

Hayling Island - traffic signal junction modelling report
1.0

ITS Group

ETE Department

Hampshire County Council

Hayling Island – traffic signal modelling report

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Introduction

Hampshire County Council ITS Group has been approached by Havant Borough Council to look at the potential implications of a series of signal controlled junctions being introduced on Hayling Island in support of the Local Development Plan.

The junctions being considered in this report are:

- A3023 Havant Road and Northney Road;
- Havant Road, Manor Road and Church Road;
- A3023 Havant Road and West Lane.

The three junctions are on a direct link from the north to the south of the island.

The proposals consider the operation in terms of a basic Linsig analysis to determine the potential operation of the proposed junction layouts as provided by Havant Borough Council. The proposals are also considered in terms of outline buildability.

Background

The project has been derived from a desire by Havant Borough Council to provide long term capacity at the junctions to support the Local Development Plan housing allocation. Traffic signal options have been developed in order that the area can appropriately meet projected future traffic demands in a safe manner.

To this end Havant Borough Council have produced a series of outline proposals for signal design options at the junctions. In order to progress the project, the designs need to be considered in terms of buildability and capacity.

It is intended that this report will allow for a preliminary determination of the potential capacity of the proposed sites along with an analysis of the typical queues and delays that can be anticipated. An over view is required of any potential issues that may arise from constructing junctions at these locations.

Analysis will be completed by applying the proposed outline layouts for the junctions into the Linsig 3 design analysis software. A review will be made, taking reference from previous experience of the ITS Group, into high level issues that may impact on the buildability of the proposed designs.

Traffic flows have been supplied by Havant Borough Council. These flows have been derived from the Hayling Island Paramics model for the local plan design year of 2036. Each signal junction has been tested for the AM peak hour (0800-0900), inter peak (1100-1200) and PM peak hour (1700-1800). Havant Borough Council have produced outline design layouts that will be used to develop the initial traffic signal modelling within Linsig. No alterations to these layouts have been tested.

A3023 Havant Road / Northney Road

Havant Road/Northney Road is the first junction that is arrived at after crossing the bridge onto the island. As such the capacity and operation of this junction would be critical to traffic entering and leaving the island. The junction is being considered for signalisation to mitigate the potential queues associated with a priority intersection.

The junction is a three arm 'T' junction with footways to the western side and north eastern side. There is a busy petrol station located to the south eastern corner of the junction.

The junction has been assessed using Linsig traffic signal design software. It has been assumed that all approaches will operate with a Saturation Flow of 1800 PCU's/hr. Pedestrian crossings are included on the layout drawing and for the purposes of this modelling report it is assumed that they would be push button controlled. A stage arrangement, based on the supplied outline design, has been assumed of:

- Stage 1 – A3023 Havant Road north and south;
- Stage 2 - Northney Road;
- Stage 3 - All Red for pedestrians.

A 90 second cycle time has been adopted for all periods.

The modelling has been based on the preliminary design drawing 2017_15 A3023/NORTHNEY ROAD (see Appendix) supplied by Havant Borough Council.

The 2036 modelling results for this signal junction are outlined below.

	AM peak 2036			Inter Peak 2036			PM peak 2036		
	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)
Havant Rd Nth	12.5 (72m)	0m 15s	65.3%	16.6 (95m)	0m 17s	75.4	161.7 (930m)	5m 51s	120.3
Northney Rd	1.5 (12m)	0m 52s	33.8%	2.6 (15m)	0m 56s	52.5	2.7 (15m)	0m 59s	54.4
Havant Rd Sth	165.0 (949m)	5m 53s	120.5%	15.0 (86m)	0m 16s	72.2	10.8 (62m)	0m 13s	60.2
Cycle time	90 secs			90 secs			90 secs		
PRC %	-33.9			19.3			-33.7		

Table 1

PCU – Passenger Car Units

PRC – Practical Reserve Capacity

The modelling results indicate that Havant Road south will be significantly over capacity in the AM period and Havant Road north far over capacity in the PM period. The mean maximum queues for these periods are shown to be approaching a kilometre (It should be noted that this measurement is mean figure and as such the queues are likely to be longer than this for at least half of the modelled period). This signal option would generate considerable levels of delay and congestion along the A3023 at peak times which would not provide a viable solution.

Design comments

In terms of the signal junction buildability a review of the drawings has shown that the widening of the footway/cycleway to the western side of the junction is likely to involve substantial works to the shore line headwall and shore line beyond in order to accommodate the widening. This may not be a desirable solution from both an ecological and a financial point of view.

It is unclear as to how the bus stops will be accommodated within the signal junction; inappropriate placement could lead to exit blocking of the junction which may have a detrimental impact on the anticipated capacity results.

Havant Road/Church Road/Manor Road

Havant Road/Church Road/Manor Road is a roundabout towards the south of the island within an area that is predominantly residential in nature, all be it on a road that forms part of the main north/south link. The junction is being considered for signalisation as a means to accommodate Local Development Plan traffic in 2036.

The junction is a three-arm roundabout junction with footways to both sides on all three arms. There is a busy newly constructed supermarket located to the south western corner of the junction.

The junction has been assessed using Linsig traffic signal design software. It has been assumed that all approaches will operate with a Saturation Flow of 1800 PCU's/hr. Pedestrian crossings have been included on all arms of the layout and push button controlled facilities have been included in the modelling. A stage arrangement, based on the supplied outline design, has been assumed of:

- Stage 1 - Havant Road left turn/Church Road;
- Stage 2 - Havant Road /Manor Road (gap seeking right turn)
- Stage 3 - All red pedestrians.

A 90 second cycle time has been adopted.

The modelling has been based on the preliminary design drawing 2017_15 A3023/MILL RYTHE ROUNDABOUT (see Appendix) supplied by Havant Borough Council. For the purposes of the modelling it has been assumed that the signal junction layout would be far more compact to minimise the amount of lost time and to maximise capacity.

Staging option A

The 2036 modelling results for this junction are shown below.

	AM peak 2036			Inter Peak 2036			PM peak 2036		
	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)
Havant Rd Nth	5.6 (32.2m)	0m 39s	54	6.3 (36m)	0m 35s	54.2	8.6 (49m)	0m 31s	61.1
Church Rd	21.1 (121m)	0m 35s		10.5 (60m)	0m 24s	24.5	9.4 (54m)	0m 28s	61.6
Manor Rd	12.1 (70m)	1m 5s		6.8 (39m)	0m 37s	37.6	4.7 (27m)	0m 31s	52.8
Cycle time	90 secs			90 secs			90 secs		
PRC %	2.1			43.9			46.2		

Table 2

PCU – Passenger Car Units
PRC – Practical Reserve Capacity

The modelling shows that the junction is almost at capacity in the 2036 AM peak but would operate comfortably within capacity in the inter and PM peaks. There would be limited queues in both the AM and PM peak periods on all approaches.

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Design comments

This staging arrangement requires Manor Road right turning drivers to cross 2 lanes of opposing traffic from Havant Road. Historically this type of staging arrangement has resulted in collisions resulting from poor driver judgement.

A review of the drawing shows the junction to have large amounts of space available to tighten up the approaches to bring the stop lines further into the junction and thus reduce the intergreen times required. This would be essential to realise the junction performance indicated above.

It was also noted that a driveway along Havant Road immediately prior to the junction is accessed through a cut through in the current island arrangements. This movement is not preserved in the proposed arrangement. Access must be maintained in any new arrangement.

Staging option B

In order to consider the potential safety of the junction, and reduce the need for a right turning vehicle from Manor Road to give way to two lanes of opposed traffic, an alternative stage arrangement has been considered that allows for a fully signalled right turn on Manor Road.

A stage arrangement, based on the supplied outline design, has been assumed of:

- Stage 1 – Havant Road left turn/Church Road
- Stage 2 – Havant Road/Manor Road ahead
- Stage 3 – Manor Road ahead and right turn
- Stage 4 – All red pedestrians

The 2036 modelling results for this junction are shown below.

	AM peak 2036			Inter Peak 2036			PM peak 2036		
	Mean max queue (PCUs)	Avg delay / pcu (secs)	Degree of saturation (%)	Mean max queue (PCUs)	Avg delay / pcu (secs)	Degree of saturation (%)	Mean max queue (PCUs)	Avg delay / pcu (secs)	Degree of saturation (%)
Havant Rd Nth	8.7 (50m)	1m 26s	88.1	7.2 (41m)	0m 45s	67.8	9.8 (56m)	0m 41s	72.9
Church Rd	23.6 (136m)	0m 45s	92.2	11.9 (68m)	0m 31s	71.3	10.6 (61m)	0m 36s	71.8
Manor Rd	10.6 (61m)	0m 50s	80.7	6.0 (35m)	0m 30s	51.5	4.2 (26m)	0m 25s	37.9
Cycle time	90 secs			90 secs			90 secs		
PRC %	-2.5			43.9			23.5		

Table 2

PCU – Passenger Car Units

PRC – Practical Reserve Capacity

The modelling shows that the junction will operate mainly within capacity during the 2036 scenario, with the AM peak slipping just outside in the modelling due to the proposed right turning movement being called every cycle in the model (this is unlikely to happen on street).

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Similarly to staging option A, the above results have been produced on the basis that the junction layout would be far more compact to minimise the amount of lost time and to maximise capacity.

Havant Road / West Lane

Havant Road/West Lane is a 'T' junction towards the south of the island within area that is predominantly residential in nature, all be it on a road that forms part of the main north/south link. The junction is being considered for signalisation to address a current congestion issue and to accommodate Local Plan development traffic. However the current junction arrangement is of an extremely poor alignment with visibility from the side road being severely limited. For this reason a new junction is being considered to the south of the current position that will require the realignment of West Lane, land take and the closure of the current junction. This is being considered as a means to improve safety as well as capacity.

The junction is a three-arm 'T' junction with footways to both sides on all three arms. There are residential properties to all sides of the junction.

The junction has been assessed using Linsig traffic signal design software. It has been assumed that all approaches will operate with a Saturation Flow of 1800 PCU's/hr. The proposed layout physically bans the West Street right turn movement to Havant Road south. A stage arrangement, based on the supplied outline design, has been assumed of:

- Stage 1 - Havant Road north right turn and West Lane left turn only;
- Stage 2- Havant Road south;
- Havant Road north left turn to operate in a separate stream as it only conflicts with a pedestrian phase. It has been assumed that the pedestrian phase would appear every cycle which represents a worst case scenario in terms of traffic delay.

A 90 second cycle time has been adopted.

The modelling has been based on the preliminary design drawing supplied by Havant Borough Council (see Appendix), and traffic flow data for 2036 again supplied by Havant Borough Council.

The 2036 modelling results for this junction are shown below.

	AM peak 2036			Inter Peak 2036			PM peak 2036		
	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)	Mean max queue (PCUs)	Avg delay / pcu (mins:secs)	Degree of saturation (%)
Havant Rd Nth LFT	4.9 (28m)	0m 4s	41.7	5.7 (33m)	0m 5s	47.0	13.3 (76m)	0m 8s	71.7
Havant Rd Nth RGT	2.3 (13m)	0m 49s	39.1	3.0 (17m)	0m 52s	49.1	4.2 (24m)	0m 44s	50.9
Havant Road Sth	24.4 (140m)	0m 18s	87.2	8.1 (47m)	0m 7s	53.1	7.1 (41m)	0m 9s	46.7
West Lane	6.9 (40m)	1m 24s	84.1	2.7 (16m)	0m 51s	45.9	1.8 (10m)	0m 39s	24.4
Cycle time	90 secs			90 secs			90 secs		
PRC %	3.3			69.4			25.6		

Table 2

PCU – Passenger Car Units
PRC – Practical Reserve Capacity

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The modelling shows that junction is likely to operate within capacity in the 2036 scenario, resulting in limited queues in both the AM and PM peak periods on all approaches.

Design comments

A review of the drawing shows bus stops located within the alignment of the proposed junction. Careful consideration will need to be given to the position of these in any proposed design in order to prevent blocking visibility to the signal heads or the creation of exit blocking.

It is also noted that the anticipated queues will need to be carefully managed due to the very windy nature of the local road network that reduce visibility to a queue ahead.

Recommendations

It is recommended that the traffic signal options for the junctions of

- Havant Road with Church Road/Manor Road
- Havant Road with West Lane

appear suitable at this stage for signalisation and could accommodate the 2036 Local Plan development traffic within capacity. The Havant Road/Church Road/Manor Road signal layout should be refined to achieve the predicted capacity performance.

It is recommended that the traffic signal option for

- Northney Road with Havant Road

Is not progressed due to the predicted severe over capacity and congestion. It is recommended that alternative proposals are investigated at this junction.

WRITTEN BY - MARK ANDREWS/Jonathan Mundy

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Appendix A



Mitigation Package
2a.pdf

Havant Road/Northney Road traffic signal option drawing (drg 2017_15 A3023/NORTHNEY ROAD)



Mitigation Package
1c.pdf

Havant Road/Manor Road/Church Road traffic signal option drawing (drg 2017_15 A3023/MILL RYTHE ROUNDABOUT)



west lane.pdf

Havant Road/West Lane traffic signal option drawing