East St Albans

Appendix 9: Transport Extract of East St Albans Landowner/Developer Engagement Stage 2 Presentations and follow up report (PPC Nov 2015)

OAKLANDS COLLEGE
STRATEGIC LOCAL PLAN

Discussion with landowners on possible development sites in the Metropolitan Green Belt.

Stage 2 - Submissions' Meeting

OAKLANDS COLLEGE

St Albans City & District Council

15-10-2015 - [2015-195]

VRG planning

AECOM

Lambert Smith Hampton

DLA ARCHITECTURE

The Masterplan must work on many levels; It must be functional and provide efficient access for vehicles and people across the site. It must enable and encourage interaction between people to help create a sense of community and avoid isolation.

It must provide people not only with a home in which to live, but a place which they can enjoy throughout the year. It must provide a range of outside spaces, shared by the community, for all people to appreciate.

It must be rich in character, distinctive and memorable.

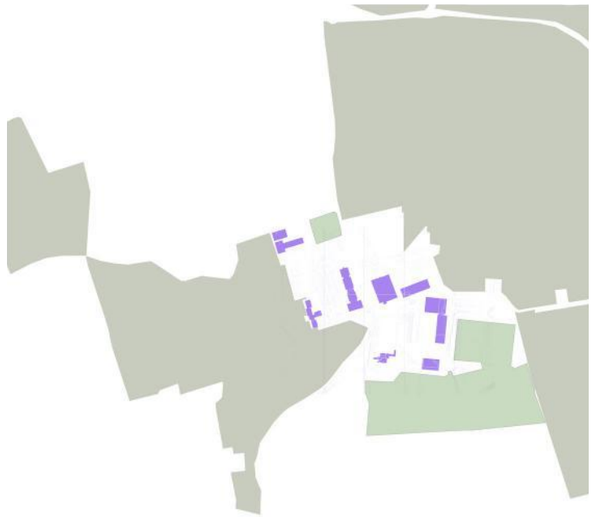
STRUCTURE, LAYERS & TEXTURES 01

1. Site Character and Densities
Oaklands Village: a solution unique to St Albans to create a sense of place and appealing to a wide demographic.

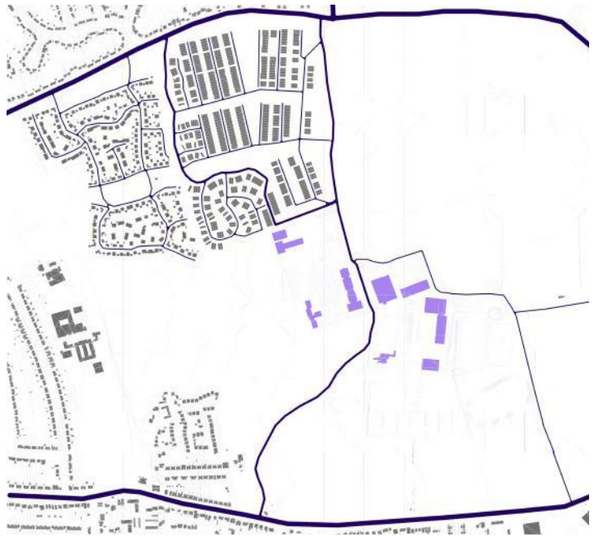
2. Public Open Space and Recreation
Accessible and inviting open spaces across the site alongside sport and recreation facilitate community cohesion.

3. Framework of Garden Spaces
Invigorating open public green spaces with shared allotments, alongside private gardens and woodland areas.

4. Pedestrian, Cycle and Jogging Routes
Clear and legible routes which promote cycling and walking providing easy access to all areas.



5. Education
Proximity and connectivity to a modern, progressive learning environmentsl – opportunities for live-work.



6. Highways
Improved connections between existing infrastructure as well as complementary integrated, sustainable travel provision.

St Albans City & District Council

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PROPOSED MASTERPLAN 01

Large areas of residential amenity space with wide habitat corridors

A Combined Heat and Power facility at the centre of the scheme

Sustainable drainage integrated into the masterplan through swales and reed beds

A new two form entry Primary school able to link with other schools in the area but also with the college

Comprehensive new road junction improvements

A mix of high quality designed homes

40% affordable housing in line with the requirements of the local community

Invigorating open public green spaces with shared allotments, alongside private gardens and woodland areas

Self-build Code Level 6 experimental homes which would also be used as a teaching tool for the College

College Square – as part of the current masterplan.

The College at the heart of the community and community education

Improved public access to college sports facilities

St Albans City & District Council

OAKLANDS COLLEGE

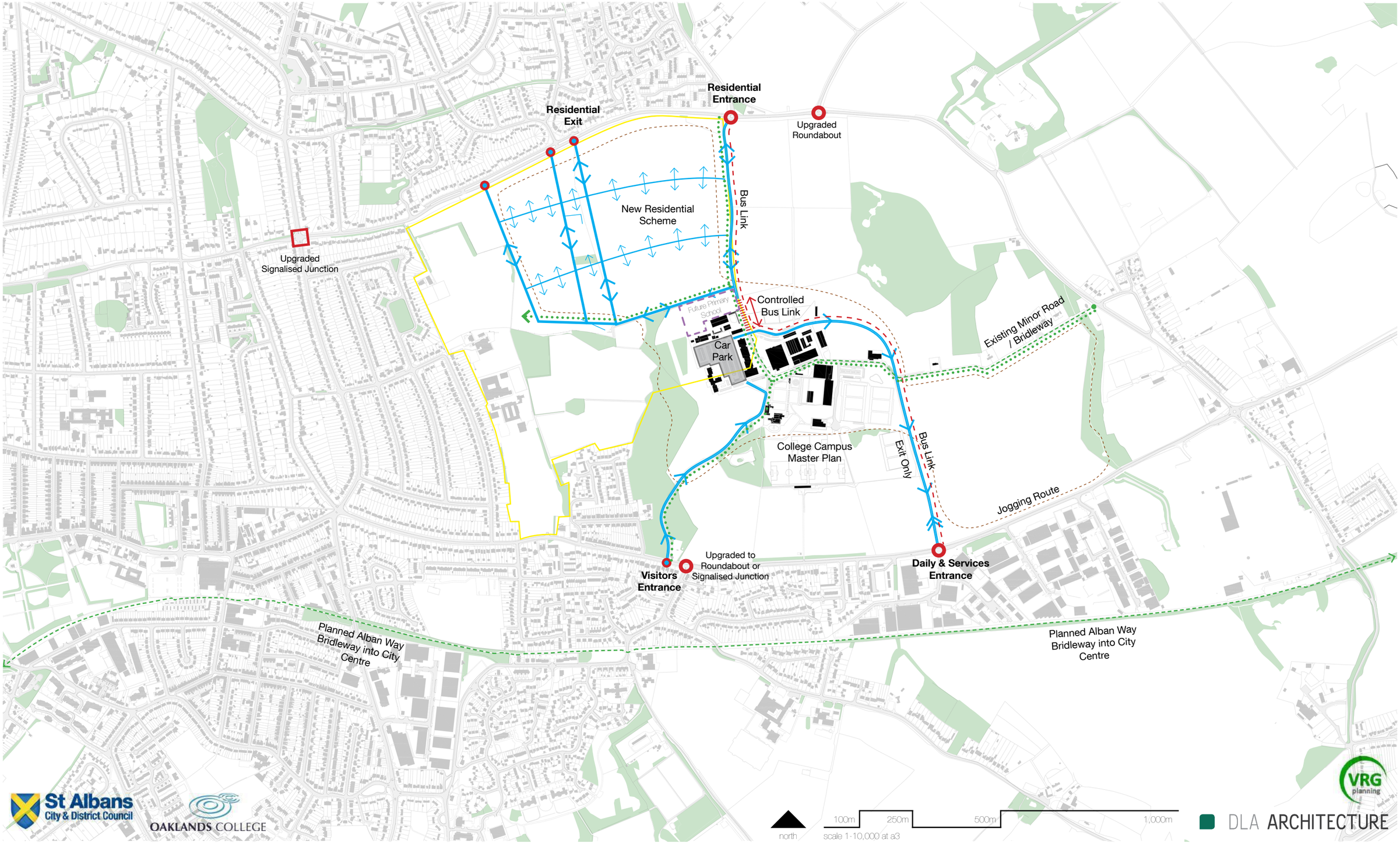
VRG planning

DLA ARCHITECTURE

TRANSPORT NETWORK & SERVICE IMPROVEMENTS 06

KEY TO DIAGRAM:

- Potential Green Belt Release Land
- New Main Road
- New Primary Access Road
- New Secondary Access Road
- Existing Minor Road / Bridleway
- New Footpath
- New Jogging Route
- Bus Link
- New Controlled Road / Bus Link to
- New & Upgraded Connection
- New & Upgraded Roundabout
- New & Upgraded Signalised Junction



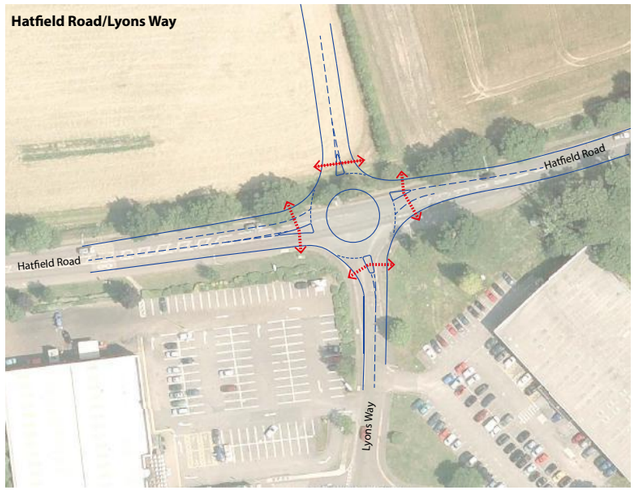
St Albans City & District Council

OAKLANDS COLLEGE

VRG planning

DLA ARCHITECTURE

TRANSPORT NETWORK & SERVICE IMPROVEMENTS 06



Hatfield Road / Lyons Way

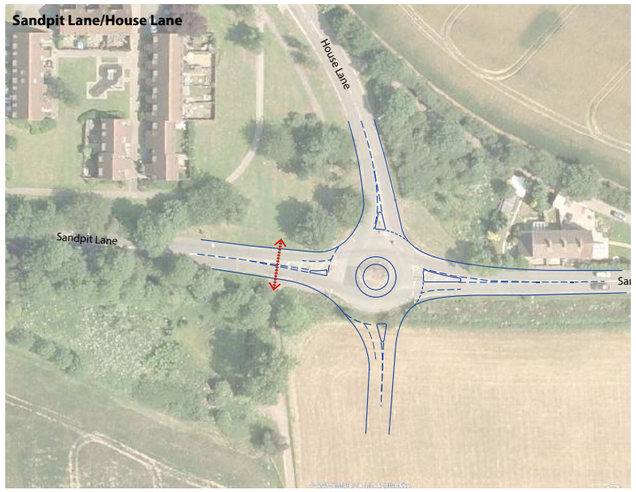
We have prepared an option showing the existing priority T-junction arrangement replaced by a 4-arm roundabout, with the northern arm serving as the new access to the College from Hatfield Road. Again, this layout is consistent with the scheme agreed for the Hub scheme, so has previously been seen and approved by Hertfordshire.

Hatfield Road / Colney Heath Lane

We have prepared two options for this junction. The first option shows the existing priority T-junction arrangement replaced by a 3 arm roundabout. This layout is consistent with the scheme agreed for the Hub scheme, so has previously been seen and approved by Hertfordshire. The second option shows the existing priority T-junction converted to a signalised junction. We did look at this as part of the Phase 2 application but couldn't get it to work due to the interaction with South Way. However, in both options we have assumed that South Way becomes entry only, therefore the signalised option may be worthy of further investigation as it requires significantly less land and allows pedestrian crossing facilities to be integrated into the junction.

Sandpit Lane / Coopers Green Lane

We have shown an enlarged 3-arm roundabout, which would provide additional capacity and also improve the safety of the junction by increasing deflection which would slow approach speeds.



Sandpit Lane / House Lane

We have prepared an option showing the existing 3-arm roundabout replaced by a larger 4-arm roundabout, with the new southern arm serving as an access to the residential development

Sandpit Lane / Marshalswick Lane

Improvements are proposed at this junction as part of the Phase 2 application – these are shown in grey in the sketch. The only option we can see for further improvement to this junction is to widen the eastern approach by taking land from the verges to the north and south. This would address the existing pinch point, although is unlikely to substantially improve capacity over and above the Phase 2 scheme. Consideration could be given to introducing advanced cycle stop lines at this junction to encourage cycling, however, Hertfordshire have previously indicated that traffic capacity is the overriding concern at this junction.

Oaklands College - Indicative Viability Assessment

REVENUE

		sqm	Gross Sales (m)
House/ Flat Sales		c. 81,000	£ 397.6
	TOTAL REVENUE		£ 397.6

COSTS

	Costs (m)
Residential Construction	£ 119.9
Ground Works	£ 6.0
Transport - roads, sustrans, Stat/ LA	£ 15.1
Landscaping - hard/ soft	£ 8.5
Primary School - 2FE	£ 7.5
CHP	£ 2.0
Developers Profit	£ 70.1
Fees - Professional, Disposal, Finance	£ 48.9
TOTAL COSTS	£ 278.0
RESIDUAL LAND VALUE	£ 119.6
less costs	£ 6.5
NET RESIDUAL LAND VALUE	£ 113.1

Viability Assessment Assumptions:

a. Based on very limited information other than considering scheme outputs.
b. No benefit of any site investigations, surveys or schematics.
c. The scheme will have the feel of high quality suburban schemes such as the award winning Accordia development in Cambridge.
d. Having regard to the above the advice provided must be considered as indicative only.

APPRAISAL APPROACH & VIABILITY ASSESSMENT 11

Development Approach

The College will be seeking developer partners for the Masterplan along with existing partner TW. To meet the Council's need to ensure that the shared vision for high quality designed sustainable homes is realised the College intends to:

- Seek developers through a procurement competition to attract the best partners;
- Run a procurement programme that enshrines the requirements into a contract that commits the developer to the scheme with a retainer mechanism;
- Manage the development closely to monitor the progress against the vision.

The College also feels that the Council will have the opportunity to encourage the vision by adopting planning which describes the vision for high quality designed homes.

Lambert Smith Hampton states that with the indicative residual land value that is shown there is no impediment to delivery. Also on the basis of the indicative Viability Assessment we can be absolutely confident about deliverability on the Oaklands College site.

The site has been subject to a great deal of site specific technical work, done in the context of the recent planning application. This assists greatly in terms of the deliverability and understanding of the proposals.

OAKLANDS COLLEGE
STRATEGIC LOCAL PLAN

Discussion with landowners on possible development sites in the Metropolitan Green Belt. Stage 2 - Submissions' Meeting

OAKLANDS COLLEGE

St Albans City & District Council

16-10-2015 - [2015.195]

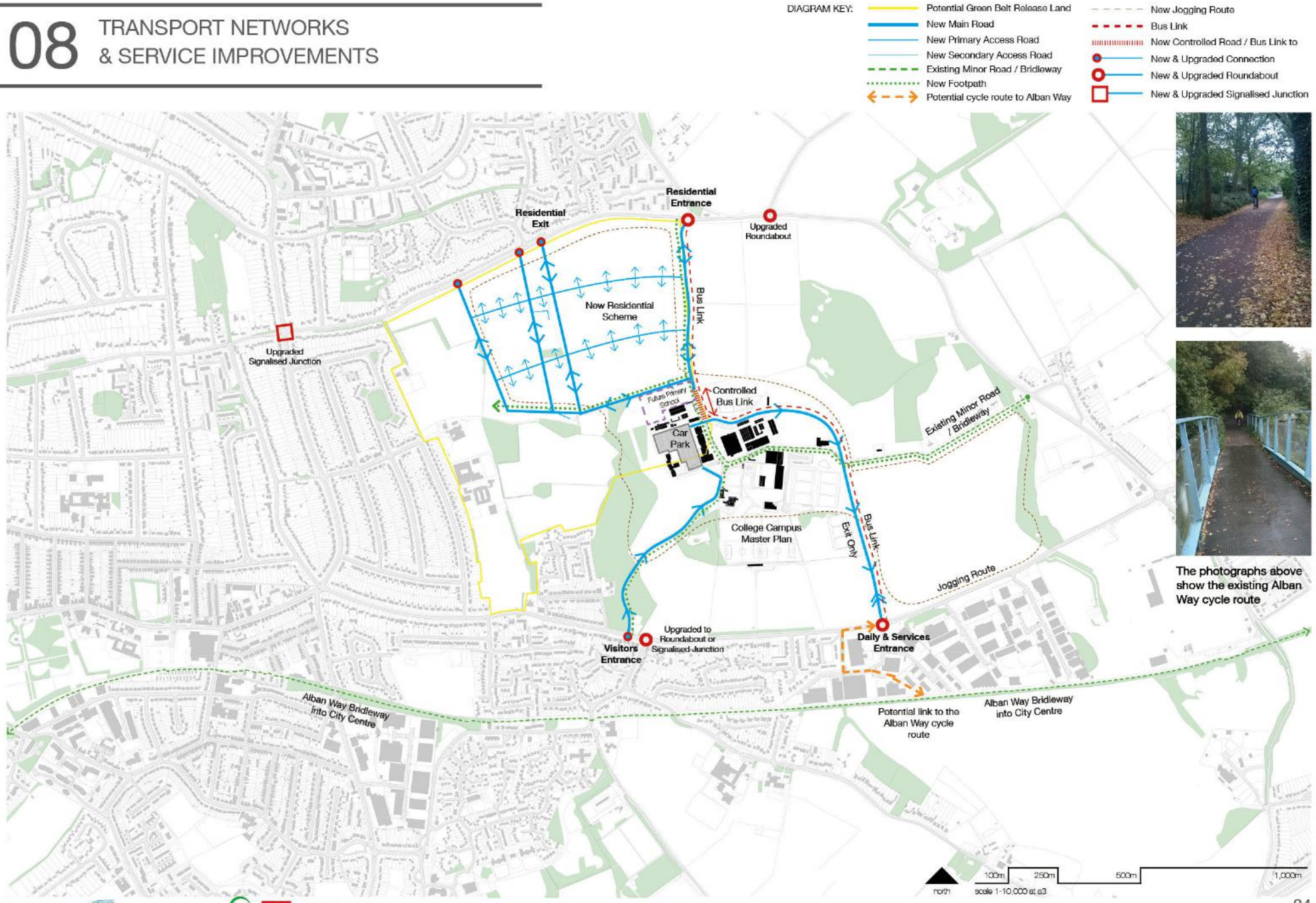
VRG planning

AECOM

Lambert Smith Hampton

DLA ARCHITECTURE

08 TRANSPORT NETWORKS & SERVICE IMPROVEMENTS



The photographs above show the existing Alban Way cycle route

08 TRANSPORT NETWORKS & SERVICE IMPROVEMENTS

THE BENEFITS OF THE PROPOSED TRANSPORT AND SERVICE IMPROVEMENTS INCLUDE:

- REDUCED TRAFFIC PROBLEMS AT THE JUNCTION OF SOUTH DRIVE / HATFIELD ROAD / COLNEY HEATH LANE
- A FREQUENT BUS SERVICE ACCESSING THE COLLEGE & RESIDENTIAL DEVELOPMENT
- BUS SERVICE DRECTLY SERVING THE COLLEGE, REMOVING THE NEED FOR STUDENTS TO WALK TO AND CONGREGATE ON HATIFLED ROAD AND AVOIDING DELAYS ASSOCIATED WITH BUSES PULLING IN / OUT
- LESS PRESSURE ON HATFIELD ROAD AS STAFF ACCOMMODATION WITHIN RESIDENTIAL DEVELOPMENT

THE EXISTING COLLEGE ENTRANCE:

HATFIELD ROAD / COLNEY HEATH LANE:

- OPTION 1:
- NEW 3 ARM ROUNDABOUT
- ACCESS ONLY THEREBY SOLVING EXIT ISSUES

- OPTION 2:
- NEW SIGNALISED JUNCTION
- ACCESS ONLY THEREBY SOLVING EXIT ISSUES

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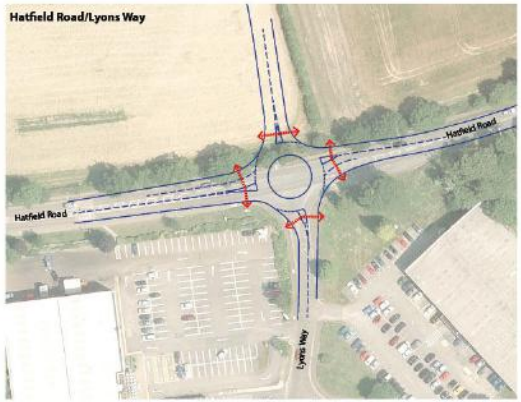
We have prepared two options for this junction. The first option shows the existing priority T-junction arrangement replaced by a 3 arm roundabout. This layout is consistent with the scheme agreed for the Hub scheme, so has previously been seen and approved by Hertfordshire. The second option shows the existing priority T-junction converted to a signalised junction. We did look at this as part of the Phase 2 application but couldn't get it to work due to the interaction with South Way. However, in both options we have assumed that South Way becomes entry only, therefore the signalised option may be worthy of further investigation as it requires significantly less land and allows pedestrian crossing facilities to be integrated into the junction.

NEW COLLEGE ENTRANCE / EXIT:

HATFIELD ROAD / LYONS WAY:

- NEW MAIN ENTRANCE / EXIT TO THE COLLEGE
- RELIEVING TRAFFIC PRESSURE
- PREVIOUSLY AGREED BY HIGHWAYS



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08 TRANSPORT NETWORKS & SERVICE IMPROVEMENTS

THE BENEFITS OF THE PROPOSED TRANSPORT AND SERVICE IMPROVEMENTS INCLUDE:

- INCREASED CAPACITY AT COOPERS GREEN AND SANDPIT LANE/MARSHALSWICK LANE
- SAFETY IMPROVEMENTS UNDERTAKEN

SANDPIT LANE / MARSHALSWICK LANE:

- WIDEN THE EASTERN APPROACH
- RELIEVING THE PINCH POINTS
- ADVANCED CYCLE STOPS

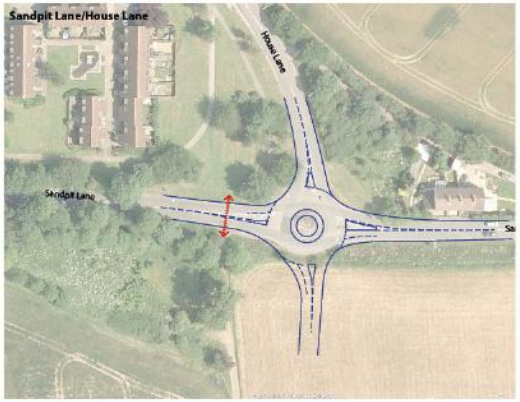
Sandpit Lane / Marshalswick Lane

Improvements are proposed at this junction as part of the Phase 2 application – these are shown in grey in the sketch. The only option we can see for further improvement to this junction is to widen the eastern approach by taking land from the verges to the north and south. The potential for two separate left hand turn lanes will be explored. Consideration could be given to introducing advanced cycle stop lines at this junction to encourage cycling.

NEW RESIDENTIAL ACCESS:

SANDPIT LANE / HOUSE LANE:

- NEW 4 ARM ROUNDABOUT
- RESIDENTIAL ENTRANCE / EXIT



Sandpit Lane / House Lane

We have prepared an option showing the existing 3-arm roundabout replaced by a larger 4-arm roundabout, with the new southern arm serving as an access to the residential development

SANDPIT LANE / COOPERS GREEN LANE:

- ENLARGED 3 ARM ROUNDABOUT
- ADDITIONAL CAPACITY
- IMPROVED SAFETY

Sandpit Lane / Coopers Green Lane

We have shown an enlarged 3-arm roundabout, which would provide additional capacity and also improve the safety of the junction by increasing deflection which would slow approach speeds.

Appendix 10: AECOM St Albans East Emerging Transport Strategy Jan 2016

Strategic Local Plan: St Albans East (Oaklands)

Emerging Transport Strategy

Prepared on behalf of Oaklands College and Taylor Wimpey North Thames

January 2016

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Contents

“Our vision for the site is to create high quality new homes set within an integrated sustainable masterplan connecting directly into the College; putting the College even more firmly at the heart of the community with public access through footpaths and cycle paths to our parkland and our agricultural setting.”

Oaklands College Strategic Local Plan Submission

Oaklands College Masterplan

01

Oaklands College Masterplan

Draft Strategic Local Plan

St Albans' draft Strategic Local Plan for the period 2011-2031 includes the potential release of Green Belt land in East St Albans (Oaklands) for a residential development of at least 1,000 units.

Highway capacity and access to Hatfield Road and Sandpit Lane are identified as key constraints on future residential development in this location, with development proposals required to deliver:

- *Substantial Green Infrastructure provision, including… extensively improved and new countryside access, public footpaths, cycleways and bridleways;*
- *Transport network (including walking and cycling links) and public transport services upgrades/improvements; and*
- *Provision of improvements to the accesses to Hatfield Road and Sandpit Lane.*

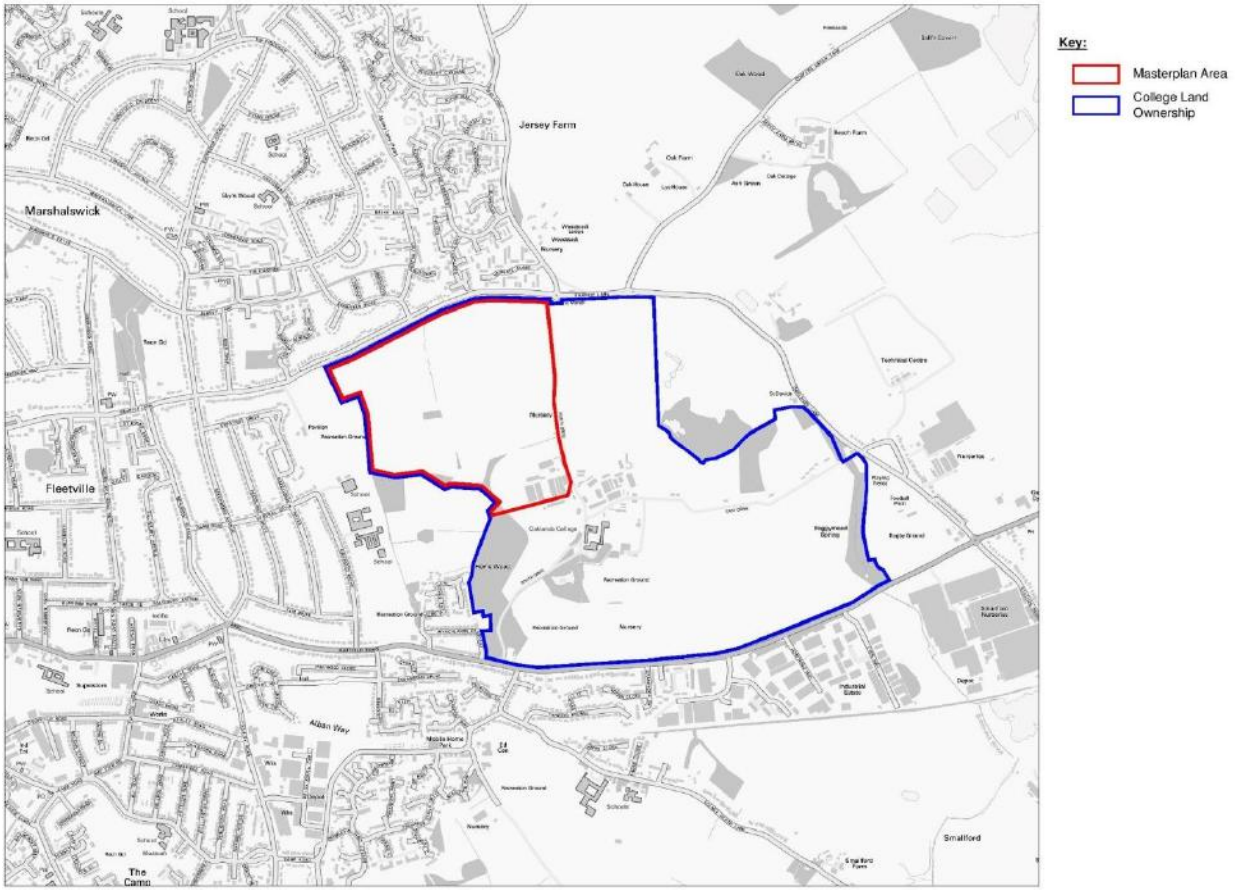
Oaklands College Masterplan

The College's vision is to create an exemplar high quality residential development of approximately 1,000 units on land to the north of the existing College development.

A planning application for an initial phase of approximately 350 residential units has already been submitted to St Albans City and District Council (Application reference 5/2013/2589). This is an enabling development, the receipts of which would fund improvements to the College facilities.

Figure 1 shows the extent of land currently owned by the College (outlined in blue) and indicative extents of the masterplan area (outlined in red).

Figure 1: Oaklands College Masterplan Area



Access Strategy: Overview

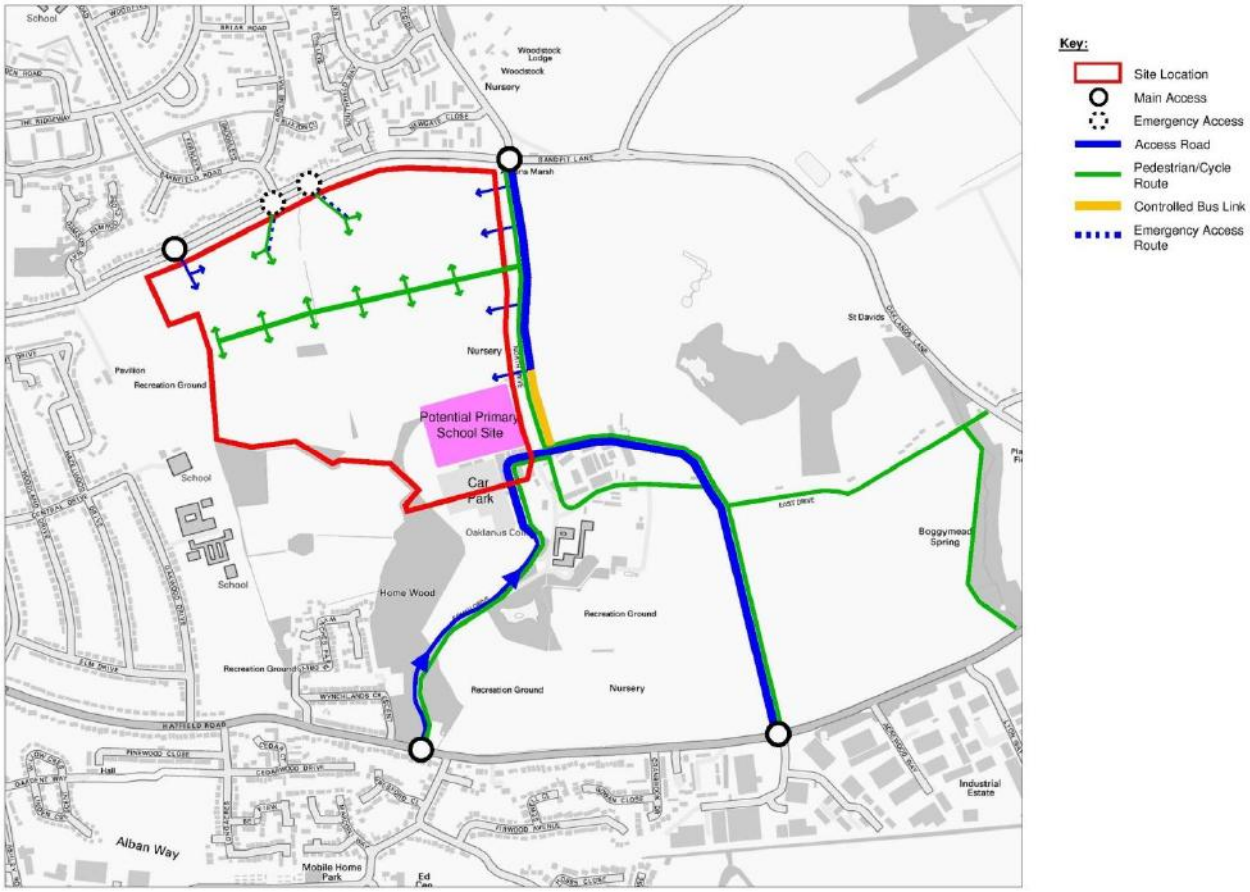
The College's vision for the St Albans Campus is to create a high quality sustainable residential development with public access to the College and surrounding areas via a network of footpaths and cycle paths that cross the site.

The emerging masterplan includes improved access to the College for all modes of transport from Hatfield Road with new pedestrian, cycle and vehicle accesses created on Sandpit Lane to serve the residential development.

A controlled road link would be provided between the College and residential developments offering opportunities for significantly improved bus access.

The emerging access strategy is shown in **Figure 2**.

Figure 2: Emerging Access Strategy

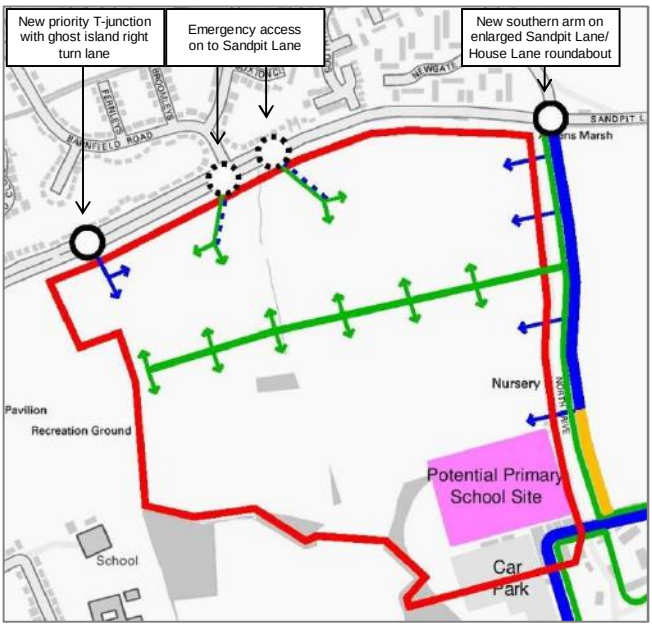


Access Strategy: Residential Development

It is envisaged that the residential development would be served by two main points of vehicular access on Sandpit Lane, with two further emergency access junctions, which would also serve as pedestrian and cycle accesses.

Figure 3 shows the emerging access strategy for the residential site.

Figure 3: Residential Site Access Strategy



The main access to the initial phase of the development would be located in the north western corner of the site on Sandpit Lane, approximately 200m east of the junction with Damson Way. The junction would be a priority T-junction with a ghost island right turn lane (**Figure 4**).

A separate emergency access would be provided onto Sandpit Lane, immediately to the east of the junction with Barnfield Road. This would also serve as pedestrian and cycle access, linking the development in to the network of routes in the predominantly residential areas further to the north.

Access to the later phases of the development would be located further east on Sandpit Lane. It is envisaged that the existing roundabout at the junction of Sandpit Lane and House lane could be enlarged with a new southern arm added to serve the expanded residential development (**Figure 5**).

Another emergency access point would be provided on Sandpit Lane, between the junctions with Barnfield Road and House Lane. This access would also provide pedestrians and cyclists with access to the development from the north.

Figure 4: Western Access Junction (Proposed Layout)

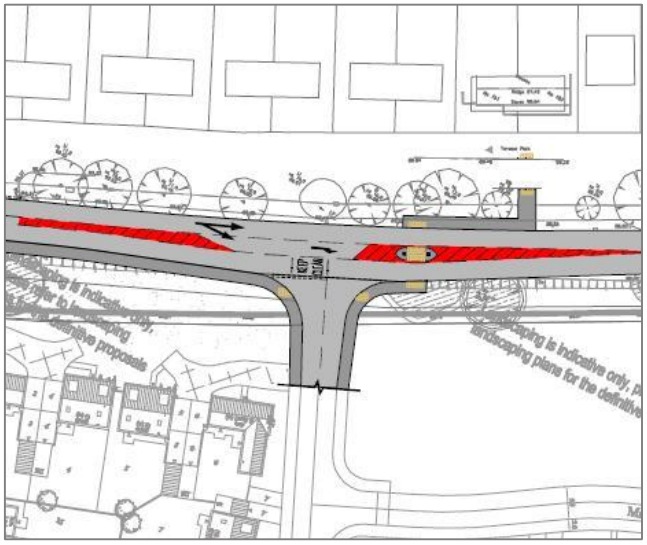
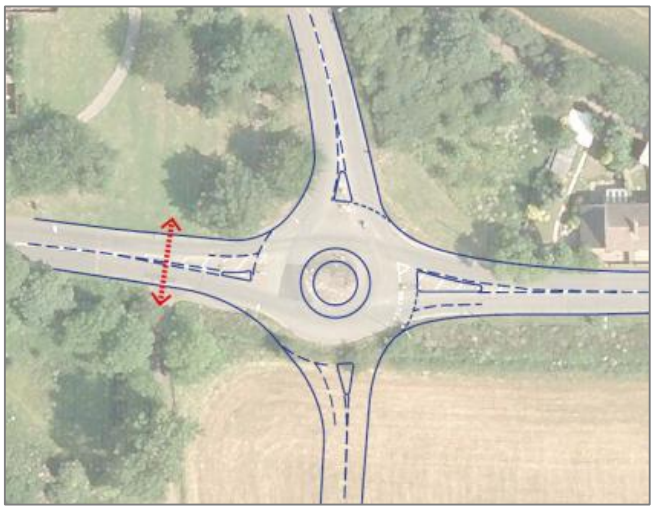


Figure 5: Eastern Access Junction (Indicative Layout)

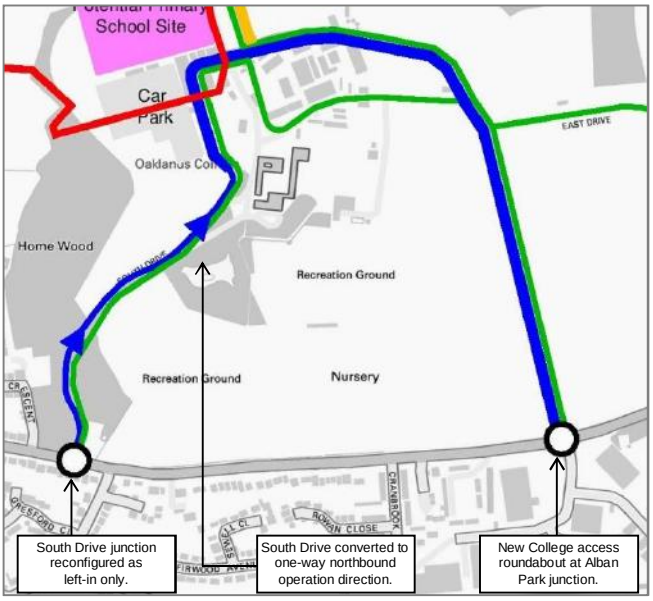


Access Strategy: College Development

The masterplan includes a new access to the site on Hatfield Road, which would become the main entrance to the College. Access to the College via South Drive would become one-way with improvements made to the facilities for pedestrians and cyclists.

Figure 6 shows the emerging access strategy for the College.

Figure 6: College Access Strategy



A new access to the College would be created on Hatfield Road at the junction with Alban Park. The existing priority T-junction would be replaced by a roundabout, with a new northern arm serving the College, as shown in **Figure 7**. This junction would become the main access into the College for staff and students, with only visitors, buses and taxis permitted to use the current access to the west.

As a result of the reduced use of the current access, it is proposed that the South Drive junction would be reconfigured so that traffic can only turn left in from Hatfield Road. This would enable South Drive to become one-way northbound, with the existing southbound lane used to provide a segregated cycle route into the College.

The removal of right turning traffic from this junction creates the potential for improvements to be made to the nearby Hatfield Road/Colney Heath Lane junction. Two potential options are being considered; the first would be to replace the existing junction with a roundabout (see **Figure 8**) while the second option involves signalising the junction (see **Figure 9**). Both options offer potential to provide improved pedestrian and cycle crossing facilities at this busy junction.

Figure 7: Hatfield Road/Alban Park Junction (Indicative Layout)

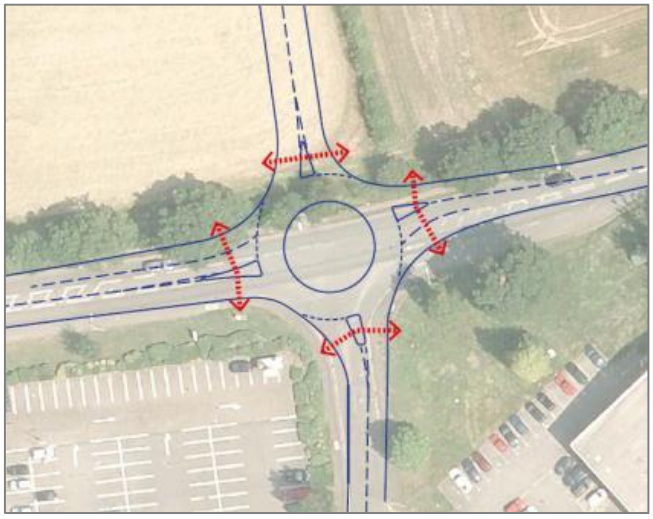
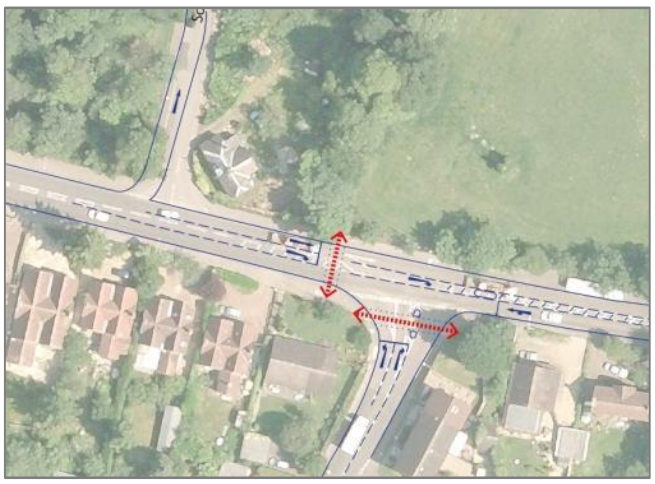


Figure 8: Hatfield Road/Colney Heath Lane Junction (Indicative Layout – Roundabout Option)

Figure 9: Hatfield Road/Colney Heath Lane Junction (Indicative Layout – Signalised Junction Option)



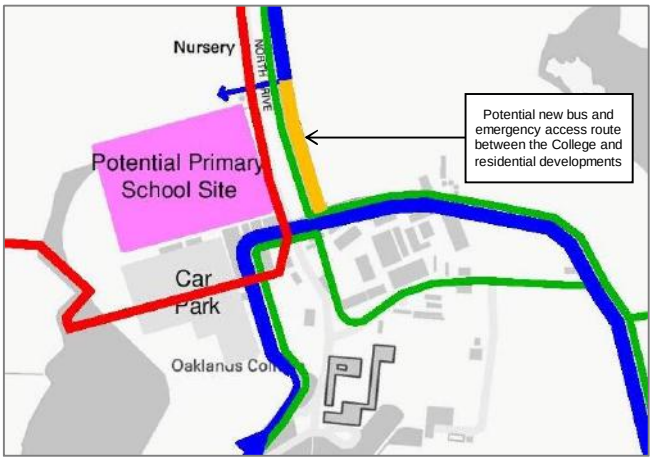
Access Strategy: Internal Connections

It is envisaged that a new road link would be created across the St Albans Campus, linking Sandpit Lane and Hatfield Road. It is not currently proposed that this route would be open to general traffic, as this would potentially encourage traffic to rat-run through the College site to avoid congestion on the local road network, particularly as the new route would offer a shorter and quicker journey than the alternative route via Oaklands Lane.

To prevent the link road being used as a through route, it is proposed that the section of road adjacent to the potential primary school site, which links the residential and College developments, would be a controlled link for use by buses and emergency vehicles only. Use of the link would be controlled by means of rising bollards or similar physical measures. The location of the link is shown in **Figure 10**.

Consideration will be given to whether it is necessary to allow some traffic from the residential development to use the link road to access Hatfield Road to spread demand across both road corridors. Further work would be required to determine what level of use is appropriate, taking account of the potential security and safety implications of routing additional traffic through the College campus; the ability of the Hatfield Road corridor to accept additional traffic; and the means of managing access between the two developments.

Figure 10: Potential Internal Bus Link



Sustainable Transport Strategy

02

Sustainable Transport Strategy: Overview

From a transport perspective, the sustainability credentials of a future residential development on the Oaklands site would depend on establishing high quality walking, cycling and public transport links that offer residents with a credible alternative to car travel.

The emerging masterplan for the College's St Albans Campus site envisions a range of improvements to the network of walking and cycling routes that cross the campus in combination with enhancements to bus access that would significantly improve the accessibility of both the College and residential developments and provide improved connections towards St Albans, Hatfield and Welwyn Garden City.

A potential sustainable transport strategy for the site is described in more detail in the following pages.

Sustainable Transport Strategy: Walking & Cycling

Existing Network

The St Albans Campus is already crossed by a number of public rights of way; North Drive and South Drive form a continuous north-south bridleway linking Sandpit Lane to Hatfield Road, while East Drive is designated as a footpath and connects the College campus to Oaklands Lane to the east.

To the south of the site, the Alban Way forms a major off-road cycle route linking Hatfield and St Albans, while to the north The Ridgeway, Jersey Lane and House Lane/Sandringham Road provide on and off-road options for cyclists.

The existing walking and cycling links on the Oaklands College site and in the local area are shown in **Figure 11**.

Emerging On-Site Strategy

A range of enhancements are envisaged to the rights of way network on the College site as part of the emerging masterplan.

South Drive would become a one-way road in the northbound direction which would allow part of the existing carriageway to be converted into a segregated two-way cycle lane providing improved cycle access into the College from the south.

A shared footway/cycleway would be provided alongside the residential access road from Sandpit Lane with an east-west spur serving the residential site.

East Drive would be upgraded from footpath to bridleway status, while a new footpath would be provided along the south-eastern boundary of the site linking East Drive with Hatfield Road.

The masterplan also includes identified routes for walking, jogging or running around the perimeter of the Oaklands site.

Emerging Off-Site Strategy

In addition to the on-site improvements, consideration will also be given to providing new and improved connections that link both the College and residential development into the surrounding network of walking and cycling routes.

To the north of the site, the potential to provide shared footway/cycleway connections alongside Barnfield Road and House Lane will be investigated, connecting the College to the existing routes on The Ridgeway and Sandringham Road.

To the south of the site, the importance of providing improved connections to the Alban Way is recognised, with new pedestrian and cycle crossings on Hatfield Road at the new College access roundabout and at the Colney Heath Lane junction.

The masterplan envisions improvements to the shared footway/cycleway through Alban Park providing a more attractive link onto the Alban Way towards Hatfield and the establishment of a new shared footway/cycleway alongside Colney Heath Lane providing a new walking and cycling link on to the Alban Way towards St Albans City Centre.

The on-site and wider area enhancements that are envisaged as part of the emerging masterplan are shown indicatively in **Figure 12**.

Figure 11: Existing Walking & Cycling Networks

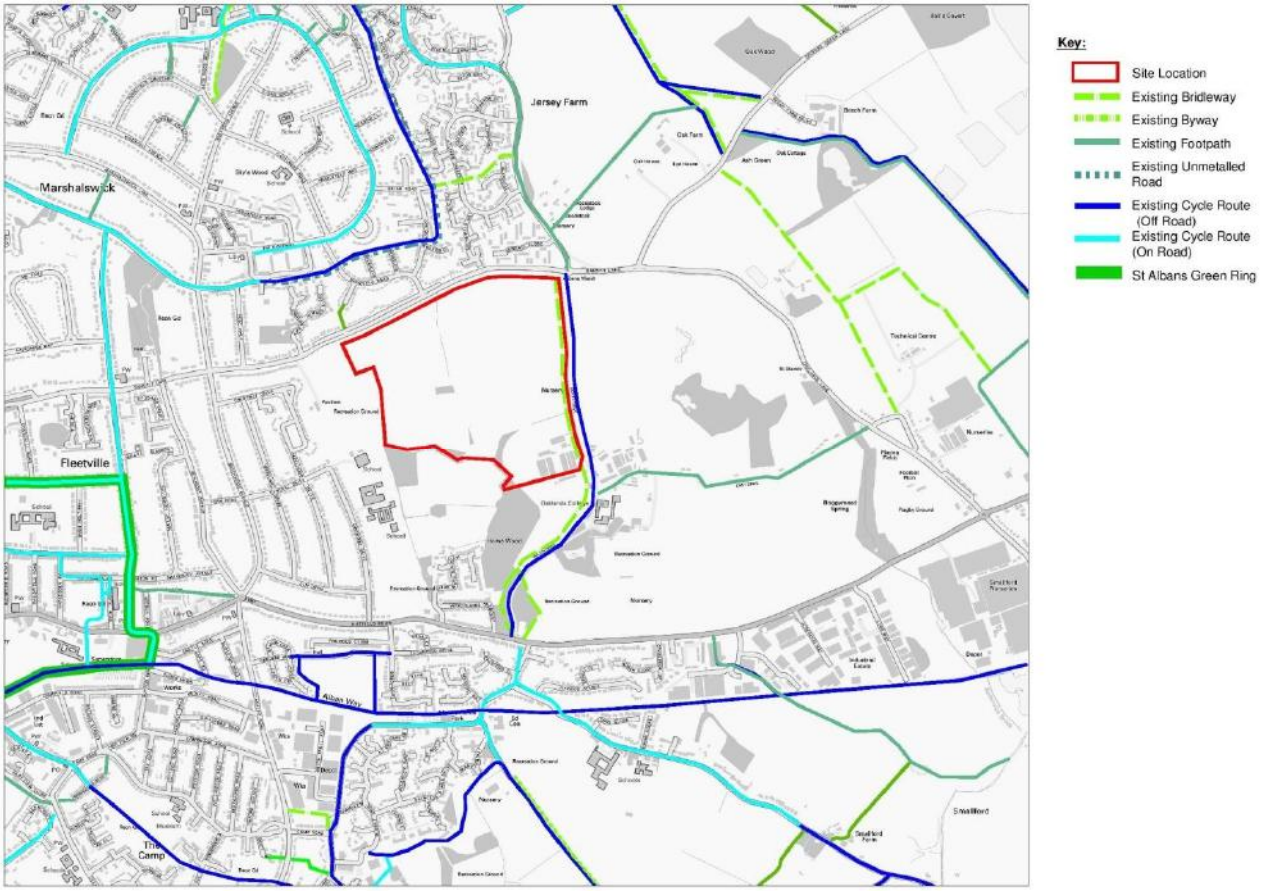
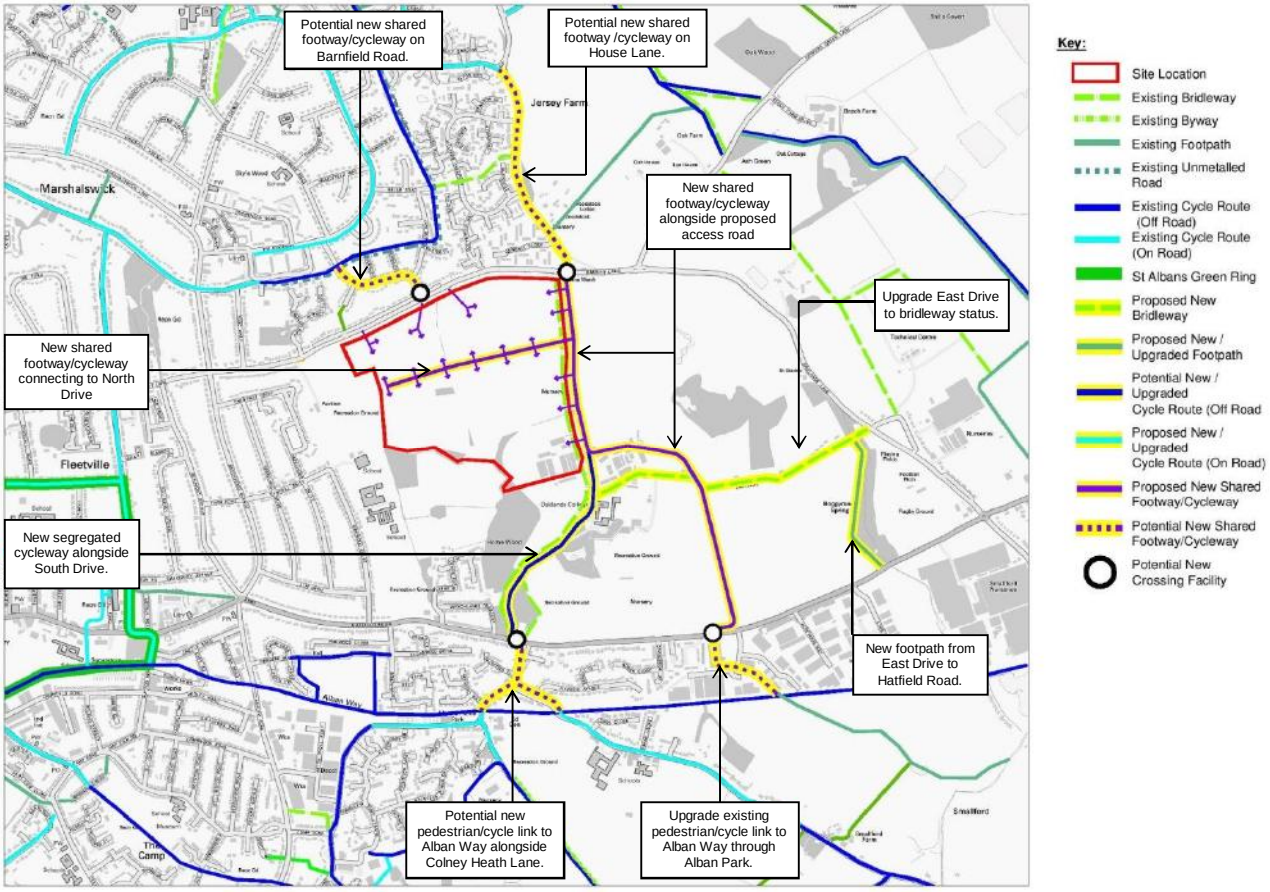


Figure 12: Indicative Walking & Cycling Strategy



Sustainable Transport Strategy: Public Transport

Existing Bus Links

The St Albans Campus is already served by numerous bus routes that operate along Hatfield Road, with the closest bus stops being located on Hatfield Road either side of the junctions with Colney Heath Lane and South Drive. These services provide fast and frequent connections to a range of destinations, most notably towards St Albans city centre and City rail station to the west and towards Hatfield and Welwyn Garden City to the east. College staff and students benefit from discounts on services operated by Uno, including the 601 (St Albans to Welwyn Garden City) and 602 (Hatfield to Watford).

Uno's 653 bus service operates along Sandpit Lane to the north of the site, providing a 20 minute frequency service between St Albans and Welwyn Garden City via Hatfield. The closest stops to the site are located on Sandpit Lane at the junctions with Marshalswick Lane to the west and the junction with House Lane to the north.

Emerging Bus Strategy

While the bus routes on Hatfield Road are used by College staff and students, the fact that bus services do not penetrate the College site means some potential passengers may be deterred from using them and that they would be unlikely to be extensively used by residents of a new residential development to the north.

The emerging masterplan therefore includes proposals to provide a bus link through the Oaklands College site connecting Sandpit Lane and Hatfield Road. This would allow the existing 653 bus service to be diverted through the site, thereby serving both the residential development and College campus, rather than along Oaklands Lane to the east.

The bus link also introduces the potential for a new circular service to be established that links the College and residential developments to St Albans city centre and City rail station.

In addition, the changes proposed to the College access arrangements would create a loop through the site, which would enable bus services operating along Hatfield Road such as the 601 and 602 to directly serve the College campus.

In combination these changes would ensure that the whole of the College campus and residential development are within 400m walk of a bus stop that is served by a high frequency bus service (at least 3 buses per hour).

The potential diversions of existing bus routes are shown in **Figure 13** and **Figure 14** while the new circular route is shown in **Figure 15**.

Figure 13: Potential diversion of 653 Bus Service

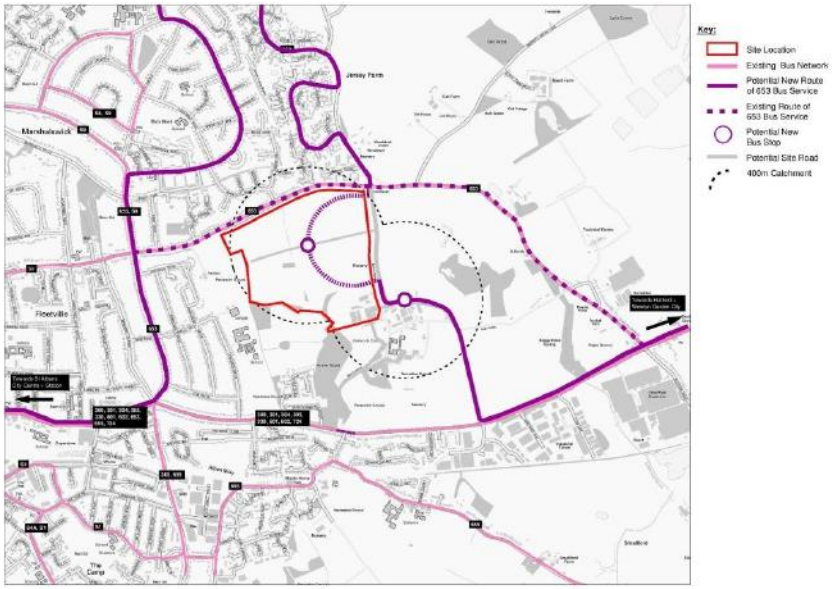


Figure 14: Potential diversion of 601 and 602 Bus Services

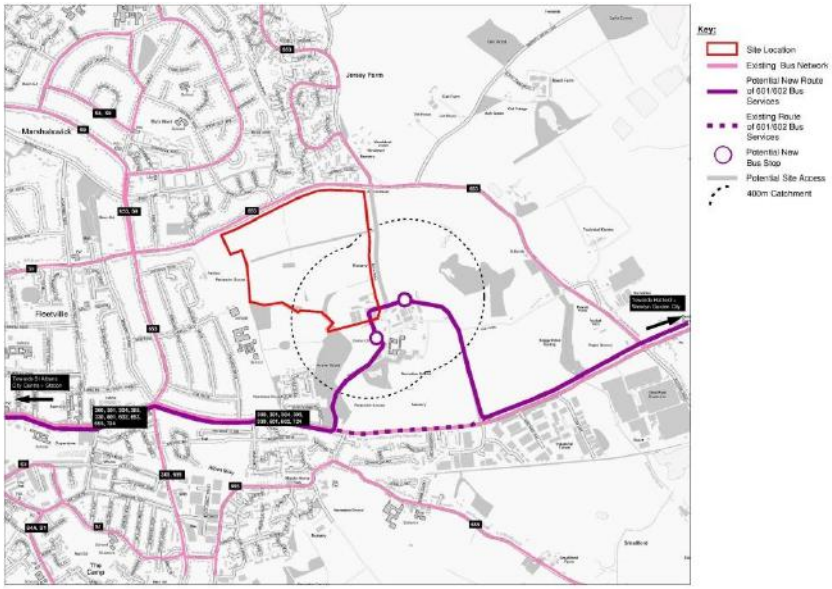
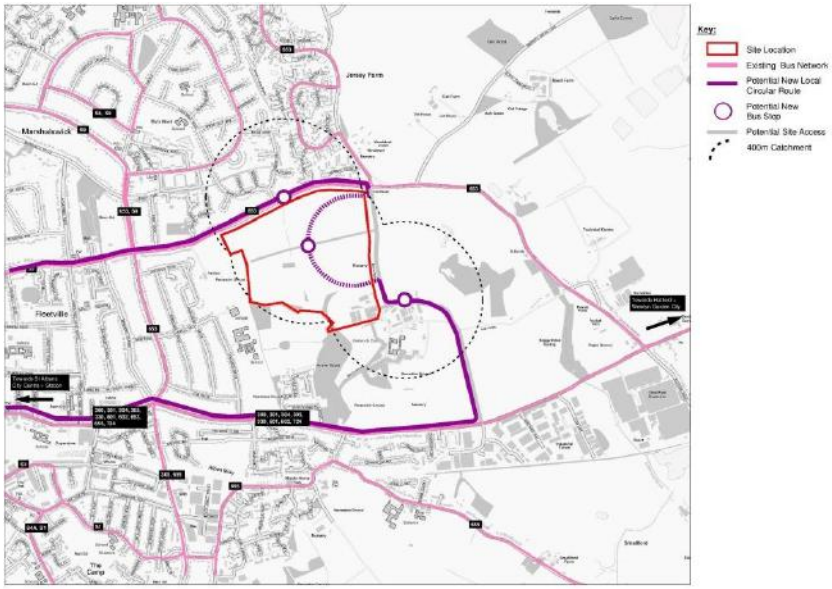


Figure 15: Potential new circular route



Highway Strategy

03

Highway Strategy: Vehicle Trip Generation

An initial high-level trip generation and distribution exercise has been carried out to determine the potential number of car trips that would be generated by a development of 1,000 residential units and the potential implications of this traffic on the surrounding local road network.

The private and affordable residential vehicular trip rates underpinning the planning application for the initial phase of the residential development have been used as the basis for this initial assessment.

The emerging masterplan includes an aspiration to provide 40% affordable housing, which is typically a lower traffic generator than private housing.

As the masterplan also includes a new two form primary school, it is expected that the majority of primary school aged children living within the residential development would attend this new school and therefore would not need to leave the development. These education trips have therefore been discounted in the trip generation calculations.

The emerging masterplan also envisages a small number of affordable units specifically targeted at College staff and students. It is expected that these units would generate very few external vehicular trips in the peak hours and therefore these trips have also been discounted in the trip generation calculations.

Table 1 summarises the estimated peak hour vehicular trip generation for the full allocation of 1,000 residential units.

Table 1: Initial Peak Hour Vehicular Trip Generation Estimates

	AM Peak (0800-0900)			PM Peak (1700-1800)		
Housing Type	**Arr**	**Dep**	**2-Way**	**Arr**	**Dep**	**2-Way**
Private	65	178	243	234	141	375
Affordable	16	61	78	107	68	174
Total Vehicle Trips	**81**	**239**	**320**	**341**	**208**	**549**

Highway Strategy: Initial Impact Assessment

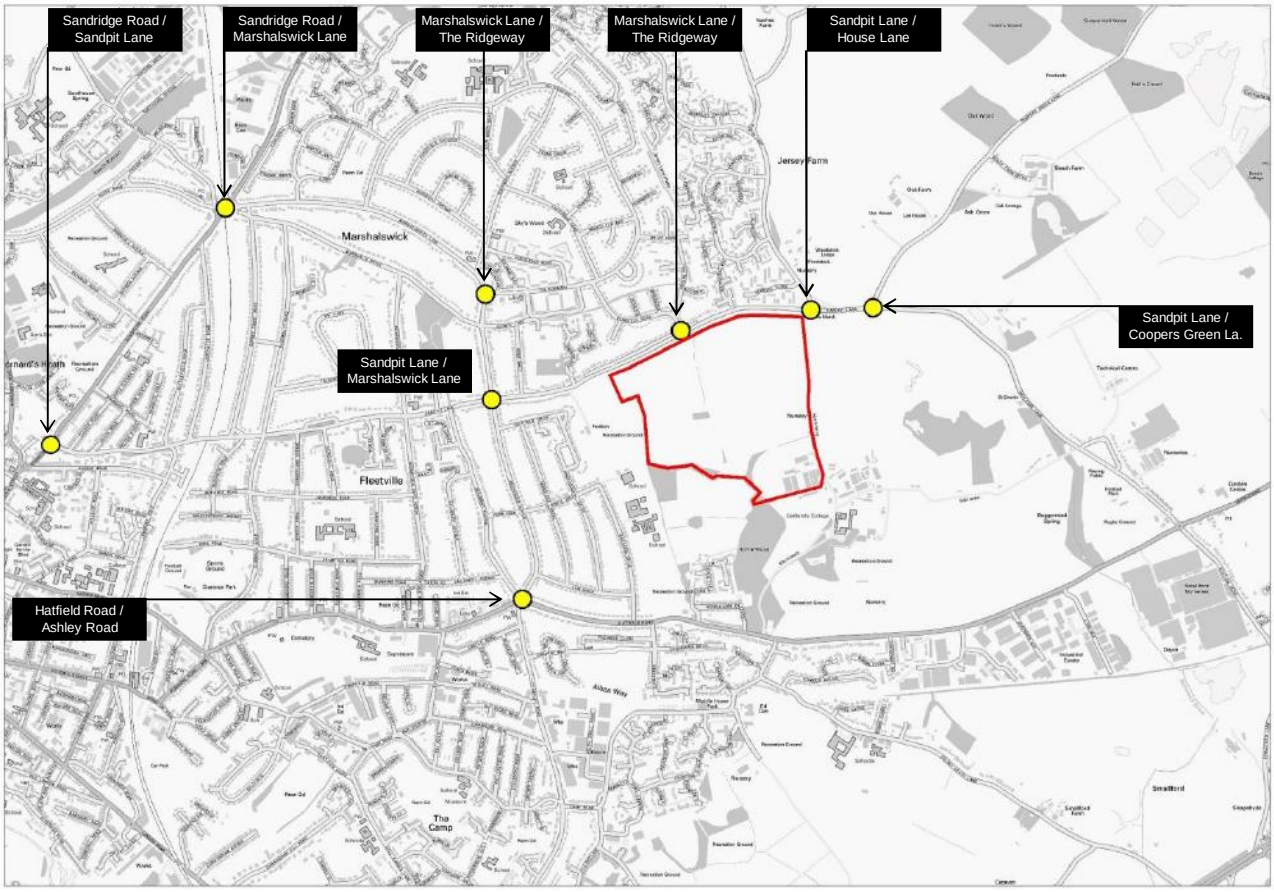
Vehicular trips have been assigned to the local highway network using the same distribution assumptions as used in the planning application for the initial phase of the residential development. The resultant development flows have been compared with future traffic forecasts in 2021 to determine the potential implications of the residential development on the surrounding local road network.

Figure 16 shows the junctions where traffic flows would be likely to increase by 5% or more in either the morning or evening peak hour as a result of the full residential development.

The largest increase in traffic flows is forecast to occur at the Marshalswick Lane/Sandpit Lane junction as the majority of the traffic from the residential development would be expected to pass through this junction. Significant traffic increases are also anticipated on Sandpit Lane at the junctions with Barnfield Road and House Lane, while there is potential for traffic flows to increase by more than 5% in the following locations:

- Marshalswick Lane/The Ridgeway (mini-roundabout);
- Sandridge Road/Sandpit Lane (priority T-junction); and
- Hatfield Road/Beechwood Avenue/Ashley Road (double mini-roundabout)

Figure 16: Initial Assessment of Impact in 2021



Highway Strategy: Off-Site Mitigation

The initial assessment of the potential development impacts suggests that a number of junctions in the local area may require improvement to accommodate the forecast levels of traffic associated with a residential development of 1,000 units. Consideration has therefore been given to the potential nature of the improvements that may be required at key off-site junctions.

Sandpit Lane/Marshalswick Lane Junction

Improvements to this junction were put forward as part of the planning application submitted for the initial phase of the residential development to provide additional capacity to accommodate the extra traffic generated by the development. The proposed improvements included removal of the existing pedestrian refuges and widening of the western and southern approaches to improve the overall throughput of the junction.

In order to accommodate the additional traffic that would be generated by a larger housing allocation, further improvements at this junction would be required. Two preliminary options have been considered for this junction.

The first option builds upon the improvements that are proposed as part of the initial phase of the residential development. It would involve widening the eastern approach to the existing junction to provide two lanes in the westbound direction and potentially banning the right turn movement from Marshalswick Lane (north) into Sandpit Lane (west).

The second option would involve replacing the existing signalised junction with a compact roundabout. Peak hour traffic flows on all four arms of the junction are relatively balanced, so a roundabout solution may improve traffic flow compared with the existing traffic signals. However, consideration would also need to be given to the impacts of a roundabout pedestrians and cyclists.

Initial concept designs have been developed for both options (see **Figure 17** and **Figure 18**), which indicate that the improvements could be delivered within the available highway land. However, both options would result in the loss of verges and some mature trees.

Initial junction assessments suggest that both of these options have potential to achieve nil-detriment (i.e. traffic conditions that are no worse with the development than if it did not go ahead). This indicates that the impact of the development on this junction can be overcome with careful mitigation, although further design and detailed modelling would need to be undertaken to confirm the most appropriate solution.

Figure 17: Sandpit Lane/Marshalswick Lane Junction (Indicative Layout – Signalised Junction Option)

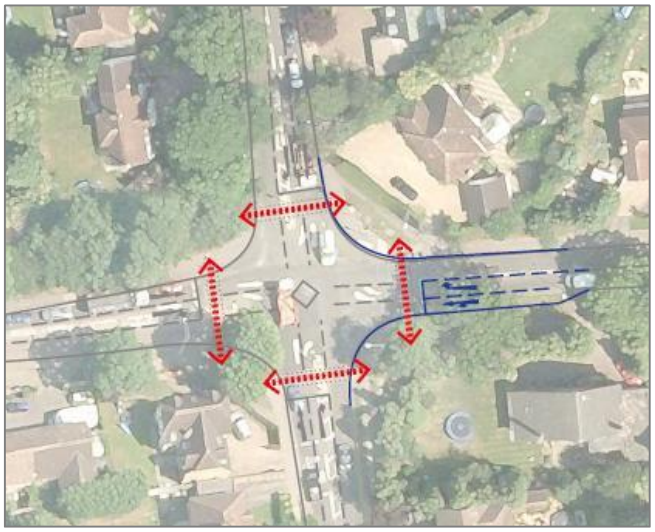
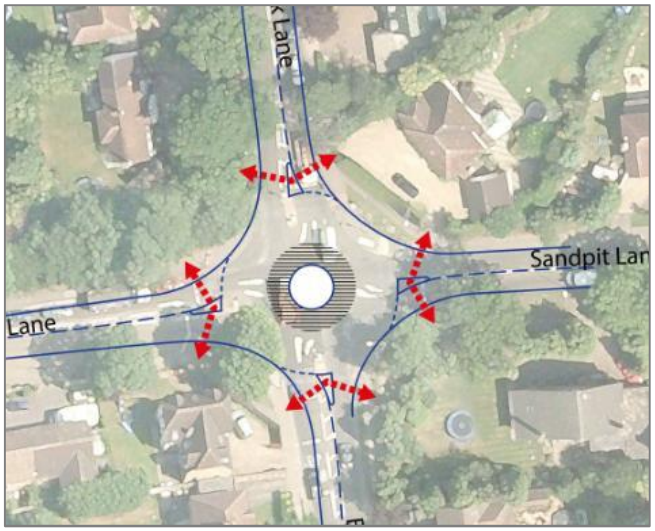


Figure 18: Sandpit Lane/Marshalswick Lane Junction (Indicative Layout – Compact Roundabout Option)



Sandpit Lane/House Lane Junction

As discussed earlier in this document, it is proposed that existing roundabout at the junction of Sandpit Lane and House Lane would be enlarged to accommodate an additional arm serving the residential development and also to provide increased capacity for the additional development traffic that would use this junction.

Sandpit Lane/Coopers Green Lane Junction

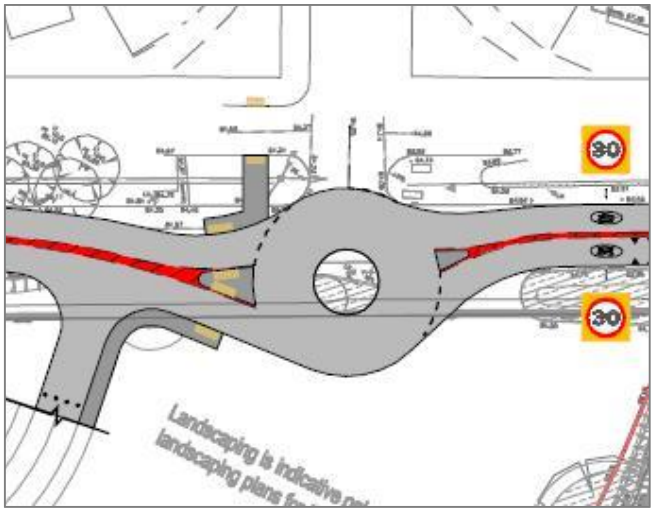
Improvements would also be required at the junction of Sandpit Lane and Coopers Green Lane to accommodate the additional development traffic and improve the existing layout. The potential improvements could include enlarging the existing roundabout within the available highway land to provide additional capacity and increasing deflection to slow approach speeds and improve safety. An indicative junction layout is shown in **Figure 19**, although this would require further design and detailed modelling to determine the appropriate geometry.

Figure 19: Sandpit Lane/Coopers Green Lane Junction (Indicative Layout)

Sandpit Lane/Barnfield Road Junction

The highway proposals associated with the initial phase of the residential development included conversion of the Sandpit Lane/ Barnfield Road junction from a priority T-junction into a compact roundabout in order to help enforce the proposed reduction in speed limit on Sandpit Lane to 30mph. The proposed layout is shown **Figure 20**.

Figure 20: Sandpit Lane/Barnfield Road Junction (Proposed Layout)



Sandpit Lane/Damson Way Junction

In order to further reduce vehicle speeds on Sandpit Lane the highway proposals associated initial phase of the residential development also included minor alterations to the junction with Damson Way, including moving the give-way line to improve visibility on the minor arm and introducing a traffic island to the west of the junction.

Need for Additional Mitigation

There are a number of other junctions where traffic flows are predicted to increase as a result of the development. A detailed Transport Assessment would need to be undertaken to determine the extent of the development impacts in these locations, with further work required to determine whether mitigation is required and the nature of the potential interventions.

Demand Management

Any future development would be supported by detailed Travel Plans, which set out the measures and initiatives that would be implemented to promote sustainable modes of transport and reduce the reliance on car travel.

The College already has a comprehensive Travel Plan that includes a wide range of measures to promote walking, cycling and bus travel, including discounted bus travel and improvements to the existing bus stops on Hatfield Road.

A similar document would be prepared for the residential development, which would detail the measures that would be implemented to encourage sustainable travel behavior and deter unnecessary car use.

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Summary

04

Summary

The emerging masterplan for Oaklands College's envisions a high quality and sustainable residential development of 1,000 units on land to the north of the existing College development. A high proportion of this housing would be affordable tenure (42%) and it would include some College specific housing.

In addition to the proposed housing, the masterplan also includes allowance for a new primary school which would serve the needs of the development and help to reduce the travel demand generated by the development, particularly during the morning peak period.

From a transport perspective, the masterplan includes a range of potential transport interventions, including:

- A new entrance to the College on Hatfield Road that would reduce the amount of traffic using South Drive, thereby facilitating improvements to arrangements for pedestrians and cyclists on this busy part of the road network;
- Two new vehicular accesses on Sandpit Lane combined with additional emergency accesses to serve the proposed residential development. All new accesses would also incorporate provision for pedestrians and cyclists;
- Improvements to the existing network of footpaths and bridleways that cross the site supported by a network of new pedestrian and cycle routes that enhance access to the campus from Sandpit Lane to the north and Hatfield Road to the south as well as ensuring interconnectivity between the College and residential developments;
- Enhancements to existing walking and cycling routes to the north and south of the site to link the campus into the surrounding network of walking and cycling routes including the Alban Way;
- A new road link across the site that links Sandpit Lane and Hatfield Road, opening up opportunities for significantly improved bus access to both the College and residential developments;
- A range of improvements to existing junctions in the immediate vicinity of the site to improve safety and provide increased capacity to accommodate the additional traffic movements that could be generated by the residential development.

The proposed transport interventions would significantly enhance access to the College's St Albans Campus, while also putting in place the transport infrastructure required to support a major residential development in East St Albans.

It is considered that there are no fundamental transport issues associated with the emerging masterplan that could not be overcome through careful planning and considerate design combined with the provision of an appropriate package of sustainable transport proposals, demand management measures and on- and off-site highway improvement schemes.

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“The Oaklands Masterplan provides a once in a generation opportunity to establish a community which can offer a wide range of benefits and opportunity to its residents that at its heart is focused on education and the improvement of lives.”

Oaklands College Strategic Local Plan Submission

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Appendix 11: AECOM St Albans East Initial Assessment of Highway Impacts March 2016

Strategic Local Plan: St Albans East (Oaklands)

Initial Assessment of Highway Impacts

Prepared on behalf of Oaklands College and Taylor Wimpey North Thames

March 2016

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Contents

“Our vision for the site is to create high quality new homes set within an integrated sustainable masterplan connecting directly into the College; putting the College even more firmly at the heart of the community with public access through footpaths and cycle paths to our parkland and our agricultural setting.”

Oaklands College Strategic Local Plan Submission

Oaklands College Masterplan

01

01 Introduction & Background

Draft Strategic Local Plan

The draft Strategic Local Plan (SLP) produced by St Albans City and District Council (SACDC) covers the period 2011-2031 and includes the potential release of Green Belt land in East St Albans (Oaklands) for a residential development of 1,000 units.

Oaklands College's vision is to create an exemplar high quality residential development of approximately 1,000 units on land to the north of the existing College development. A planning application for an initial phase of approximately 350 residential units has already been submitted to SACDC (Application reference 5/2013/2589). This is an enabling development, the receipts of which would fund improvements to the College facilities.

Background

As part of the ongoing consultation process for the draft SLP, SACDC invited landowners/promoters to submit their vision for the development sites allocated within the draft SLP. An initial masterplan for the Oaklands College site was developed and submitted to SACDC in November 2015. The area covered by the masterplan is shown in Figure 1.1 below.

Following submission of the masterplan document, an emerging transport strategy for the East St Albans (Oaklands) allocation was submitted to SACDC in February 2016, which outlined a potential access strategy for all modes of transport and a range of potential on- and off-site improvements designed to improve the accessibility of the site on foot, by cycle and by public transport as well as identifying the nature of potential off-site highway mitigation measures. The emerging access strategy is illustrated in Figure 1.2

Purpose of this Report

This report builds upon the information set out in the emerging transport strategy document. It sets out initial trip generation forecasts for the full allocation of 1,000 units and goes on to assess the impact that this level of development is likely to have on the key junctions surrounding the Oaklands College site. It goes on to consider the potential nature of junction improvements that may be required to accommodate the additional traffic that would be generated by the full allocation.

Figure 1.1: Oaklands College Masterplan Area

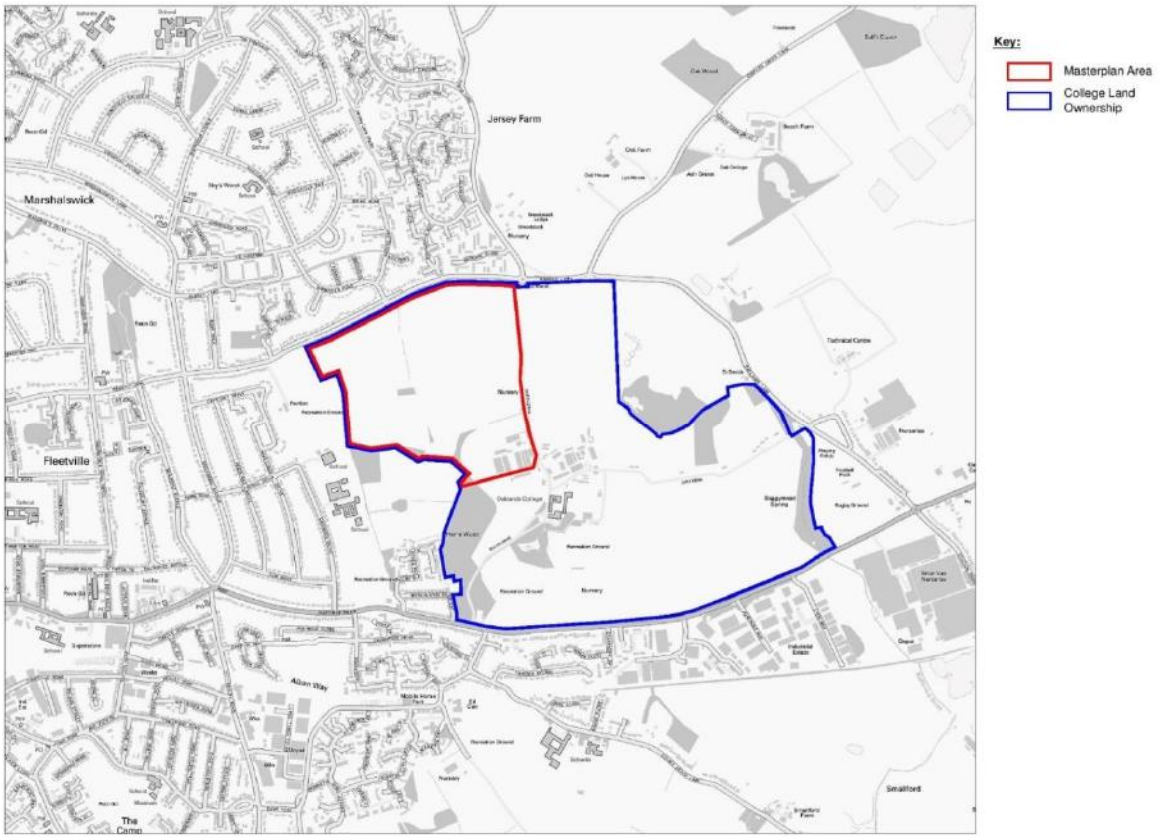
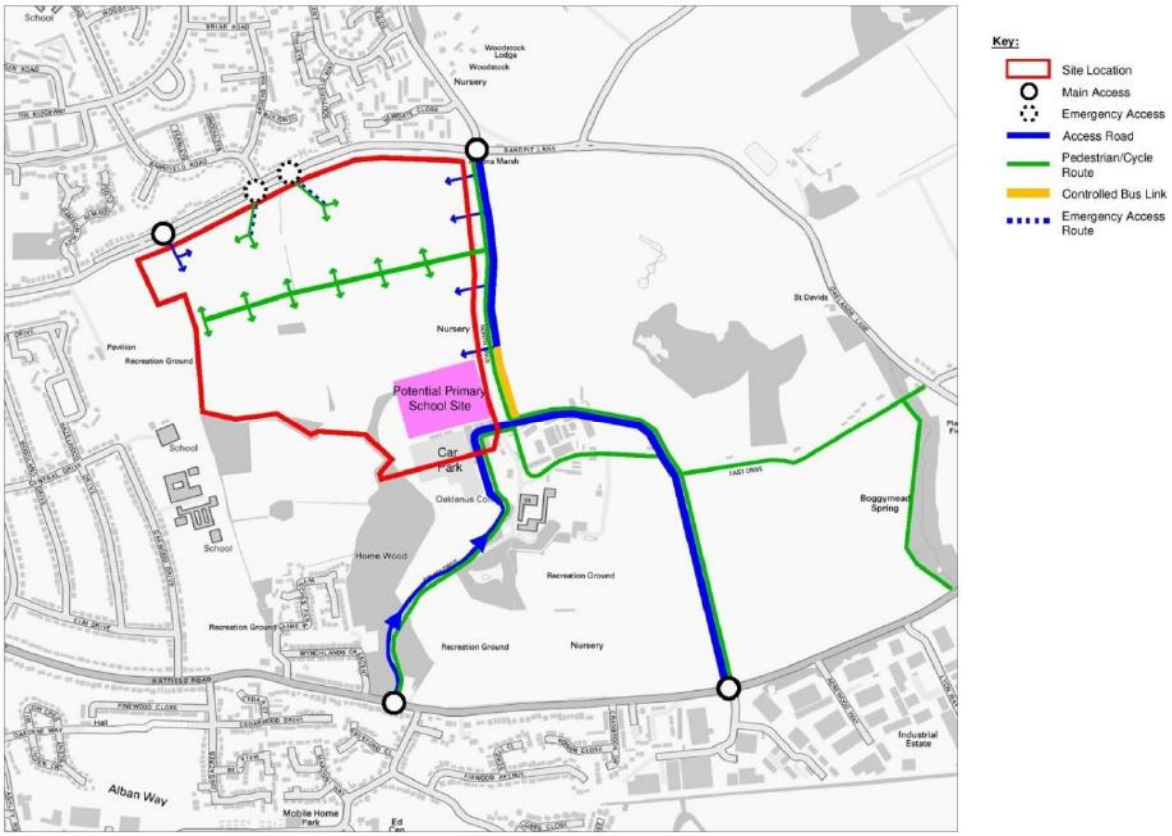


Figure 1.2: Emerging Access Strategy



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Trip Generation Forecasts

02

02 Trip Generation Forecasts

Development Quantum

The draft SLP indicates that the East St Albans (Oaklands) site could accommodate 1,000 dwellings. As noted above a planning application for an initial phase of approximately 350 units has already been submitted to SACDC.

The College's emerging masterplan includes an aspiration to provide 42% affordable housing across the whole site, which is typically a lower traffic generator than private housing. This includes a small number of affordable units specifically for College staff and students.

Table 2.1 below summarises the proposed quantum of development by phase. It is envisaged that the development would comprise a mixture of unit types, ranging from 1 and 2-bed flats to 5-bed houses.

Table 2.1: Indicative Quantum of Development

Housing Type	Initial Phase	Later Phases	Total
Private	227	357	584
Affordable (General)	123	273	396
Affordable (College)	0	20	20
Total	**350**	**650**	**1,000**
% Affordable	**35%**	**45%**	**42%**

Vehicle Trip Rates

The private and affordable residential vehicular trip rates underpinning the planning application for the initial phase of the masterplan have been used as the basis for this assessment.

The trip rates applied reflect the anticipated mix of tenures and unit types. As the masterplan includes a small number of affordable units for use by the College it is expected that these units would generate very few if any vehicular trips in the peak hours and therefore for the purposes of this initial assessment the trip rates for these units have been set to zero.

Table 2.2 below summarises the peak hour vehicle trip rates for private, affordable and College accommodation.

Table 2.2: Peak Hour Vehicular Trip Rates

	AM Peak (0800-0900)			PM Peak (1700-1800)		
Housing Type	**Arr**	**Dep**	**2-Way**	**Arr**	**Dep**	**2-Way**
Private	0.153	0.418	0.5711	0.410	0.246	0.656
Affordable (General)	0.056	0.214	0.270	0.276	0.175	0.451
Affordable (College)	**0.000**	**0.000**	**0.000**	**0.000**	**0.00**	**0.000**

Initial Vehicular Trip Generation Forecasts

In order to calculate the vehicular trip generation for the site, the vehicular trip rates in Table 2.2 have been applied to the indicative housing mix in Table 2.1. Table 2.3 below summarises the peak hour vehicular trip generation forecasts for the initial and later phases of the masterplan.

Table 2.3: Indicative Peak Hour Vehicular Trip Generation

	AM Peak (0800-0900)			PM Peak (1700-1800)		
Housing Type	**Arr**	**Dep**	**2-Way**	**Arr**	**Dep**	**2-Way**
Initial Phase (350 units)						
Private	35	95	130	93	56	149
Affordable (General)	7	26	33	34	21	55
Affordable (College)	0	0	0	0	0	0
Total	**42**	**121**	**163**	**127**	**77**	**204**
Later Phases (650 units)						
Private	55	149	204	147	88	235
Affordable (General)	15	58	74	75	48	123
Affordable (College)	0	0	0	0	0	0
Total	**70**	**208**	**278**	**222**	**136**	**358**
Combined (1,000 units)						
Private	90	245	334	240	144	384
Affordable (General)	22	85	107	109	69	178
Affordable (College)	0	0	0	0	0	0
Total	**112**	**329**	**441**	**349**	**213**	**562**

Internalisation of Primary School Trips

The masterplan includes a new two form of entry (2FE) primary school and therefore it is expected that all of the primary school aged pupils living within the site would attend this new school. The vehicular trip rates include education and education escort trips and therefore these trips have been discounted from the trip generation forecasts.

In order to calculate the proportion of education trips relating to primary school students, data from the National Travel Survey (September 2015) and 2011 Census have been used. The NTS indicates that in the morning (0800-0900) 50% of weekday trips are classified as 'Education' or 'Education Escort', while in the evening (1700-1800) only 4% of trips are education related.

Population age data has been extracted from the 2011 Census for the Lower Super Output Area (LSOA) around the Oaklands site (St Albans 015D). This indicates that there were 250 people of school age (5-16 years old) in this LSOA in 2011, of which 137 (55%) were of primary school age (age 5-10 old) and 113 (45%) are of secondary school age (11-16 years old).

The reduction in vehicle trips has been calculated by applying the proportion of education and education escort trips (50% in morning, 4% in evening) to the percentage of primary school age pupils (55%). Table 2.4 summarises the peak hour reduction that has been applied to the vehicle trip generation forecasts in Table 2.3 above.

Table 2.4: Primary School Reduction

	AM Peak (0800-0900)	PM Peak (1700-1800)
% Education Trips	50%	4%
Primary Age	55%	55%
Trip Rate Reduction	**27%**	**2%**

Adjusted Vehicular Trip Generation Forecasts

Table 2.5 below summarises the resultant peak hour vehicular trip generation forecasts for the site which have been adjusted to remove the internal trips to and from primary school.

Table 2.5: Adjusted Peak Hour Vehicular Trip Generation

	AM Peak (0800-0900)			PM Peak (1700-1800)		
Housing Type	**Arr**	**Dep**	**2-Way**	**Arr**	**Dep**	**2-Way**
Initial Phase (350 units)						
Private	25	69	94	91	55	146
Affordable (General)	5	19	24	33	21	54
Affordable (College)	0	0	0	0	0	0
Total	**30**	**88**	**118**	**124**	**76**	**200**
Later Phases (650 units)						
Private	40	109	148	143	86	229
Affordable (General)	11	42	54	74	47	120
Affordable (College)	0	0	0	0	0	0
Total	**51**	**151**	**202**	**217**	**133**	**349**
Combined (1,000 units)						
Private	65	178	243	234	141	375
Affordable (General)	16	61	78	107	68	174
Affordable (College)	0	0	0	0	0	0
Total	**81**	**239**	**320**	**341**	**208**	**549**

Future Traffic Forecasts

03

03 Future Traffic Forecasts

Baseline Traffic Data

Traffic surveys undertaken as part of the work underpinning the planning application for the initial phase of the masterplan have been used as the basis for assessing the potential impacts of a development of 1,000 homes on the Oaklands College site.

A set of manual classified turning counts (MCTCs) were undertaken between 0700 and 1900 on Wednesday 28 November 2012 at the following junctions.

- A1057 Hatfield Road / Colney Heath Lane / South Drive;
- Sandpit Lane / Beechwood Avenue / Marshalswick Lane;
- Sandpit Lane / House Lane; and
- Sandpit Lane / Coopers Green Lane / Oaklands Lane.

Future Base Traffic Flows

The draft SLP covers the period up to 2031, therefore for the purpose of this exercise growth factors covering the period 2012-2031 have been applied to the base traffic surveys to produce initial forecasts of future base traffic flows in 2031.

HCC is currently developing a Countywide Transport Model (COMET) which will provide a platform to test strategic mitigation measures and growth scenarios across Hertfordshire. This model will feed into the emerging HCC 'Transport Vision' (a successor to Local Transport Plan 3), which will then identify packages of transport interventions to enable growth across the county to 2050. COMET is considered to be the best source of future traffic growth forecasts, however the COMET model is still under development and is not due to be available to test options until later in the year.

As data from the COMET model is currently unavailable, a number of alternative data sources of traffic growth factors have been analysed including:

- TEMPRO;
- DfT Annual Average Daily Flow; and
- DIAMOND.

The TEMPRO 6.2 database with dataset 62 has been used to forecast background traffic growth in St Albans (26UG2) over the period from 2012 to 2030 based on the National Trip End Model (NTEM) and local planning data. The TEMPRO factor for the morning peak period (0700-1000) is 1.2431 while the factor for the evening peak period (1600-1900) is 1.2365.

The DfT hold annual traffic data figures for A-roads in Hertfordshire covering the period from 2000 to 2014. Annual Average Daily Flow (AADF) figures are provided for a number of sites in St Albans. For the purpose of this exercise, two sites on Hatfield Road were chosen; the first is located at the junction with Lyon Way (site 7074) and the second is located at the junction with Clarence Road (site 78321). The growth in traffic between 2012 and 2014 on the Lyon Way site was 1.026 while growth on the Clarence Road site was 1.028. As these sites have very similar levels of growth, an average of the two values has been taken (1.027).

DIAMOND (Development Impact Assessment Model of Network Demand) is a model that has been jointly developed by AECOM and the Highways Agency to assess the traffic impact of proposed growth. There are several instances of DIAMOND covering different areas of the UK. The work undertaken for the initial phase of the Oaklands development is based on the Hertfordshire DIAMOND model. Base year traffic forecasts from DIAMOND for the roads in the immediate vicinity of the site have been analysed for the period from 2012 to 2021. The growth factor in the morning peak hour is 1.099 while the factor for the evening peak hour is 1.117.

Table 3.1 summarises the different sources of traffic growth factors discussed above and converts them to average annual growth factors to allow direct comparison. For the purposes of this assessment the highest of these annual growth factors has been used for forecast potential future traffic levels, as this represents a worst case scenario.

Table 3.1: Traffic Growth Factors

Source	Annual Growth Factors	
	AM Peak (0800-0900)	**PM Peak (1700-1800)**
TEMPRO	1.0122	1.0119
DfT	1.0135	1.0135
DIAMOND	1.0106	1.0124
Maximum	**1.0135**	**1.035**

Traffic Distribution from Masterplan Site

Vehicular trips have been assigned to the local highway network using the same distribution assumptions as used in the planning application for the initial phase of the residential development. Table 3.2 below summarises the assignment of masterplan site traffic by time period.

Table 3.2: Distribution of Traffic from Masterplan Site

Route	Corridor	AM Peak (0800-0900)		PM Peak (1700-1800)	
		Arr	Dep	Arr	Dep
St Albans	Sandpit Lane	29%	24%	39%	29%
	Hatfield Road (W)	9%	10%	7%	1%
	Marshalswick Lane	10%	22%	14%	12%
	Ashley Road	4%	10%	3%	0%
	Colney Heath Lane	9%	16%	9%	33%
	House Lane	2%	0%	0%	0%
	Barnfield Road	0%	0%	0%	0%
	The Ridgeway	0%	0%	0%	0%
	Sub-Total	**63%**	**83%**	**72%**	**76%**
Hatfield	Hatfield Road (E)	12%	8%	17%	15%
	Station Road	15%	0%	10%	0%
	Sub-Total	**28%**	**8%**	**27%**	**15%**
Welwyn Garden City	Coopers Green Lane	9%	9%	2%	9%
	Sub-Total	**9%**	**9%**	**2%**	**9%**
Total		**100%**	**100%**	**100%**	**100%**

Table 4.2 indicates that the majority of traffic generated by the site is forecast to use the Sandpit Lane, Marshalswick Lane and Hatfield Road corridors in both the morning and evening peak hours.

Future Base + Development Traffic Flows

Traffic flows for the 2031 'Future Base + Development' scenario have been derived from combining the traffic flows associated with the full allocation (1,000 units) with the 2031 'Future Base' traffic flows.

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Development Impacts

04

04 Development Impacts

Initial Assessment of Impact

As discussed above, runs from the COMET model are currently unavailable and therefore for the purposes of this assessment detailed junction analysis has only been undertaken for the junctions assessed as part of the planning application for the initial phase of the residential development.

Table 4.1 below summarises the impact that the additional traffic is likely to have on each of these junctions in terms of overall traffic volumes in 2031 with and without the traffic generated by the Oaklands masterplan. For the avoidance of doubt, the future base traffic forecasts assume that no development has taken place on the Oaklands College site and therefore do not include any development traffic associated with the Oaklands masterplan.

Table 4.1: Impact of Masterplan Traffic on Total Junction Flows

Junction	Base (2012)	Future Base (2031)	Future Base+Dev (2031)	Impact
AM Peak (0800-0900)				
Sandpit Lane/House Lane	2,325	2,356	2,584	+10%
Sandpit Lane/Coopers Green Lane	2,281	2,312	2,380	+3%
Sandpit Lane/Marshalswick Lane	2,446	2,479	2,729	+10%
Hatfield Road/Colney Heath Lane	1,885	1,911	1,854	-3%
PM Peak (1700-1800)				
Sandpit Lane/House Lane	1,944	1,970	2,372	+20%
Sandpit Lane/Coopers Green Lane	1,765	1,789	1,931	+8%
Sandpit Lane/Marshalswick Lane	2,391	2,423	2,830	+17%
Hatfield Road/Colney Heath Lane	1,646	1,668	1,677	+1%

Sandpit Lane/House Lane and Sandpit Lane/Marshalswick Lane junctions are forecast to experience the largest change in overall traffic flows, with potential for increases in traffic of up to 20%. The Sandpit Lane/Coopers Green Lane junction is forecast to experience lower levels of growth at around 3-8%, while traffic flows are forecast to marginally reduce at the Hatfield Road/Colney Heath Lane junction due to the reassignment of College traffic associated with the proposed new access junction further to the east on Hatfield Road at the junction with Alban Park.

Further assessment of the potential impacts of the masterplan traffic on the wider road network would need to be undertaken once traffic forecasts from the initial COMET runs become available

Performance of Existing Junctions

Junction capacity assessments have been undertaken for the 2031 'Future Base' and 2031 'Future Base + Development' scenarios in the morning and evening peak hours. Traffic flows have been input into models of the existing junctions prepared as part of the Transport Assessment submitted with the planning application for the initial phase of the masterplan. For reference the geometry underpinning the existing junction assessments is included in Appendix A.

The performance of each junction has been assessed by comparing the forecast ratio of flow to capacity (RFC) or degree of saturation (DoS) and forecast queue lengths on each of the approach arms in the 2031 'Future Base' (i.e. without the additional masterplan traffic)and 'Future Base + Development' (i.e. with the additional masterplan traffic) scenarios.

Sandpit Lane/House Lane

The operational performance of the Sandpit Lane/House Lane junction has been assessed using ARCADY6 software, which is the industry standard for predicting capacities, queues and delays at priority controlled roundabouts. The results of the junction capacity assessments presented in Table 4.2 below.

Table 4.2: Summary of Junction Capacity Assessments: Sandpit Lane/House Lane

Junction	2031 Future Base (Existing Layout)	
	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)		
House Lane	78%	3
Sandpit Lane (E)	75%	3
Sandpit Lane (W)	107%	46
Max RFC / Queue	**107%**	**46**
PM Peak (1700-1800)		
House Lane	28%	0
Sandpit Lane (E)	91%	8
Sandpit Lane (W)	88%	6
Max RFC / Queue	**91%**	**8**

The results indicate that in the 2031 'Future Base' scenario, the junction is forecast to operate in excess of capacity in the morning peak hour with a maximum RFC of 107% and a maximum queue of 46 vehicles on Sandpit Lane (W). In the evening peak hour the junction is forecast to operate within capacity with a maximum RFC of 91% and a maximum queue of 8 vehicles on Sandpit Lane (E).

The performance of the existing junction in the 2031 'Future Base + Development' scenario has not been assessed as it is proposed to add a fourth arm to the junction to serve the masterplan site.

Sandpit Lane/Coopers Green Lane

The operational performance of the Sandpit Lane/Coopers Green Lane junction has been assessed using ARCADY6 software, which is the industry standard for predicting capacities, queues and delays at priority controlled roundabouts. Table 4.3 summarises the results of the 2031 'Future Base' and 2031 'Future Base + Development' junction capacity assessments

Table 4.3: Summary of Junction Capacity Assessments: Sandpit Lane/Coopers Green Lane

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Existing Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
Coopers Green Lane	100%	17	102%	21	+2%	+4
Oaklands Lane	51%	1	53%	1	+2%	-
Sandpit Lane (W)	97%	17	100%	27	+3%	+10
Max RFC / Queue	**100%**	**17**	**102%**	**27**	**+2%**	**+10**
PM Peak (1700-1800)						
Coopers Green Lane	83%	5	86%	5	+3%	-
Oaklands Lane	67%	2	80%	4	+13%	+2
Sandpit Lane (W)	49%	1	53%	1	+4%	-
Max RFC / Queue	**83%**	**5**	**86%**	**5**	**+3%**	**-**

The results indicate that in the 2031 'Future Base' scenario, the junction is forecast to operate at capacity in the morning peak hour but well within capacity in the evening peak hour. In the morning peak hour the junction is forecast to operate with a maximum RFC of 100% and a maximum queue of 17 vehicles on the Coopers Green Lane approach while in the evening peak hour the junction is forecast to operate with a maximum RFC of 83% and a maximum queue of 5 vehicles on the Coopers Green Lane approach.

In the 2031 'Future Base + Development' scenario, the junction is forecast to operate marginally in excess of capacity in the morning peak hour, with a maximum RFC of 102% and a maximum queue of 21 vehicles on the Coopers Green Lane approach. In the evening peak hour the junction is forecast to continue to operate within capacity with a maximum RFC of 86% and a maximum queue of 5 vehicles on the Coopers Green Lane approach.

Sandpit Lane/Marshalswick Lane

The operational performance of the Sandpit Lane/Marshalswick Lane junction has been assessed using LINSIG V3 software, which is the industry standard for predicting capacities, queues and delays at signalised junctions. Table 4.4 summarises the results of the 2031 'Future Base' and 2031 'Future Base + Development' junction capacity assessments.

Table 4.4: Summary of Junction Capacity Assessments: Sandpit Lane/Marshalswick Lane

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Existing Layout)		Development Impact	
	Max DoS (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)
AM Peak (0800-0900)						
Marshalswick Lane	121%	38	142%	98	+21%	+60
Sandpit Lane (E)	133%	94	141%	143	+8%	+49
Beechwood Avenue	128%	32	157%	73	+29%	+41
Sandpit Lane (W)	124%	84	102%	34	-22%	-50
Max DoS / Queue	**133%**	**94**	**157%**	**143**	**+24%**	**+49**
PM Peak (1700-1800)						
Marshalswick Lane	100%	19	90%	20	+59%	+1
Sandpit Lane (E)	130%	88	189%	207	+59%	+119
Beechwood Avenue	111%	31	170%	157	+59%	+126
Sandpit Lane (W)	124%	83	170%	190	+46%	+107
Max DoS / Queue	**130%**	**88**	**189%**	**207**	**+59%**	**+119**

The results indicate that in the 2031'Future Base' scenario, the junction is forecast to operate significantly above capacity in both the morning and evening peak hours. In the morning peak hour the junction is forecast to operate with a maximum DoS of 133% and a mean maximum queue of 94 vehicles on the Sandpit Lane (E) approach. In the evening peak hour the junction is forecast to operate with a maximum DoS of 130% and a mean maximum queue of 88 vehicles on the Sandpit Lane (E) approach.

In the 2031 'Future Base + Development' scenario, the junction is forecast to continue to operate significantly in excess of capacity in both the morning and evening peak hours. In the morning peak hour the junction is forecast to operate with a maximum DoS of 157% on the Beechwood Avenue approach and a mean maximum queue of 143 vehicles on the Sandpit Lane (E) approach. In the evening peak hour the junction is forecast to operate with a maximum DoS of 189% and a mean maximum queue of 207 vehicles on the Sandpit Lane (E) approach.

Hatfield Road/Colney Heath Lane

The operational performance of the Hatfield Road/Colney Heath Lane junction has been assessed using PICADY5 software, which is the industry standard for predicting capacities, queues and delays at priority controlled junctions. Traffic flows have been input into a model of the existing junction. Table 3.5 summarises the results of the 2031 'Future Base' and 2031 'Future Base + Development' junction capacity assessments.

Table 3.5: Summary of Junction Capacity Assessments: Hatfield Road/Colney Heath Lane

Junction		2031 Future Base (Existing Layout)		2031 Future Base+Dev (Existing Layout)		Development Impact	
		Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)							
Colney Heath Lane	L	127%	49	148%	52	+21%	+3
	R	124%	19	149%	66	+25%	+47
Hatfield Road (W)	A+R	50%	1	48%	1	-2%	-
Max RFC / Queue		**127%**	**49**	**149%**	**66**	**+22%**	**+17**
PM Peak (1700-1800)							
Colney Heath Lane	L	61%	1	71%	2	+10%	+1
	R	51%	1	78%	3	+27%	+2
Hatfield Road (W)	A+R	48%	1	54%	1	+6%	-
Max RFC / Queue		**61%**	**1**	**78%**	**3**	**+17%**	**+2**

The results indicate that in the 2031 'Future Base' scenario, the junction is forecast to operate in excess of capacity in the morning peak hour, with a maximum RFC of 127% and a maximum queue of 49 vehicles on the left turn out of Colney Heath Lane. In the evening peak hour the junction is forecast to operate well within capacity with a maximum RFC of 61% and a maximum queue of 1 vehicle on the left turn movement out of Colney Heath Lane.

The College's development proposals are only expected to result in a small change in the overall volume of traffic forecast to use the Colney Heath Lane/Hatfield Road junction. However, as the College development proposals potentially include a new access at the Alban Park junction, with access to South Drive restricted to visitors and taxis only, there is expected be some localised reassignment of traffic which would change the turning proportions at this junction. For the purpose of this assessment it is assumed that only 20% of traffic from Hatfield Road (W) would continue to access the College via South Drive.

With the re-assigned 2031 'Future Base + Development' traffic flows, the junction is forecast to continue to operate significantly above capacity in the morning peak hour with a maximum RFC of 149% and a maximum queue of 66 vehicles on the right turn from Colney Heath Lane. In the evening peak hour the junction is forecast to continue to operate well within capacity with a maximum RFC of 78% and a maximum queue of 3 vehicles on the right turn movement from Colney Heath Lane.

Potential Highway Improvements

05

05 Potential Highway Improvements

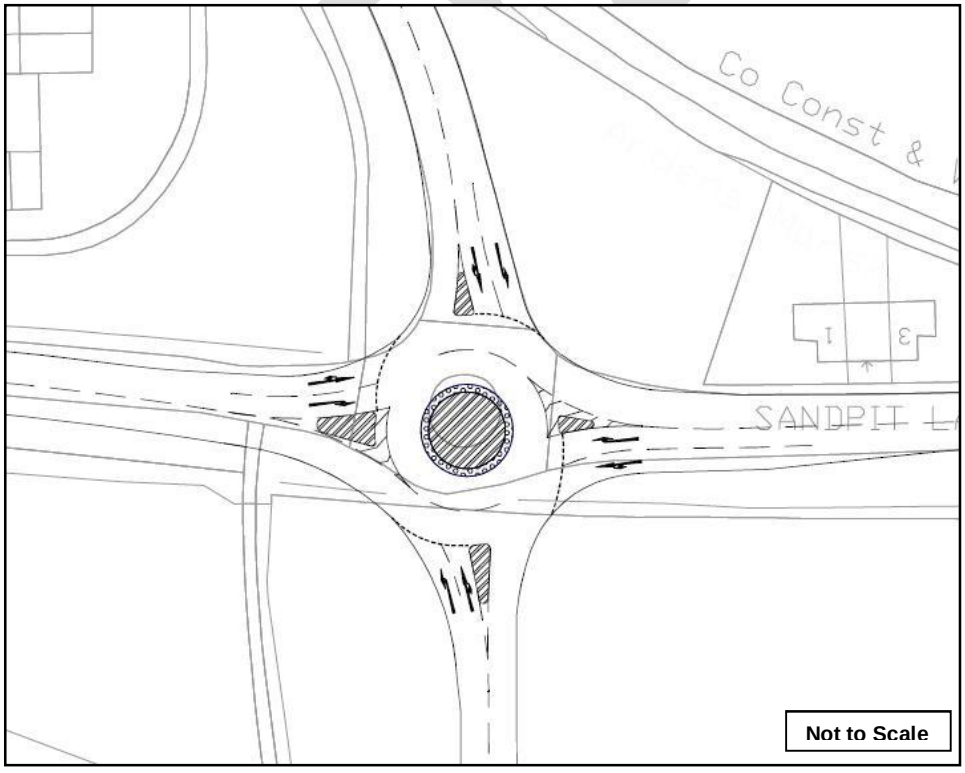
Introduction

The initial impact assessment suggests that a number of junctions in the local area may require improvement to accommodate the forecast levels of traffic associated with a residential development of 1,000 units. Consideration has therefore been given to the potential nature of the improvements that may be required at key off-site junctions.

Sandpit Lane/House Lane

It is envisaged that the existing roundabout at the junction of Sandpit Lane and House Lane would be enlarged to accommodate a southern arm serving the Oaklands residential development and also to provide increased capacity for the additional development traffic that would use this junction. The preliminary layout is shown in Figure 3.1 below.

Figure 3.1: Preliminary Layout of Sandpit Lane/House Lane Junction



The operational performance of the preliminary design layout above has been assessed using ARCADY6 software, which is the industry standard for predicting capacities, queues and delays at priority controlled roundabouts. Traffic flows have been input into a model based on the above preliminary design. Table 3.6 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the results of the assessments of the existing junction layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.6: Summary of Junction Capacity Assessments: Sandpit Lane/House Lane

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
House Lane	78%	3	63%	2	-15%	-1
Sandpit Lane (E)	75%	3	61%	2	-14%	-1
Residential Accewss	-	-	21%	0	-	-
Sandpit Lane (W)	107%	46	78%	3	-29%	-43
Max RFC / Queue	**107%**	**46**	**78%**	**3**	**-29%**	**-43**
PM Peak (1700-1800)						
House Lane	28%	0	24%	0	-4%	-
Sandpit Lane (E)	91%	8	82%	4	-9%	-4
Residential Accewss	-	-	21%	0	-	-
Sandpit Lane (W)	88%	6	75%	3	-13%	-3
Max RFC / Queue	**91%**	**8**	**82%**	**4**	**-9%**	**-4**

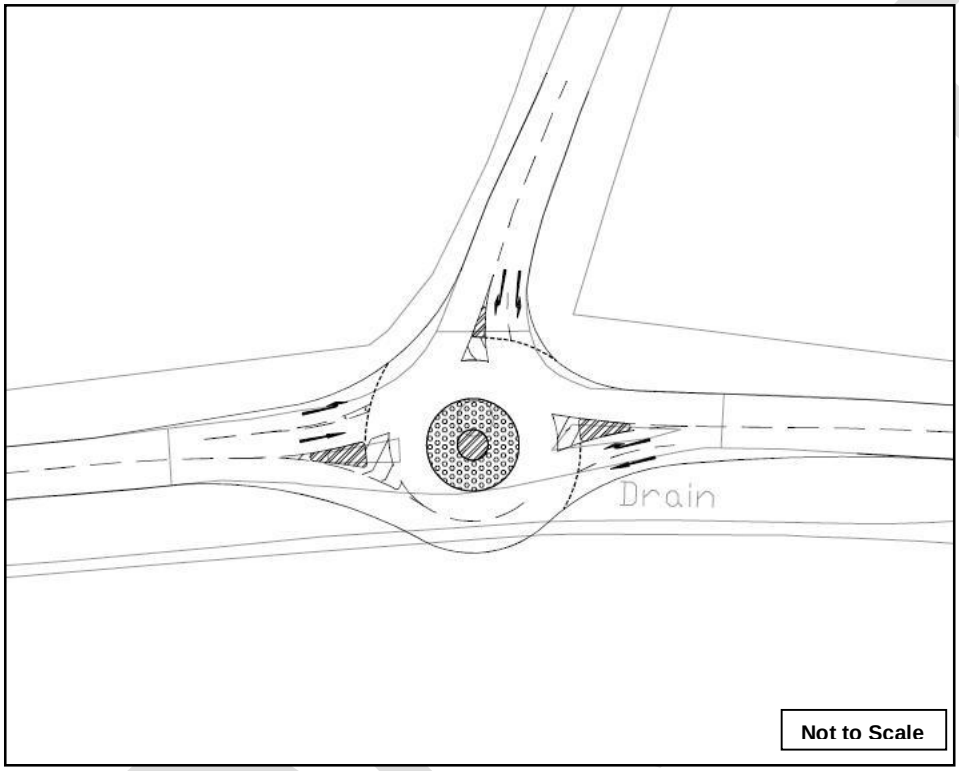
The results indicate that the site access junction is forecast to operate well within design capacity in both the morning and evening peak hour. In the morning peak hour the junction is forecast to operate with a maximum RFC of 78% and a maximum queue of 3 vehicles on the Sandpit Lane (W) approach. In the evening peak hour the junction is forecast to operate with a maximum RFC of 82% and a queue of 4 vehicles on the Sandpit Lane (E) approach.

The junction is forecast to operate well within design capacity and would provide significant betterment in the morning peak hour compared with the forecast conditions if the development did not go ahead.

Sandpit Lane/Coopers Green Lane Junction

Improvements would also be required at the junction of Sandpit Lane and Coopers Green Lane to accommodate the additional development traffic and improve the existing layout. The potential improvements could include enlarging the existing roundabout within the available highway land to provide additional capacity and increasing deflection to slow approach speeds and improve safety. A preliminary junction layout is shown in Figure 3.2 below.

Figure 3.2: Preliminary Layout of Sandpit Lane/Coopers Green Lane Junction



The operational performance of the preliminary design option has been assessed using ARCADY6. Traffic flows have been input into a model based on the above preliminary design. Table 3.7 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.7: Summary of Junction Capacity Assessments: Sandpit Lane/Coopers Green Lane

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
Coopers Green Lane	100%	17	83%	5	-17%	-12
Oaklands Lane	51%	1	42%	1	-9%	-
Sandpit Lane (W)	97%	17	95%	14	-2%	-3
Max RFC / Queue	**100%**	**17**	**95%**	**14**	**-5%**	**-3**
PM Peak (1700-1800)						
Coopers Green Lane	83%	5	70%	2	-13%	-3
Oaklands Lane	67%	2	62%	2	-5%	-
Sandpit Lane (W)	49%	1	51%	1	+2%	-
Max RFC / Queue	**83%**	**5**	**70%**	**2**	**-13%**	**-3**

In this option the junction is forecast to operate within capacity in both time periods, with a maximum RFC of 95% and a maximum queue of 14 vehicles on Sandpit Lane (W) in the morning peak hour and a maximum RFC of 70% and a maximum queue of 2 vehicles on the Coopers Green Lane approach in the evening peak hour.

The results indicate that the performance of the junction would be improved on all arms of the junction compared with the 2031 'Future Base' scenario, with the exception of the Sandpit Lane (W) arm in the PM peak hour. On this approach, there would be a slight deterioration in performance compared with the 2031 'Future Base' scenario, however, the arm would continue to operate well within capacity indicating that the additional development traffic is unlikely to have a material impact on junction operation.

Overall the results of the initial junction capacity assessments indicate that an enlarged roundabout would improve the operation of the Sandpit Lane/Coopers Green Lane junction compared with the 2031 'Future Base' scenario, resulting in some betterment in both peak hours.

Sandpit Lane/Marshalswick Lane

The results of the assessments undertaken on the existing junction layout indicate that the additional masterplan traffic is likely to worsen performance in the morning peak hour by up to 29%, while in the evening peak hour performance is likely to deteriorate by around 59%.

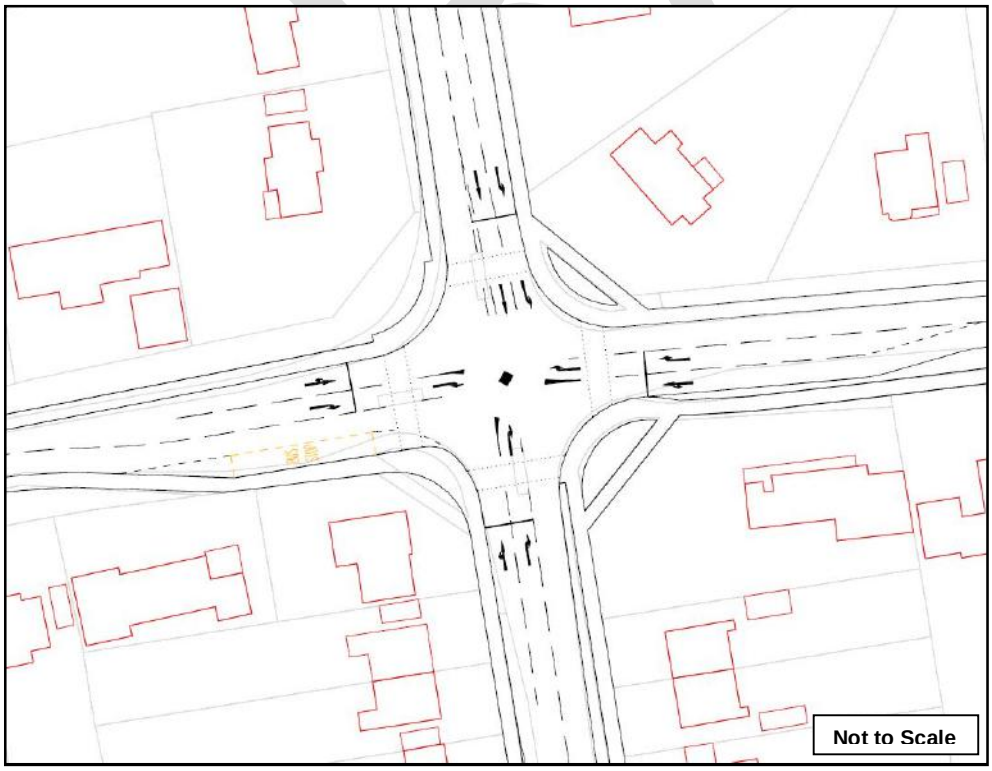
Improvements to this junction were put forward as part of the planning application submitted for the initial phase of the masterplan to provide additional capacity to accommodate the extra traffic generated by the development. The proposed improvements included removal of the existing pedestrian refuges and widening of the western and southern approaches to improve the overall throughput of the junction.

In order to accommodate the additional traffic that would be generated by the full allocation, further improvements at this junction would be required. Three potential options have been considered for this junction.

Signalised Junction Option

The first option builds upon the improvements that are proposed as part of the initial phase of the masterplan. It would involve widening the eastern approach to the existing junction to provide two lanes in the westbound direction and potentially banning the right turn movement from Marshalswick Lane (north) into Sandpit Lane (west). A preliminary design of this option is shown in Figure 3.3 below, which indicates that the improvements could be delivered with the available highway land, although it would result in the loss of verges and some mature trees.

Figure 3.3: Preliminary Layout of Sandpit Lane/Marshalswick Lane Junction (Signalised Junction Option 1)



The operational performance of the preliminary design option above has been assessed using LINSIGV3 software, which is the industry standard software for assessing signalised junctions. Traffic flows have been input into a model based on the above preliminary design. Table 3.8 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.8: Summary of Junction Capacity Assessments: Sandpit Lane/Marshalswick Lane (Signalised Junction Option 1)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max DoS (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)
AM Peak (0800-0900)						
Marshalswick Lane	121%	38	101%	29	-20%	-9
Sandpit Lane (E)	133%	94	102%	38	-31%	-56
Beechwood Avenue	128%	32	100%	28	-28%	-4
Sandpit Lane (W)	124%	84	84%	17	-30%	-67
Max DoS / Queue	**133%**	**94**	**102%**	**38**	**-31%**	**-56**
PM Peak (1700-1800)						
Marshalswick Lane	100%	19	109%	44	+9%	+25
Sandpit Lane (E)	130%	88	111%	61	-19%	-27
Beechwood Avenue	111%	31	107%	29	-4%	-2
Sandpit Lane (W)	124%	83	111%	62	-13%	-21
Max DoS / Queue	**130%**	**88**	**111%**	**62**	**-19%**	**-26**

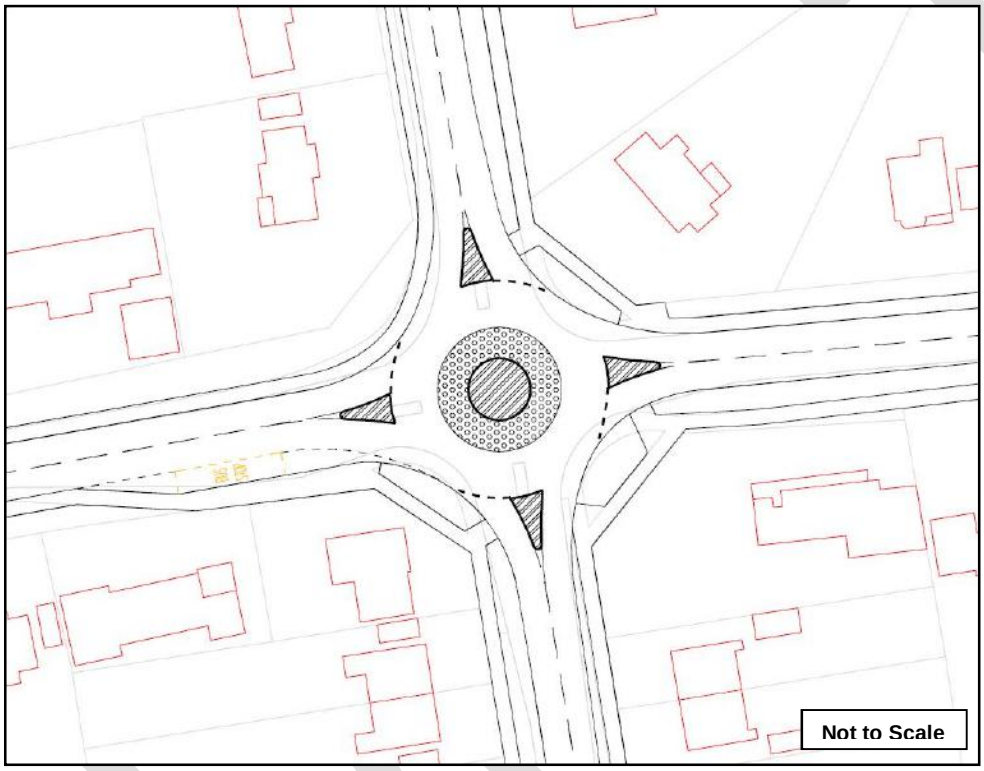
In this option, the junction is forecast to operate above capacity in both time periods. In the morning peak hour the junction is forecast to operate with a maximum DoS of 102% and a mean maximum queue of 38 vehicles on the Sandpit Lane (E) approach while in the evening peak hour the junction is forecast to operate with a maximum DoS of 111% and a mean maximum queue of 62 vehicles on the Beechwood Avenue approach.

While the junction would continue to operate at or above theoretical capacity, the results indicate that there would be an improvement in performance on all arms of the junction compared with the 2031 'Future Base' scenario. This represents a significant betterment at this junction in both the morning and evening peak hours compared with the forecast conditions if the development did not go ahead.

Compact Roundabout Option

The second option that has been considered for the Sandpit Lane / Marshalswick Lane junction involves replacing the existing signalised junction with a compact roundabout with an inscribed diameter of 28m. Peak hour traffic flows on all four arms of the junction are relatively balanced, so a roundabout solution may improve traffic flow compared with the existing traffic signals. However, consideration would also need to be given to the impacts of a roundabout on pedestrians and cyclists. A preliminary design for this option is shown in Figure 3.4 and indicates that it is likely that a scheme of this nature could be delivered within the available highway land, although it may result in the loss of verges and some mature trees.

Figure 3.4: Preliminary Layout of Sandpit Lane/Marshalswick Lane Junction (Compact Roundabout Option)



The operational performance of the preliminary design option above has been assessed using ARCADY6, which is the industry standard software for assessing priority roundabouts. Table 3.9 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.9: Summary of Junction Capacity Assessments: Sandpit Lane/Marshalswick Lane (Preliminary Layout – Compact Roundabout Option)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max DoS (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)
AM Peak (0800-0900)						
Marshalswick Lane	121%	38	90%	6	-31%	-32
Sandpit Lane (E)	133%	94	111%	49	-22%	-45
Beechwood Avenue	128%	32	82%	4	-46%	-28
Sandpit Lane (W)	124%	84	85%	5	-39%	-79
Max DoS / Queue	**133%**	**94**	**111%**	**49**	**-22%**	**-45**
PM Peak (1700-1800)						
Marshalswick Lane	100%	19	91%	8	-9%	-11
Sandpit Lane (E)	130%	88	97%	14	-33%	-74
Beechwood Avenue	111%	31	92%	9	-19%	-22
Sandpit Lane (W)	124%	83	109%	41	-15%	-42
Max DoS / Queue	**130%**	**88**	**109%**	**41**	**-21%**	**-47**

In this option the junction is forecast to operate above capacity on only one arm in each time period. In the morning peak hour the junction is forecast to operate with a maximum DoS of 111% and a mean maximum queue of 49 vehicles on the Sandpit Lane (E) approach while in the evening peak hour the junction is forecast to operate with a maximum DoS of 109% and a mean maximum queue of 41 vehicles on the Sandpit Lane (W) approach.

These results indicate an improvement in performance on all arms of the junction in comparison with the 2031 'Future Base' scenario and are a marginal improvement on the first signalised junction option. Overall, the results suggest that a compact roundabout option could provide significant betterment compared with the forecast conditions if the development did not go ahead, albeit that some arms of the junction would continue to operate above theoretical capacity.

Standard Roundabout Option

The final option that has been considered for the Sandpit Lane / Marshalswick Lane junction would involve replacing the existing signalised junction with a standard roundabout with an inscribed diameter of 32m. This is slightly larger than a compact roundabout and means that the approaches can be flared to provide two lane entries, which provide increased capacity. A preliminary design for this option is shown in Figure 3.5. Again, it appears that this option could be delivered within the available highway land, although it would result in the loss of verges and some mature trees.

Figure 3.5: Preliminary Layout of Sandpit Lane/Marshalswick Lane Junction (Preliminary Layout – Standard Roundabout Junction Option)

The operational performance of the preliminary design option above has been assessed using ARCADY6. Traffic flows have been input into a model based on the above preliminary design. Table 3.10 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.10: Summary of Junction Capacity Assessments: Sandpit Lane/Marshalswick Lane (Preliminary Layout – Standard Roundabout Option)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max DoS (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max DoS (%)	Queue (Vehs)
AM Peak (0800-0900)						
Marshalswick Lane	121%	38	73%	3	-48%	-35
Sandpit Lane (E)	133%	94	78%	3	-55%	-91
Beechwood Avenue	128%	32	71%	2	-57%	-30
Sandpit Lane (W)	124%	84	73%	3	-51%	-81
Max DoS / Queue	**133%**	**94**	**78%**	**3**	**-55%**	**-91**
PM Peak (1700-1800)						
Marshalswick Lane	100%	19	76%	3	-24%	-16
Sandpit Lane (E)	130%	88	70%	2	-60%	-86
Beechwood Avenue	111%	31	78%	3	-33%	-28
Sandpit Lane (W)	124%	83	93%	9	-31%	-74
Max DoS / Queue	**130%**	**88**	**93%**	**9**	**-37%**	**-79**

In this option the junction is forecast to operate within capacity in both time periods. In the morning peak hour the junction is forecast to operate with a maximum DoS of 78% and a mean maximum queue of 3 vehicles on the Sandpit Lane (E) approach while in the evening peak hour the junction is forecast to operate with a maximum DoS of 93% and a mean maximum queue of 9 vehicles on the Sandpit Lane (W) approach.

These results indicate an significant improvement in performance on all arms of the junction in comparison with the 2031 'Future Base' scenario. This option represents an improvement over the signalised junction and compact roundabout options considered and would provide significant betterment in both the morning and evening peak hours compared with the forecast conditions if the development did not go ahead.

Hatfield Road/Colney Heath Lane

A new access to the College would be created on Hatfield Road at the junction with Alban Park. The existing priority T-junction would be replaced by a roundabout, with a new northern arm serving the College. This junction would become the main access into the College for staff and students, with only visitors, buses and taxis permitted to use the current access to the west.

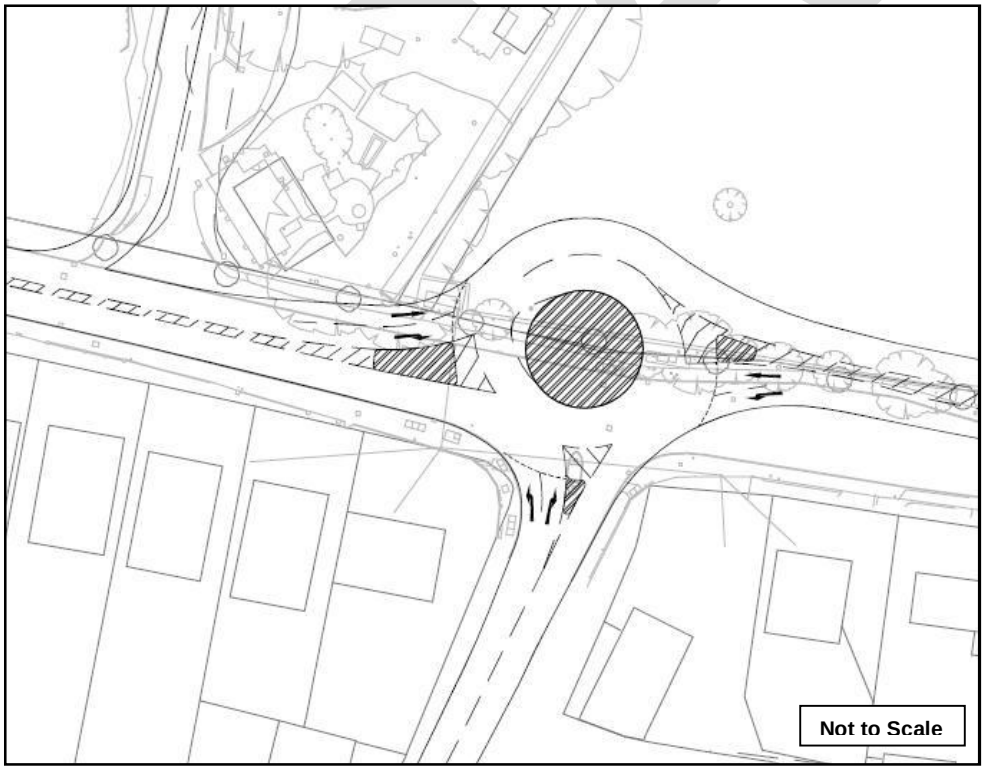
As a result of the reduced use of the current access, it is proposed that the South Drive junction would be reconfigured so that traffic can only turn left in from Hatfield Road. This would enable South Drive to become one-way northbound, with the existing southbound lane used to provide a segregated cycle route into the College.

The removal of right turning traffic from this junction creates the potential for improvements to be made to the nearby Hatfield Road/Colney Heath Lane junction and two potential options have been considered.

Roundabout Option

The first option would be to replace the existing junction with a roundabout. It is envisaged that the roundabout would be approximately 32m in diameter. A preliminary junction layout is shown in Figure 3.6.

Figure 3.6: Preliminary Layout of Hatfield Road/Colney Heath Lane Junction (Preliminary Layout – Roundabout Junction Option)



The operational performance of the preliminary design option has been assessed using ARCADY6. Traffic flows have been input into a model based on the above preliminary design. Table 3.11 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.11: Summary of Junction Capacity Assessments: Hatfield Road/Colney Heath Lane (Preliminary Layout – Roundabout Option)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
Hatfield Road (E)	-	-	45%	1	-	-
Colney Heath Lane	127%	68	64%	2	-63%	-66
Hatfield Road (W)	50%	1	69%	2	-19%	+1
Max RFC / Queue	**127%**	**68**	**69%**	**2**	**-63%**	**-66**
PM Peak (1700-1800)						
Hatfield Road (E)	-	-	63%	2	-	-
Colney Heath Lane	61%	2	44%	1	-17%	-1
Hatfield Road (W)	48%	1	47%	1	-1%	-
Max RFC / Queue	**61%**	**1**	**63%**	**2**	**+2%**	**-1**

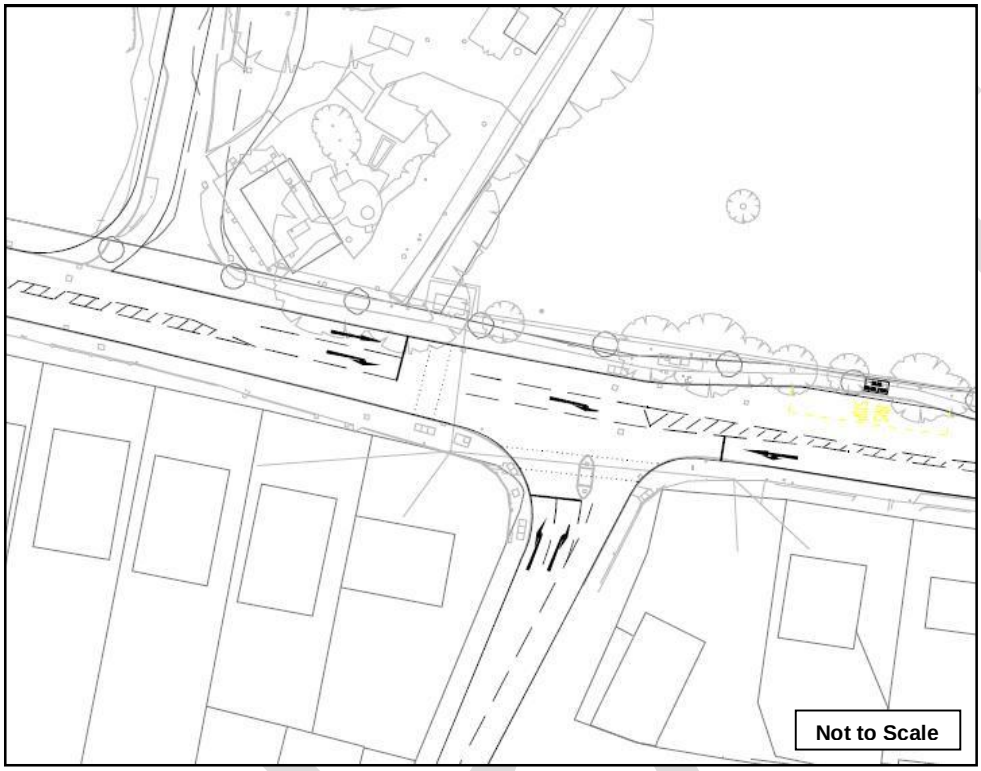
The operational assessment indicates that in the morning peak hour and the junction is forecast to operate well within capacity with a maximum RFC of 69% and a maximum queue of 2 vehicles on the Hatfield Road (W) approach. In the evening peak hour, the junction is forecast to operate well within capacity, with a maximum RFC of 63% and a maximum queue of 2 vehicles on the Hatfield Road (E) approach.

The results of the assessment indicate that the roundabout option would operate well within capacity in both peak hours, with conditions in the morning peak hour significantly improved compared with the 2031 'Future Base' scenario.

Signalised Junction Option

The second option would be to signalise the junction and a preliminary design of the junction is shown in Figure 3.7. The preliminary junction design includes pedestrian crossings on both the Hatfield Road (W) and Colney Heath Lane approaches.

Figure 3.7: Preliminary Layout of Hatfield Road/Colney Heath Lane Junction (Preliminary Layout – Signalised Junction Option)



The operational performance of the signalised junction option has been assessed using LINSIG V3 software. Traffic flows have been input into a model based on the above preliminary design. Table 3.12 summarises the results of the assessments undertaken for the preliminary layout based on the 2031 'Future Base + Development' scenario and compares the results back to the existing layout in the 2031 'Future Base' scenario (i.e. without the additional development traffic).

Table 3.12: Summary of Junction Capacity Assessments: Hatfield Road/Colney Heath Lane (Preliminary Layout – Signalised Junction Option)

Junction	2031 Future Base (Existing Layout)		2031 Future Base+Dev (Preliminary Layout)		Development Impact	
	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)	Max RFC (%)	Queue (Vehs)
AM Peak (0800-0900)						
Hatfield Road (E)	-	-	69%	15	-	-
Colney Heath Lane	127%	68	92%	20	-35%	-48
Hatfield Road (W)	50%	1	91%	28	+41%	+27
Max RFC / Queue	**127%**	**68**	**92%**	**28**	**-35%**	**-40**
PM Peak (1700-1800)						
Hatfield Road (E)	-	-	79%	21	-	-
Colney Heath Lane	61%	2	89%	13	-28%	+11
Hatfield Road (W)	48%	1	90%	14	+42%	+3
Max RFC / Queue	**61%**	**1**	**90%**	**21**	**+42%**	**+20**

The results indicate that the signalised junction option is forecast to operate within capacity in the morning peak hour, with a maximum DoS of 92% on the Colney Heath Lane approach and a maximum queue of 28 vehicles on the Hatfield Road (W) approach. In the evening peak hour the junction is forecast to operate within capacity, with a maximum DoS of 90% and a maximum queue of 14 vehicles on Hatfield Road (W).

The results of the assessment indicate that the signalised junction option would operate within theoretical capacity in both peak hours, with conditions in the morning peak hour significantly improved compared with the 2031 'Future Base' scenario, but some worsening of performance in the evening peak hour.

The performance of the signalised junction option is forecast to be worse than the roundabout option, however as the preliminary design also incorporates pedestrian crossing facilities on both the Colney Heath Lane and Sandpit Lane (W) approaches, this represents a significant improvement in facilities for pedestrians over existing conditions.

Summary

Table 3.13 below summarises the results of the initial junction capacity assessments (maximum RFC/DoS) for the existing junctions with the 'Future Base' traffic flows compared with the results of the potential junction layouts with the 'Future Base + Development' traffic flows.

Table 3.13: Summary of Initial Junction Capacity Assessments (Maximum RFC/DoS)

Junction	Option	2031 Future Base (Existing)	2031 Future Base+Dev (Improved)	Development Impact
AM Peak (0800-0900)				
Sandpit La/House La	Roundabout	107%	78%	-29%
Sandpit La/Coopers Green La	Roundabout	100%	95%	-5%
Sandpit La/Marshalswick La	Signalised Junction	133%	102%	-31%
	Compact Roundabout		111%	-22%
	Standard Roundabout		79%	-54%
Hatfield Rd/Colney Heath La	Roundabout	127%	69%	-58%
	Signalised Junction		92%	-35%
PM Peak (1700-1800)				
Sandpit La/House La	Roundabout	91%	82%	-9%
Sandpit La/Coopers Green La	Roundabout	83%	70%	-13%
Sandpit La/Marshalswick La	Signalised Junction	130%	111%	-19%
	Compact Roundabout		109%	-21%
	Standard Roundabout		93%	-37%
Hatfield Rd/Colney Heath La	Roundabout	61%	72%	+2%
	Signalised Junction		90%	+29%

The results of these initial junction capacity assessments indicate that the potential mitigation schemes are forecast to significantly improve the operation of most of the junctions in both the morning and evening peak hours compared with the existing junction layouts in the 2031 'Future Base' scenario. At all junctions, options have been identified that would allow the junctions to operate within theoretical capacity in both peak hours.

Summary

06

06 Summary

Background

The draft Strategic Local Plan (SLP) produced by St Albans City and District Council (SACDC) covers the period 2011-2031 and includes the potential release of Green Belt land in East St Albans (Oaklands) for a residential development of 1,000 units on land to the north of the existing Oaklands College development.

As part of the ongoing consultation process, SACDC invited landowners/promoters to submit their vision for the development sites allocated within the draft SLP. An initial masterplan for the Oaklands College site was developed and submitted to SACDC in November 2015 with an emerging transport strategy submitted to SACDC in February 2016.

This note builds upon the information set out in the emerging transport strategy document. It sets out initial trip generation forecasts for the full allocation of 1,000 units and goes on to assess the potential impact that this level of development is likely to have on the key junctions and the potential nature of junction improvements that may be required to accommodate the additional traffic that would be generated by the full allocation.

Initial Trip Generation Forecasts

The draft SLP indicates that the East St Albans (Oaklands) site could accommodate 1,000 dwellings. A planning application for an initial phase of approximately 350 residential units has already been submitted to SACDC, with the later phases providing a further 650 units and a 2FE primary school.

The College's emerging masterplan includes an aspiration to provide 42% affordable housing across the whole site, including a small number of affordable units for specifically for College staff and students.

Initial vehicular trip generation forecasts for the full allocation of 1,000 units have been developed using the private and affordable residential vehicular trip rates underpinning the planning application for the initial phase of the masterplan and discounting trips associated with the primary school and College affordable housing. This initial assessment indicates that the development would generate in the region of 320 vehicle movements in the morning peak hour and around 550 vehicle movements in the evening peak hour (2-way).

Initial Assessment of Development Impacts

An initial assessment of the potential impacts of a development of 1,000 residential units has been undertaken. In the absence of traffic forecasts from HCC's COMET model, traffic growth forecasts have been based on a range of sources, with the highest traffic growth rate assumed as a worst-case scenario.

This assessment indicates that the Sandpit Lane/House Lane and Sandpit Lane/Marshalswick Lane junctions are forecast to experience the largest change in overall traffic flows, with potential for increases in traffic of up to 20% in 2031 compared with the 'Future Base' scenario. The Sandpit Lane/Coopers Green Lane junction is forecast to experience lower levels of growth at around 3-7%, while traffic flows are forecast to marginally reduce at the Hatfield Road/Colney Heath Lane junction due to the reassignment of College traffic associated with the proposed new access junction further to the east on Hatfield Road at the junction with Alban Park. Further assessment of the potential impacts of the masterplan traffic on the wider road network would need to be undertaken once traffic forecasts from the initial COMET runs become available.

Potential Mitigation Schemes

Given the potential level of impact on the key junctions around the Oaklands College site, consideration has been given to the potential nature of the improvements that may be required in each location. At the Sandpit Lane/House Lane junction, it is proposed to enlarge the existing roundabout to accommodate a new southern arm serving the residential development and provide additional capacity for the development traffic. The Sandpit Lane/Coopers Green Lane roundabout would also be enlarged to provide additional capacity and improve safety.

Three potential options have been identified for the Sandpit Lane/Marshalswick Lane junction; the first option increases the capacity of the existing signalised junction by widening the eastern approach to the existing junction to provide two lanes in the westbound direction and potentially banning the right turn movement from Marshalswick Lane (north) into Sandpit Lane (west). Two alternative options that involve replacing the existing signalised junction with a roundabout have also been investigated; the first based on a compact roundabout and the second based on a slightly larger standard roundabout .

Two potential options have been identified for the Hatfield Road/Colney Heath Lane junction. The first option would replace the existing priority junction with a roundabout, while the second option would introduce traffic signals at the junction.

The results of these initial junction capacity assessments indicate that the potential mitigation schemes are forecast to significantly improve the operation of most of the junctions in both the morning and evening peak hours compared with the existing junction layouts in the 2031 'Future Base' scenario. At all of the locations assessed, including the Sandpit Lane/Marshalswick Lane junction, options have been identified that would ensure the junctions would operate within theoretical capacity in both peak hours.

Conclusion

Overall this initial assessment indicates that there are a range of potential highway improvements that could be implemented which would not only mitigate the potential impacts of a residential development of 1,000 units on the Oaklands College site, but also result in significant improvements in performance across the local road network compared with the situation if the development did not take place.

The impact of a residential development of this size and the nature of the improvements required would need to be considered in more detail as part of any future planning application, in consultation with the local highway authority, Hertfordshire County Council.

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“The Oaklands Masterplan provides a once in a generation opportunity to establish a community which can offer a wide range of benefits and opportunity to its residents that at its heart is focused on education and the improvement of lives.”

Oaklands College Strategic Local Plan Submission

About AECOM

AECOM (NYSE: ACM) is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries.

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Hertfordshire County Council

Appendix 12: Hertfordshire County Council COMET progress Slides April 2016 (to be replaced by HCC report)

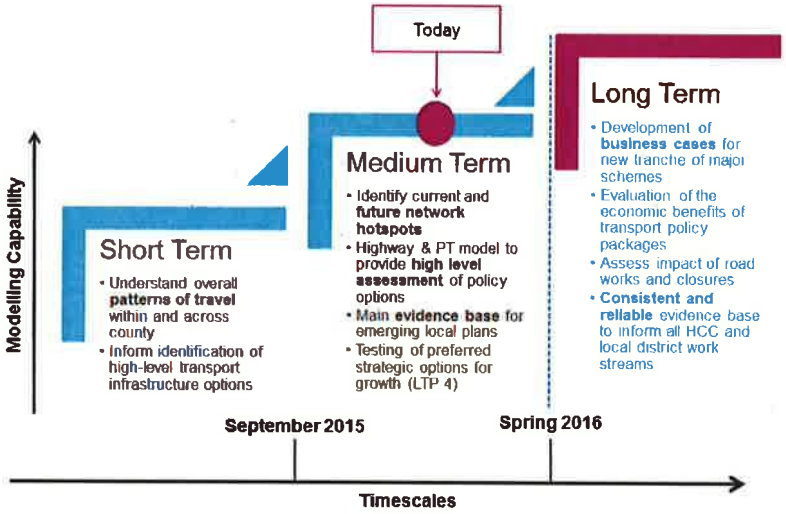
HPG Dev Plans Meeting 22nd April 2016
COMET Model Update

- Model Format
- 2031 Forecast Year assumptions
- 2031 Forecast Year results (inc corridor results)
- Ongoing development and use of the model
- Link with Local Plan process and protocol

COMET – COunty ModEl of Transport

- New suite of models covering Hertfordshire and the surrounding area
  - Highway model - all A, B □ C roads
  - Public Transport Model (scheduled bus and rail services)
  - Demand model - Links models and allows tests of time shifts and mode shift

Model development - a staged approach



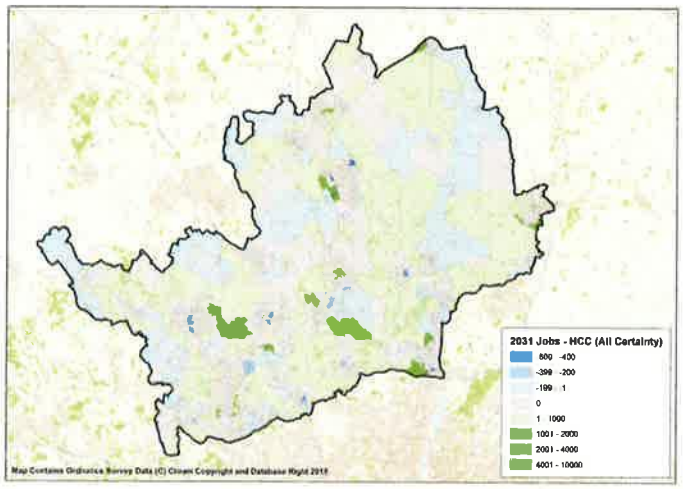
Model performance
AM %Difference Cordon and Screenlines

Forecast Model Assumptions

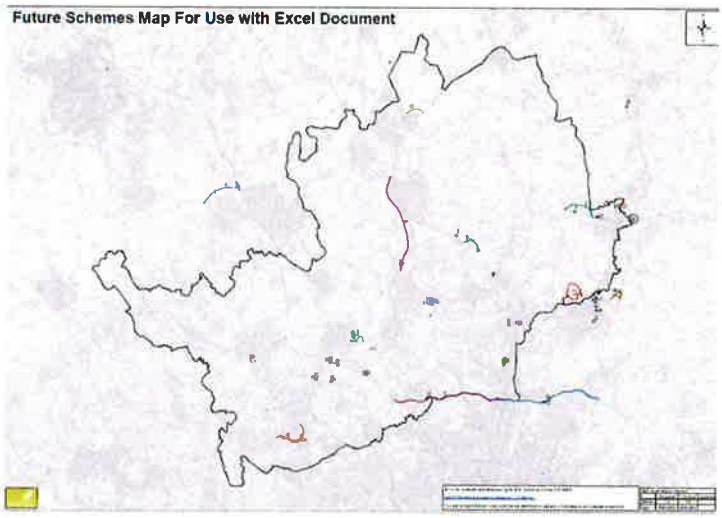
Housing Growth to 2031

District	2031 HCC Dwellings	2031 NTEM v6.2 Dwellings	2031 Difference
Broxbourne	5905	2700	-3205
Dacorum	7710	5548	-2162
East Hertfordshire	13324	5475	-7849
Hertsmere	3829	3836	7
North Hertfordshire	13301	12727	-574
St Albans	7833	1556	-6277
Stevenage	7382	9005	1643
Three Rivers	1842	3612	1770
Watford	4141	3624	-517
Welwyn Hatfield	12589	2035	-10554
Total	77,836	50,119	-27,717

Planning Data Employment Forecasts



Forecast Model Transport Schemes

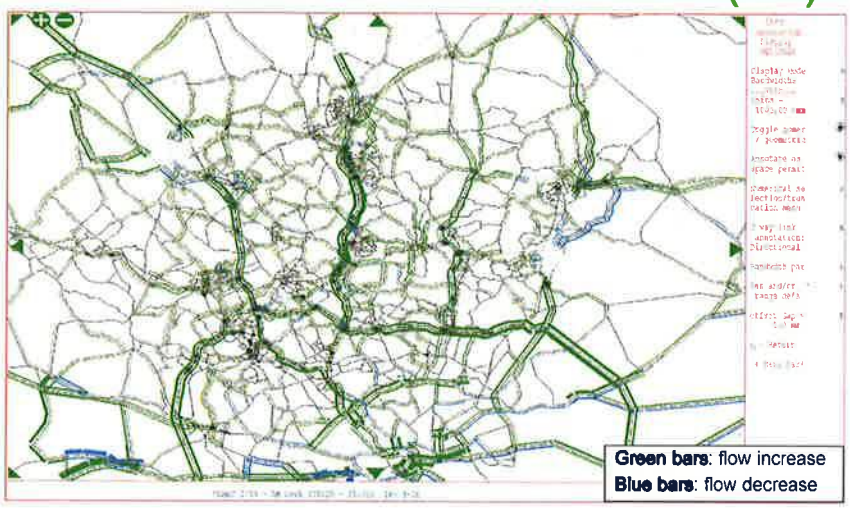


Forecast Model Results

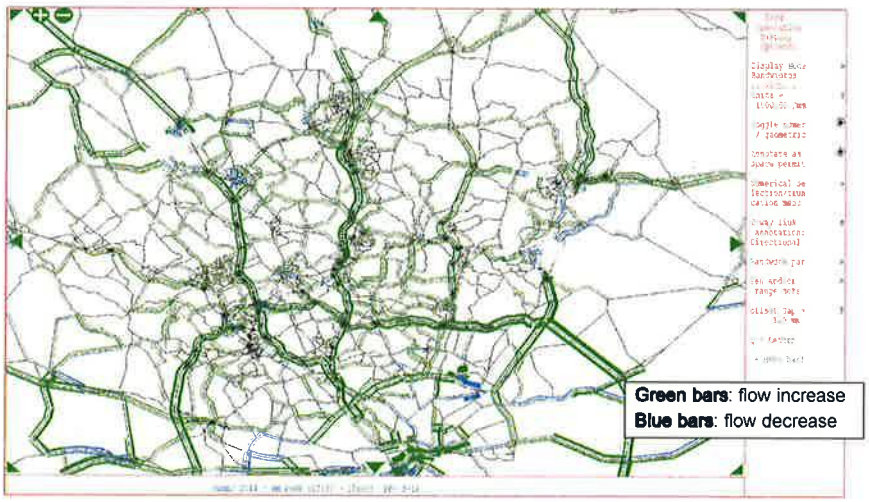
Impact of Growth on the Transport Network – Key headlines

- Population and employment growth leads to growth in demand
- Increase greater in inter peak and off peak periods
- AM peak 0700-1000 – 13% increase overall. 61,000 additional vehicle trips in Hertfordshire.
- Interpeak – 20% increase overall.
- PM peak 1600-1900 – 15% increase overall. 82,000 additional vehicle trips.
- Larger increases in LGV trips and non work trips.
- Passenger transport trips increase by similar percentages. Most of growth is for rail.

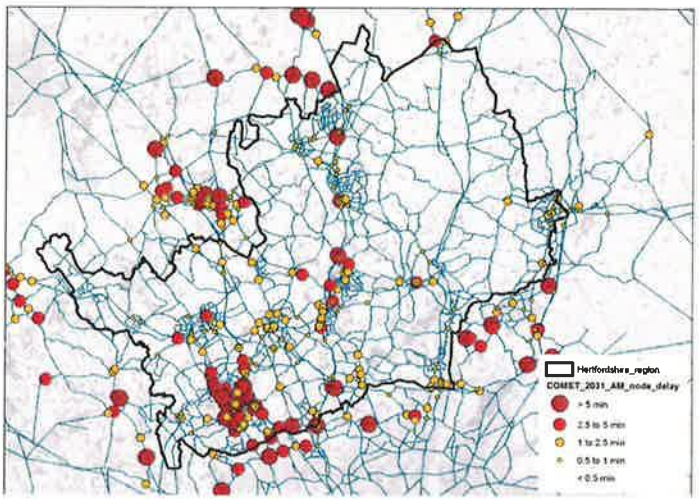
Forecast Model Results - Highway Model Actual Flow Differences 2031 vs 2014 (AM)



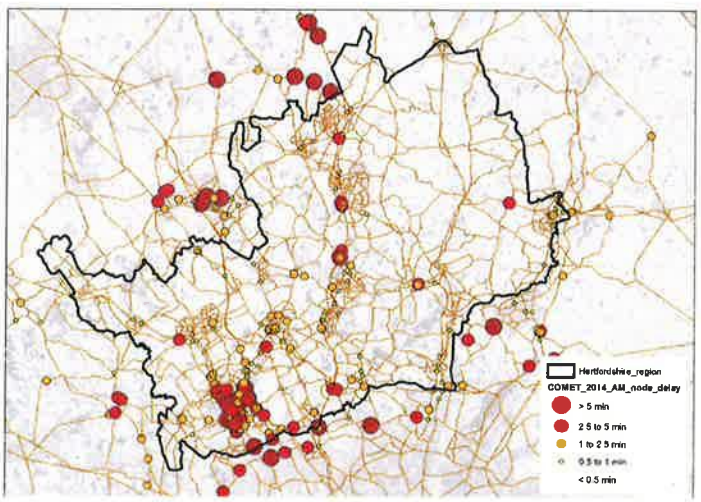
Forecast Model Results - Highway Model Actual Flow Differences 2031 vs 2014(PM)



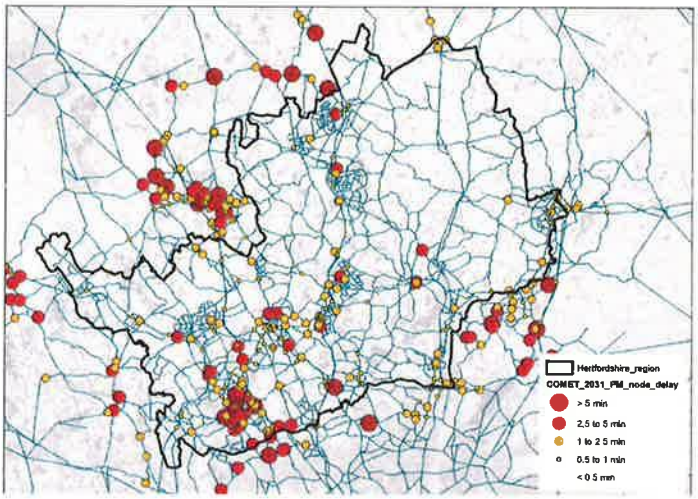
2031 COMET AM Junction Delay



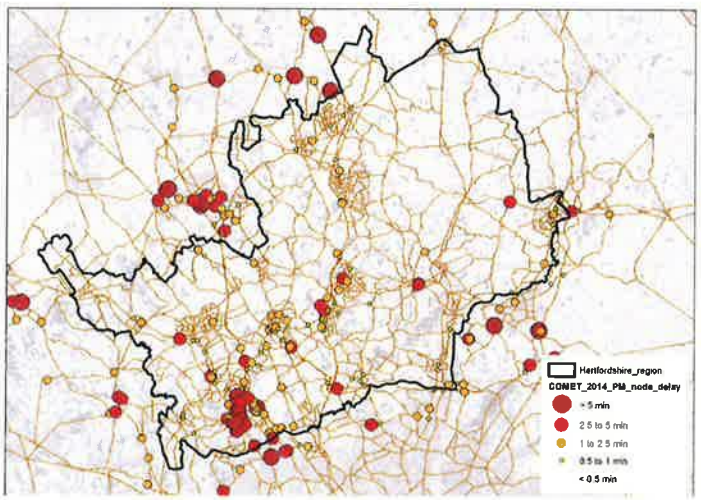
2014 COMET AM Junction Delay



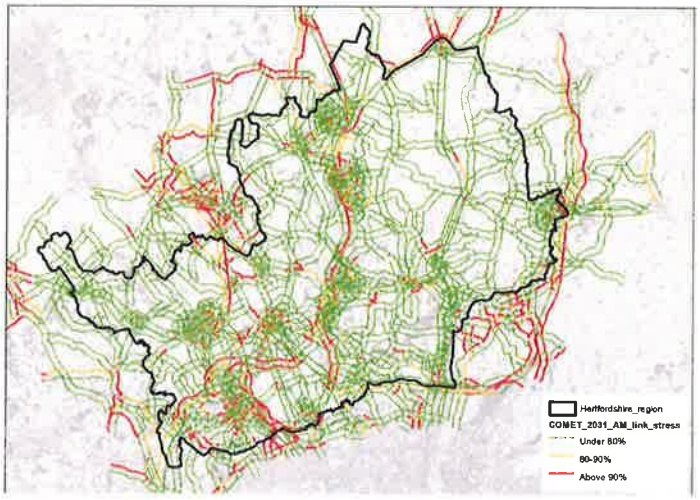
2031 COMET PM Junction Delay



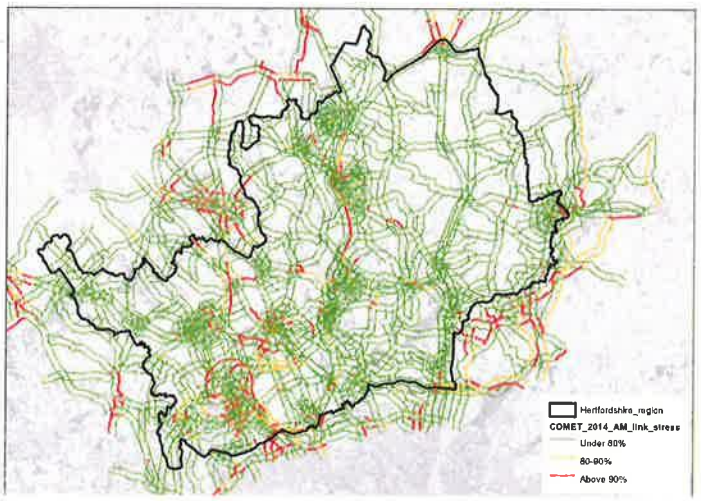
2014 COMET PM Junction Delay



2031 COMET AM Link Stress



2014 COMET AM Link Stress



Key Results – A414 corridor

– Increase in flow

- Flow increases are evident mainly on the section between Harlow and the A1m. Capacity issues south of St Albans limit the amount of additional traffic further west and a high level of latent demand is evident on this section.

– Increase in delay

- Journey times increase across the corridor. Greatest in PM peak WB direction (19%)
- In the AM peak the main increase in delays is at the Rush Green roundabout in Hertford, Holwell Lane roundabout, A1000 junction (Mill Green), A1(m) junction 4 and at the Colney Heath longabout as well as key junctions in Hemel Hempstead. Delay at the Park Street roundabout is however reduced.
- In the PM peak the delays increase primarily on the eastern section around Eastwick (especially for WB traffic) and remain high on the junctions in Hertford and at the London Colney roundabout.

– Caveats / issues – the model overestimates flows and journey times on the section between the M1 and A1m. On other sections traffic flows are better replicated but some journey times are over / underestimated

Key Results – A10 corridor

– Increase in flow

- Flow increases are evident in both directions on the A10 between Buntingford and Cheshunt (south of here some rerouting is evident). The single lane section south of Buntingford becomes close to capacity in the peak periods

– Increase in delay

- In the AM peak further increases in delay are evident on the A10 in Cheshunt, at Rush Green and at the A10/ A602 junction north of Ware.
- In the PM peak increases in delay are evident on the southern section in Cheshunt.

– Latent demand

- Additional latent demand is evident on the section south of the A602 junction with additional traffic wanting to use the A10 SB in the AM peak and NB in the PM.

– Caveats / issues the model replicates flow well along the length of the corridor and is picking up capacity issues on the southern section in Broxbourne reasonably well along this corridor but tends to underestimate journey times in the AM peak southbound direction between Hertford and the M25 and in the AM peak northbound north of the A507

Key Results – A505 corridor

– Increase in flow

- In the AM peak the largest increases in flow are evident east of Hitchin.

– Increase in delay

- In the peak hours increases in delay are evident at the Pirton Road, Bedford Road/ Old Park Road and Woolgrove Road junctions in Hitchin and at the junction with Old North Road in Royston. Within Baldock increases in delay are predicted on the old A505 at the Weston Road junction and the junction with the A507 Clothall Road remains congested.

– Latent demand

- It is evident that additional traffic wants to use the route in both directions particularly in the EB direction east of the A1m in the AM peak.

– Caveats / issues

The model is not replicating flows well on the A505 west of Hitchin and underestimates journey times in the eastbound direction in all time periods. On the section through Hitchin and Letchworth again journey times are underestimated especially in the westbound direction in the AM peak and the EB direction in the PM peak. It does however appear to pick up congestion issues in Hitchin and Letchworth and around Royston.

Key Results – A1 corridor

– Increase in flow

- Large increases in flow are evident in both directions, particularly in the AM peak. This is a combination of the impact of development and the additional capacity provided by the Smart motorway proposals.

– Increase in delay

- The Smart motorway proposals reduce southbound journey times between junctions 4-7 in the AM peak but there are increases in delay to the north and south. In AM peak NB and the PM peak (both directions) overall journey times increase by 2-3 minutes despite the improvements.
- Delays increase on slip roads and approaches to the junctions. In the AM peak the key increases are at junctions 3, 4, 5, 8 □ 9. In the PM peak the increases are concentrated at junctions 3 and 5.

– Latent demand -

Despite the increase in capacity even more traffic wants to use this corridor with a high level of supressed demand SB in the AM peak.

– Caveats / issues

– Model appears to be underestimating NB stress and delays between junctions 6-8 in the PM peak.

Key Results – M1 corridor

– Increase in flow

- Large increases in flow are evident along corridor length especially in NB direction in the AM peak and both directions in the PM peak.

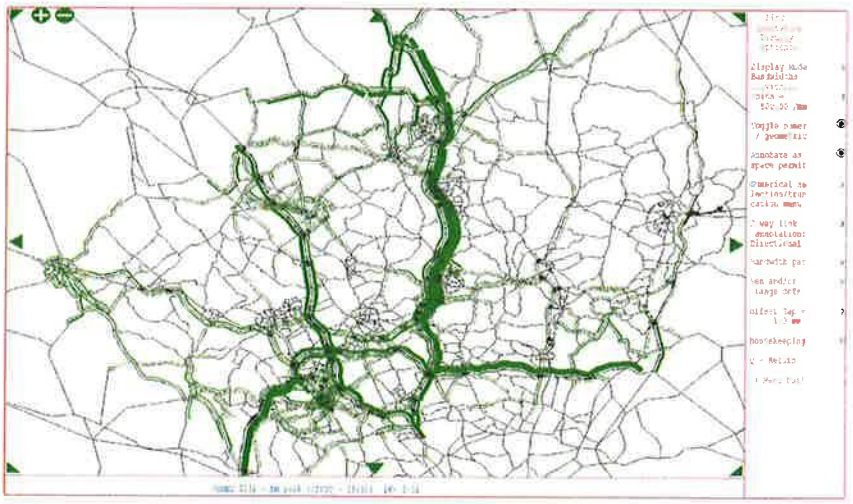
– Increase in delay

- Steady increases in journey times expected across all time periods, with the largest increases in journey times experienced in the AM peak (between 14-16%).
- There are also increases in delay at junctions on the on and off slips and on the approach roads. In the AM peak the key increases are evident at junctions 6, 6a and junction 9. In the PM peak increases are evident at junctions 6, 9 and 10 and long delays are evident at junction 6a.

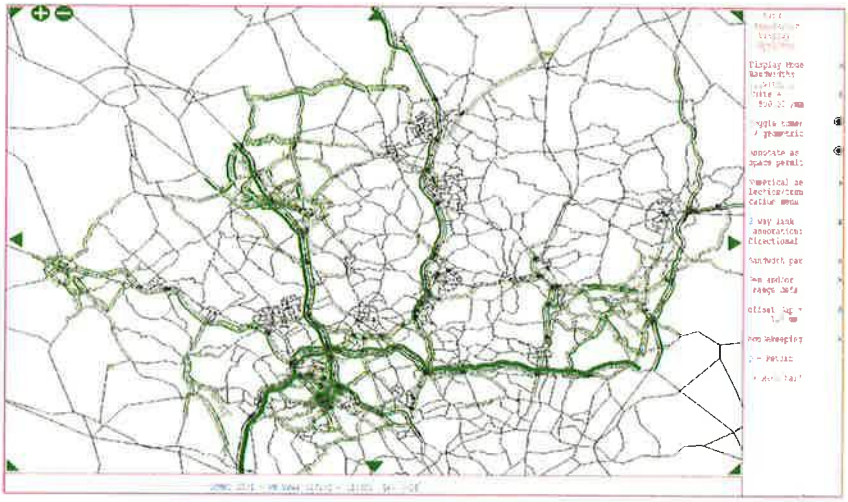
– Latent demand

- A high level of latent demand is evident, particularly in the AM peak

Latent Demand
Demand Flow less Actual Flow 2031 AM



Latent Demand
Demand Flow less Actual Flow 2031 PM

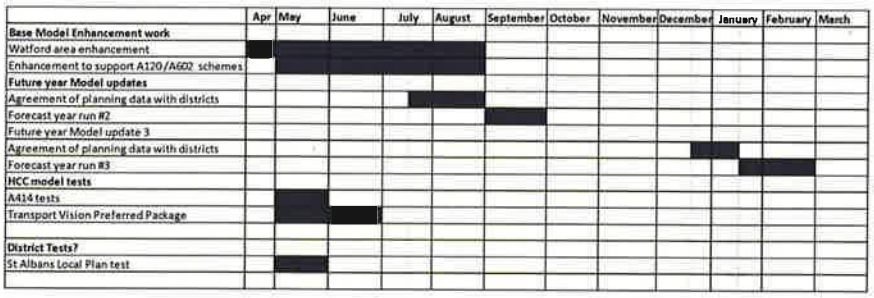


Ongoing Model Use Development

Principles of ongoing model use

- Use of current forecast model to support Transport Vision □ Local Plan work
- Planned enhancement of base year model to support GTP □ major project work.
- Twice yearly update of Forecast model (September □ February) to be commissioned with up to date planning data and potentially more schemes.
- 2021, 2031 (□ possibly 2026) reference cases to be developed (to support developer use □ scheme tests).

COMET Proposed Work Programme



Use of Model to support Local Plan process

- Districts to continue to use pre existing models where appropriate (eg WHaSH).
- Use of COMET to provide cross checks with modelling work done to date □ indication of cumulative impacts of development
- HCC could provide district / SHMA specific notes / workshops to support developing Local Plans
- COMET model available for option testing to fill in gaps / test strategic impacts of schemes
- Under new contract AECOM can be commissioned directly by districts but initial inception meeting with HCC and ongoing liaison is strongly recommended.

Use of Model By Developers

- Medium term (unenhanced model) suitable for high level assessment only
- Can provide information on routeing from developments, likely scale of impact □ highlight locations of concern but unsuitable for detailed development / mitigation scheme testing
- Encouragement of use of enhanced longer term model by developers in time to ensure consistent evidence base and identification of wider impacts.
- Likely to still be need for more detailed localised modelling

Local Plan Protocol

- Updated protocol reflecting use of COMET to be circulated
- Broad principles
  - Role of site promoters to provide evidence on standalone impacts and then to develop detail as part of planning process
  - Role of LPA to test cumulative impact of growth in their district (using pre existing / COMET model)
  - Role of HCC as LHA
    - Share results on cumulative forecast runs of COMET model
    - Advise districts on additional locations of concern caused by cumulative growth □ advise on cross boundary impacts
    - Work with LPAs □ HE to identify suitability, feasibility □ deliverability of transport mitigation measures to feed into IDP
    - Feed in information on priority strategic transport projects from Vision work whilst developing more local measures through Growth and Transport Plan process

Appendix 13: Hertfordshire County Council COMET Report (to follow)

Water Infrastructure

Appendix 14: Water Study Project for Hertfordshire Project Brief

Water Study Project Brief

Overview

Hertfordshire is located within the East of England, the driest region in the UK. Hertfordshire's natural environment makes a significant contribution to the quality of life of its residents. This environment is under increasing stress. The Upper Lee Catchment Abstraction Management Plan found that in nine out of 32 water bodies within the Upper Lee Catchment, average actual flows were not sufficient to support their ecology.

Water supply and wastewater treatment facilities are enabling infrastructure - that is they have an important role in supporting the provision of housing and jobs. Current growth levels in Hertfordshire will increase pressure on water related infrastructure and the environment. Development success is critically dependent on timely decisions throughout the planning process. Without adequate and timely infrastructure provision, housing and jobs are likely to be delayed or lost as developers and companies look to where provision is more certain and at lower cost.

All the water companies serving Hertfordshire predict significant deficits in water supply in the medium term. There are some known waste water capacity issues which are currently unresolved. All water scarcity and wastewater treatment issues are resolvable on some level. Under the Water Industry Act 1991, water companies have a general duty to ensure that their area is effectively drained and to develop and maintain an efficient and economical system of water supply. Water companies require certainty around the scale, location and phasing of growth to plan for future infrastructure needs.

Failing to take a proactive approach to infrastructure provision could result in a number of potential risks. These could, if not carefully managed, include:

- decreasing environmental quality such as habitat degradation and loss e.g. dried up rivers and streams and changing ecological parameters such as when water is transferred into a chalk catchment from a nonchalk catchment
- an increase in the cost of infrastructure to the developer, affecting the viability of a development and reducing the potential for realising other benefits
- increasing costs to the consumer as more energy is used to provide water over longer distances or higher level treatment processes are required to meet water quality standards
- increased risk of flooding when water is transferred into catchments
- a delay in the delivery of housing and provision of jobs
- reduced water pressure for existing residents
- increased risk of disruption to supply at times of peak demand

For growth to happen sustainably and in good time, these issues must be explored. We need to know how the land use and water resources planning processes can best plan for sustainable resource use and where the synergies lie. We need to know where infrastructure capacity exists on a catchment scale, so that future growth does not breach environmental limits. We also need to know how resilient the networks are, to ensure that water can be moved about to where it is needed most, and wastewater treated, at times of peak demand.

Purpose and Context

Development

Strategic development aspirations for the study area look to be a minimum of around 85,000 homes by 2021, entailing 68,000 new employment opportunities, according to the now defunct Regional Spatial Strategy. The two largest district councils, North Hertfordshire District Council and East Hertfordshire District Council, are currently proposing 7,000 and 12,000 new homes respectively. This level of development looks to increase the population of Hertfordshire by around 15%, which is 10% more than the current national average for the same period. This higher rate will inevitably put greater pressure on various infrastructure assets and services when considered in the local context, exemplifying the necessity for local partners to work together based on local needs and constraints.

The Hertfordshire Local Enterprise Partnership (LEP) has three growth areas aimed at creating flagship housing, employment and improving transport connectivity in the area, levering £430m of public and private investment. The £22.3m investment secured from the Local Growth Fund will be used to support the delivery of 20,000 new homes and 15,000 new jobs by 2021, demonstrating the effectiveness of the partnership in driving the local economy. This study will be aimed at providing evidence to directly support the LEP and their strategic goals, specifically aimed at securing funding for their growth areas.

High levels of growth are proposed in Hertfordshire, influenced heavily by the region's location within the London commuter belt. This in turn drives affluence that leads to higher consumption rates. This effectively leads to extra demands on 'service' that can form a cycle of self-sustaining inflation in investment requirements. Considered alongside the issues of climate change and an ageing infrastructure the true pressures in the region start to emerge. Growth is also inexorably linked to the underlying economic stability of the UK, an aspect of urban development that has been less stable recently. This adds uncertainty to development trends and future 'scenarios', creating the need to implement holistic strategies that incorporate all the tangible factors that may influence the build out of proposed development.

An integrated and sustainable approach to water infrastructure planning, as proposed for this study, is vital given the regional and local pressures on the water environment. The requirement is reinforced by both Planning Policy Statement 12 and the supplement to Planning Policy Statement 1, which highlights the requirement for Planning Authorities to take account the capacity of existing infrastructure and the phasing and delivery of new infrastructure to support development strategies.

Climate Change & Urban Creep

Climate change and its effect on the hydrogeological and urban environments is one of the biggest challenges faced by infrastructure and asset managers. Current projections indicate the summers in Hertfordshire are likely to be around 7% to 10% drier by the mid-century. Reductions in rainfall will inevitably lead to increased abstraction rates without the provision for additional storage or catchment transfer, all of which create their own specific environmental and economic impacts. Even though the region is generally one of the driest places in the UK, introducing its own pressures on water supply, rainfall in winter is likely to increase by 10% to 15% in winter. Increased rainfall reduces the capacity to accommodate runoff, let alone the ever-increasing runoff associated with continued development and urban creep, within an aging wastewater infrastructure. Uncertainty associated with climate change and urban growth hampers the linking of infrastructure investment with local and strategic council planning, an issue that is central to the outcome of this study. The outputs of this study should help not only the various partners share information and strategies, but also assist them

internally, ensuring different departments have a wider appreciation of the impact of their policies and activities.

The pressures on the wastewater infrastructure assets and networks are significant and challenging. Based on a recent Water & Wastewater Treatment study only 0.2% of public sewers were replaced each year between 2000 and 2008 across the UK, at a rate implying that new pipework installed today needs to last for over 500 years. This demonstrates an essential need to pursue alternative, novel and strategic approaches to manage wastewater infrastructure to meet this challenge.

Urban creep and small-scale in-fill development is a hidden danger for wastewater infrastructure, gradually eating away at spare capacity and headroom with treatment processes, reducing long-term resilience. This aspect of runoff management is very hard to identify and mitigate at the local scale, typically requiring strategic investments to resolve.

Water Quality

Pollution due to discharges from wastewater assets, such as intermittent sewer discharges, final effluent and flooding, are likely to worsen due to increases in winter rainfall. Growth and the potential increase in rainfall runoff will inevitably exacerbate this issue further. With the two main Water Framework Directive waterbodies currently failing compliance, the pressures on infrastructure not to impact them through additional discharges will be become more significant.

Infrastructure Planning

County, district and local councils already understand to a reasonable degree the long-term projections, likely outturns for development and employment. With planning at the core of their operation, the development of strategic outlooks can be robust and relatively holistic. However, for water companies, planning at this scale entails a range of alternative challenges. The AMP reporting cycle can also hinder a water company's ability to develop and implement effective long-term strategies aimed at accommodating climate change, urban development and integrated asset management.

TW, Anglian Water (AW) and Affinity Water (AfW) cover this region and are responsible for overlapping elements of the water supply and wastewater treatment infrastructure. It is essential for long-term planning across multiple organisations that each understands the others infrastructure management strategies, their assets and how all their work fits in with the overarching development planning frameworks.

This study and its outputs will provide a robust evidence base and aims to assist the key partners as follows:

Local Authorities: Evidence base for their LDFs, and sets out the water and wastewater infrastructure, amongst other measures, that will need to be in place to achieve their growth targets. There are nine Local Authorities within the study area of Hertfordshire, one within Buckinghamshire County to the west (Chilterns District Council) and Hertfordshire County Council (HCC) itself. As some only lie partly within the catchment, the relevance of the information to the LDF process contained within this study may be variable.

Hertfordshire Local Economic Partnership: Their focus on driving sustainable economic growth will reply on sound holistic advice on the long-term development of key urban infrastructure, including water supply and wastewater. This study will provide valuable insight into the areas and direction for

growth, assisting their coordinated strategies ensuring that any barriers to growth can be avoided. The economic viability of this region is important to ensure the LEP can continue to provide infrastructure to support its position within the 'Golden Research Triangle'.

Environment Agency: Provides them with the confidence needed to support the scale of development that is proposed, making sure that no deterioration of the environment is felt. However, this study does not constitute the approval of the EA on any specific site allocation or development policy. The EA retain the right to comment upon site specific planning applications.

Water Companies: AW, TW and AfW will be able to use this study as a mechanism to improve their knowledge of development proposals and increase the level of communication with the Local Authorities. It can be used to support their business plans for the provision of key infrastructure to meet internal and Ofwat agreed targets. An integrated strategy based on the entire catchment, rather than individual water company boundaries, can allow for the development of more sustainable solutions and for possible collaboration to be explored.

Objectives

Key objectives are:

Objective 1 - To identify how current and planned local water supply and wastewater treatment infrastructure could affect future growth levels for Hertfordshire, and where possible and relevant, neighboring areas. This will be achieved through the development of robust scenarios based on the standardisation of council planning information within a single GIS database. An array of partner and external GIS datasets will facilitate the definition of sub-catchment boundaries, relevant to administrative boundaries, drainage network catchment, natural watersheds and the general urban makeup of Hertfordshire. Our modelling experience and familiarity with the water companies serving Hertfordshire will enable us to assess and breakdown the capacity and headroom within the water supply and wastewater treatment infrastructure, integrating into the GIS database and effectively assessed against the future development scenarios. Our robust selection of the study catchment area will enable all partners to see how their areas fit in within the wider context and encourage greater collaboration. The study will hopefully help address issues that transect administrative boundaries.

Objective 2 - To identify potential changes to water supply and wastewater treatment infrastructure required to support the scale of development envisaged for the county as a whole, and considering the Local Enterprise Partnership (LEP) growth corridors, and wider sub-region, where relevant. Informative and innovative data graphics and excel-based analytics will ensure that this objective can be challenged and ultimately met. Modelling results for the baseline and development scenarios will be analysed to identify trends and thresholds, used to determine points of intervention and long-term headroom / capacity issues. From this, infrastructure improvement strategies will be derived, measured against the modelling results and targeted at accommodating the evaluated developments scenarios for the various timeframes.

Objective 3 - To scope out potential environmental impacts of the development of water supply and wastewater treatment related infrastructure. Our expertise in environmental impact assessment will be utilised to ensure we can effectively identify and classify all potential current and future environmental constraints, providing a clear guide as to the likely options which will have to be pursued. Consideration will be given to the potential that environmental consents may be tightened in future, leading to short-sighted funding commitments and / or abortive works. This consideration will enable us to ensure proposed investments are robust and environmentally sound for the extent of the various scenarios and timeframes.

Objective 4 - To provide a range of options to meet strategic and local infrastructure needs, and an indication of the scale of investment required at the sub-catchment level. International best practice advisors and urban water specialists within ARCADIS Global will provide technical direction throughout the optioneering stage, alongside our UK-based Hyder experts. This broad range of expertise will ensure we can propose a wide range of pragmatic and feasible options, incorporating innovative and sustainable approaches taken from the UK and further afield. The project online SharePoint site will promote 'live' collaboration during the development and feasibility design of options, helping to ensure that all potential partner concerns, site issues and other risk elements can be identified. Innovation will be central to the options identification and development process to ensure climate change resilience and environmental protection remain key pillars of long-term development. This approach should also help to elevate the region's attractiveness to prospective 'Golden Research Triangle', aligning infrastructure development with the underlying growth of sustainable thinking in high-tech industries. The options developed within the Water Resources in the South East Project (WRSEP) will be appraised and used as the springboard in this study, building upon previous work and partner engagement. This will help ensure that this project ties in with previous work and forms the logical next step in the process to procuring and implementing the necessary infrastructure improvements.

Objective 5 - To set out a range of wider policy options and solutions to remedy any shortfalls in infrastructure provision. The identification and assessment of necessary infrastructure investment strategies and options will provide a clear and objective profile to assist long-term planning. This process will clearly demonstrate where direct infrastructure investments will facilitate development and where some of the catchment constraints are unlikely to be resolved. Policy options and solutions will be discussed and tailored to fit around any defined options, supplementing them with supporting strength and removing uncertainly where possible.

Modelling & Analysis

ARCADISs Principal Consultants, Senior Consultants and International Expert Advisors will work together to define a range of critical factors and thresholds, agreed through consultation with the water companies and other partners. The primary elements that will be considered will include, but are unlikely to be limited to, the following.

- Wastewater drainage network conveyance capacity
- Key wastewater asset capacity (e.g pumping stations)
- STW process headroom
- Wastewater consents
- Water supply capacity
- Water supply storage reservoir capacity
- WTW processing capacity

Water abstraction limits / consents All the final critical factors and thresholds form the basis of a numerical assessment of infrastructure deficits and will be used to inform the sensitivity testing methodology.

Some of the likely impacts of future growth, which will be assessed in order to identify the key catchment constraints, include the following:

- Increased consented discharges of treated effluent from the STWs, leading to increased suspended solids, increased bio-chemical oxygen demand and eutrophication. EA compliance

requirements may prevent growth in some catchments, requiring costing for STW process improvement works.

- Reduction in the capacity of the sewerage network, leading to increased frequency of intermittent discharges to the environment and risk of foul sewer flooding, polluting nearby watercourse and creating a public health hazard. OFWAT regulation of the water companies tightly controls flooding and environmental discharges and could severely inhibit the achievement of the desired growth levels.
- Increased abstraction of water to support both the residential growth and potential industrial needs, leading to reduced volumetric flows in rivers, decreased water levels and detrimental environmental impacts on natural wetlands. This would restrict abstraction and denote that large-scale catchment transfer schemes would be required prevent severe river impacts.
- Increased rainfall creating additional pressure on combined sewerage systems and reducing available headroom in the network and for treatment to accommodate urban developments. Additional development inflows could also results in increased intermittent discharges to the environment, impacting compliance levels and resulting in fines.

ARCADIS are acutely aware of the potential conflicts between growth aspirations, the current economic climate and upheaval of planning policy framework, protection of the water environment, and the statutory responsibility of water companies. We have experience of successfully resolving such conflicts at a local level to the agreement of all parties, which we can bring to bear for this study. Constraints and opportunities will be classified in terms of severity / importance using a Red Amber Green (RAG) system to allow clear interpretation by the project partners

Optioneering

With reference to the LDPs, HCC Strategic Infrastructure Plan, WRSE, WREA and water company AMP plans, the Principal and Senior Consultants will identify and develop outline schematic plans for a range of conceptual changes to offset the projected deficits. We will compare the expected water and wastewater demand with the infrastructure capacity, constraints and deficits, and through consultation with the partners agree a long list of infrastructure, water resource and wastewater treatment options to provide the necessary capacity at a local, strategic and policy scale. The Partnership The Water Companies SharePoint Site

ARCADIS will consult with stakeholders to develop a clear set of sustainability objectives and targets against which any proposed solutions will be assessed, including:

- Water quality and biodiversity opportunities
- Carbon (both embedded and operational, i.e. energy use)
- Water efficiency and impact on resources
- Technical feasibility and deliverability risk
- Affordability and funding options
- Development / infrastructure lead-in time / phasing
- Organisational / administrative responsibilities ♣ Wider sustainability considerations

ARCADIS will work with partners to develop the sustainability framework and identify a suitable scoring and weighting mechanism to allow the robust and transparent comparisons of potential solutions.

The serious water stress experienced in this region can be a positive influence, in that there is a pressing need to investigate and promote sustainable and resilient principles will have to be made to work. The ‘business as usual’ approach is not an option. The aspiration for water neutrality must also

be explored at all levels to ensure existing water resources and the environment are protected, allowing greater flexibility to accommodate future development.

All our options strategies will be identified and designed through collaboration with our International Expert Advisors, drawing confidence from the success of various schemes delivered by ARCADIS in other countries, specifically the Netherlands. Some potential options that could be considered during this stage include the following:

- Formation of blue-green corridors (providing recreational opportunities and enhanced biodiversity potential, as we designed for the Waterakkers Water Park project in Breda, Netherlands)
- Import of water from neighboring catchments
- Optimisation and / or re-tasking of existing assets, such as the conversion of obsolete STW / SPS tanks into storm storage or balancing tanks
- Use of purified surface water runoff to recover groundwater levels as part of large-scale separate drainage and / or strategic sustainable infrastructure
- Approaches such as this should help to demonstrate the HCCs, and the other partners, commitment to innovation and sustainability, elevating the regions attractiveness to prospective 'Golden Research Triangle' companies
- Development of surface water separation strategies to relief expected pressures on foul sewer networks, providing headroom and addressing pollution through reduced intermittent discharges to the environment
- Smart operational control-based EA permitting framework to maximize urban wastewater system performance by balancing conflicting objectives such as operational cost, treatment processes and environmental risk simultaneously. (University of Exeter, A Cost-effective Regulation Framework for Water Quality Risk Management)
- Implementation of nutrient release reducing schemes to balance any residual, post treatment increase arising from proposed development

All option plans and working drawings will be hosted on the SharePoint and used as the basis for partner consultation and inclusion within the optioneering process. The feasibility and environmental impact of options will be assessed, used to target the most appropriate and relevant options.

ARCADIS will review the water company's performance standards and capacity constraints through consultation with the asset owners, and identify any relevant existing plans for rehabilitating or upgrading the existing assets.

Appraisal of the options will be undertaken using a multi-criterion appraisal tool, to identify those options which are most socially acceptable, economically viable, technically feasible and sustainable (it is assumed that detailed cost estimates are not required, but high-level indications of likely off-site network and treatment costs to allow robust option comparison). The appraised options will be presented by the Principal Consultant to the project partners at the second workshop, with the aim of securing acceptance of the final options short-list which will be evaluated and detailed in full within the final report.

A complete review of the Water Companies current AMP6 and longer-term investment and management plans will be undertaken to align any proposals, with the aim of identifying existing synergy and promoting the re-evaluation of plans to incorporate wider goals.

ARCADIS will ensure that option development accounts for innovative international best practice through continued collaboration with our International Expert Advisors, and opportunities for

including smart technologies and providing multi-functional solutions are fully explored (e.g. water retention and purification / highway water transport systems etc.).

The results of the optioneering, along with all the other activities and outputs of the whole project, will be summarised in a Final Report. At this stage we will also identify the key limitation and confidence in the proposals for this 'Phase 1' work, outlining missing data or identified improvements to help guide the 'Phase 2' work

Appendix 15: Hertfordshire Planning Group Committee 25 May 2016- Water Study Project Update Extract

DRAFT

HPG Main Committee – 25 May 2016
Watford Borough Council, Town Hall, Hempstead Road
Watford WD17 3EX

Attendees

Tracy Harvey	(TH)	St Albans City & District Council (Chair)
Jon Tiley	(JT)	Hertfordshire County Council
John Rumble	(JR)	Hertfordshire County Council
Ian Fullstone	(IF)	North Herts District Council
Renato Messere	(RM)	Three Rivers District Council
Jane Custance	(JC)	Watford Borough Council
Sue Tiley	(ST)	Welwyn Hatfield Borough Council
Des Welton	(DW)	HPG Co-ordinator (Minutes)

Guests

Alina Congreve	(AC)	University of Hertfordshire
Darragh Murnane	(DM)	University of Hertfordshire
Richard Southern	(RS)	University of Hertfordshire

Item	Discussion/Conclusion	Action
14.	**Water Study** An update report was circulated and introduced by John Rumble. JR advised that the project was slightly behind schedule and revised deadlines will be reported to HIPP. JR added that there was an interim issue relating to the progress of Local Plans and it was proposed to issue a statement that will give some assurance to local authorities who are at a critical stage in the LP process.	**JR**

Appendix 16: Water Study Project for Hertfordshire Interim Report (to follow)

Appendix 17: Water Study Project for Hertfordshire Final Report (when available)