
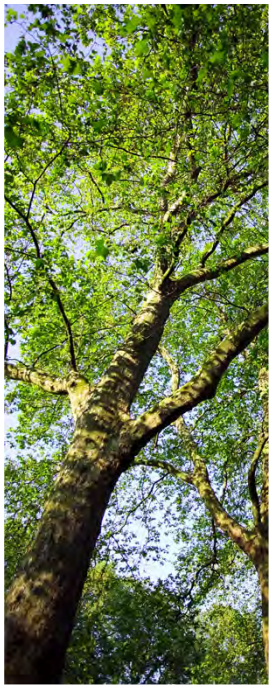


M27 Parallel Study

July 2010

Transport for South Hampshire

Mott MacDonald

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Content

Executive Summary

The development proposed in South Hampshire, including the North/North East Hedge End and North Fareham Strategic Development Areas (SDA) and the North Whiteley development, has implications for the motorway network in the area. With regards to the scope of this report, the access to and across the M27 motorway will be impacted by the new travel patterns that the developments will create.

This report reviews the existing layout of the M27 Junctions 7, 8, 9, 10 and 11, and suggests possible at-grade improvements that could increase capacity at each location to mitigate against the traffic flow generated by the development.

Junction 7 is considered to be fully developed, and the scope for improvement is limited to bus priority at the signal controlled junctions.

Junction 8 and Windhover Roundabout currently cope with existing traffic volume although flows are approaching saturation point. Signalisation of Junction 8 would help accommodate the additional development traffic flows, and additional capacity could be created by widening the carriageway at the junction to accommodate more traffic lanes and create Segregated Left Turn Lanes (SLTL). All findings rely on a new or improved link road being constructed from the North/North East Hedge End SDA to Junction 8 to avoid the Hedge End urban area.

Within the existing junction footprint there is limited scope for improvements at the Windhover Roundabout. A traffic route prioritising flows east/west along the Junction 8/A3024 Bursledon Road corridor (Southampton City Council's preferred traffic route) could be implemented by amending road markings on the roundabout. However, a new link within the roundabout to serve the Bursledon Road / Hamble Lane traffic, coupled with lane improvements and signalisation of the other approaches, may also offer a significant increase in capacity.

There are a number of options for increasing traffic capacity at Junction 9. By creating SLTL, traffic flows could be improved for journeys to/from the Whiteley development and destinations to the east of Junction 9. However, improvements to Junction 9 need to be considered in association with its neighbouring junctions.

Junction 10 provides the greatest potential for providing improved access to the motorway from the North Fareham SDA to the north. Upgrading Junction 10 to an all direction access/egress interchange could provide access for a high volume of traffic coming from the north/SDA.

There would be a requirement for larger scale works to those proposed to the other junctions in this report (in the region of £4-14M).

Junction 11 has limited access to the North Fareham SDA and requires a link-road or a realigned A32 to be implemented. To improve the traffic flows at the junction to accommodate the additional traffic generated by the SDA, signalisation of the junction and SLTL on the motorway off-slips flow could be constructed. Widening the link to the Delme Roundabout to four lanes would also improve the capacity of Junction 11.

This report is conceptual in its nature. As part of the Stakeholder consultations the Highways Agency have been involved in the in principal discussions surrounding potential improvements at the motorway junctions.

1. Introduction

As part of the development plans for the South Hampshire area, this report will review the existing layouts of Junctions 7, 8, 9, 10 and 11 on the M27 Motorway, and suggest potential way of improving the flow of traffic through and across the Junctions.

The South East Plan allocates a total of 80,000 dwellings for the South Hampshire sub region. Of this total 6,000 are allocated for the North / North East Hedge End Strategic Development Area (SDA), a further 3,000 dwellings are allocated for the Whiteley development, and 10,000 dwellings at the North Fareham SDA (this figure has since been revised to 7,500 dwellings). Employment areas are also proposed at North / North East Hedge End SDA and North Fareham SDA.

Inevitably, the proposed development sites will generate additional trips which will impact on the local highway network.

The M27 is a barrier between the development sites and the urban conurbation to the south. This study aims to identify potential means of providing improved capacity at each of the motorway junctions, and also within the existing junction footprints.

Mott MacDonald was commissioned to provide initial engineering feasibility advice regarding the potential to upgrade key junctions on the existing road network. Approximate costs are provided.

2. M27 Junction 7

2.1 Existing Junction Layout and Traffic Controls

The existing M27 Junction 7 is a grade separated junction, between the M27 (D3M standard), A334 (Charles Watts Way) and B3036 (Upper Northam Road).

The junction comprises a five arm roundabout, situated above the motorway. Two-lane slip roads connect the motorway to the local road network.

The A334 between Botley Road and the motorway is a dual two lane (D2AP) road. West of the junction, into Southampton, the A334 is a single carriageway road.

Each arm of the roundabout is traffic controlled. At present, the junction experiences heavy traffic flows throughout the day, due to the existing retail park accessed via the A334.

In describing the potential to upgrade the junction's geometry, the study has considered the eastern and western halves the roundabout separately.

2.1.1 East Side

A Segregated Left Turn Lane (SLTL) from the M27 southbound off-slip is already provided to the eastbound dual carriageway of the A334.

On the A334 approach to the junction, a third lane has already been constructed which comes from the retail park, limiting the opportunity for widening improvements. The remaining two lanes take traffic that would be created by the North Hedge End SDA.

Traffic signals control all junction arms.

2.1.2 West Side

To the west of the motorway, A334 Charles Watts Way comprises a two-way carriageway. There is an existing three lane flare to ease the traffic flow across the roundabout.

A three lane approach is provided on the motorway's northbound off-slip.

Traffic signals control all junction arms.

Within the existing layout, it is assessed that the junction is developed to its optimal potential.

2.2 Review of existing traffic conditions at peak times (anecdotal)

There are significant traffic movements at present during peak hours, associated with Junction 7, with queuing on all approaches due to the signalised approaches. It is clear that the junction works well below its capacity during off-peak hours. A traffic survey is required, to provide current data on traffic flows and turning movements, especially during peak times.

The preferred access strategy for the North / North East Hedge End SDA to access the wider network is via Junction 8. However there will be some traffic which will prefer to travel via Junction 7. Given the stress that this junction currently operates under, particularly in the peak periods, additional traffic is likely to create problems which need to be mitigated against.

2.3 "At Grade" Junction Improvement Options

The objective of the engineering assessment is to offer solutions for the improvement of Junction 7, in order to increase the Junction capacity.

The junction is developed to an optimal level; only minor upgrades to the layout can be achieved at-grade. Due to the roundabout being situated above the motorway, widening of the circulatory carriageway would come with very high cost implications. The junction is already signalised, and therefore only very minor improvements could be made by adjusting signal phasing. Even then, improvements in one corridor could be to the detriment of another.

With regards to the options available for widening/altering the junction layout it is considered unfeasible to provide SLTL on the M27 Northbound off-slip. This is due to the radius required to complete the manoeuvre onto the A334, traffic merging into a single lane on the A334 and existing land boundaries.

To solve the problem, "progressive" approaches should be considered, including improving the public transport services, car sharing and work place travel plans. Bus priority measures which could be implemented include;

- MOVA (Microprocessor Optimised Vehicle Actuation) - Bus Priority: A system using Selective Vehicle Detectors (SVD), via loops in the carriageway, which distinguish buses from other vehicles. The traffic signals are then triggered to give more green time to the congested traffic flows that contain the bus, and minimises excessive disruption to other traffic.

- Automated systems such as bus mounted cameras, roadside CCTV or roadside fixed cameras.

2.4 Approximate Costs

Implementation of MOVA Bus Priority System – Approx £200K minimum.

3. M27 Junction 8 and Windhover Roundabout

3.1 Existing Junction Layout and Traffic Controls

The existing M27 Junction 8 is a grade separated junction, located to the North/East of Southampton.

The junction comprises a four arm priority roundabout, situated beneath the motorway. Dodwell Lane and Bert Betts Way are accessed directly from the junction, with Windhover Roundabout providing additional connections to the A27, A3024 and A3025.

3.2 Review of Existing and Proposed Traffic Conditions

Significant traffic movements across Junction 8 have been observed during the morning peak. Currently there are no traffic signals installed at this junction.

The preferred access strategy for the North / North East Hedge End SDA is via Junction 8, as this would accord with Southampton City Council's preferences.

A TRANSYT model has been created for the junctions and forecast development traffic flows added. The model was created from a number of sources and used historical count data at Windhover Roundabout together with link flow data at Junction 8 and assumed turning movements. As the data was collected from a number of sources, it has been factored up to obtain the predicted traffic flows through the interchange. The data shows that there is saturation even before the development traffic flows are added. As the model is therefore an approximation it is suggested that the data be validated on site before the design concepts are taken forward to the detailed design stage.

The morning peak results show that at Junction 8 the Dodwell Lane and Bert Betts Way approaches would both be over saturated at 119% and 124% respectively. Windhover Roundabout is also over saturated on several approaches with Bert Betts Way left lane at 138%, Hamble Lane at 121% and Bursledon Road at 109%.

The evening peak results show that at Junction 8 the Bert Betts Way approach is again over saturated at 103% and the eastbound off-slip at 138%. Windhover Roundabout is also over saturated on several approaches with Bert Betts Way left lane at 120%, A27 Providence Hill at 123%, Hamble Lane at 119% and Bursledon Road at 124%.

3.3 "At Grade" Junction 8 Improvement Options

Introducing signal control on the roundabout could increase junction capacity by giving additional green time to the critical traffic links (Dodwell Lane and A3024 Bert Betts Way). Controlling the traffic by signalisation could help the roundabout operate more freely and assist the traffic entering from the uncontrolled approaches.

After the provision of signal control measures, if the road network struggles to accommodate the additional development traffic, widening and segregation measures could be introduced. Parallel to the signal control, changes to the junction layout such as carriageway widening, provision of SLTL and auxiliary lanes on the approaches, could improve the roundabout operation.

Considering "at grade" interventions for junction improvement and depending on the traffic assessment and data, the following options are considered.

A. No works to be carried out.

B. No changes to the junction geometry, but introduction of traffic signals control. Timed signalisation or vehicle actuation traffic signal control/traffic loops.

C. MOVA control strategy, HA standard control strategy for signalised Junctions on trunk roads, (TD 35/06).

D. Alter junction's layout, providing additional lane capacity with a combination of B or C. Provision of SLTL at the westbound on- and off–slips and the eastbound on-slip. It is unclear at this time whether the proposed SLTL can be constructed with or without building beyond the existing kerb line. Both scenarios have been estimated in section 3.6 of this report.

E. Junction's layout altered/additional lane capacity with combination of B or C. Widening the circulatory carriageway to three lanes.

F. Junction's layout altered/additional lane capacity with combination of B or C. Widening the circulatory carriageway to three lanes and provision of SLTL at the westbound on- and off – slips. Widening the existing carriageways should provide cross-sections complying with TD27. To make the best use of the available space, all spare space shall be used. The

widening will be at the expense of the adjacent verges. The structure should be protected by H2 containment level VRS, as the minimum verge widths and set-backs shall comply with the requirements of TD27.

G. Exit from Junction 8 onto Dodwell Lane to be widened to two full lanes for at least 100m. Entry onto Junction 8 from Dodwell Lane to be two full lanes for at least 50m.

In order to accommodate Heavy Goods Vehicle (HGVs), the running lane widths should be maintained to 3.5m. The minimum lane widths should ensure the safety of the road maintenance operations and the mobility of emergency services. If any narrow cross-sections are unavoidable, the Designer should submit a Departure from the Standards to the Highways Agency (HA).

As widening the circulatory carriageway will bring the traffic closer to existing structures, the designer should consider the risk of collision with the structure and refer to BD48 for assessing the structure supports to vehicle impact.

3.4 Windhover Roundabout - Existing Layout and Traffic Controls

Windhover Roundabout is a five-arm non standard shape, normal type roundabout. The roundabout is sited on level ground. Three of its approaches, (i.e. A3024/ Bursledon Road (towards Southampton), A27/ North, A27/South) are single carriageways. The A3025 Hamble Lane for approximately 300m is a dual carriageway (mainly to provide a turning lane into the Tesco superstore), then converting into a single carriageway. Only A3024, Bert Betts Way, in the eastern direction towards Junction 8 is a dual carriageway.

Existing flared approaches and exits allow better traffic flow capacity, as two vehicles can enter and leave the roundabout at the same time on a particular arm.

Two of the approaches, A3024 Bursledon Road and A3025 Hamble Lane are traffic signals regulated. The remaining three approaches are uncontrolled.

At present the roundabout operates close to capacity during peak hours, resulting in queuing in all directions. With the new development traffic, it is anticipated that increased and unbalanced traffic flows at the

entries will adversely affect the ability of the roundabout to self-regulate itself.

3.5 "At Grade" Improvement at Windhover Roundabout

As capacity is reached, the measures to improve the traffic flows include;

a. Rearrangement of the road markings to prioritise traffic flows on the A3024 corridor;

b. Introduce signal control on all approaches to Windhover Roundabout (although the TRANSYT model results show that the A27 West End Road does not require it). Installation of MOVA controls;

c. Widening the entry width to three lane approach may be beneficial on the A3024, Bursledon Road approach to the roundabout;

d. Additional lane on Bert Betts Way for left turning traffic only;

e. Additional lane on circulating carriageway at A27 Providence Hill;

f. Hamble Lane approach to be 3 full lanes for at least 80m from stop line;

g. New link through the centre of the roundabout for traffic from Bursledon Road to Hamble Lane, combined with widen the Bursledon Road approach to provide additional lanes into the new link road.

h. Combine options c, d, e, f and g

The introduction of a 'hamburger' style junction has been considered but the issues over disruption to the A27 and access to the Tesco superstore have ruled out this option.

3.6 Approximate Costs

The cost estimates for the considered options are based on SPON'S, Civil Engineering and Highway Works Price Book 2010 approximate method.

All Purpose Roads prices include for earthworks, structures, drainage, pavement, road markings, studs, signs, vehicle restraint systems, statutory undertakings and landscaping as appropriate to the type and location of the carriageway. The earthworks elements as earthworks Depth and Ground Conditions are adjusted with reference factors (K_D & K_{GC}) taken from the book. The Junctions area is considerably flat, K_D =1 and K_{GC} =1. The average earthworks proportion of the above prices is assumed to be 33%. The rest of the works is 67%. The prices are approximate costs per metre run of roadway and are based on information from a number of sources, including engineering estimates, tenders, final account values, etc, on a large number of highway contracts.

The prices for All Purpose Roads do not include the costs of associated features such as interchanges, bridges, culverts, Junctions, roundabouts, etc. The values of these are shown separately beside the cost range. All prices are the cost per metre run of the road.

The table below summarises the proposed option costs. It is important to highlight that these costs are very approximate, based only on linear rates which are anecdotal, and do not include ancillary costs such as land purchase, traffic management and site accommodation.

Option	Description	unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000) (A+B)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
Junction 8												
A	No works								0	0	0	0
B	Traffic Signals -Average unit cost	nr	24		250				6	0.6	3.9	10.5
C	Traffic Signal Control/MOVA	Item							100	10	65	175
D1	SLTL, M27 Westbound On-slip, 3.7m wide, within existing kerb line	m		300	770	231			231	23.1	150.15	404.25
D1a	As above, but requiring build out beyond existing kerb line	m		300	3000	900			900	90.0	585.0	1,575.0
D2	SLTL, M27 Westbound Off-slip, 3.7m wide	m		250	770	231			231	23.1	150.15	404.25
D2a	As above, but requiring build out beyond existing kerb line			250	3000	750			750	75.0	487.5	1,312.5
D3	SLTL, M27 Eastbound On-slip, 3.7m wide	m		250	770	231			231	23.1	150.15	404.25

Option	Description	unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000) (A+B)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
D3a	As above, but requiring build out beyond existing kerb line			250	3000	750			750	75.0	487.5	1,312.5
E	Widening the roundabout circulatory carriageway			500	770	385			385	38.5	250.25	673.75
F(a)	Options C+D+E, assuming works remain within existing kerb-line								941	94.1	611.65	1,646.75
F(b)	Options C+D+E assuming works extend beyond existing kerb-line								2,885.0	288.5	1,875.25	5,048.75
G	Widen Dodwell Road access/egress from Junction 8 to two lanes for 50/100m			150	350	52.5			52.5	5.25	34.13	91.88
Windhover Roundabout												
a	Alterations roadmarking on circulatory c'way								35.0	3.5	22.75	61.25
B	Full Traffic Signal Control/MOVA								150.0	15.0	97.5	247.5

Option	Description	unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000) (A+B)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
c	Widening the entry width to three lanes on the A3024, Bursledon Road			150	350	52.5			52.5	5.25	34.13	91.88
d	Additional lane on Bert Betts Way for left turning traffic only			400	770	308.0			308.0	38.0	200.20	539.0
e	Additional lane on circulating carriageway at A27 Providence Hill.			80	350	28.0			28.0	2.80	18.20	49.00
f	Hamble Lane approach to be 3 full lanes for at least 80m from stop line.			80	770	61.6			61.6	6.16	40.04	107.80
g	New link through the centre of the roundabout for traffic from Bursledon Road to Hamble Lane, and widen Bursledon Road approach to provide additional lanes into new link road			80 80	2000 350	160.0 28.0		37,000	197.0 28.0	19.7 2.8	128.05 18.20	393.75
h	Combine options c, d, e, f and g			n/a	n/a	638.1		37,000	675.1	67.5	438.8	1181.4

4. M27 Junction 9

4.1 Existing Junction Layout and Traffic Controls of Junction 9, M27

The existing M27 Junction 9 comprises a six arm roundabout, situated above the motorway. The junction is a grade separated junction formed between the M27 (D3M standard), A3051 (Southampton Road) and Whiteley Way. Two-lane carriageway slip roads connect the motorway to the local road network. There are additional access/ egresses to a highways depot and Hill Coppice Road which leads to a small residential estate. A3051 Southampton Road is a dual two carriageway road (D2AP). Whiteley Way (not a trunk road) is a dual carriageway.

The two traffic flows coming from the motorway and A27 are signal controlled. There is no traffic signal control on the arms for Whiteley Way and the two access roads. The circulatory carriageway of the roundabout comprises three signal controlled lanes.

Whiteley Way is a dual carriageway, and on the approach to Junction 9, Whiteley Way flares to three lanes. The Whiteley Way approach to Junction 9 currently experiences congestion during peak times (particularly in the evening).

At the west-bound on-slip to the motorway, there is a SLTL for traffic from the A3051 (Southampton Road).

4.2 Review of existing traffic conditions at peak times (anecdotal)

Junction 9 carries the traffic from the A3051/A27. Whiteley village to the north of the Junction is almost exclusively accessed from Junction 9. Consideration needs to be given to the development proposed in the Whiteley area and the implication this will have on Junction 9.

At present, the Junction 9 operates at the limits of its capacity with traffic queues and delays during the peak hours. Particularly heavily loaded are the entries from Whiteley Way and the westbound off-slip of the M27.

4.3 "At Grade" Junction Improvements

In order to mitigate the increased traffic loading that a development to the north of the Junction would create, an engineering assessment has been carried out, and solutions to increase capacity for M27 Junction 9 are proposed below.

It should be noted that there is a possibility (the bridges' deck width and strength allowing) to widen the three lane circulatory carriageway to four lanes, although at this stage, the intervention is not considered feasible due to the substantial cost implications. However, ensuring two lanes of prioritised traffic flow from Whiteley to Southampton is the major requirement in order to provide efficient traffic flow. To achieve that the following interventions are proposed:

A. Do nothing

B. SLTL on the existing M27 eastbound on-slip road. Minimum width of 3.5m should be maintained. It is unclear at this time whether the proposed SLTL can be constructed with or without building beyond the existing kerb line. Both scenarios have been estimated in section 4.4 of this report;

C. SLTL on the existing M27 westbound off-slip road. Minimum width of 3.5m should be maintained. It is unclear at this time whether the proposed SLTL can be constructed with or without building beyond the existing kerb line. Both scenarios have been estimated in section 4.4 of this report;

D. Close down the access/egress from Hill Coppice Road;

E. Combination of B, C, and D listed above. The minimum lane widths should ensure the safety of the road maintenance operations and the mobility of emergency services. If any narrow cross-sections are unavoidable, the Designer should submit a Departure from the Standards to the Highways Agency;

F. The following measures are essential in order to improve the traffic in the area and relieve the traffic congestion at Junction 9, M27;

   - Provision of improved public transport provision;
   - Better bus links between Whiteley and Swanwick railway station, via Yew Tree Drive.

4.4 Approximate Cost

The cost estimates for the considered options are based on SPON'S, Civil Engineering and Highway Works Price Book 2010 approximate method.

All Purpose Roads prices include for earthworks, structures, drainage, pavement, road markings, studs, signs, vehicle restraint systems, statutory undertakings and landscaping as appropriate to the type and location of the carriageway. The earthworks elements as earthworks Depth and Ground Conditions are adjusted with reference factors (K_D & K_{GC}) taken from the book. The Junctions area is considered flat, K_D =1 and K_{GC} =1. The average earthworks proportion of the above prices is assumed to be 33%. The rest of the works is 67%. The prices are approximate costs per metre run of roadway and are based on information from a number of sources, including engineering estimates, tenders, final account values, etc, on a large number of highway contracts.

The prices for All Purpose Roads do not include the costs of associated features such as interchanges, bridges, culverts, Junctions, roundabouts, etc. The values of these are shown separately beside the cost range. All prices are the cost per metre run of the road.

The table below summarises the proposed option costs. It is important to highlight that these costs are very approximate, based only on linear rates which are anecdotal, and do not include ancillary costs such as land purchase, traffic management and site accommodation.

Option	Description	unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
Junction 9												
A	No works								0.0	0.0	0.0	0.0
B(a)	SLTL, M27 eastbound on-slip	m		250	770	192.5			192.5	19.3	125.3	337.1
B(b)	As above, but requiring build out beyond existing kerb line	m		250	3000	750.0			750.0	75.0	487.5	1,312.5
C(a)	SLTL, M27 westbound off-slip	m		400	770	308.0			308.0	30.8	200.2	539.0

Option	Description	unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
C(b)	As above, but requiring build out beyond existing kerb line	m		400	3000	1,200			1,200.0	120.0	780.0	2,100.0
D	Close access to Hill Coppice Road		1		20,000	20			20.0	2.0	13.0	35.0
E	Combine Options B, C and D.	Item							520.5	52.0	338.5	911.1

Option	Description	unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
E	Combine Options B, C and D, as above, but requiring build out beyond existing kerb line	Item							1,970.0	197.0	1,280.5	3,447.5
F	Improved public transport	Item	Non quantifiable at this time.									

5. M27 Junction 10

5.1 Existing Junction Layout and Traffic Controls at Junction 10, M27

Junction 10 has only eastbound on- and westbound off-slips. There is also an existing problem with traffic from Fareham queuing on the northbound A32, to perform U-turns as a means of accessing the M27 eastbound on-slip.

The brief was to provide options for the missing west facing eastbound off- and westbound on-slips. As a sub-option of these, restricting access from the south and investigation of a bus only connection from the south were investigated as a means of avoiding increased traffic flows on the A32 to the south of the M27. These works are being considered in conjunction with increasing capacity at Junction 11.

5.2 Provision of an Eastbound Off-slip, M27 Eastbound to A32

There is considered to be only one viable option that being a conventional slip road, as illustrated in both layout options with a desirable minimum radius in accordance with the Design Manual for Roads and Bridges (DMRB). To reduce the impact on the development land, a reduction of the radius could be considered though this is likely to require a Departure from Standard.

The junction with the A32 has been shown as a merge type for northbound traffic with a right turn stub being shown as a sub-option to allow traffic to travel south on the A32.

It is considered that this junction would require signal control for safety reasons, due to the acute angle of junction. This would also reduce the impact on development land. Another advantage of signalisation is that it retains control of queue with the Highway Authority land.

For options that restrict access from the south onto the eastbound M27 the facility to U-turn at the end of the existing dualled section would need removing, thus forcing traffic to go north to Knowle Village roundabout or access M27 eastbound via Junction 11.

5.3 Provision of M27 Westbound On-slip

Two layouts have been considered for providing this manoeuvre, one being converting the existing westbound loop to a two way loop utilising as much of the existing carriage asset as possible. The design standard for interchange (TD22) clearly distinguishes between loops and slips. In the case of loops, a significantly reduced horizontal radius

is permitted and that shown in Layout 1 is a 75m loop radius, this being the minimum permitted in the standard.

The other, Layout 2, is the provision of a link road from north of M27 over the motorway to connect to the M27 westbound, west of Junction 10. The disadvantage of this option is considered to be the cost of crossing the M27 and the general increase in cost associated with environmental impacts.

The two layouts have very different A32 Junction issues. Although Layout 2 has a greater cost and environmental penalty, the junction with the A32 north of the M27, again signalised, gives more options for restricting access to the south and providing bus only facilities.

With Layout 1 the confined nature of the junction means that, without taking properties, the capacity for and the provision of a bus only north/south connection would be more difficult. The latter option is only likely to be achievable with the introduction of traffic orders, thus adding enforcement as a potential issue.

5.4 Approximate Cost

It is important to highlight that these costs are very approximate, based only on linear rates which are anecdotal, and do not include ancillary costs such as land purchase, traffic management and site accommodation.

Estimate for Junction 10 alternative layouts at 2010 prices are:

- Layout 1

£2.280M construction cost, £0.280M design costs, optimism bias £1.482M

Total Cost £4.042M

- Layout 2

£8.210M construction cost, £0.821M design costs, optimism bias £5.337M

Total Cost £14.368M

6. M27 Junction 11

6.1 Existing Junction Layout and Traffic Controls of Junction 11, M27

M27 Junction 11 serves as an access for the Gosport area to the motorway. The four arm roundabout has access to/from the motorway in both directions and a link to the south to the A27. Currently the A27 access to the roundabout and the M27 off-slips are controlled by traffic signals. There is also a link to the north of the junction to Boarhunt Road, which serves a rural area. The link to Boarhunt Road seems to act as an unofficial car park – presumably for people sharing a lift into Fareham/Gosport from this point.

Currently there are heavy traffic flows into and out of Fareham/Gosport during peak hours, which causes queuing on the M27 eastbound off-slip and the A27 link road.

6.2 Review of Traffic Modelling

By factoring up historical (2006) traffic count data, a TRANSYT model has been created for this junction and estimated development traffic flows added. The model is an approximation and data should be validated on site before design concepts are taken forward to detailed design.

The traffic model shows that before any development flows are added the junction is already working at saturation in the peak hours on the westbound off-slip.

The morning peak results show that both of the motorway off-slips would be overloaded. On the eastbound off-slip the left hand lane would be at 113% saturated with the circulating lanes at up to 97%. The westbound off-slip would be even more saturated with 130% on the left hand lane and 100% on the circulating lanes.

The evening peak results show that both off-slips would again be over saturated at 105% and 130% for eastbound and westbound respectively. The most saturated approach however, is the southbound approach from Boarhunt which is 150% saturated.

6.3 "At Grade" Junction Improvement Options

A. Introducing traffic signal control at southbound entry from Boarhunt with two full lanes on the entry and three lanes on the circulating carriageway.

B. There is an option to install SLTL on both eastbound and westbound off-slips to increase capacity across the junction. It is unclear at this time whether the proposed SLTL can be constructed with or without building beyond the existing kerbline. Both scenarios have been estimated in section 6.4 of this report;

C. Options A and B combined.

D. Widen existing three lane southbound link to Delme Roundabout to four lanes.

Introducing all of the above measures would bring all the links comfortably below 100% saturation.

Simply adding an additional lane on the westbound slip, does not provide adequate capacity. The majority of this traffic is turning left and providing two full left turn lanes and one lane for traffic proceeding round the roundabout is not sufficient. With almost 2000 vehicles turning left a single free flow lane would struggle to cope with the traffic.

Two lanes turning left on a free flow, and a single lane signal controlled onto the roundabout would provide sufficient capacity. Ideally two lanes exiting the roundabout on to the A27 Eastern Road should be maintained with four lanes continuing south as far as the slip road for Delme Roundabout. It would need to be confirmed that this weaving length is sufficient and the existing lay-by would probably need to be removed on safety grounds.

To the north of Junction 11, the link to Boarhunt Road would require a new road to be constructed up to the SDA area across rural land. At this point is not clear which route such a link road would take.

6.4 Approximate Cost

The cost estimates for the considered options are based on SPON'S, Civil Engineering and Highway Works Price Book 2010 approximate method.

All Purpose Roads prices include for earthworks, structures, drainage, pavement, road markings, studs, signs, vehicle restraint systems, statutory undertakings and landscaping as appropriate to the type and location of the carriageway. The earthworks elements as earthworks Depth and Ground Conditions are adjusted with reference factors (K_D & K_{GC}) taken from the book. The Junctions area is considered flat, K_D =1 and K_{GC} =1. The average earthworks proportion of the above prices is assumed to be 33%. The rest of the works is 67%. The prices are approximate costs per metre run of roadway and are based on information from a number of sources, including engineering estimates, tenders, final account values, etc, on a large number of highway contracts.

The prices for All Purpose Roads do not include the costs of associated features such as interchanges, bridges, culverts, Junctions, roundabouts, etc. The values of these are shown separately beside the cost range. All prices are the cost per metre run of the road.

It is important to highlight that these costs are very approximate, based only on linear rates which are anecdotal, and do not include ancillary costs such as land purchase, traffic management and site accommodation.

Option	Description	Unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
Junction 11												
A	Upgrade to full signalisation of Junction.								75.0	7.5	48.75	131.25
B(i)	SLTL, M27 eastbound on-slip	m		250	770	192.5			192.5	19.3	125.3	337.1
	As above, but requiring build out beyond existing kerb line.	m		250	3000	750.0			750.0	75.0	487.5	1,312.5

Option	Description	Unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
B(ii)	SLTL, M27 eastbound on-slip	m		250	770	192.5			192.5	19.3	125.3	337.1
	As above, but requiring build out beyond existing kerb line	m		250	3000	750.0			750.0	75.0	487.5	1,312.5
C	Option A + B(i) + B(ii)								460.0	46.0	299.0	759.0
	As above, but requiring build out beyond existing kerb line								1,575.0	157.5	1,023.75	2,756.25

Option	Description	Unit	nr	Length (m)	Rate (£)	Base Cost(£ '000) (A)	Feature Rate (£)	Feature Cost (£) (B)	Total Cost(£ '000)	Design Costs (+10%) (£ '000)	Optimism Bias (+65%) (£ '000)	Final Cost(£ '000)
D	Widen link to Delme Roundabout to four lanes			500	770	385.0			385.0	38.5	250.5	673.8

Appendices

Appendix A. Figures

Site Plan & Scale

Notes

Key to symbols

Area of widening

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1			Drawing Created		

Mott Gifford
Stoneham Place
Stoneham Lane
Southampton
Hampshire SO50 9NW
United Kingdom
Tel +44 (0)23 8062 8500
Fax +44 (0)23 8062 8801

Client

Hampshire County Council

STUART JARVIS,N BSc DipTP FCIHT MRTPI, DIRECTOR OF ENVIRONMENT, THE CASTLE, WINCHESTER.

Title

M27 Parallels Study

Junction 8
Location Plan

Designed	S.Locke	SL	Eng.Chk.	S. Horrocks	SHo
Drawn	S.Locke	SL	Coordination		
Dwg.Chk.	S. Horrocks	SHo	Approved	S.Jones	SLJ
Scale 1:500 (at A1)		Project 227552MH			Status PRE
		CAD file			
Drawing No Figure 1					Rev P1

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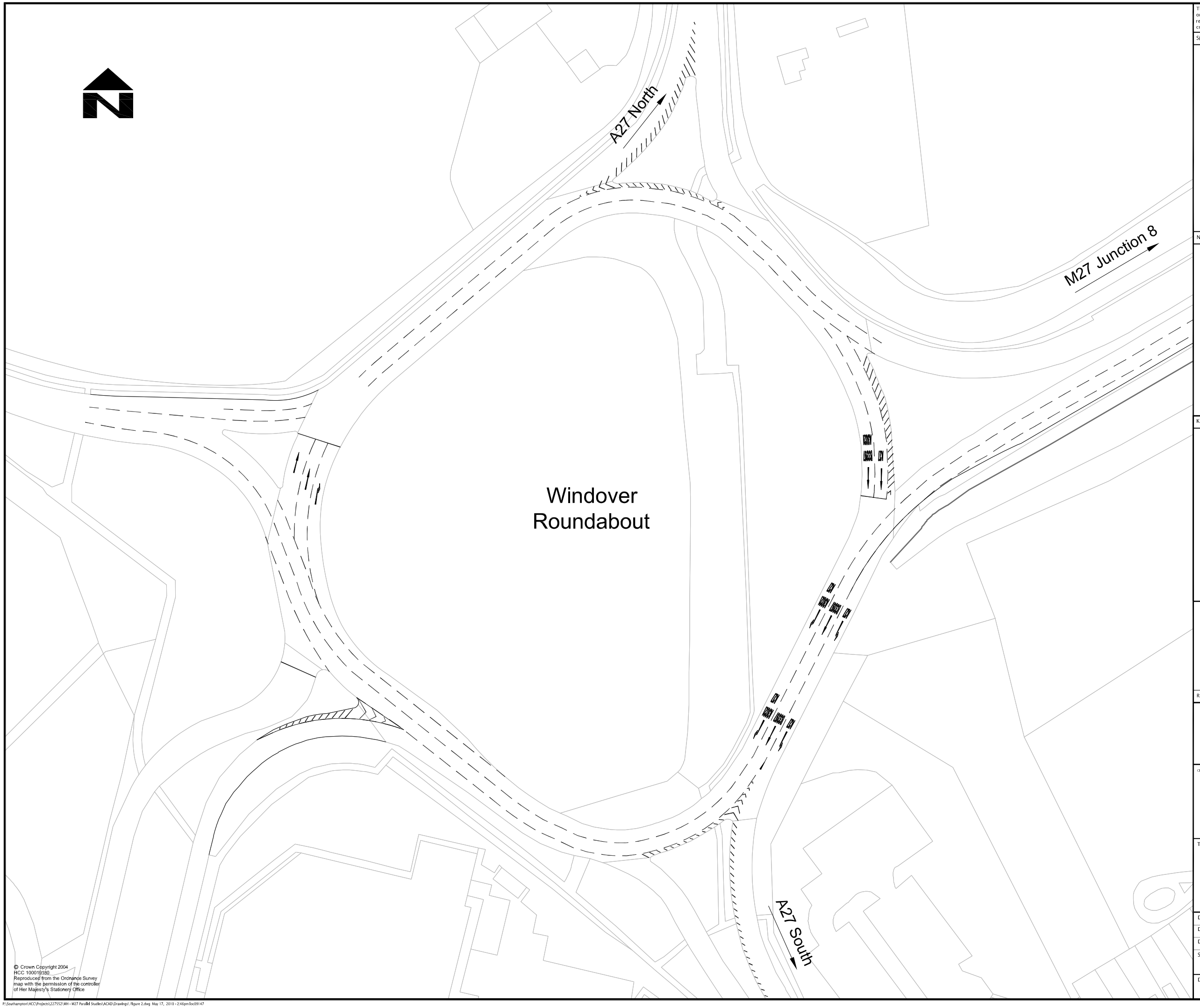

Site Plan & Scale

Notes

Key to symbols

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P1			Drawing Created		

Mott Gifford
Stoneham Place
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Client

Hampshire County Council

STUART JARVIS,N BSc DipTP FCIHT MRTPI, DIRECTOR OF ENVIRONMENT, THE CASTLE, WINCHESTER.

Title

M27 Parallels Study

Windover Roundabout

Designed	S.Locke	SL	Eng.Chk.	S. Horrocks	SHo
Drawn	S.Locke	SL	Coordination		
Dwg.Chk.	S. Horrocks	SHo	Approved	S.Jones	SLJ

Scale 1:500 (at A1)

Project 259758MH

CAD file

Status PRE

Drawing No Figure 2

Rev P1

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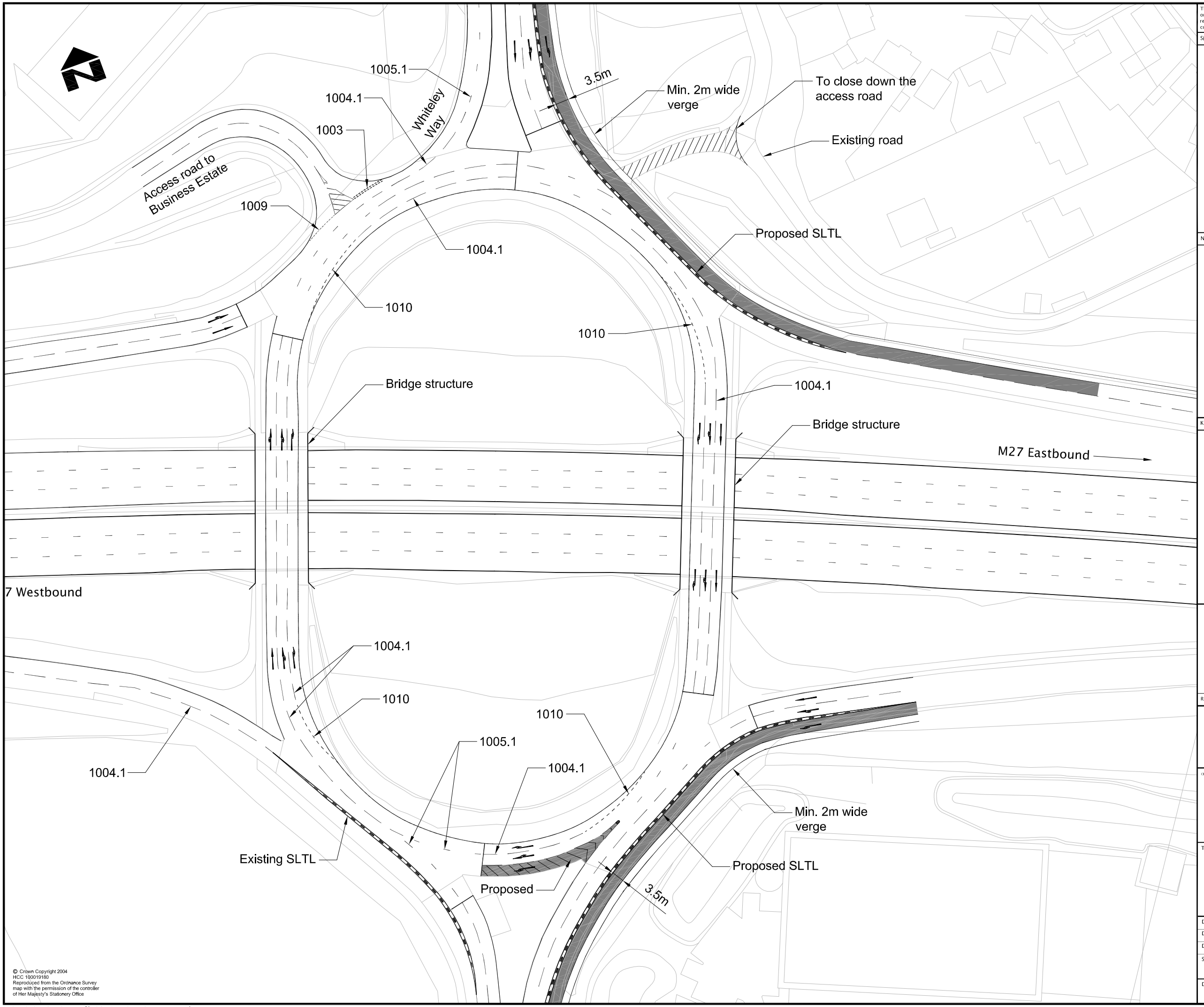

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Site Plan & Scale

Notes

Key to symbols

Area of widening

Existing access road to be closed

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1			Drawing Created		

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Hampshire County Council

Engineering Consultancy

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Title

M27 Parallels Study

Junction 9

Designed	S.Locke	SL	Eng.Chk.	S. Horrocks	SHo
Drawn	S.Locke	SL	Coordination		
Dwg.Chk.	S. Horrocks	SHo	Approved	S.Jones	SLJ
Scale 1:500 (at A1)			Project 227552MH		Status PRE
			CAD file		

Drawing No

Figure 3

Rev P1

Site Plan & Scale

Notes

Key to symbols

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1			Drawing Created		

Mott Gifford
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Hampshire County Council

Engineering Consultancy Certificate No 21605

STUART JARVIS,N BSc DipTP FCIHT MRTPI, DIRECTOR OF ENVIRONMENT, THE CASTLE, WINCHESTER.

Title

M27 J10 Parallels Study

West to North Connection

Layout 2

Designed	A. Jarmin	AJJ	Eng.Chk.	S. Horrocks	SHo
Drawn	A. Jarmin	AJJ	Coordination		
Dwg.Chk.	S. Horrocks	SHo	Approved	S. Jones	SLJ
Scale	As Shown	Project	227552MH		Status PRE
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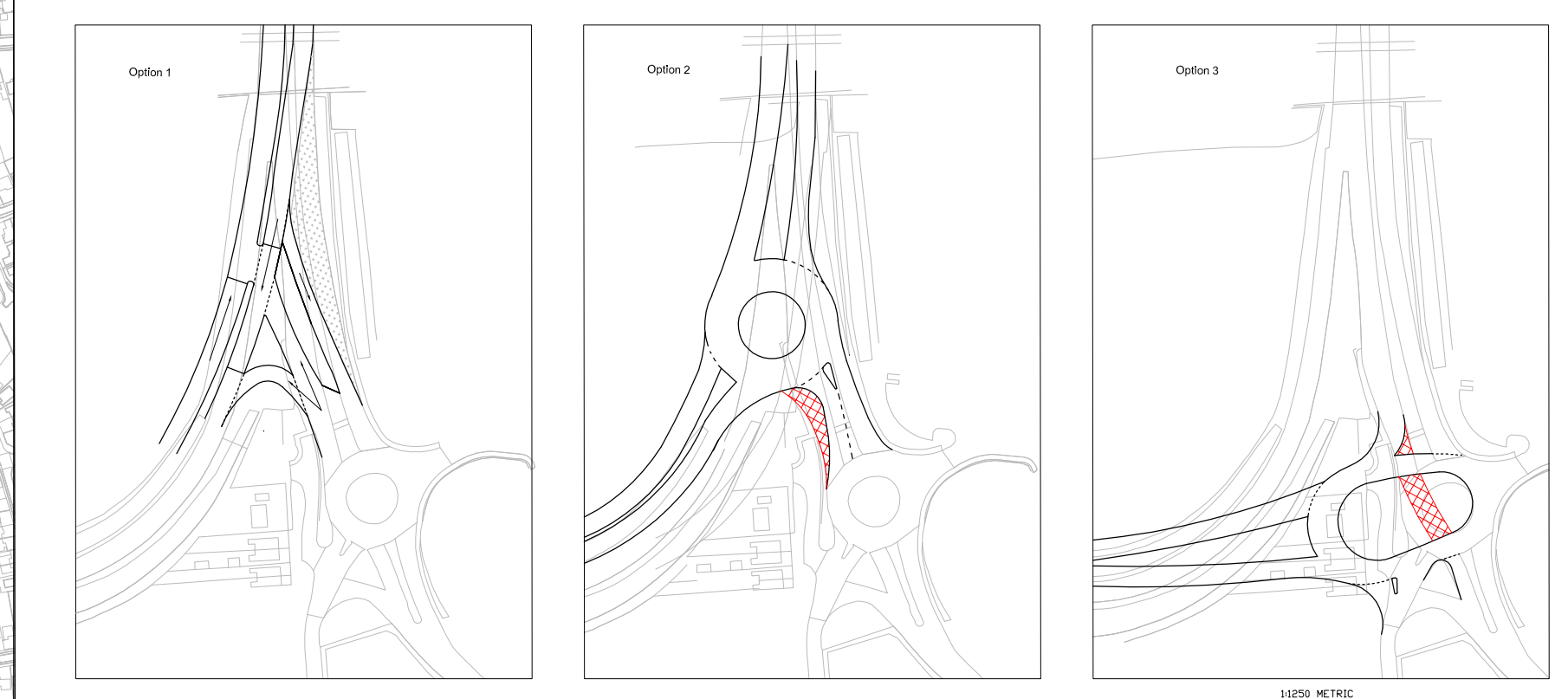

Site Plan & Scale

Notes

Key to symbols

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1			Drawing Created		

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Client

Hampshire County Council

STUART JARVIS,N BSc DipTP FCIHT MRTPI, DIRECTOR OF ENVIRONMENT, THE CASTLE, WINCHESTER.

Title

M27 J10 Parallels Study

North to West Connection

Layout 1

Designed	A. Jarmin	AJJ	Eng.Chk.	S. Horrocks	SHo
Drawn	A. Jarmin	AJJ	Coordination		
Dwg.Chk.	S. Horrocks	SHo	Approved	S.Jones	SLJ
Scale	As shown	Project	227552MH		Status PRE
		CAD file			
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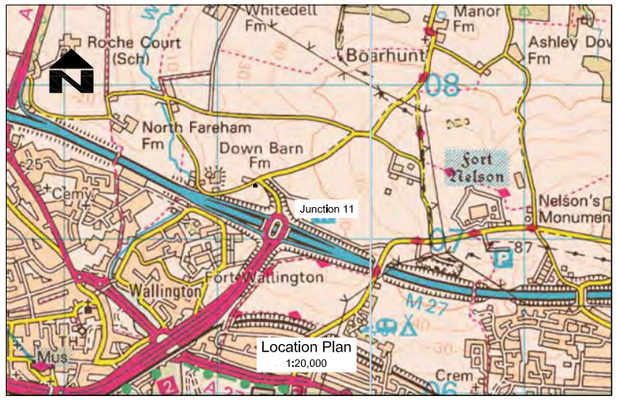

Site Plan & Scale

Notes

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Area of widening

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P1			Drawing Created		

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Client

Hampshire County Council Engineering Consultancy

STUART JARVIS,N BSc DipTP FCIHT MRTPI, DIRECTOR OF ENVIRONMENT, THE CASTLE, WINCHESTER.

Title

M27 Parallels Study

Junction 11
Location Plan

Designed	S.Locke	SL	Eng.Chk.	S. Horrocks	SHo
Drawn	S.Locke	SL	Coordination		
Dwg.Chk.	S. Horrocks	SHo	Approved	S.Jones	SJ
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			CAD file		
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