Huntingdon Road Junction Option Review

1. INTRODUCTION

1.1 Cambridgeshire County Council (CCC) has published a transport study for the major development at Cambridge North West which covers land between Madingley Road and Histon Road. An Area Action Plan is being developed for land owned by the University to the south west of Huntingdon Road, whilst David Wilson Homes (DWH) has submitted a planning application for an urban extension to Cambridge on land to the northeast of Huntingdon Road on land owned by NIAB/DWH.

1.2 The principles of access are a critical issue for the development at North West Cambridge. The interaction between land owned by NIAB/DWH and the University is central to the future successful development of the area.

1.3 CCC has commissioned Atkins to undertake a study of the principal forms of access across Huntingdon Road linking the two parcels of land and their implications including: land ownership and delivery; costs; pedestrian and cycle accessibility; public transport accessibility; highway capacity; highway safety; urban design; and community development. This technical note describes the results of this study.

1.4 The purpose of this technical note is to compare the feasibility of various access options against one another. The options tested are not absolute and detailed solutions will need to be determined through the Transport Assessment and Masterplanning process for each site.

2. OPTION DEVELOPMENT

2.1 The NIAB/DWH site is located adjacent to existing residential properties accessed from Histon Road. The site is bounded by the Green Belt to the north, Histon Road to the east, Huntingdon Road to the south and the Cambridge City boundary to the west.

2.2 The University site is located on land between Huntingdon Road and Madingley Road and is bounded by residential properties fronting onto Huntingdon Road in the north, residential properties fronting onto Storey's Way in the east, Madingley Road in the south and the M11 in the west.

2.3 The frontage of the two sites onto Huntingdon Road meets along the section of road between Howes Lane and The Brambles. Two potential forms of access junction that can be provided along this stretch of road have been identified:

- **Option 1**: Signalised staggered crossroads; and
- **Option 2**: Signalised crossroads.

3. OPTION ANALYSIS

3.1 All options have been analysed using 2025 AM Peak traffic flows obtained from the Cambridge North West Transport Study SATURN model. This provides an initial assessment only and more detailed modelling will be required as part of the Transport Assessment/ Masterplanning process for each development site.

3.2 Options have been analysed according to the criteria set out below:

- Land ownership and delivery;
- Indicative costs;
- Pedestrian and cycle accessibility;
- Public transport accessibility;
- Highway capacity;
- Highway safety;
- Urban design; and
- Community development.

3.3 Option shave been ranked according to criteria set out in Appendix A, using a scoring system between 1 and 7 (1 being very poor/unacceptable and 7 being excellent).

3.4 The results of the analysis are summarised in Appendix B and described below.

OPTION 1: SIGNALISED STAGGERED CROSSROAD

3.5 This option proposes a signalised staggered crossroads. The NIAB/DWH arm of the staggered crossroads would be located at a position west of Howes Place, at a similar point put forward by DWH in their recent planning application. The University arm of the staggered crossroads would be located at a position west of the Travellers Rest Inn. The minimum distance between the arms of the stagger should provide

sufficient traffic storage so that traffic exiting the junction can do so without obstruction.

Land Ownership & Delivery

3.6 The NIAB/DWH and University arms of the staggered crossroads could be accommodated on land owned by developers of CNW. Huntingdon Road highway to the back of the footway is adopted public highway within the control of Cambridgeshire County Council, as Highway Authority.

Cost

3.7 The basic junction form would cost approximately £2.0 - 2.2 million to construct. This estimate does not include any third party land take requirements (if found necessary in detailed design), statutory undertakers plant diversion requirements, or additional measures to promote bus priority over and above those included within signal system.

Pedestrian and Cycle Accessibility

3.8 The junction design includes staggered pedestrian crossings on all junction arms. Radial crossing movements are catered for with a crossing on both the NIAB/DWH and University access arms. This will facilitate pedestrian movements between the two sites.

3.9 Orbital pedestrian movements between the developments will be staggered, but through careful masterplanning, permeability into both sites along the frontage can extend beyond the vehicular access points.

3.10 Cycle movements are facilitated by providing a direct link from the NIAB/DWH and University accesses onto the on-street cycle paths on Huntingdon Road. Advanced stop lines and on-street cycle lanes can be provided on all junction arms providing safe space for cyclists to negotiate the signalised section of Huntingdon Road. Orbital cycle movements between the two sites are less direct for cyclists using the staggered junction than would be the case for a non-staggered crossroads arrangement (such as Option 2).

3.11 Off-road/segregated cycle facilities can be incorporated into the junction design and the pedestrian crossing points can be upgraded to Toucan crossings. As with pedestrian movements, careful masterplanning can deliver penetration of the NIAB/DWH site for cyclists along the Huntingdon Road frontage and not limit cycle access to the site via the vehicular access.

Public Transport Accessibility

3.12 The staggered crossroads arrangement allows for orbital and radial bus movements to be made through the junction. The staggered arrangement however, will add a limited degree of mileage and delay to orbital bus movements between the two sites. This may increase journey times for orbital bus routes and may also affect journey time reliability on such routes.

3.13 The purpose of this assessment is to review the feasibility of various access options only and as a result no physical bus priority measures have been included in the design. Further testing of this option may need to consider whether two traffic lanes are required in both directions through the staggered section. If a separate bus lane is found to be needed, this would involve considerable widening of the carriageway with additional land take.

3.14 Bus priority measures should be provided within both development sites regardless of the access option chosen.

Highway Capacity

3.15 The junction capacity has been assessed with LINSIG V2 using typical junction geometric data and intergreens. Both junctions have been modelled in a linked LINSIG V2 model.

3.16 The junction design assumes a three stage operation at the signals with pedestrian demand phases being called every cycle. Both junctions within the staggered crossroads have been modelled with the pedestrian phases integrated with the traffic movements to minimise the lost time at the junction. The cycle time has been set at 100 seconds. The results of the assessment are presented in Table 1.

3.17 The staggered crossroads have been modelled with 2 ahead lanes on Huntingdon Road and 2 exit lanes from NIAB/DWH and the University land parcels. Two ahead lanes have been modelled on Huntingdon Road to ensure that the junction has sufficient capacity for the predicted Huntingdon Road traffic demand.

Table 1 – Option 1 LINSIG Analysis

Link	Degree of Sat (%)	Delay sec/pcu	Mean Max Queue
NIAB/DWH JUNCTION			
Huntingdon Rd East Ahead	40.9	14.3	7.4
Huntingdon Rd East Ahead & Right	28.7	14.2	4.3
Huntingdon Rd West Ahead & Left	64.6	13.9	10.6
Huntingdon Rd West Ahead	60.3	14.6	10.6
NIAB/DWH Exit Left	50.4	62.2	2.8
NIAB/DWH Exit Right	63.7	66.6	4.3
UNIVERSITY JUNCTION			
Huntingdon Rd East Left & Ahead	49.9	5.2	1.4
Huntingdon Rd East Ahead	20.3	3.5	0.6
Huntingdon Rd West Ahead	53.6	14.0	10.6
Huntingdon Rd West Ahead & Right	59.0	14.8	13.0
University Exit Left	4.3	50.3	0.2
University Exit Right	69.4	70.4	4.9
Junction PRC	NIAB/DWH: 39.2 University: 29.7		
Junction Delay (pcuHr)	NIAB/DWH: 12.99 University: 9.54		

3.18 The results in Table 1 suggest that the staggered crossroads could operate within capacity on all junction arms. The mean max queue eastbound between the junctions is 10.6 passenger car unit (pcu) which would extend along approximately 64 metres of roadspace. It is therefore unlikely that traffic will block back across the junction.

3.19 It may be possible to reduce the junction cycle time providing additional benefits to pedestrians and road users through waiting times. A cycle time of 100 seconds has been maintained to allow direct comparison with Option 2.

3.20 However there may be problems with exit capacity through the junction as a result of upstream congestion. The two lanes on Huntingdon Road passing through the junction will merge into one lane downstream and this will reduce the traffic throughput on Huntingdon Road. LINSIG models assume free-flowing traffic exiting the junction. In addition, the queues forming on the westbound Huntingdon Road arm of the junction may cause exit problems for traffic turning right out of Hotel Felix.

3.21 The next stage of junction design to be undertaken by the developers will need to take into account agreed development flows. This exercise was to compare one access strategy against another and inform the masterplanning process.

Highway Safety

3.22 A Stage 1 Safety Audit of the junction has not been undertaken. Depending upon the exact location of the junction, private houses will have accesses within the proposed junction, giving rise to the potential for vehicle-vehicle or vehicle-pedestrian/cyclist conflicts. There is also the requirement to accommodate access to Whitehouse Lane within the junction design.

Urban Design/Landscape Impact

3.23 The urban design implications and landscape/townscape impact of the proposals for providing access to each of the development sites are somewhat different and there are advantages and disadvantages to each. It is not the purpose of this report to look at detailed design aspects and while a particular junction may be favoured in urban design and landscape terms this cannot be deemed to be a final view until the exact design and details of any junction are known.

3.24 The option of creating a staggered junction with the NIAB/DWH access point to be positioned west of the NIAB HQ building could have considerable impacts in terms of the amount of roadspace, lighting and pedestrian crossings. The result could well have a negative townscape impact on Huntingdon Road and the NIAB HQ.

3.25 However, the creation of a staggered access arrangement would allow for the creation of a better arrangement of blocks into the University land and help safeguard the SSSI.

3.26 As with the crossroads option (Option 2), an access to the NIAB/DWH land to the west of the existing NIAB HQ would have the advantage of entering the site centrally and create a direct route towards the proposed local centre. Having buildings on both sides of the road would create a street which is well defined and legible and which promotes vitality and viability.

3.27 The staggered solution would also allow for the masterplanning work on each of the sites to continue independently and allow for better block layouts and open space arrangements to be created.

Advantages

- Avoids a negative impact on the strategic green gap/Girton gap, trees and hedgerows;

- Traffic will enter the centre of the NIAB site. Entrance boulevard can be strong and well defined;
- Traffic for the NIAB HQ will not have to go through a residential area; and
- Allows flexibility for design of the University site.

Disadvantages

- The setting of the NIAB HQ will be harmed and trees lost;
- There will be additional highway paraphernalia beyond that necessary for crossroads;
- There may be a requirement for more turning lanes/road space to accommodate public transport movement; and
- The design will not be as legible as a crossroads design.

Community Development

3.28 The proposed layout does not preclude the ability to create a sense of community between the sites and the surrounding areas within the site constraints. Well considered masterplanning along both development frontages, such as high pedestrian and cycle permeability, will ensure that Huntingdon Road does not become a psychological barrier between the two sites.

3.29 Each of the developments will have its own identity, but will have to link with each other in terms of shared facilities. Community development must not concentrate solely on the two sites and must also include the relationship with existing communities and with the emerging West Cambridge Site south of Madingley Road.

3.30 The two sites will interact in terms of shared facilities and must therefore work coherently. A crossroad junction would allow for ease of movement between the two sites for all transport modes including pedestrians and cycles, while a stagger may delay movement between the two sites. Huntingdon Road should not act as a barrier between the two spaces and it should not be the aim for short trips between the two developments to be carried out by car.

3.31 It is therefore important for pedestrian and cycle links to allow for ease of movement between the two sites across Huntingdon Road. Both sites will have more than one option for pedestrian links between the sites and depending on the location of the shared facilities within the sites one may be more convenient than the other.

OPTION 2: SIGNALISED CROSSROAD

3.32 This option proposes a four arm signalised crossroads. For the purpose of this exercise it is not necessary to identify the exact location of this junction.

Land Ownership & Delivery

3.33 Examination of the existing land ownership and extent of site frontage onto either side of Huntingdon Road reveals that one or other arms of the junction will require third party land in order to be designed to deliver an appropriate junction.

Cost

3.34 The junction would cost approximately £1.3 million to construct. This estimate does not include compulsory purchase costs, statutory undertakers plant diversion requirements or additional measures to promote bus priority over and above those included within signal system.

3.35 Due to the fact that the exact location of the junction has not been defined it is not possible to provide an estimate of the likely cost of acquiring third party land if necessary. However, given the existing price of housing along Huntingdon Road, costs for the compulsory purchase of land are likely to be in excess of £2.5 million. This estimate should be treated with caution and it is recommended that a detailed assessment of the costs of compulsory purchase of land is provided once the location of the junction has been fixed.

3.36 It is important to note that some properties along Huntingdon Road have been the subject of recent renovation/expansion/redevelopment and the cost of compulsory purchase of these properties is likely to be far in excess of the estimate above.

Pedestrian and Cycle Accessibility

3.37 The junction design includes staggered pedestrian crossings on all junction arms. Advanced stop lines and on-street cycle lanes can be located on all junction arms providing safe space for cyclists to pass on-road junction turns.

3.38 Radial crossing movements are catered for with a crossing on both the NIAB/DWH and the University junction arms. This will facilitate pedestrian movements on Huntingdon Road.

3.39 Orbital movements between the developments will be more ‘direct’ compared to Option 1 with crossing points located on both Huntingdon Road junction arms.

3.40 Cycle movements are facilitated by providing a ‘direct’ link from the NIAB/DWH and University accesses to the on-street cycle paths on Huntingdon Road. Advanced

stop lines should be provided to facilitate safe turning movements onto Huntingdon Road. Orbital movements between the two sites are direct with straight across movements from NIAB/DWH site to the University site and vice versa.

Public Transport Accessibility

3.41 The crossroads arrangement of the junction allows for direct orbital and radial bus movements to be made through the junction. The crossroad arrangement of the junction will reduce mileage and delay to orbital bus movements between the two sites compared to Option 1. Journey time on orbital routes is therefore likely to be reduced in comparison to Option 1 and journey time reliability will be improved. This assessment does not include junction delay on exiting the development sites although initial LINSIG assessments suggest this would be similar for both layout options.

3.42 The purpose of this assessment is to review the feasibility of various access options only and as a result no physical bus priority measures have been included in the design. These could be accommodated as necessary.

3.43 Bus priority measures should be provided within both development sites regardless of the access option chosen.

Highway Capacity

3.44 The junction capacity has been assessed with LINSIG V2 using typical junction geometric data and intergreens.

3.45 The junction design assumes a four stage operation at the signals with pedestrian demand phases being called every cycle. The junction has been modelled with the pedestrian phases integrated with the traffic movements to minimise the lost time at the junction. A cycle time of 100 seconds has been used to assess the proposed junction. The results are shown in Table 2.

3.46 The crossroads has been modelled with two ahead lanes on Huntingdon Road. This is to ensure the junction has sufficient capacity for the predicted traffic demand on Huntingdon Road.

Table 2 - Option 2 LINSIG Analysis

Link	Degree of Sat (%)	Delay sec/pcu	Mean Max Queue
Huntingdon Rd East Left & Ahead	80.9	33.8	18.8
Huntingdon Rd East Ahead & Right	85.0	159.7	3.0
University Left & Ahead	47.8	66.3	2.4
University Right	52.9	69.7	2.6
Huntingdon Rd West Ahead & Left	76.6	31.3	16.9
Huntingdon Rd West Ahead & Right	76.2	30.3	18.2
NIAB/DWH Ahead & Left	83.9	89.5	7.1
NIAB/DWH Right	18.3	49.7	1.1
Junction PRC	5.9		
Junction Delay (pcuHr)	29.08		

3.47 The results in Table 2 show that all junction arms operate within capacity, as tested. This is based on 100 second cycle time with intergraded pedestrian movements. As for Option 1, there may be issues with exit capacity on Huntingdon Road due to upstream congestion (see 3.18).

3.48 The results show that the longest queue is on Huntingdon Road East left and ahead lane. This is because the right turn traffic in the offside lane is opposed and therefore vehicles are more likely to use the nearside lane so they do not get blocked. The heavy eastbound movements mean right turning traffic can only clear in the intergreen period.

3.49 The eastbound movement has been split between the two ahead lanes at the stop line. Long approach flares will be required on this junction arm to achieve the required capacity for through movements in the AM Peak Hour year 2025. Queuing on Huntingdon Road in the AM Peak Hour flow could block access to Felix Hotel and therefore keep clear marking will be required.

Highway Safety

3.50 A Stage 1 Safety Audit of the junction has not been undertaken. Depending upon the location of the crossroad private houses and/or Whitehouse Lane could potentially have accesses onto Huntingdon Road within the proposed junction design. This gives the potential for vehicle-vehicle or vehicle-pedestrian conflicts as residents leave their driveways or enter/leave Whitehouse Lane.

Urban Design/Landscape Impact

3.51 With regards to the options available and at a more theoretical and less site specific level, a crossroads would be preferable in urban design terms as it creates a more legible street network and so lends itself to the creation of better links between the proposed developments to either side of Huntingdon Road and so could help to help reinforce community development. It would also reduce the amount of highway space required and the associated traffic lights and other highway paraphernalia. However the final location of a crossroads would have further and more site-specific implications in terms of landscape and townscape impacts.

3.52 On the southern side of Huntingdon Road there are several possible points at which an access could be formed to enter the University land. In terms of urban design, any access would want to avoid creating a contrived and torturous route into the site. The need to avoid the SSSI located on the University land may result in the need to create such a tortuous and contrived access. There may also be the need to acquire properties on the south side of Huntingdon Road that could have negative townscape implications.

3.53 If the access could be formed using a crossroads aligned to the proposed NIAB/DWH access whilst safeguarding the impact on the SSSI, this option would be preferred in terms of the creation of a clear connection between the two sites. An access to the NIAB/DWH land to the west of the existing NIAB HQ would also have the advantage of entering the site centrally and create a direct route towards the proposed local centre. Having buildings on both sides of the road would create a street which is well defined and legible and which promotes vitality and viability.

3.54 If a crossroads were to be formed on an alignment with Whitehouse Lane there would be a negative landscape impact on the setting of the 'Girton gap' with the probable loss of trees and hedgerows along Whitehouse Lane.

Advantages

- A crossroads would provide a more permeable solution; and
- There will be fewer traffic lanes and signs necessary than is required for option 1.

Disadvantages

- There is no obvious location which works equally well for development on both sides of Huntingdon Road;
- Depending upon the exact location of the junction, the Girton gap/Whitehouse Lane, Strategic green gap or the SSSI may be harmed; and
- Roadside trees may be lost.

Community Development

3.55 The junction provides 'direct' access across Huntingdon Road between the two sites and to surrounding areas. This allows for a joint sense of community.

3.56 The two sites will interact in terms of shared facilities and must therefore work coherently. A crossroad junction would allow for ease of movement between the two sites for all transport modes including pedestrians and cycles, while a stagger (Option 1) may delay movement between the two sites. Huntingdon Road should not act as a barrier between the two spaces and it should not be the aim for short trips between the two developments to be carried out by car.

3.57 It is therefore important for pedestrian and cycle links to allow for ease of movement between the two sites across Huntingdon Road. Both sites will have more than one option for pedestrian links between the sites and depending on the location of the shared facilities within the sites one may be more convenient than the other.

4. CONCLUSIONS

4.1 Analysis of both options, with regards to transportation, reveals that the signalised crossroads (Option 2) provides the marginally greater benefits for public transport, pedestrian and cycle connectivity between the NIAB/DWH and University sites. Both junctions, as tested, are capable of operating within the acceptable limits in terms of capacity, but this analysis is only preliminary and will require further detailed assessment building in the final development quanta, exact junction design and any bus priority measures to maximise public transport efficiency.

4.2 With regard to Urban Design issues and community development in conclusion, there are advantages and disadvantages for both options none of which present an ideal solution. A crossroads located on the Whitehouse Lane junction would severely compromise the green wedge, with the loss of vegetation and resulting in a tortuous route into the NIAB/DWH site. A crossroads junction elsewhere would not be easily achievable because of the need for third party land being required and the route through the University land being constrained by the SSSI.

4.3 The staggered solution whilst the least preferable in terms of design due to the impact on Huntingdon Road, does allow the maximum flexibility for progressing the masterplanning of the two individual sites and allows routes into the sites to be well integrated and designed. Therefore given the constraints of both sites and the need to safeguard the setting of Whitehouse Lane and the Girton Gap the preferred approach would be to progress the staggered junction option.