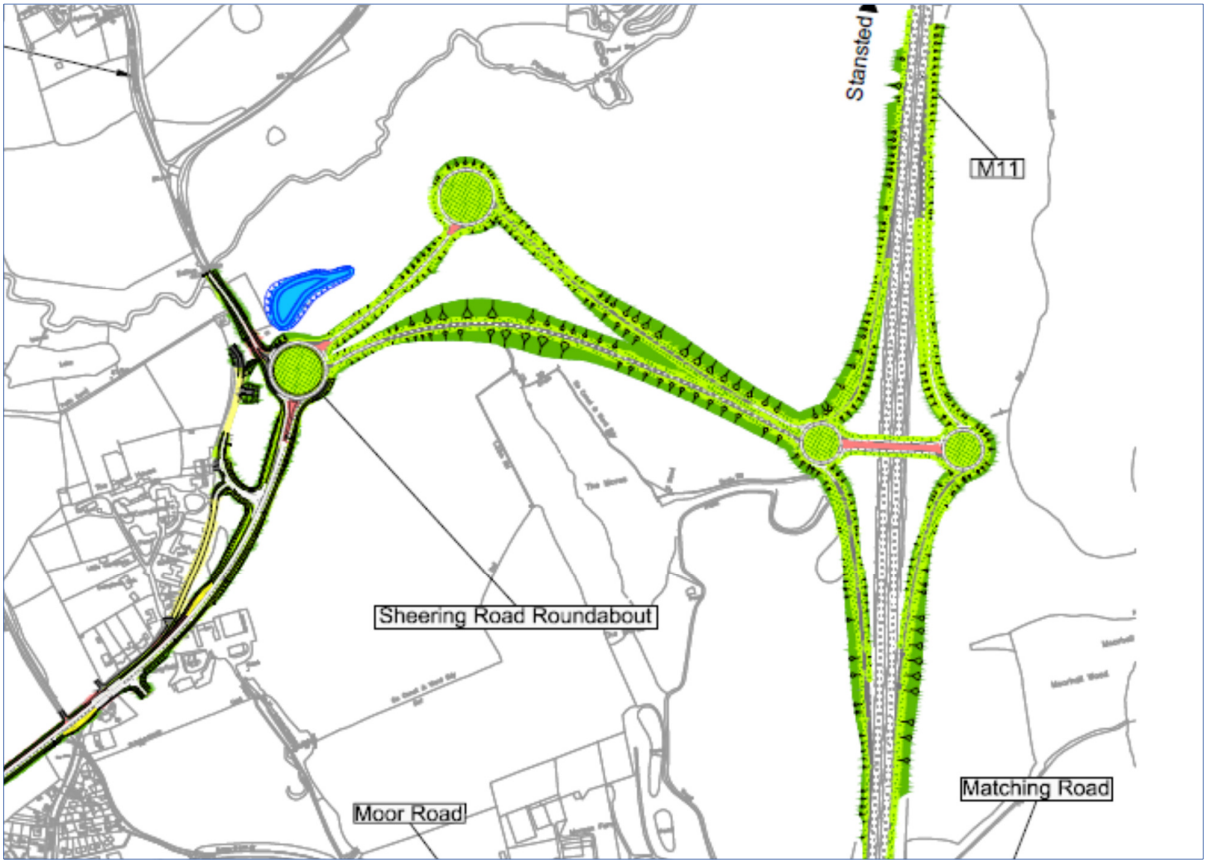
M11 J7A option is a combination of the top four high level options in that, it considered a possible future northern bypass, and could be developed in combination with the M11 J7A scheme subject to adequate funding.

Future proofed option

Figure5.5

After a further PIE held in July 2015, comments from the Public Information Exhibition in July 2015 and further elaboration of the design considering the reduction of environmental impacts and the physical constraints, the planning application and the current scheme of the M11 J7A was developed.

Figure 5.6



5.2.6 Advantages of the preferred option

The advantage of this scheme was that it enabled full incorporation of a northern bypass with the northern link as a future merge to a Northern Bypass and the southern arm, the diverge. It would also be developed in phases depending on the growth and the proven need of a Northern Bypass with the traffic operational needs combined in the interim phased design as recognised in the planning application. For planning application see Susanna Coe's PoE

5.2.7 Formal Public Consultation

A Formal Public Consultation was held in May 2016, bringing the number of public stakeholders' engagement events to three during the development of the scheme.

6. M11 J7A Consultation and impact on design of the scheme

The following changes were made to the scheme after Stakeholders Engagement and the Public Consultations;

- The removal of the 'helical loop' ramp from the east bound link that was replaced with an at-grade roundabout to address residents' concerns about the height of the scheme and impact on the environment.
- New junction to The Campions and a dedicated access road for all the properties;
- New access to Mayfield Farm;
- A 40mph speed limit on B183 Gilden Way/Sheering Road and the new link road to the new Junction 7A roundabout;
- Improvements to the Non-Motorised User (NMU) facilities throughout the scheme by creating a footway and cycleway along the northern side of Gilden way from London Road to Sheering Road;
- Improvements to the existing pedestrian crossing and 3 additional signalled crossings were incorporated into the scheme;
- Improvements to the existing bus stops;
- HGV ban covering Old Harlow and Churchgate Street;
- Right turn ban into Old Harlow via Mulberry Green was incorporated to primarily address rat-running issues, but also safety concerns; and
- Restriction on non-residential movements along Lower Sheering Road.

7. The Design

7.1 Existing conditions

7.1.1 Locality

The proposed scheme has a connection to the M11 Motorway, via a new grade-separated junction and a connection to the north-east of Harlow Town, through the B183 to the A414. The location is essentially rural and the dual carriageway section goes through the agricultural land sandwiched between the B183 Gilden Way and the M11, east of the Campions.

Thus, the scheme crosses agricultural fields associated with Mayfield Farm (on B183 Sheering Road) and Morgan Farm (on Moor Hall Road). The land within the locality is predominantly arable.

The closest residential area to the proposed Scheme is the Campions, which is a small hamlet on the west side of Sheering Road (B183) consisting of approximately a dozen properties. Other nearby residential properties include 163 Sheering Road, a stand-alone residential property just south of Pincey Brook, and Sheering Hall, which is located just north of the Pincey Brook.

There are a few small businesses within the area including Mayfield Farm bakery and café, and Churchgate sausage shop which are both within the Mayfield Farm buildings. A corridor of land between the east of Harlow Town and the M11 is the ongoing Gilden Park development that would provide residential properties and other essential amenities for the new community.

7.1.2 Highways network

7.1.3 Drainage

From the surface water drainage asset records available, the existing Gilden Way highway drainage catchment is currently served by kerbs and gullies. Two independent carrier pipe drainage systems convey the surface water runoff to the Harlowbury Brook, one system to the southwest of Harlowbury Brook and another system to the northeast.

In the vicinity of the proposed Junction 7A, the existing M11 drains from south to north from a high point approximately 1.8km south of the Pincey Brook and discharges to the Pincey Brook immediately west of the M11. Each carriageway is served by a surface water channel and carrier pipe system in the verge.

The section of the M11 on embankment however discharges via toe drains at the upstream end until a carrier pipe connects the system into the Pincey Brook, which is the receiving watercourse located approximately at the geometric low point of the highway catchment.

7.1.4 Lighting

The B183 section of the scheme is partially lit between Mulberry Green junction and the Churchgate roundabout. The remainder of the road proposed for improvement, between London Road roundabout and Mulberry Green, and Churchgate roundabout through Mayfield Farm and the Campions, is unlit.

The new M11 Junction 7A road proposals run through predominantly rural countryside and there is currently no existing road lighting over 1km north and south of the proposed new M11 Junction 7A.

The nearest system of road lighting is located at the M11 Junction 7 and 8 roundabouts. There is also additional road lighting on the M11 main carriageway south of junction 8 which starts half a mile from the A120 (W) Bishops Stortford, Services exit.

7.1.5 Non-Motorised Users (NMU)

The existing facilities for non-motorised users along the existing sections of the route comprise an existing section of footway along the western section of the B183 Gilden Way between London Road and The Oxleys, an existing section of footway along the B183 Sheering Road between Gilden Way and The Campions and a Toucan Crossing at Mulberry Green where National Cycle Network Route 1 crosses Gilden Way.

An existing underpass provides a grade-separated crossing from Gilden Close to the Oxleys. This underpass has an arrangement of facilities including guardrails, access ramps / staircase that enable pedestrians to cross under the B183 from Gilden Close on the south to the Oxleys in the north to access a local bus stop.

There are no other controlled crossings of the existing route. Eleven existing Public Rights of Way (all Public Footpaths) connect to the B183 Gilden Way and B183 Sheering Road but few of these can be accessed directly from the existing footway.

7.2 Scheme Proposals

7.2.1 General Arrangement of scheme

The proposed scheme boundary commences at the London Road roundabout on Gilden Way (B183) and involves widening the existing two-lane road to three lanes. Each lane will be 3.3m wide. Double white road marking lines would demarcate the road space for the opposing outbound and inbound traffic. When completed, two of the lanes will take traffic in a westerly direction into Harlow Town and the third lane will take the outbound traffic east onto the M11. The widening of the existing carriageway will all be carried out within the existing highway boundary, so no land take will be required from private properties other than Harlow District Council Land.

Gilden Way Widening and Improvements

The widening of Gilden Way is undertaken by upgrading the existing footway along Gilden Way to accommodate both pedestrians and cyclists. The vulnerable road user's safety has been taken into consideration by designing standard crossings for non-motorised traffic. The scheme will not close or sever any existing public rights of way (PRoW). To minimise traffic disruption during construction Gilden Way ties into existing levels with no need for significant earthworks.

The existing junctions along Gilden Way have been reconfigured to improve safety and traffic flow. Traffic regulation orders accompanied by appropriate signing will be put in place. These measures will be aimed at preventing rat running through the residential streets, and in particular Mulberry Green, without impacting on existing bus routes. As part of the drive to improve safety, ECC have committed to reducing the speed limit from 60mph to 40mph on the proposed 3.3m wide traffic lanes.

At Marsh lane, Gilden Way becomes Sheering Road and the scheme veers offline and is constructed on CPO land with the Sheering Road converted into a local access only for the Campions.

The Campions access road will be separated from the realigned Sheering Road at the most southern part by a 2.5m Island which will include screening from the carriageway. The existing access to Mayfield Farm has also been re-aligned to tie in with the new alignment. The Campions access road will also become a shared use surface for pedestrians and cyclists. A new crossing will also be included as part of the works and will be located close to Marsh Lane joining the existing public rights of way in that area and the bus stops on either side of Sheering Road.

Campions Roundabout to the M11 Junction

The Campions roundabout is the link between Gilden Way (reclassified the A1025), the new link road and the realigned Sheering Road. The Campions roundabout has an inscribed circle diameter (ICD) of 80m. The Sheering Road from the Campions Roundabout joins the existing Sheering Road at the Pincey Brook Bridge. Two new footways will be created to join the two existing public rights of way either side of Sheering Road and the new Campions shared use access track. The scheme has tied into a substandard Sheering road just south of the Pincey brook because of the bridge constraints.

The Link road

The scheme to be constructed, without Phase 2b, curves around The Mores woodlands. The vertical and horizontal alignment of the road has been determined by the future proofing for the Northern Bypass. In the planning application Phase 2b is a future eastbound merge to the Northern Bypass and the Phase 2a is the diverge from the Northern Bypass.

The phased design (phase 2a) Link Road is a Dual carriageway All Purpose Urban road (D2UAP) linking the M11 J7A in accordance with TD27.

Dumbbell Roundabouts

Two new roundabouts will be constructed on either side of the M11 with an ICD of 60m and will be connected by a new overbridge to enable free flow access onto the new road from the Motorway and onto the Motorway both in the northbound and south bound directions. The location of the M11 junction has been specifically chosen to reduce the amount of earthworks required and to allow for any potential northern bypass in the future.

Public Right of Ways (PRoWs) and Non-Motorised Users

Existing Footpath 204_30 runs southwards from the B183 Sheering Road across a field and through Mayfield Farm to the New Town boundary. From here it continues as Footpath 198_42 along a farm track to Moor Hall Lane. The re-aligned new road (A1025) severs the footpath between Mayfield Farm Access and the new junction for the Campions. At this point the footpath has been re-aligned to the new Mayfield Farm access to tie in with the new footway along the new road re-classified as A1025

Footpath 204_35 follows Marsh Lane from the junction with the A1025. It links with the footpaths to the north west of the Campions.

Footpath 204_29 runs through woodland and pasture land in an easterly direction from Footpath 204_35 to the B183 Sheering Road approximately 60 metres south of Ealing Bridge. The eastern end of Footpath 204_29 is adjacent to property number 163 close to where the proposed northwest arm of the roundabout would tie into the northern section of the B183 Sheering Road. In order to provide continuity the scheme has made the Campions access a shared surface for cars and Non-Motorised Users (NMUs) and this footway links up with the two footpaths north of the Campions through the realigned Sheering Road.

Footpath 204_17 runs along Pincey Brook eastwards from Ealing Bridge on the B183 Sheering Road. The realigned B183 Sheering Road will tie into the existing highway layout close to the start of this footpath.

Footpath 204_26 runs westwards from the B183 Sheering Road from a point approximately 40 metres north of Ealing Bridge. This route has not been affected by the scheme because the alignment of the B183 Sheering Road will not be altered beyond the bridge.

7.2.2 Alignment Design

The M11J7A alignment design was developed in accordance with the Design Manual for Roads and Bridges (DMRB) and the associated Interim Advice Notes (IANs)

"The DMRB was introduced in 1992 in England and Wales, and later in Scotland and Northern Ireland. It includes all current standards, advice notes and other documents relating to the design, assessment and operation of trunk roads, including motorways. The DMRB has been developed from many separate series of documents previously published by the overseeing organisations of England, Scotland, Wales and Northern Ireland. These documents, together with later additions, have been

gathered together in 15 volumes to help road transport professionals meet the requirements of quality assurance procedures." DMRB

Interim Advice Notes

IANs are issued by Highways England from time to time. They contain specific guidance, which shall be used only in connection with works on motorways and trunk roads in England, subject to any specific implementation instructions contained within an IAN. While IANs must be read together with the DMRB and MCHW for works on motorways and trunk roads and may incorporate amendments or additions to documents in these publications, they are not part of the DMRB or the MCHW.

Other Essex design guidelines including the Manual for Streets were used specifically for highways within the ECC highway boundaries.

The alignment design can be categorised into 8 corridors as shown on the schematic below with 04 and 09 not used. The corridors are :

Corridor 01 – Gilden Way South

Corridor 02 – Gilden Way North

Corridor 03 – Sheering Road Roundabout & Links

Corridor 05 – Link Road

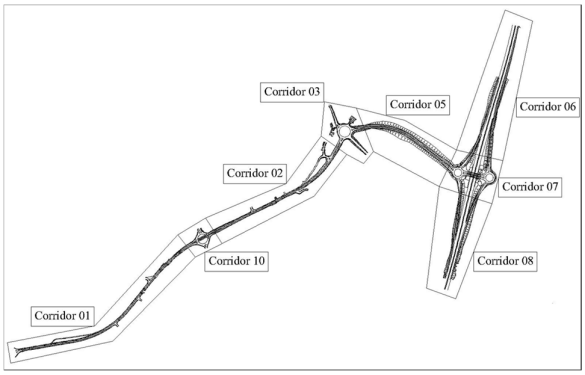
Corridor 06 – Northbound Merge & Southbound Diverge

Corridor 07 – Eastern & Western Roundabouts and Dumbbell Link

Corridor 08 – Northbound Diverge & Southbound Merge

Corridor 10 – Churchgate Roundabout

Figure 7.1 Design Segments



7.2.3 Gilden Way South Design Fix 5 (Redline boundary)

Design Fix 5 is the design freeze that enabled the environmental impacts levels considered in the published ES statement to be assessed. This design resulted in the fixing of the planning application redline boundary.

The overarching design constraint along Gilden Way was the need to avoid people's properties and fit the design within the existing Highways Boundary. Constraints on Gilden Way (re-classified as A1025) included the sub-way near The Oxleys and the wooded area near the London Road Roundabout

As a result, the cross section of the highways was designed as 2x3.3m lanes for Westbound traffic and 1x3.3m lane for Eastbound traffic separated by double white lines (100mm wide lines with a gap of 90mm) in what is commonly referred to (2+1).

To avoid land take, the finished carriageway levels were kept as close as possible to the existing pavement.

A 2.5m wide footway / cycleway adjacent to the eastbound carriageway to cater for NMU according with the NMU studies undertaken. The NMU context report is appended in Appendix C.

The tie-ins to roundabouts were designed in accordance with the technical standards in the DMRB.

A design speed of 70kph was used throughout Gilden Way (A1025), to minimise encroachment onto private land and to reduce the number of relaxations and departures.

Footway/verge widths in critical areas were designed with pinch-points also to avoid land take.

- Slopes of earthworks were considered as 1:2 in certain stretches to avoid land take.
- The taper and widths of bus stops were kept same as existing.
- For safety reasons, all priority junctions were made left in and left out because of the (2+1) lane arrangements.
- Tie-ins were made as short as possible to avoid the land take including at Mulberry Green Junction
- Access roads minimum gradient was kept at 2% except for one property at Mulberry Green.
- The location of the existing Toucan crossings were kept unchanged. One more Toucan crossing was added further West and a Zebra crossing was added on the eastern arm of the London Road roundabout. This zebra crossing was then changed to a Toucan crossing and shifted further eastwards, away from the roundabout, based on the Stage1 Road Safety Audit (RSA).

- The verge Stopping Sight Distance (SSD) widening for visibility at the exit from Churchgate Roundabout to Gilden Way South was relaxed to one step below desirable minimum to avoid land take.

7.2.4 Gilden Way North Design Fix 5 (Redline boundary)

The design of the Gilden Way North was exactly the same as the South except for the area around Pincey Brook where the SSD was relaxed to avoid the woodland. The vertical alignment was also relaxed within permitted parameters in order to tie-in before the Pincey Brook bridge.

All alignment tie-ins at The Campions were designed to avoid land take. A Bus Stop at The Campions was moved slightly north in order to avoid taking land from The Campions.

7.2.5 The Link Road Design Fix 5 (Redline Boundary)

In designing the link road, corridor 05, the DMRB standards criteria and maximum/minimum levels of provision whose incorporation in the road design would achieve a desirable level of performance in average conditions in terms of traffic safety, operation, economic and environmental effects were considered. Relaxations and in some cases departures to the design standards allowable in the standards were used where it was impossible to justify the parameters in economic, environmental impact and traffic terms. Relaxations were also used where the land take was excessive.

To understand the link road design, it must be noted that the preferred option scheme is future proofed for a northern bypass which could be constructed in the future. This future alignment fixes the vertical alignment of the scheme. For the details of the need for the northern bypass I will defer to David Sprunt's proof of evidence(PoE)

The design therefore considered a potential Northern bypass, fixed its level above Pincey Brook and Sheering Road. The design speed for the bypass was 100kph and that for the links is 70kph. The potential Northern Bypass was designed as a Dual carriageway All Purpose Road (D2AP) in accordance with TD27 Originally, the links were designed as single lane with a hard shoulder (DGIC) and the merge as a single carriageway with a hard shoulder (MG1C) cross-sections.

Further design iterations for the redline boundary fix meant the Northern Bypass element and the M11 J7A scheme being shifted south. The shift would optimise the foot print of the Grade Separated Junction and minimise land take while optimising scheme benefits. Another value engineering element was the removal of the loop arrangement at the Pincey Brook which resulted in an at-grade roundabout for the east bound merge. The vertical alignment remained in the same place with the highest level of the Northern Bypass 10m clearance above the Pincey Brook roundabout connecting road finished road level to finished road level.(FRL)

The two arms for the merge and diverge for the redline boundary planning design were always envisaged to be constructed in phases but to operationalise that would mean modification of the southern link to accommodate the eastbound traffic. The diverge (southern arm) had been changed from a design speed of 60kph to 70 kph and changing from a single lane with hard shoulder to a two lane with hard strips (DG1C to DG2E). This accommodated the level of traffic from the modelling and matched the Gilden Way (A1025) traffic link capacity . See Design Rationale notes in Appendix D.

The slopes were designed as 1:3 to allow planting and landscaping.

7.2.6 Construction Phasing and the Phased design

During the development of the scheme, an emerging procurement and construction strategy was developed. The construction phasing which mirrored the procurement phasing initially envisaged three stages of construction, phase 1 (Gilden Way i.e. A1025), phase 2a (the southern arm of the planning application i.e. the diverge) and phase 2b (the northern arm of the planning application). The strategy was refined into a two-contract strategy. Phase 1 was the construction of the Gilden Way, the utility diversions and the advance ecological work in a smaller contract. Phase 2a and 2b would be constructed as part of the main works contract.

As traffic modelling was refined and the funding routes became clearer, ECC concluded that a Northern Bypass would not be required immediately, i.e. within the current Local Plan period, but the scheme would remain future proofed. It was also apparent that it was cost effective to include the construction of Gilden Way in the main works but use a separate Advance Works Contract (AWC) for utility diversions and the Advance Ecological mitigation work. Without the immediate need for a Northern Bypass, the east bound cross-section, single lane and hard shoulder, i.e. MGIC (effectively two lanes would be merged into two with the DG2E diverge (two lanes) to form a four-lane road. Phase 2a and phase 1 would then be constructed together as the main works contract all within the redline boundary. The phased design would have a separate planning application as alternative 2a. For the planning application details, I will refer you to Susanna Coe's PoE.

The combined DG2E and the MIGC links were initially developed as a Dual All-Purpose Road (D2AP). To reduce land take and minimise environmental impact especially on the Mores woodlands to the south of the scheme, the cross-section width was altered to the Dual Urban All-Purpose Road (D2UAP).

7.3 Operational Assessment and Junction Design

All traffic data used for the design of the scheme was derived from the Vissum M11J7A Strategic model and for the details of the strategic modelling I refer you to Chris MacDonald s proof of Evidence appended in appendix A of this PoE

7.3.1 Micro-Simulation

Operational Assessment in highways design is an evaluation of the operational effectiveness and operational suitability of a design using Micro-Simulation Tools. Junctions are designed through progressive Micro-Simulation.

Traffic microsimulation tools are widely used both in industry and research mainly because of the ability of these tools to reflect the dynamic nature of the transportation system in a realistic fashion.

For this project the microsimulation tool used was VISSIM.

VISSIM is a time-step and behavioural based microscopic traffic simulation model developed at the University of Karlsruhe, Germany, in the early 1970s and therefore has been in use in the industry for over 40 years.

In addition to VISSIM, LinSig and JUNCTIONS9 traffic modelling tools were also utilised in support of the microsimulation. LinSig is used to simulate signal-controlled junctions and JUNCTIONS9, which incorporates ARCADY, is used to simulate priority junctions (roundabouts).

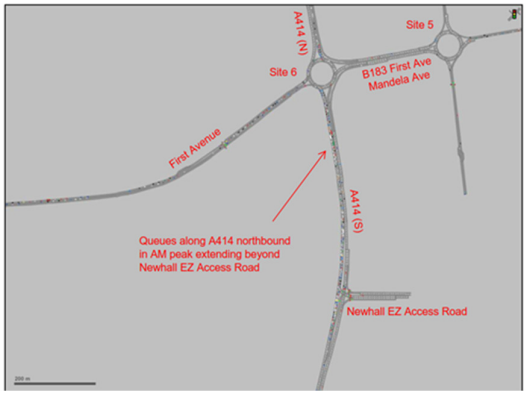
VISSIM has the capability to model both these types of junctions (signals and priority) in a single network. VISSIM models each vehicle individually, including driver behaviour characteristics, and provides a visual representation of the interaction between vehicles, assisting in the assessment of the road network operation, providing detailed assessment on impact that one junction has on others, in terms of queuing and blocking back, and platooning of traffic.

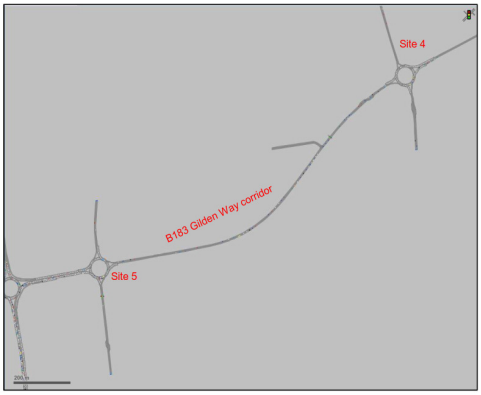
7.3.2 Application of VISSIM to the M11 Junction 7a project

The specific use of VISSIM for this project, in context with its industry purpose, was to inform the design of junctions, to be in accordance with industry standards as set out in the Design Manual for Roads and Bridges (Volume 6) and to provide confidence in junction capacity levels in the future – demonstrating that the junction is operating at acceptable levels of capacity in the future; ensuring that projected traffic flow levels (traffic demand taking into account future traffic growth and planned development) can be accommodated and associated junction capacity and performance.

Three existing key junctions along the B183 corridor were operationally assessed and are listed below:

- B183 Gilden Way(A1025) / Sheering Road / Harlowbury Access Road junction (Churchgate Roundabout) – Site 4
- B183 Gilden Way / London Road Roundabout – Site 5
- A414 / B183 First Avenue Roundabout – Site 6 (Although Site 6 is outside the remit of the scheme it is included here for a complete picture of the operational assessment, given it's close proximity to the scheme).





Two new junctions were also assessed:

- A new grade separated dumbbell layout motorway junction; Junction 7a – Site 1
- A new roundabout where the Junction 7a link road meets Sheering Road, known as The Campions roundabout – Site 2

Three more junctions or traffic loading points along the B183 corridor were included in the VISSIM modelled network. These junctions included, one signal controlled and two 'left-in left-out' arrangements and were added to the VISSIM network to reflect potential access points related to the Harlow East Development and Harlowbury Development.

The above junctions were assessed using either LINSIG (signal-controlled junctions) or JUNCTIONS9 - ARCADY (priority junctions) traffic modelling software and all formed part of the road network modelled in VISSIM microsimulation software.

The details and conclusions from the traffic modelling exercise have been recorded in a project technical note called "M11 Junction 7A – Operational Assessment Technical Note", B3553F05/REP/77. That technical note is included in Appendix E of this Evidence.

7.3.3 VISSIM Assessment Results

A visual assessment in VISSIM in relation to vehicle delays, queuing and traffic platooning was carried out.

The junction capacity assessments for a scenario without the scheme (Do-Nothing) and with the scheme (Do Something) were carried out to determine if the existing junctions along the B183 corridor would have sufficient capacity in 2021 (opening year) and 2036 (design year) to facilitate increased traffic (future demand) due to local districts planned growth (housing and/or retail developments), and the introduction of Junction 7A.

VISSIM microsimulation assisted in the operational assessment and also demonstrated the spatial interaction between vehicles.

The Micro- Simulation modelling for junction capacity was carried out as follows;

- Do Nothing (Without the scheme) results (reference case) 2021 (opening year) and 2036 (design year)
- Do Something (DS) results 2021 (opening year) and 2036 (Design Year).

Result of the Micro-Simulation would be presented as follows;

- Do Nothing modelling results (approach or lane capacity, delay, queues)
- Do Something modelling results (approach or lane capacity, delay, queues)

Results

The junction traffic and microsimulation models suggest that in 2021 and 2036, in the Do-Nothing scenario, site 4 (Churchgate Roundabout) and Site 5 (London Road Roundabout) in 2021 both peak periods traffic is forecast to flow through these junctions without any issues. However, in 2036 AM peak period, traffic is likely to experience significant delays at these junctions due to congestion at Site 6 (A414 / B183 First Avenue roundabout) that has a slow-moving westbound queue on the B183 Gilden Way, resulting in exit blocking. This situation is likely to be slightly better in the PM peak period. This situation is not critical early years of the design life but would need intervention approximately 2028 if projected growth is realised however the client has approved a Hamburger design arrangement as part of the M11J7A scheme at Church gate which resolves the issue.

At Site 6 for both 2021 and 2036 operating years in both peak periods, traffic is likely to experience significant delays with queuing on most of the junction approach arms. ECC have committed to a low-cost intervention during the life of the scheme.

The Traffic simulation models have shown that in 2021 and 2036, in the Do Something scenario, at Sites 1 and 2 in 2021 and 2036 during both peak periods, traffic should flow through these junctions without any issues.

At Site 4 (Churchgate Roundabout) in both 2021 and 2036 operating years in both peak periods, with the Hamburger arrangements, traffic should flow through the junction without any issues.

At Site 5 in 2021 PM peak period London Road southbound experiences increased delays due to the major eastbound traffic flows. In 2036 both peak periods the junction experience significant delays due to the Harlow East Development signalised T-junction access further east causing exit blocking and grid lock.

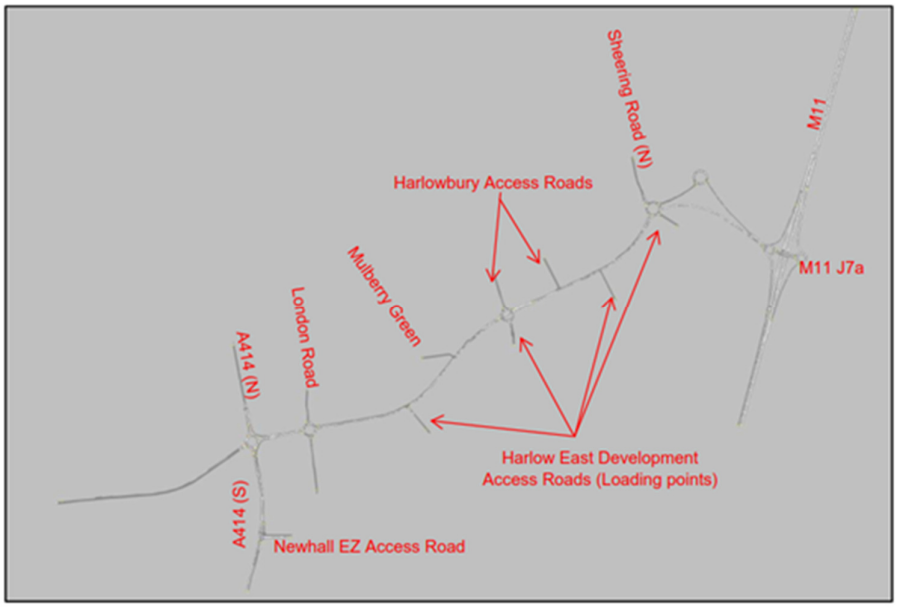
Note that Site 6 is outside our scheme boundary but affects the scheme.

The delays at site 6 in both operating years are less than compared to the situation where the scheme is not constructed (Do-Nothing situation).

A main contributor to these delays is likely to be the Harlow East Development signalised T-junction access further east causing exit blocking and grid lock. In order to tie in with the highway design for Gilden Way, one lane was assumed on the eastbound approach to the new signalised T-junction at the Harlow East Development access / egress east of Site 5 (loading point 4). The model indicated that this arrangement would cause significant delays to eastbound traffic with significant queues extending to the A414 / B183 First Avenue Roundabout. This problem was acknowledged as a pinch-point in the scheme but should be recognised to be caused primarily by a future junction. It should be noted that the layout or this particular Harlow East access point used in the operational assessment was an initial simplistic design to enable generated traffic to load onto the network. It is expected that all feasibility and design would be undertaken by site promoters/developers of this and other development sites and would form part of the masterplanning and development planning processes. These detailed assessments and further improvements, including land purchase for the junction will be considered as part of any planning application. ECC have been informed by Harlow District Council (HDC) that were necessary, would procced with the Compulsory Purchase Order to deliver a compliant junction. ECC have said that the site would be expected to achieve a sustainable travel across the site , that the promoter and developer site must deliver mode shift as well as traffic management, in order to reduce impacts on Gilden Way.

Amendments are required for the existing A414/ B183 First Avenue Roundabout junctions (i.e. just retaining the existing layouts), the junction capacity assessments suggest that these junctions will not operate satisfactory in the design year 2036 without the M11 J7A scheme and with the M11 J7A scheme. Operational assessment show that simple intervention which includes partial signalised roundabout on the A414 approaches, retaining the left turn slip roads and further widening of the roundabout to provide more storage space for traffic queueing at the internal stop lines on the gyratory would significantly improve this off-scheme pinch point. ECC have committed to address it in a low-cost separate scheme in the life of the scheme.

Figure 7.2 The extent of the Vissim modelling



A summary of the recommendations at the existing junctions along the B183 corridor is given below.

Table 7.0 Summary of recommendations informing the design.

Site	Recommendations (for scheme opening year 2021)	Recommendations (for scheme design year 2036)
4 B183 Gilden Way / Churchgate St / Harlowbury access roundabout	Through-about (hamburger roundabout) layout with traffic signal control	N/A (Through-about layout with traffic signal control is sufficient for design year 2036)
5 B183 Gilden Way / London Rd roundabout	Widening of Gilden Way arm to three lanes - two lanes westbound and one lane eastbound	Consider an additional lane for eastbound traffic between London Road and new signalised T-junction at the Harlow East Development (Loading point 4). This action is for the would be developer to carry forward. Consider local widening and introduction of traffic signals at the roundabout

6 A414 / B183 First Ave roundabout	N/A (retain existing layout i.e. priority roundabout with segregated left turn slip roads)	Partial signalised roundabout – A414 approaches, retaining the left turn slip roads Further widening of the roundabout to provide more storage space for traffic queueing at the internal stop lines on the gyratory

7.4 Grade Separated Junction and Slip Roads

7.4.1 Over bridge

Structure 1 – Proposed M11 J7A Overbridge

Type of Construction and Span Options

A principal criterion for the bridge is to keep disruption to the existing traffic to a minimum during construction and future maintenance operations. With this being considered a pier in the central reserve has been ruled out of design options and therefore a single span across the M11 will be required. For this report the existing M11 carriageway is taken as being 35m between the outside of both hard shoulders.

To minimise the span, it is assumed an N2 containment level vehicle restraint system could be installed with a set-back of 0.6m from the hard shoulder and a working width of 1.0m – W3 in accordance with BS EN 1317-2. The resulting verge width would therefore be 1.6m. This would also satisfy clause 4.7.2 of TD 27/05. This would result in a clear span of approximately 38m.

Three options have been considered for supporting the dumb-bell link road

1. Single Span Multi - Girder Composite Deck
2. 3 Span Continuous Multi - Girder Composite Deck
3. Single Span Pre-Cast Pre-stressed W17 Beams

Option 1 has been progressed further but the final option will be chosen by the Design and Build Contractor

Single Span Multi - Girder Composite Deck

The proposed option would be a multi–girder composite structure with constant depth girders. Integral abutments would be positioned at the back of the verge to keep the span to a minimum. The composite

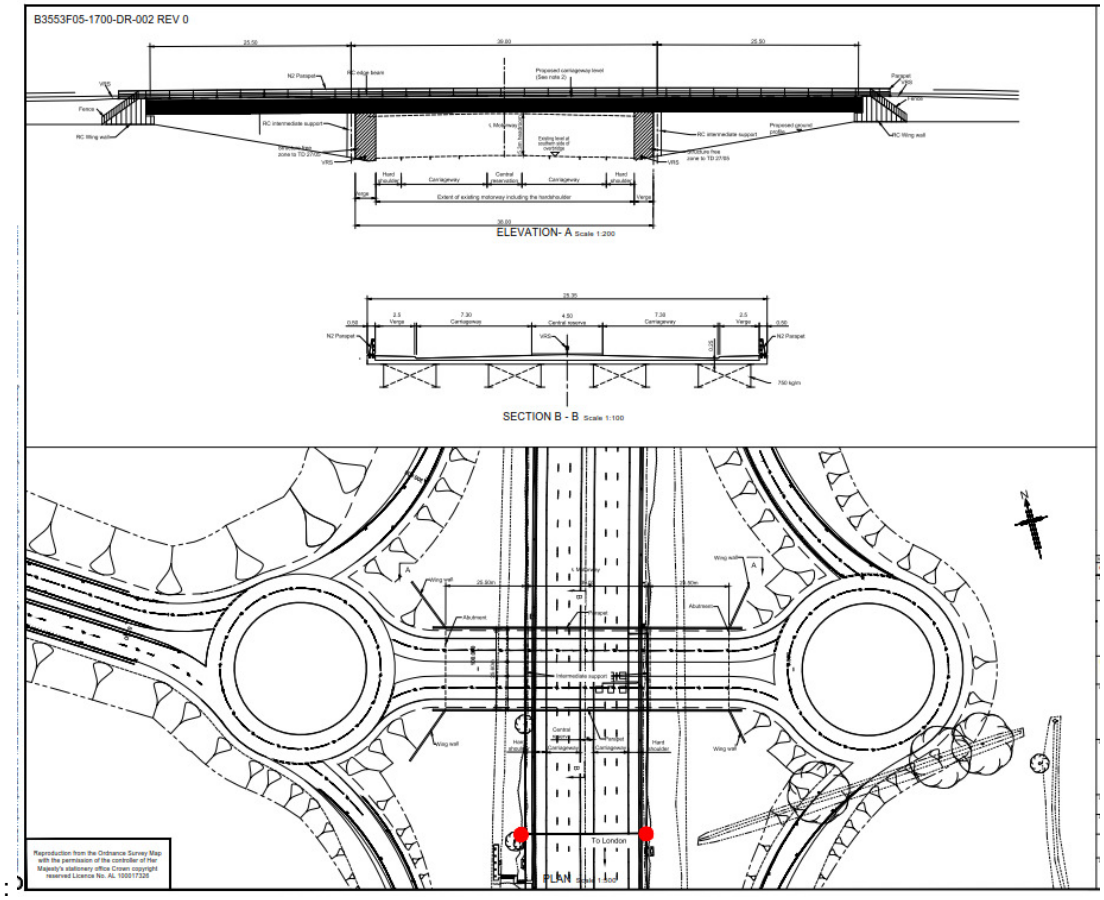
deck depth at this option stage is considered as span/20 resulting in an approximate 1.70m deep girder + 0.25m RC slab. To ensure surface water drainage a longitudinal crest curve would be created, and it is assumed for this preliminary stage that a 1 in 150 fall would be adequate. To create this the girders would be fabricated with a pre-camber. After dead load and superimposed deflection has occurred a vertical camber height of 267mm would be required to provide this fall, accommodating carriageway surface course and live load deflection. A review of the longitudinal profile of the motorway suggests that the head room clearance will not be affected by a sag curve. Therefore the total distance between existing motorway surface level and proposed bridge carriageway surface finish level = 5.3m + 1.95m + 0.267m = 7.52m.

The outline design requires 8 No. steel girders to keep the girder flange plates to a practical thickness of 50mm maximum and to enable them to be lifted in-place in pairs. The required beam length of approximately 40m will necessitate a site splice connection to be made.

The principal advantage of a single span bridge is that it will have the lowest superstructure cost. This style of bridge however is likely to be the least aesthetically pleasing and the abutments will be close to the carriageway.

The bridge will be designed with integral abutments eliminating the need for expansion joints. This is a requirement for bridges up to 60m span and will require an abutment foundation design that will ensure minimal settlement. At this stage beams have been sized as simply supported, however in further design stages it is envisaged that girder depths can be reduced at mid-span.

Figure7.3 M11 overbridge



Foundations

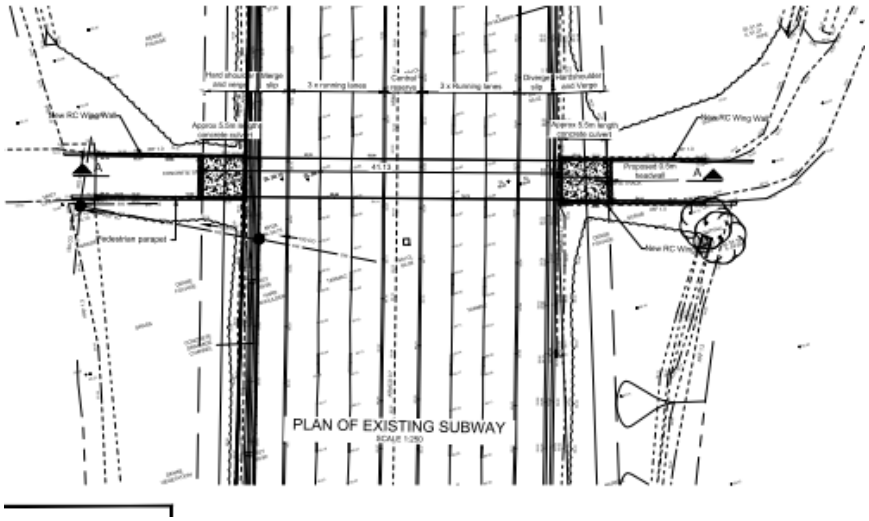
The Preliminary Sources Study Report informs that London Clay or Lambeth Sand Formations are likely to be the founding material encountered (underlying superficial deposits). Pile foundations would therefore be required to bear into the above material ignoring any contribution from superficial deposits.

7.4.2 The M11 subway

Type of Construction

The latest record Principal Inspection carried out in 2009 reports this structure to be in a good condition. The latest assessment signed in 2002 reports an assessed live load capacity of 40T HA, 45 units of HB and that the structure can sustain Abnormal Indivisible loads as Category E 259.08 tonnes on TM 1277/12 and 294.64 Tonnes on W 987/14.

Figure 7.4 Sheering Hall Subway



Both ends of the subway will need to be extended by approximately 5.5m each to support the on and off slips to the proposed junction 7A. It is considered that the internal dimensions of the existing structure will be maintained by the extended ends. The proposed solution to be put forward is to cast the new RC box structure extensions insitu – refer to drawing B3553F05-1700-DR-004 – Sheering Hall Subway. The ends of the existing box structure will be connected into by anchoring in new rebars to form an integral load transfer joint. A movement joint would not be desired at a location that would be heavily trafficked with a risk of differential settlement. The wing walls and base slabs will also be cast insitu but will not be integral with the extended RC box. The joints will be a dowel system that will be embedded into the insitu RC box extensions with a length protruding to enable casting into the wing walls and slab. The protruding length will be coated or sleeved to enable transfer of shear forces but allow horizontal movement.

The main issue with casting insitu is the duration of disruption to the existing users. Alternative routes, size and sequence of casting will need to be considered.

7.4.3 Dumbbell Roundabouts

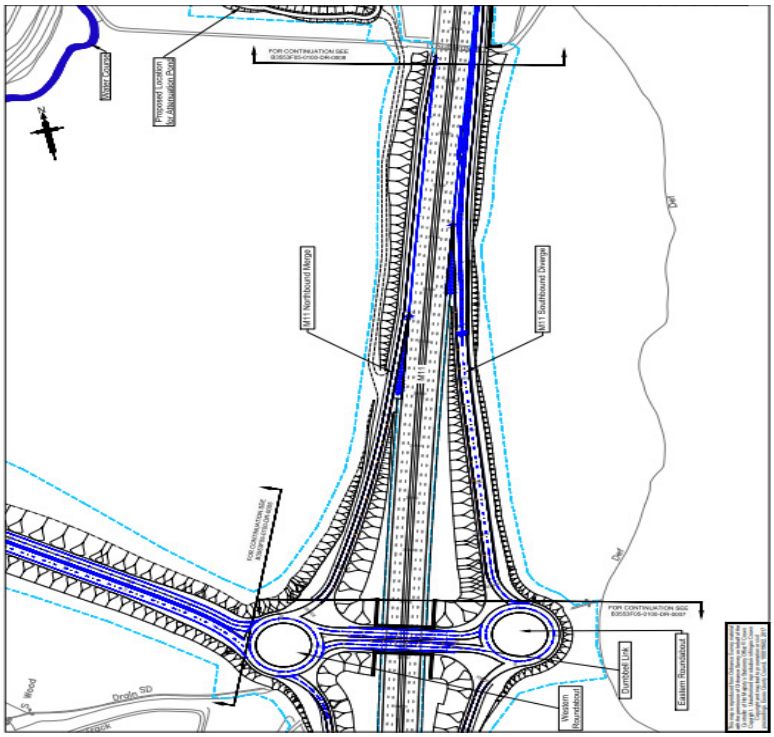
The original design for the link road was a D2AP before it was changed to D2UAP to minimise foot print and reduce the land take. However the

The circulatory carriageway, entry and exit parameters and ICD have been designed in accordance with TD16.

The central reserve for the link over the bridge has been designed as paved central reserve raised kerbs of 0.125m

7.4.4 Slip Roads, Merge and Diverges

Figure 7.5 northbound merge and southbound diverge



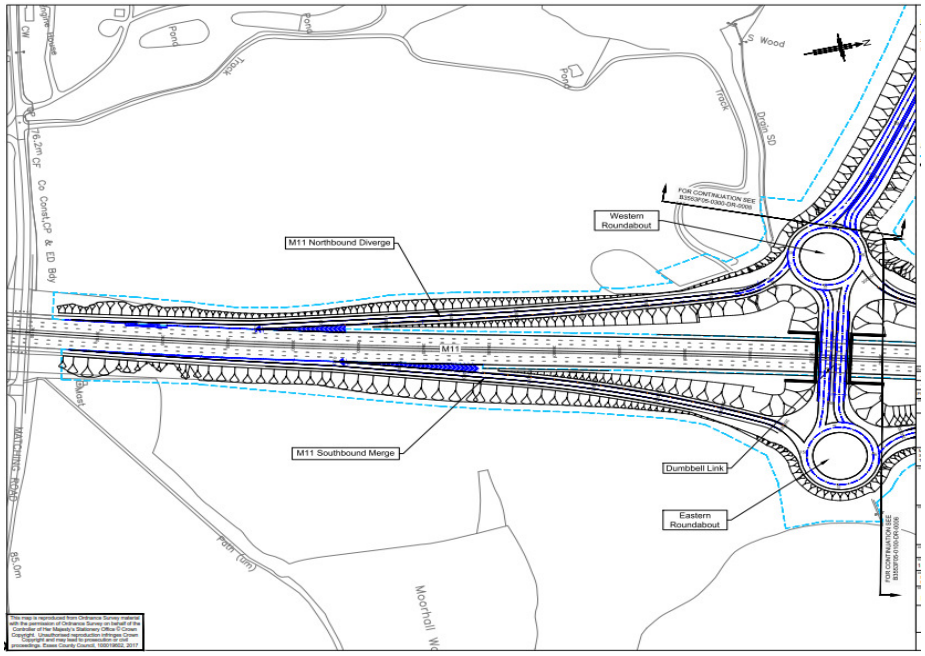
Link	Cross Section	Layout type
M11 Southbound diverge	DG2A (two lanes with a hard strip	Type B (Ghost Island)
M11 Northbound merge	MG1A (one lane with a hardshoulder)	Type B

Note:

- Layout Types and Cross sections are derived from TD 22/06 Departures
- The selected layout of the proposed M11 northbound merge is not in accordance with the requirements of TD22/06 Cl. 2.29. This is due to the substitution of Type E (lane gain merge), derived from the use of Figure 2/3 MW, with a Type B (parallel merge).
- The nose length, auxiliary lane length and auxiliary lane taper length for the proposed M11 northbound merge are not in accordance with the requirements of TD22/06 Table 4/3 for rural motorways. These lengths are amended by relaxing the road class to 'Rural All-Purpose 120kph' as described in IAN149/17 clauses 3.6 to 3.10.

• The selected layout of the proposed M11 southbound diverge is not in accordance with the requirements of TD22/06 Cl. 2.43. This is due to the substitution of Type C (lane drop at taper diverge), derived from the use of Figure 2/5 MW, with a Type B (ghost island diverge). This constitutes a Departure from Standards.

Figure 7.6 Northbound diverge and Southbound merge


Western Roundabout
M11 Northbound Diverge
M11
M11 Southbound Merge
Dumbbell Link
Eastern Roundabout
Moorhall Wood
Pond
Pond
Pond
Pond
Pond (dm)
Moorhall Wood
Dodo SD
Trock
Trock
Trock

Highways England have approved departures from standards for diverge and merges on the M11 grade separated junction. Lane gain and lane drop would have meant changing the M11 configuration resulting in massive additional scheme costs and additional land take. All departures were successfully approved by the approving authority Highways England in recognition that the proposed design is the most cost beneficial.

7.4.5 Lighting Design

Due to the nature of new alignment and to achieve compliance with the relevant standards, the Street Lighting on the M11 J7a and Gilden Way/Sheering Road link has been designed as below:

- Lighting to be provided on the entire new M11 Junction 7a scheme;
- M11 Junction 7a to be fully lit with extents of the lighting on the slip roads connecting to the M11 mainline extending from the junction for a distance long enough to provide the 5 seconds of driving at the expected traffic speed ie 156m
- Extents of the lighting on the new improved B183 Gilden Way/Sheering Road link shall be fully lit.
- Due to the requirement of a dark corridor along the old Sheering Road, to maintain the bat corridor. Column heights have been reduced to 6m and fitted with back louvers at the bat crossing points between CH375 and CH475, to reduce disturbance to bats using the bat hop over.

The new proposed M11 and associated link road passes through areas which are outstanding in wildlife and landscape. To mitigate the environmental implications in addition to reducing the energy and carbon emissions, the following measures were implemented:

- Junction lighting and extents are compliant with Institution of Lighting Professionals PLG02.
- The lanterns to have pre-set (re-programmable) dimming gear to reduce the lighting levels where the traffic flow is low in off-peak hours to provide the right amount of light in the right place and at the right time in addition to having a healthier, safer and greener network;
- having full-cut off lanterns (glare classification G4 minimum) with Light Emitting Diodes ‘LEDs’ as the light source. LED’s do not emit any ultra violet output so will have less impact on nocturnal animals, insects, flora and fauna;

The lighting levels are in accordance with BS5489-1 and BS EN 13201-2, as detailed in the table below:

Road Description	Lighting classes to BS 5489-1 & BS EN 13201-2
Gilden Way B183	M3
Gilden Way Link Road	M3
Shearing Road	M3
Western Dumbbell Roundabout	C2
Eastern Dumbbell Roundabout	C2
London Road Roundabout	C2
Churchgate Roundabout	C2
Sheering Road Roundabout	C2

7.5 Section 16

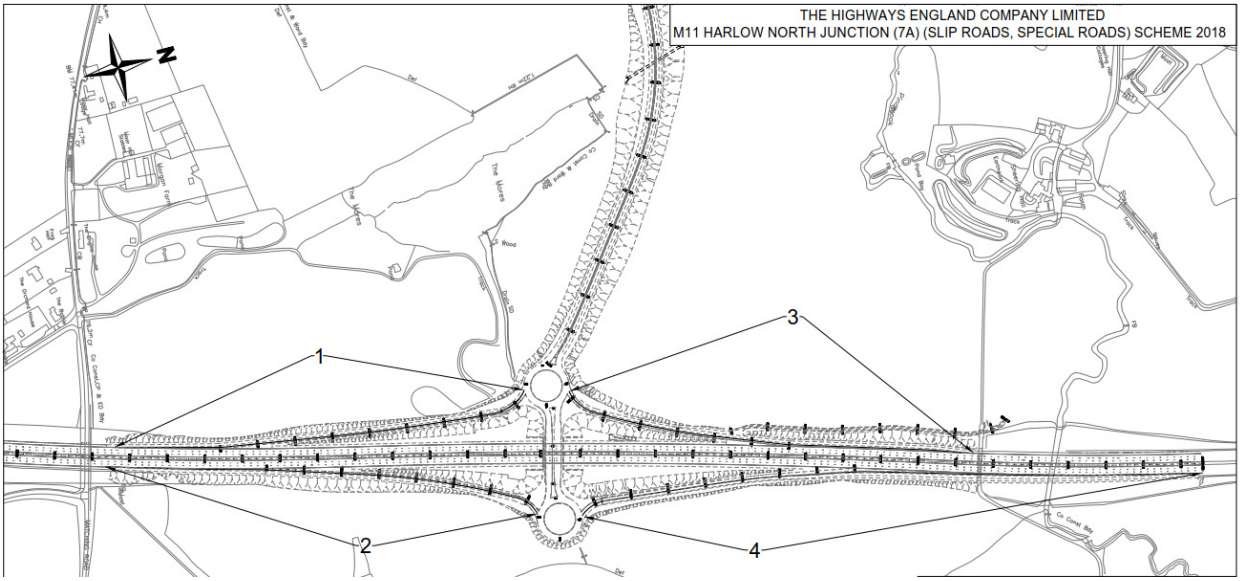
7.5.1 Special road scheme

The M11 J7A scheme provides access to the M11 Motorway, a strategic road subject to special road classification. The M11 motorway is a “special road ” for the purposes of section 16 of the Highways Act 1980 for which Highways England (as the Strategic Highways Company) are the highway authority by virtue of section 1 of the Act.

To access M11, a special roads scheme is required and under section 16 of the Highways Act, a highway authority may be authorised by means of a scheme under this section to provide, along a route prescribed by the scheme, a special road for the use of traffic of any class prescribed thereby.

A special roads scheme for the M11 slips is made under a section 16 Highways Act 1980 by HECL which will, if confirmed by the Secretary of State for Transport, authorise Highways England (and the Council on its behalf) to provide four new Slip Roads to connect the northbound and southbound carriageway of the M11 Motorway which will be provided for the use by standard motorway traffic (Classes I and II of the classes set out in Schedule 4 of the Highways Act 1980). The new slip roads are a key part of the project and the project cannot be delivered without their construction. The four slip roads are shown in the diagram below.

Figure 7.7 The Special Road Scheme showing the 4-slip roads.



Some of the land needed for the construction of the new slip roads is in Highways England ownership and will be available for the construction. Other land is subject of this compulsory purchase order made by Essex County Council. The land required for the project includes land for the diversion of the High Pressure Gas Main which is located in part of the land to be built over..

7.6 Drainage Design

The scheme drainage systems have been designed in accordance with the Highways England Design Manual for Roads and Bridges (DMRB), the CIRIA SuDS Manual 2015 and guidance from Essex County Council (ECC) as Lead Local Flood Authority (LLFA)

The Flood Estimation Handbook (FEH) (CEH,1999) has been used for the simulation of the Design Rainfall. An allowance for climate change of 30% enhanced rainfall intensity has been made for the

design of the proposed drainage systems, with sensitivity analysis of 40% checked against attenuation locations. No climate change allowances have been applied during reviews of the existing drainage systems.

7.7 Table 2.1 summarises the design return periods adopted at this stage.

Table 2.1 : Design Return Periods

Event	Return Period	Guidance
Piped network		
No surcharging of pipe	1 in 1 year (Highway Drainage Catchments B and C) 1 in 2 years (Highway Drainage Catchment A)	DMRB HD 33/16 ECC Development Construction Manual January 2012
No surcharging above formation of combined filter drains	1 in 5 years	DMRB HD 33/16
No flooding	1 in 30 years	CIRIA SuDS Manual 2015
Attenuation structures		
Ponds / Tank		
No flooding	1 in 100 years	CIRIA SuDS Manual 2015
Oversized Pipes		
No flooding	1 in 30 years	CIRIA SuDS Manual 2015
Management of exceedance flows	1 in 100 years	CIRIA SuDS Manual 2015

Based on geotechnical investigation works carried out to date, there are currently thought to be significant ground condition constraints to using infiltration-based SuDS across the scheme.

7.7.1 Gilden Way

This is proposed to contain 2 ponds and a tank as well as online storage in oversized pipes, the allowable discharge is based on existing flows into Harlowbury Brook.

7.7.2 Link road

This is proposed to contain 1 pond, the allowable discharge is based on greenfield rates

7.7.3 M11 Junction 7a

This is proposed to contain 1 pond, the allowable discharge here is based on the existing flows into the Pincey Brook from the M11 and the greenfield rates for the additional footprint of the junction.

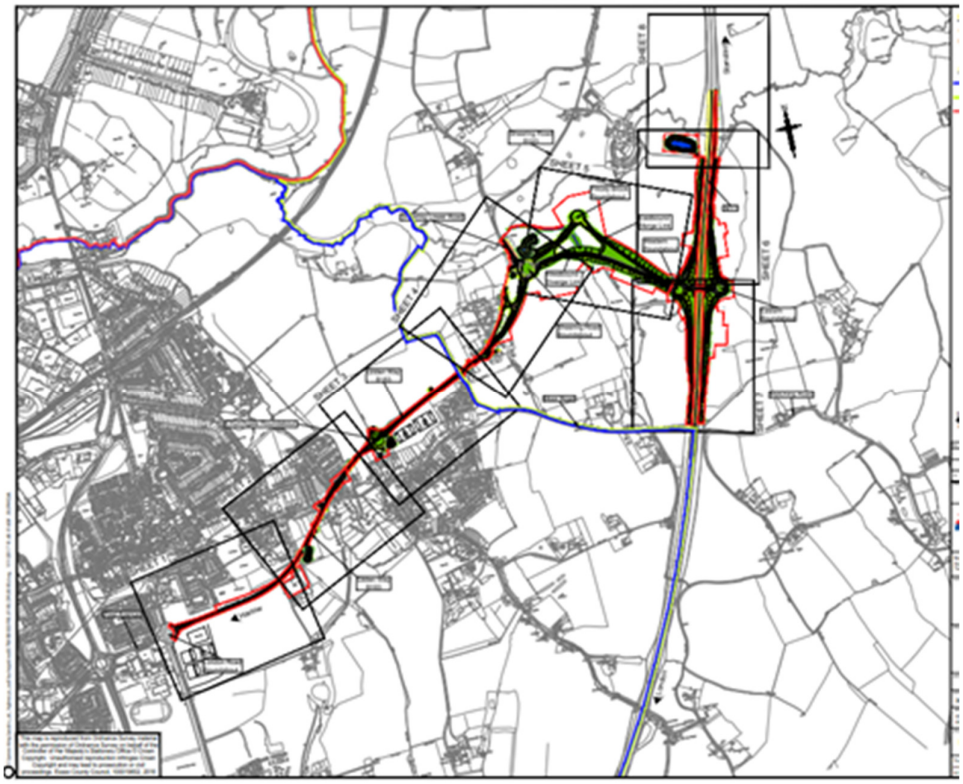
8. Development of the CPO Process

It must be noted that all land identified in the Compulsory Purchase Order plans (CPO) is required for the permanent works including the environmental impact mitigation. The land in the blue plots is required for the temporary works including the areas for the materials lay down, haul routes and the construction site compounds.

The M11 J7A scheme received Preferred Route Status in December 2016 and planning consent in June 2017 from the Local Planning Authority, ECC.

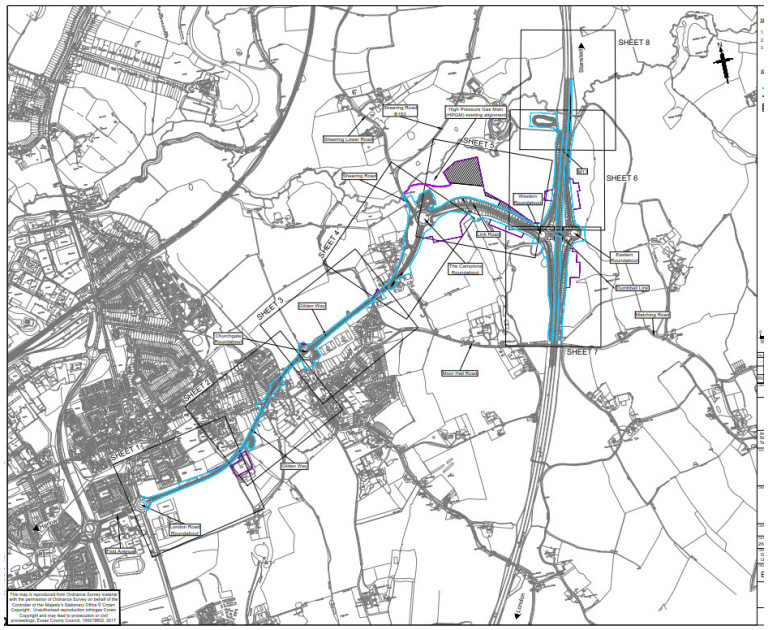
8.1.1 The consented scheme

Figure 8.1



Following on from the Redline Design Fix and the preparation of the route Status General Arrangement (GA) design, it was necessary to elaborate on the alignment design to a reasonable standard and to determine the land required for construction and operation of the scheme safely.

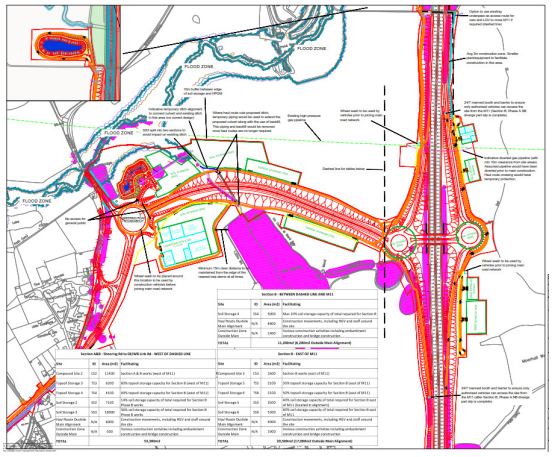
8.1.2 Figure 8.2The Phased Design


SHEET 8
SHEET 5
SHEET 6
SHEET 4
SHEET 3
SHEET 7
SHEET 1
SHEET 2
Southend
Chelmsford
Shearing Road
Shearing Lower Road
High Pressure Gas Main (HPGM) existing alignment
Western Roundabout
Eastern Roundabout
The Centre Roundabout
Kelvedon Lane
Kelvedon Road
Ford End Road
Cross Road
Boreham Road
Roundabout
Boreham Road
Roundabout
Roundabout
Roundabout

Land under category b) is required temporarily during the construction period and will be returned to the individual landowners on completion of the works.

In developing the scheme, the designers working in conjunction with Essex County Council (ECC) Project Sponsors, made reasonable efforts to retain the footprint of the scheme and works within the existing highways boundary of the B183 Gilden Way and land already in public ownership without encroachment upon private land.

8.1.3 Figure 8.3 Haul, routes, construction compounds laid down areas etc



Searches were made at the Land Registry to obtain ownership records for the parcels of land within the scheme boundary. The information obtained from the Land Registry includes:

a) Official register of land titles

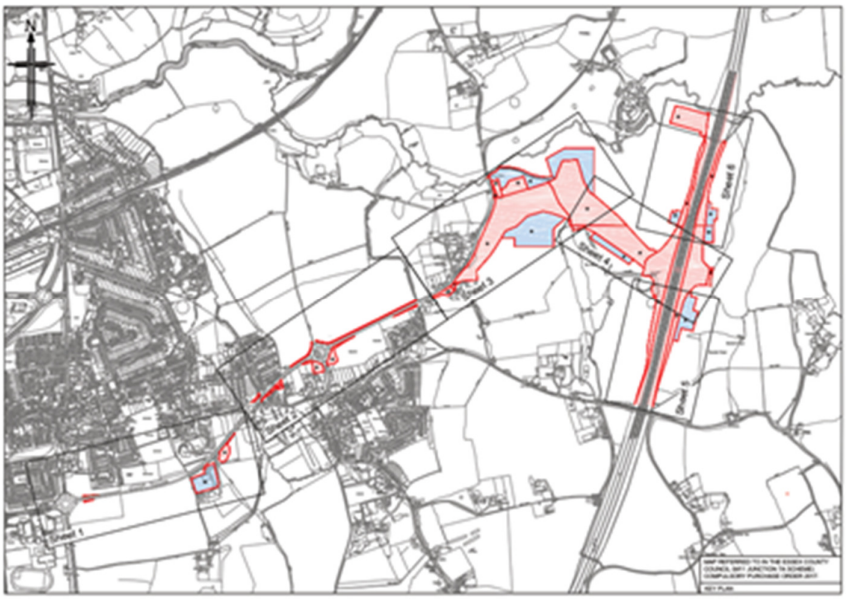
b) Boundaries of each parcel of land

c) Land in public ownership registered as highways, public rights of ways or land in ownership of Harlow District Council

d) A CPO plan was developed

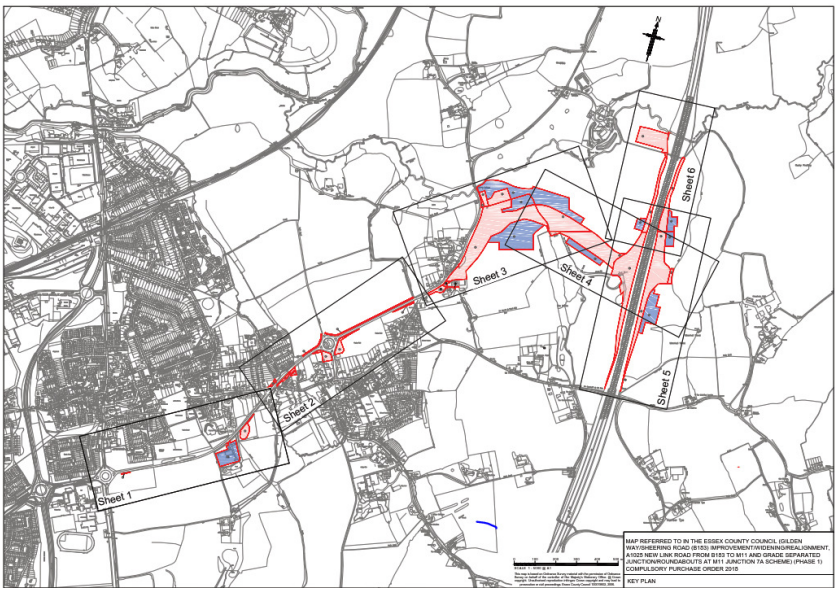
The initial CPO plans included land required for the future Phase 2b as shown below.

8.1.4 Figure 8.4 Initial CPO plans



This CPO plan included all the lands inside the redline . Consultation with the landowners carried out by Lambert, Smith and Hampton (LSH) indicated that the landowners were in favour of the land take by leaving out 2B out of the CPO for now. For detailed discussions with the farmer I refer you to Roger Moore's proof of evidence.

8.1.5 Figure 8.5 Final CPO plan after consultation



Thus, in developing the CPO the following was completed;

- A master drawing showing the parcels of land within the scheme boundary and Land Registry title references was prepared that followed on to detailed CPO maps, reference Appendix F
- A CPO schedule containing ownership information and entities interested in specific parcels, which were refined through the Section 5 responses was issued in conjunction with the maps.

Therefore, the land being sought for the development of the scheme as defined in the CPO plans is based on Land required for the permanent works, requirements for construction logistics and for the mitigations of the adverse impacts of the scheme.

9. Scheme Constructability

9.1 General Construction methodology

Throughout the development and design of the scheme the project team has held buildability workshops and considered how the scheme would be built. Construction experts have been part of the project design development and a constructability discipline one of the key teams in the project team.

Buildability in construction is a pre-construction exercise that assesses designs from the perspective of those that will build and install and carry out the construction of the works. In this project development the construability team has been an integral part of the project team. The buildability exercises have been integral to the achievement of the following;

- The desired final quality of the design of the M11 J7A including spatial arrangements.
- Optimising programming by estimates of the opening year by producing a dry run of the construction programme
- The de-risking of construction of the scheme due to addressing all perceived problems including in this case, sources of fill material, Traffic Management, site vehicular movement, haul routes, site compounds and how the scheme can be phased.
- The constructability studies have been instrumental in arriving at the total land take for the CPO plans.
- Achieving optimum value for money.

The table below summarise the phasing that is required and proves that the scheme can be constructed.

Construction Phasing Table

Main Phase	Sub-Phase	Sub-Phase Brief Description
Section A (London Roundabout [Ch0] – New The Campions roundabout [Ch2252] Including The Campions	Gilden Way (Ch0-Ch1900) Phase A	EB widening works up to the top of concrete level only including Churchgate Roundabout works
	Gilden Way (Ch0-Ch1900) Phase B	WB widening works up to the top of concrete level only

roundabout junction)	Gilden Way (Ch0-Ch1900) Phase C	New WB lane 1 works up to binder course *(Depending on the nature of widening required, Lane 1 would contain either the new widened area + half of the existing carriageway or only new widened area or only*
	Gilden Way (Ch0-Ch1900) Phase D	New WB lane 2 works up to binder course *(Lane 2 would contain the rest of the existing carriageway)*
	Gilden Way (Ch0-Ch1900) Phase E	New EB lane 1 works up to binder course *(Depending on the nature of widening required, Lane 1 would contain either the new widened area + half of the existing carriageway or only new widened area or only the existing carriageway)*
	Gilden Way (Ch0-Ch1900) Phase F	Surfacing works for all three lanes
	New Link (Ch1900-The Campions roundabout) Phase G	Offline section up to and including surfacing works
	New Link (Ch1900 - The Campions roundabout) Phase H	Tie in works
	New Link (Ch1900-The Campions roundabout) Phase I	Minor works on existing Sheering Road
Section B (East of The Campions roundabout up to M11 Dumbbell roundabout junction including N/B & S/B	Part Slips Phase A	Part construction of new slips from M11 up to existing ground level
	Phase B	New EB/WB link (part construction) and M11 over bridge

On & Off slips on the existing M11)	Phase C	New M11 dumbbell roundabout junction, remaining EB/WB link and remaining M11 slips

9.2 Site compounds

Site compounds are required for the welfare facilities for the contractor, the storage of materials and for parking plant and equipment during construction.

A site compound (CS1) has been proposed at location south side between London Road Roundabout and Churchgate Roundabout (approximately Ch:500 - Ch:600, areas known as Mulberry Green Nursery). This compound is designed to accommodate between 25-30 staff and includes; pre-fab area & material storage, plant/equipment storage, lorry holding area, welfare facilities and a car park and caravan site. Due to space constraints, the compound size has been minimised as far as reasonably practicable.

Another main site compound (CS2, 11400m2) has been proposed on the South Side of the main link road near The Campions Roundabout. This would facilitate the Section B works to the west of the M11 as well as Section A offline works (Ch1900 – Sheering Road Roundabout). This compound is designed to accommodate between 75-125 staff and provide for; a pre-fab area, material storage, plant/equipment storage, lorry holding area, welfare facilities and a car park and caravan site

A third secondary site compound (CS3, 1600m2) is proposed and located adjacent to the proposed SB diverge slipway on the eastern side. This would only facilitate Section B works in the table above (to the east of the M11). This compound is designed to accommodate between 20-40 staff and provide for; material storage, plant/equipment storage, welfare facilities and a car park

9.3 Lay down areas for top soil and haul routes

Soil storage areas have been designing to store 100% of all the stripped and required top soil and in addition act as a holding place for imported fill material.

Haul routes have been planned to be used for construction works to facilitate on-site movements of construction vehicles and shall be reinstated once they are no longer required. Where these coincides with permanent maintenance toe-drain track they will be retained for that purpose.

9.4 Earthworks management

The scheme embankments require significant volumes of fill materials, approximately 260 000 cubic metres with just over 100 000 cubic metres coming from the cut-fill balance. Over 155 000 cubic metres of the fill materials will have to be important in 20 tonne (9.2m3) road wagons.

9.5 Traffic Management

Traffic Management plans been developed for each of the phases mentioned in the Construction Phasing Table above. Simply put the TM for Gilden Way ensures that there are two narrow 3m lanes each way for running traffic to minimise disruption. There is a 1.2 m exclusion zone for the safety of the workers which has been reduced 0.5m at pinch points with the traffic speed limits reduced 30 mph. See the appended Construction Phasing

9.5.1 M11J7A consultations

For the M11 working detailed consultations have been held between Highways England, the incumbent Area Asset Support Framework Contractor. Draft Detailed Local Operating Agreements (DLOA) have been agreed to operationalise the construction of the scheme within the context of the strategy.

9.5.2 Sheering Hall Subway

The Sheering road subways is to be extended by approximately 5m each side to accommodate the merge and diverges on the M11J7A. It is proposed to close the access through the Subway structure for a temporary duration whilst the extension works are ongoing for the safety of general public the construction works.

The Principal Contractor would need to liaise with the local farmers / stakeholders and propose a diversion route prior to closing the existing access through the subway structure.

In order to create a diversion route for the period of Sheering Hall Subway extension works, we have also proposed that the importation of Fill material for the construction of E/B & W/B diverge link must not start until the Sheering hall subway extension works are finished and the underpass opened for public use.

10. Objections

1. Lack of justification for the land take for soil storage

The topsoil storage areas are used to temporarily stockpile topsoil striped from all construction areas at the beginning of construction. The stockpiles have a maximum height of 2m for safety reasons. All topsoil will be reused onsite for landscaping exposed sides of the embarkments and bunding. The topsoil sites have a capacity of 100% of the required calculated volumes from site based on the topsoil removal depth of 0.2m to remove nutrients and organic matter. The areas which are to be striped of top soil include, all constructions areas, storage areas, haul routes and compound areas. Their location is based on the following;

- Easy access to and from the road network/ haul routes
- Close to the works to minimise travel distance
- In line with overall construction programme and phasing strategy.

On completion of the whole of the works the storage areas would be reinstated and handed back to the respective land owner. Topsoil areas are shown on drawing included in Appendix H

The area required for soil storage is 38900 square metres and assuming maximum height of 5m storage the total volume stored would be 194500 cubic metres compared total fill volume of 240000c.u.m to 255987 c.u.m required for the scheme. The area is conservative.

2. Lack of justification for the acquisition of land as far as the underpass entrances below the existing M11 motorway which is vital to farm the land efficiently. Lack of clarity over maintenance of underpass during construction and thereafter

All land included in the Compulsory Purchase order (CPO) is required for road construction, essential mitigation measures or temporary works associated with the construction in which case it will be returned to the owner at completion of the works.
This particular land is required for the Northbound merge and slip road and the Southbound diverge and slip road as shown on the CPO drawings appended. The Subway is required to be extended by at least 5m each side of the M11 to accommodate the slip roads.

The departures checklist referred to previously in this PoE would show that the design has reduced the amount of land take by applying for a departure from standards. Without a departure, Type E with a lane gain would have changed the configuration of the M11 and would require substantially more land than currently taken. A departure from standards has resulted in Type B parallel merge design with less

impact on costs and land. The same can be said of Southbound diverge where a departure from Type C to Type B diverge has been obtained.

The construction of the scheme does not change the use of the underpass after construction and during construction a draft DLOA has been agreed which aims at maintaining reasonable operations of the network during the Works. However, it envisaged that the contractor may close the Sheering Hall underpass for a period of time with consultations to facilitate construction of works. However he will be required to agree diversion routes before the sheering Hall works start.

3. Lack of provision for access from the new Junction 7A and associated links into objector's land which is identified in the emerging Harlow and Epping Forest Local Plans for major residential development. Similarly, a lack of provision for the possible relocation of the Princes Alexandra Hospital. A failure to provide suitable connections between the severed parts of the development area. The Proposed Scheme therefore fails to deliver the benefits to the area but could actively prevent growth aspirations

The scheme does not preclude future connections by the developers, who would need to obtain their planning approval for their development master plans. The scheme capacity has been based on the level of growth considered reasonable by ECC in the M11J7A Vissum Strategic Model for which elements of design have been assessed using Microsimulation and other design tools. The scheme has included stubs where necessary which can be improved and developed as junctions for any future developments. Although not included in the design other traffic loading nodes have been considered in the microsimulation as potential future junctions. It is expected that all feasibility and design would be undertaken by site promoters/developers for the specific development sites and would form part of the masterplanning and development planning processes.

The Proposed Scheme does not include works for access to agricultural and retained land including access to existing borehole, continuity of water supply, demonstrable land drainage, rabbit proof /post and rail fencing and level plans to show that soil extraction does not extend into the adjacent retained land

I refer you to Roger Moore's proof of evidence for response to objections, but I will highlight here that design has developed sketches of potential accommodation works for discussion and the *Employer's Requirement* in the Design and Build contract *Works Information* has made it mandatory for the contractor to address the accommodation works required.

11. Construction costs, funding and financial viability.

11.1 Funding Source

The Project is fully funded with the funding provided by Central Government, the Local Enterprise Partnership and Essex County Council. I refer you to David Sprunt s proof of evidence for detailed breakdown of the funding.

11.2 Construction costs

The Project costs of £75m were submitted to Central Government for funding. In August 2016, the Council made a successful bid to the Department of Transport (DfT) through the South East Local Enterprise Partnership (SELEP) and received £1.5m towards the development costs.

In 2018 the scheme cost was revised down to £72m as a pre-tender estimate with the following break down ;

Cost limit (Ex VAT- ECC have said they do not pay VAT)	£65.4m
Land costs and part 1 claims	£6.6 m
Total	£72.0m

The cost limit includes an optimism bias of 3% (£1.6m). HM Treasury Supplementary Green Book Guidance advises a recommended adjustment range of 3% at the lower band up to 44 % at the higher band for Optimism Bias on standard Civil Engineering Projects as detailed below.

Recommended Adjustment Ranges

Project Type	Optimism Bias (%)[2]			
	Works Duration		Capital Expenditure	
	Upper	Lower	Upper	Lower
Standard Buildings	4	1	24	2
Non-standard Buildings	39	2	51	4
Standard Civil Engineering	20	1	44	3
Non-standard Civil Engineering	25	3	66	6
Equipment/Development	54	10	200	10
Outsourcing	N/A	N/A	41*	0*

"*The lower bound values represent the optimism bias level to aim for in projects with effective risk management by the time of contract award. Ideally by this time, the project' scope should be clearly identified, its costs robustly estimated, its risks identified and valued, and effective project and risk management strategies developed*". HM treasury Green Book

Similarly, DfT TAG Unit 1.2 section 3.5.6 recommends that cost estimates at this stage of maturity be uplifted by 3% for Optimism Bias.

Allowance of 3% was therefore been included in line with DfT guidelines.

The cost limit also includes an inflation figure of £7.7m calculated using the Building Cost Information Service (BCIS) General Civil Engineering Cost Index.

The cost Limit also included a risk quantum of (£8.3m representing the P-Mean value of the total risk quantum in the risk register. A quantified cost risk analysis(QCRA) and Monte Carlo simulation was undertaken following a risk workshop. In accordance with the Department for Transport TAG Unit A1.2 Scheme Costs, section 3.2.23, the P(mean) value was used for the purpose of project costs appraisals.

11.2.1 Contributions form Dft

In January 2017, the Council received DfT commitment to support the new junction as part of Central Government's £1.2 billion local roads funding to improve roads, cut congestion and improve journey times.

11.2.2 Delegation Power

ECC have entered into an agreement with Highways England Company Limited (HECL) in relation to the delegation of powers in relation to the Project and is able to deliver the entire Project if the Compulsory Purchase Order is confirmed.

12. Conclusion

12.1 All land included in the Compulsory Purchase order (CPO) is required for road construction, essential mitigation measures or temporary works associated with the construction in which case it will be returned to the owner at completion of the works.

12.2 The existing M11J7 and the network cannot meet the demand trips of travel from Harlow and its associated areas. The existing infrastructure prohibits housing growth and the economic development of Harlow. ECC has followed a process of identifying this need and developing a scheme to address it the objective. They have followed the processes required to achieve a planning permission and a commitment to future funding, via Scheme Business Case. They now require powers to secure land and construct the M11J7A scheme.

12.3 This evidence has shown that the scheme proposed represents the optimum means of meeting ECC's stated objectives and no alternative, considered or suggested, better meets this requirement.

12.4 As stated in 12.1 all of the land shown in the CPO is required to provide the scheme, including necessary mitigation measures.

12.5 The Scheme would enhance the facilities provided for Non-Motorised Users; providing them with an improved network of footways and cycleways.

Statement of truth

This proof of evidence is true to the best of my knowledge and I have also made clear where I have relied on others for information. Signature…….....

SEE Appendices documents for the list of appendices