Addendum
Transport Assessment

Title	Research and Development Building
Client	UK Atomic Energy Authority (UKAEA)
Location	Culham Science Centre
Project number	18-0656
BIM reference	RDBC-BSP-ZZ-XX-RP-D-0002-P05_Addendum_Transport_Assessment
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Authorisation Sheet & Revisions Record

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P02	26.11.21	Finalised	JSP	MM	MWR
P03	27.01.22	Revised trip rates and sensitivity tests added as agreed with OCC	JSP/MM	MM/JSP	MWR
P04	03.02.22	Car parking proposals confirmed	JSP	MM	MWR
P05	31.03.22	Revised following OCC comments	JSP	MM	MWR

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Contents

1.0 Introduction

1.1 This Addendum Transport Statement (TS) has been prepared on behalf of The United Kingdom Atomic Energy Authority (UKAEA), in response to consultation comments on the recent planning application for a proposed Research and Development Building at Culham Science Centre (CSC) (App Ref: P21/S1257/FUL) and additional work agreed with the Local Highway Authority, Oxfordshire County Council.

1.2 Further to the Transport Statement provided to accompany the planning application, capacity assessment work has been requested in order to quantify the impact of the proposed development on the surrounding highway network.

1.3 The report has been revised to include further commentary in response to comments regarding the parking proposed adjacent to the building. It also includes some minor corrections and additional flow diagrams to illustrate the methodology, along with the updated capacity assessments and results where applicable. These minor changes have not affected the conclusions.

1.4 This additional work has been completed in the context of the OCC paper on "Releasing Development Strategy in Didcot and surrounding villages in the vicinity of HIF1 Schemes".

> *Prior to Didcot Garden Town Centre Housing Infrastructure funding (HIF1) being secured… it was established that the local and strategic highway network that serves Didcot and the surrounding area has severe congestion and capacity issues during the morning and evening commuter periods. The areas of concern most affected have been identified as the river crossing between Sutton Courtney and Culham, Clifton Hampden village signal junction, and the A4130 as the main route between Didcot and Milton Interchange (A34).*

1.5 This led to an OCC strategy in 2017 that heavily controlled development and resulted in highways objections to development that would generate any new vehicular trips in the morning and evening commuter peak times.

1.6 Securing HIF1 funding in June 2019 and the adoption of Local Plans for Vale of White Horse (VoWH) and South Oxfordshire (SO) and has provided more confidence in the delivery of HIF1.

> *Although it continues to be recognised by OCC that in the absence of the HIF1 infrastructure, much of the highway network is at design capacity during the morning and evening commute times. It remains the fact that all applications are assessed on their merits and TDC officers are mindful that there is an overall national planning gain in delivering houses and economic growth in Oxfordshire and should not be seen to be obstructing this, whilst also maintaining a working highway network.*

1.7 In June 2021, Oxfordshire County Council's Cabinet adopted a strategy to assist with the delivery of some new development in the VoWH and SO districts prior to HIF1 funded infrastructure being open for public use, based upon the following requirements:

- Development site housing build programmes / trajectories / occupations being aligned with (or after) the delivery of HIF 1 which will require occupation thresholds / controls on development sites.
- Development sites to provide agreed sustainable / active travel infrastructure at the beginning (early occupations) of development sites to reduce traffic impact on the highway network prior to HIF 1 delivery.
- New services or enhancements to existing bus service arrangements being implemented at the beginning (early occupations) of development sites.
- Local off-site and on-site highway works to be delivered at the early stages of development to lessen the direct impact of a development site on the highway network.
- Travel Plans prepared and approved by the council's Travel Plan team with deliverable and monitored targets.
- Strategic transport / highway contributions will be sought in accordance with Regulation 122 and the three Section 106 tests.

1.8 A four-tiered approach is to be used when considering development that is promoted in the Vale of White Horse (VoWH) and South Oxfordshire (SO) districts, to enable some development to come forward prior to the delivery of HIF1. Tier 1-3 relate to increasing scales of housing development. Tier 4 relates to commercial developments and states the following:

> *Tier 4: Commercial developments. It is recognised by OCC that there are significant existing and proposed commercial sites in the area that help support the local and national economy such as Culham Science Centre, Milton Park, Harwell Campus (and others). While these sites are not directly linked to releasing housing via the delivery of HIF1 they are to play an essential role in its delivery, such as providing land or delivering some elements of the highway works. While HIF1 funding has been secured and OCC is confident is delivering HIF1, Tier 4 development proposals will be assessed on their merits but will be expected to mitigate their own impact through local and site wide measures which may include providing excellent pedestrian, and/or cyclist provisions and enhanced frequent public transport service provisions to help reduce their impact in the local area before HIF1 is delivered and in the long term. Restrictions on gross floor area usage or occupation thresholds may be applied to development sites to lessen the cumulative impact on the highway network.*

1.9 The content of this report is summarised as follows:

- Section 2.0 sets out the study area and base traffic flow information;
- Section 3.0 establishes the growth factors and committed developments applicable for each of the assessment years;
- Section 4.0 outlines the development proposals, including the site access and parking arrangements;
- Section 5.0 quantifies the amount of traffic likely to be generated by the development proposals;
- Section 6.0 establishes the potential impact of traffic associated with proposed development in terms of additional vehicular trips on the highway network within the study area;
- Section 7.0 demonstrates the impact of the development traffic on operational capacity at the study area junctions for each of the assessment years; and
- Section 8.0 summarises the key findings of the report, highlighting the transport implications of the proposals, and summaries any mitigation measures if considered necessary.

2.0 Study Area Base Information

2.1 The confirmed study area is as follows:

- Site Access
- Clifton Hampden signals (A415 / Oxford Road / High Street / Watery Lane)
- Clifton Hampden Bridge signals
- Berinsfield roundabout (A4074 / A415 / Wimblestraw Rd)
- Golden Balls roundabout (A4074 / B4015 / Oxford Rd)
- Waggon Horse signal junction (A415 / Tollgate Road)
- Culham river crossing signals (Tollgate Road / Abingdon Road)
- Appleford Road (B4016) / Abingdon Road
- A415 / High Street / Stert Street
- Ock Street / Stratton Way
- Ock Street / Marcham Road / B4017 / Spring Road
- Marcham Road / Colwell Drive
- Marcham Road / Nuffield Way

2.2 Peak hour turning movement data was obtained for 2018 from a count at the CSC site access. (The latter 2019 survey was affected by an off-site incident in the PM peak hour so has not been used).

2.3 Peak hour turning movement data has been obtained for the following junctions for 2020 from OCC's Didcot Garden Town Housing Infrastructure Fund HIF1 planning application (Application Ref R3.0138/21):

- Clifton Hampden signal junction (A415 / Oxford Road / High Street / Watery Lane)
- Waggon Horse signal junction (A415 / Tollgate Road)
- Culham river crossing signals (Tollgate Road / Abingdon Road)
- Appleford Road (B4016) / Abingdon Road

2.4 Peak hour turning movement data has been purchased for the following junctions from OCC for 2017:

- Clifton Hampden Bridge signals
- Berinsfield roundabout (A4074 / A415 / Wimblestraw Rd)
- Golden Balls roundabout (A4074 / B4015 / Oxford Rd)

2.5 Peak hour turning movement data for 2017 was obtained for the following junction from the Transport Planning Associates TA for the Project Swift farm park and activity centre development, as there were temporary traffic signals in place on Abingdon bridge that may affect the operation of the junction:

- A415 / High Street / Stert Street

2.6 Surveys were completed at the following junctions on Wednesday 13th October 2021, after the October half term:

- Ock Street / Stratton Way
- Ock Street / Marcham Road / B4017 / Spring Road
- Marcham Road / Colwell Drive
- Marcham Road / Nuffield Way

2.7 A copy of the survey data is provided in **Appendix A**.

2.8 The survey data for the full study area is shown on Flow Diagram 1 in **Appendix B**.

3.0 Assessment Years, Traffic Growth and Committed Developments

3.1 The assessment years suggested by OCC are as follows:

- Baseline / existing conditions (2021)
- Pre-HIF delivery (which is programmed for end of 2024) and estimated occupation of the proposed development (2023/24).
- After HIF is open for public use (2024 "with HIF")
- End of Local Plan period (2035, or 2034 allowing for all planned development)

3.2 The adopted Vale of White Horse District Council (VoWHDC) Local Plan Part 1 and 2 period ends in 2034. The adopted South Oxfordshire District Council (SODC) Local Plan period ends in 2035, although little growth is expected between 2034 and 2035. Therefore, as agreed with the highway authority for the Didcot Garden Town Housing Infrastructure Fund (HIF1) assessment work, 2034 flows have been used for the future year assessment, which include all the Local Plan allocated development sites and committed infrastructure included in the Didcot Paramics microsimulation model.

2021

3.3 Local NTM TEMPro growth factors have been obtained and applied to all the base traffic flows that are pre-2021 to provide a 2021 baseline scenario. This is shown on Flow Diagram 2 in **Appendix B** (see Appendix B for all Flow Diagrams).

Table 3.1: TEMPro Growth Factors

Super Output Area (Mid-Layer)	Base Year	Assessment Year	AM	PM
SO 006	2017	2021	1.0591	1.0580
SO 006	2018	2021	1.0442	1.0435
SO 006	2020	2021	1.0157	1.0155
Super Output Area (Mid-Layer)	**Base Year**	**Assessment Year**	**AM**	**PM**
VoWH 006	2017	2021	1.0720145	1.0695905
Super Output Area (Mid-Layer)	**Base Year**	**Assessment Year**	**AM**	**PM**
VoWH 010	2020	2021	1.0164062	1.0163058

3.4 Traffic associated with the following committed developments have also been added to the junctions where surveys were completed prior to 2021.

Amey site / Land South of Appleby Road, Sutton Courtney (P10/V1907/O & P14/V2061/RM)

3.5 The Didcot Garden Town Housing Infrastructure Fund (HIF1) TA assumed 85 dwellings constructed and occupied by 2020 and added associated traffic movements to the base flows for the 2020 scenario.

3.6 The trip rates have been taken from the Lawrence Walker TA for the outline application to calculate the number of trips anticipated, and this is presented in Table 3.2 below.

Table 3.2: Vehicular Trip Rates and Trip Generation Summary – Land South of Appleford Road

Amey Site / Land South of Appleford Road	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Rate (per dwelling)	0.125	0.375	0.500	0.375	0.125	0.500
Trip Generation (85 dwellings)	14	41	55	41	14	55

3.7 There were varying trip distributions presented in the original TA and in subsequent TAs which included this site as a committed development, and none extended across the whole study area used in this assessment. Therefore a Census based distribution model was completed using the usual place of work accessed by car from residences in the mid layer super output area E02005987 : Vale of White Horse 010, where the housing site is located.

3.8 The distribution data is provided in **Appendix C** with a summary provided on Flow Diagram 3.

3.9 The resulting committed development traffic flows (to apply to junctions where base surveys were completed prior to 2020/21) are shown on Flow Diagram 4.

Culham Science Centre OAS2

3.10 A new building for the Oxford Advanced Skills (OAS) training facility, known as OAS2, was provided on campus and occupied in September 2019. Therefore, this would not have been included in traffic surveys completed prior to this date.

3.11 The Transport Statement for OAS3, set out trip rates and apprentice numbers for both OAS2 and OAS3. This estimates up to 96 full time and 116 block release apprentices on site on any given day in 2021/22 increasing to 168 block release apprentices in 2022/23. The block release timetable is split into groups of 10-12 apprentices. In 2020/21, 90 apprentices saw just one to two groups of around 10 on site on any one day. Although this is expected to increase to up to three groups of 12 on site per day. Therefore, a total of 96 full time and 36 block release students have been allowed for in the 2021 scenario. The number of staff is expected to increase from 20 in 2020/21 to 25 in 2022/23, and therefore all 25 have been allowed for.

3.12 Table 3.3 shows the trip rate and trip generation.

Table 3.3: Vehicular Trip Rates and Trip Generation Summary – OAS2

OAS2	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Rate (per apprentice)	0.563	0.000	0.563	0.000	0.000	0.000
Trip Generation (132 apprentices)	74	0	59	0	0	0
Trip Rate (per staff)	0.178	0.000	0.178	0.000	0.142	0.142
Trip Generation (25 staff)	4	0	4	0	4	4
Total Trip Generation	79	0	79	0	4	4

3.13 Postcode data from existing users of the OAS2 facility were used to establish a distribution model for these trips. The distribution data is provided in **Appendix D** with a summary on Flow Diagram 5.

3.14 The resulting committed development traffic flows (to apply to junctions where base surveys were completed prior to 2021) are shown on Flow Diagram 6.

Culham Science Centre RACE Extension

3.15 An extension to the RACE building was occupied in March 2021 so after most of the traffic survey data was obtained.

3.16 The Transport Statement which accompanied the planning application set out the expected trip generation for the building. This is summarised in Table 3.4 below for the expected level of occupation by 2021 and 2023 onwards. This excluded 18 staff that were relocating from within campus.

Table 3.4: Trip Generation Summary – RACE Extension

RACE Extension	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Generation (2021 – 30 staff)	9	0	9	0	5	55
Trip Generation (2023 – 72 staff)	22	0	22	0	12	12

3.17 Postcode data from existing employees at CSC have been used to establish a distribution model (further details are included in section 5.0). This is shown on Flow Diagram 7.

3.18 The resulting committed development traffic flows for the initial occupancy of the building, to apply to junctions where base surveys were completed prior to 2021, are shown on Flow Diagram 8. The remaining trips for up to full occupation will be added to the 2024 scenario.

3.19 The 2021 existing scenario is shown on Flow Diagram 9 and where applicable includes for committed traffic growth since traffic surveys were completed. Growth factors have not been applied to the turning movements in/out of CSC as the growth is accounted for with the committed developments on campus.

2024 Pre-HIF

3.20 Local NTM TEMPro growth factors have been applied to the 2021 flows to provide 2024 base flows. The base flows for 2024 are shown on Flow Diagram 10.

Table 3.5: TEMPro Growth Factors

Super Output Area (Mid-Layer)	Base Year	Assessment Year	AM	PM
SO 006	2021	2024	1.044204	1.045073
VoWH 006	2021	2024	1.058873	1.059896
VoWH 010	2021	2024	1.055142	1.057135

3.21 Traffic associated with the following committed developments have also been added.

Amey site / Land South of Appleby Road, Sutton Courtney (P10/V1907/O & P14/V2061/RM)

3.22 The outline application was for a total of 171 dwellings, increased to 195 dwellings at reserved matters stage. Didcot Garden Town Housing Infrastructure Fund (HIF1) TA assumed 85 dwellings constructed and occupied by 2020 and 192 dwellings constructed and occupied by 2024. To allow for the full 195 dwellings with planning permission, the increase in dwellings between 2020 and 2024 is 110 dwellings.

3.23 The trip rates have been taken from the Lawrence Walker TA for the outline application to calculate the number of trips anticipated, and this is presented in Table 3.6 below.

Table 3.6: Vehicular Trip Rates and Trip Generation Summary – Land South of Appleford Road

Amey Site / Land South of Appleford Road	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Rate (per dwelling)	0.125	0.375	0.500	0.375	0.125	0.500
Trip Generation (110 dwellings)	14	41	55	41	14	55

3.24 The same distribution model as used above for the initial 85 dwellings has been applied (see Flow Diagram 3).

3.25 The resulting committed development traffic flows have been combined with those for the other committed housing development at Appleby Road which is detailed below.

Land north of Appleby Road, Sutton Courtney P15/V2933/O – 43 dwellings (of 93)

3.26 The Didcot Garden Town Housing Infrastructure Fund (HIF) TA assumed 0 dwellings constructed by 2020, 43 dwellings constructed and occupied by 2024, with all 93 constructed and occupied by 2034. The trip rates from the Transport Assessment for the outline application for the development of Land north

of Appleby Road, Sutton Courtney P15/V2933/O has been used to confirm the trips associated with the 43 dwellings expected to be completed by 2024. (The total of 93 dwellings that have permission are included in full in the 2034 scenario).

Table 3.7: Vehicular Trip Rates and Trip Generation Summary – Land North of Appleford Road

Land North of Appleford Road	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Rate (per dwelling)	0.111	0.500	0.611	0.354	0.207	0.561
Trip Generation (43 dwellings)	5	22	26	15	9	24

3.27 The same distribution model as used above for the land south of Appleby Road has been applied (see Flow Diagram 3).

3.28 The resulting committed development traffic flows for both committed housing development sites on Appleby Road for the 2024 scenario are shown on Flow Diagram 11.

Culham Science Centre OAS3

3.29 The TS for OAS3 set out the forecasts for delivering training programs the academic year of 2024/25 and confirmed that they would result in the following maximum number apprentices and staff on any given day.

Table 3.8: Total Apprentice Numbers 2024/2025

	Full Time	Block Release	Staff	Total
OAS2	96	36	25	157
OAS3	0	72	11	83
Total	**96**	**108**	**36**	**240**

3.30 The OAS2 trips have been included where appropriate in the 2021 scenarios. Therefore, the additional OAS3 trips are now added, for the additional up to 72 apprentices a day and 11 additional staff. **Table 3.9** below shows the trip rate and trip generation.

Table 3.9: Vehicular Trip Rates and Trip Generation Summary – OAS3

OAS3	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Rate (per apprentice)	0.563	0.000	0.563	0.000	0.000	0.000
Trip Generation (72 apprentices)	41	0	41	0	0	0
Trip Rate (per staff)	0.178	0.000	0.178	0.000	0.142	0.142
Trip Generation (11 staff)	2	0	2	0	2	2
Total Trip Generation	43	0	43	0	2	2

3.31 Postcode data from existing users of the OAS2 facility were used to establish a distribution model for these trips (see Flow Diagram 5).

3.32 The resulting committed development traffic flows for OAS3 are shown on Flow Diagram 12.

Culham Science Centre RACE Extension

3.33 The Transport Statement which accompanied the planning application for an extension to the RACE building set out the expected trip generation for the building. This is summarised in Table 3.10 below for the expected level of occupation by 2021 and 2023 onwards, once fully occupied, as well as the increase from the allowance in the 2021 flows.

Table 3.10: Trip Generation Summary – RACE Extension

RACE Extension	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Generation (2021 – 30 staff)	9	0	9	0	5	5
Trip Generation (2023 – 72 staff)	22	0	22	0	12	12
Increase between 2021 and 2024	13	0	13	0	7	7

Culham Science Centre NFTP and STEP/UKAEA Offices

3.34 The above proposed buildings have planning consent and are due to be occupied in 2022 and 2023 respectively. The Transport Statements which accompanied the planning applications set out the expected trip generation for the buildings.

3.35 The trip generation for NFTP is summarised in Table 3.11 below for the expected level of occupation by 2024 and 2025 onwards, once fully occupied.

Table 3.11: Trip Generation Summary - NFTP

NFTP	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Generation (2024 – 225 staff)	68	0	68	0	38	38
Trip Generation (2025 – 300 staff)	90	0	90	0	51	51

3.36 The trip generation for the STEP / UKAEA office is summarised in Table 3.12 below for the expected level of occupation, once fully occupied. This does not include 300 staff that are relocating from within the campus.

Table 3.12: Trip Generation Summary – STEP/UKAEA

STEP / UKAEA	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
Trip Generation (300 employees)	90	0	90	0	51	51

Culham Science Centre – Total Committed Developments 2022-2024

3.37 There are additional proposals for a new entrance and main gate building for CSC, to tie in with the proposed HIF infrastructure, and a new nursery to replace the existing. These schemes are expected to be completed by 2024 but will not generate additional peak hour trips as they are all replacing existing facilities.

3.38 The total trip generation associated with committed development at CSC between 2022 and 2024 is summarised below. For robustness, it has been assumed that NFTP could be fully occupied.

Table 3.13: Trip Generation Summary – CSC 2022-2024

	AM Peak Hour 0800-0900			PM Peak Hour 1700-1800		
	In	Out	Total	In	Out	Total
RACE Extension	13	0	13	0	7	7
NFTP	90	0	90	0	51	51
STEP / UKAEA	90	0	90	0	51	51
Total	**193**	**0**	**193**	**0**	**109**	**109**

3.39 The increase in trips has been distributed using the model based on postcode data from existing employees at CSC, as shown on Flow Diagram 7. The resulting committed development traffic flows to add to the 2024 scenario, are shown on Flow Diagram 13.

3.40 The 2024 + committed pre-HIF scenario is shown on Flow Diagram 14 and includes background growth from 2021 and specific committed development traffic as set out above. Growth factors have not been applied to the turning movements in/out of CSC as the growth is accounted for with the committed developments on campus.

2024 Post-HIF

3.41 Initially the "2024 With HIF" data from the TA submitted for the Didcot Garden Town Housing Infrastructure Fund (HIF1) application, has been used to determine flows on the study area network included in that assessment. This included the signals at A415 / Tollgate Road, the Culham River crossing and the Appleford Road junction, and also the Clifton Hampden signalised junction. The data was also obtained for the CSC site access which is to be upgraded to a roundabout as part of the Clifton Hampden bypass works and realigned A415. The traffic flows are shown on Flow Diagram 15.

3.42 It should be noted that the HIF1 assessment scenarios included additional SO and VoWH Local Plan allocated sites and infrastructure, that are not yet approved or "committed".

3.43 The difference in trips on the network when comparing the 2024 with and without HIF scenarios at the HIF1 study area junctions have been used to factor the flows in our 2024 pre-HIF scenario to a 2024 post-HIF scenario.

3.44 The difference in flows have been distributed based on the turning movements to and from the appropriate arm at the Golden Balls roundabout and Berinsfield roundabout and the difference in flows has been applied to the Clifton Hampden Bridge. The first junction sees an increase in flows as it provides access to and from the new Clifton Hampden bypass. To the south and east of the Clifton Hampden signals flows were shown to have reduced, as traffic uses either the new Thames river crossing and/or the Clifton Hampden bypass, once the HIF infrastructure is open to traffic. Through Abingdon the impact has been assigned based on the development trip distribution assuming mainly through traffic is affected, with limited impact on junctions along the A415 corridor through Abingdon. The adjustments are shown on Flow Diagram 16.

3.45 The results of making the adjustments associated with the opening the proposed HIF infrastructure on the study area junctions not included in the HIF1 assessment work, are shown on Flow Diagram 17, as the 2024 post-HIF scenario.

2034 Pre-HIF

3.46 OCC requested the assessment of both a 2034 pre-HIF and a 2034 post-HIF scenario.

3.47 Local NTM TEMPro growth factors have been applied to the 2021 flows to provide 2034 base flows. The base flows for 2034 are shown on Flow Diagram 18.

Table 3.14: TEMPro Growth Factors

Super Output Area (Mid-Layer)	Base Year	Assessment Year	AM	PM
SO 006	2021	2024	1.135589714	1.140042804
VoWH 006	2021	2024	1.188198311	1.191771139
VoWH 010	2021	2024	1.169557470	1.177738728

3.48 Traffic associated with committed developments have also been added (see full details in paragraphs 3.22 – 3.40 above). The 2034 plus committed development flows are shown on Flow Diagram 19.

2034 Post-HIF

3.49 The 2034 post-HIF scenario again uses data from the TA submitted for the Didcot Garden Town Housing Infrastructure Fund (HIF1) application, for the study area network included in that assessment. The traffic flows are shown on Flow Diagram 20.

3.50 The HIF1 TA includes for all Local Plan allocated development including growth at CSC.

3.51 The 2034 flows on the arm between the HIF1 study area and the adjacent junctions, namely Golden Balls, Berinsfield roundabout, Clifton Hampden bridge and Bridge Street / High Street / Stert Street has been used as the total flow expected on these arms. Where necessary the two-way flow has been distributed at the junction based on existing turning movements. These traffic flows are shown on Flow Diagram 21.

3.52 Local NTM TEMPro growth factors for 2024-2034 have been applied where the flows are not otherwise affected by the above adjustments.

Table 3.15: TEMPro Growth Factors

Super Output Area (Mid-Layer)	Base Year	Assessment Year	AM	PM
SO 006	2024	2034	1.087494	1.090837
VoWH 006	2024	2034	1.121735	1.124217

3.53 The results of making the adjustments associated with expected growth between 2024 and 2034, are shown on Flow Diagram 22, to provide the 2034 post-HIF scenario.

4.0 Development Proposals

4.1 The proposed Research and Development Building is to be located on the 'western flank' of the CSC campus. The proposed Research and Development Building has an overall GIA of 9,870sqm and comprises office space (6,428sqm NIA) and a large rig hall. Car parking for staff using the Research and Development Building is to be provided in an adjacent multi-storey car park. A service yard is also provided for access to the rig hall. The proposed site layout is provided in **Appendix E**.

4.2 Access to the site is provided from the internal road network within the CSC campus. Access to the CSC is via a ghost island right turn lane junction on the A415. The junction includes two exit lanes on the minor (site access) arm to facilitate flows from the site during the evening peak period.

4.3 The main highway and transport considerations, which have influenced the proposed design, are:

- provision of high-quality access and on-site facilities to support the use of sustainable modes of travel and BREEAM accreditation
- provision of suitable operational access/delivery/servicing arrangements, including adequate turning areas
- provision of parking for cycles and cars including disabled badge holders, EV charging, and car sharers

4.4 The main pedestrian entrance to the building is via a proposed public plaza located between the Research and Development Building and the STEP / UKAEA offices which are proposed immediately to the north (subject to a separate reserved matter planning application) on the western side of Main Avenue.

4.5 Vehicular access to the multi-storey car park and to the service yard for the rig hall will be off Main Avenue. There also will be parking for disabled badge holders and cyclists on Main Avenue adjacent to the building. Footpaths and footways provide connections between the parking facilities and the building and tie into the existing pedestrian network on the campus. The existing footways through the CSC campus will provide a pedestrian connection between the proposed facility and other buildings on campus.

4.6 The currently anticipated timescales for first occupation of the Research and Development Building is from Jan 2024.

4.7 The amount of parking to be provided to serve the building is proposed to be reduced, following discussions between OCC and the UKAEA, and a willingness by the UKAEA to compromise in this instance.

4.8 Car parking for staff using the Research and Development Building is to be provided in an adjacent multi-storey car park. This will form one of the proposed car parking hubs on campus, in line with the overall

strategy to have all car parking closest to the site entrance with non-car travel promoted within the campus.

4.9 Applying the OCC/SODC parking standard for offices to the total building (9,870sqm GIA) would equate to 329 spaces. The original proposals included the provision of 292 parking spaces, and so less than the maximum number of spaces permitted by applying the office parking standards for the total building size.

4.10 The main source of occupancy of the building will be the offices (6,248sqm NIA), although there will be staff based in the rig hall who would be in addition to the office-based employees. To re-calculate the number of spaces using OCC/SODC parking standards, a lower parking ratio for the rig hall element has been applied. In discussions with OCC, it was considered that the warehousing parking standards would be the most appropriate, although as shown below this would only provide a very low provision of 17 spaces for 35% of the building.

4.11 The OCC/SODC car parking standards for offices are 1 space per 30sqm, and for warehousing uses are 1 space per 200sqm. When applied to the respective floor areas, that results in the following number of spaces:

- Office element (6,428sqm) at 1 space per 30sqm = 214 spaces
- Rig hall element (3,442sqm) at 1 space per 200sqm = 17 spaces
- Total parking provision = 214 + 17 = 231 spaces

4.12 This results in a reduction in parking spaces of just over 20%, when the proposed 231 parking spaces is compared to the original proposals for 292 spaces. It is also 98 spaces or 30% less than applying the parking standards for offices to the whole building.

4.13 The reduced level of parking provision will need to be supported through implementing the Travel Plan measures to achieve modal shift away from single occupancy car trips towards the use of more sustainable travel modes for journeys to and from the campus. The reduced level of parking is also expected to result in a reduced level of trips, therefore the expected trip generation associated with the development was reviewed accordingly, and the results of correspondence with OCC is set out in section 5.0 below.

4.14 The revised total number of parking spaces for the Research and Development Building (231) is to include 12 (5%) spaces for disabled badge holders, 12 (5%) for car sharers and 23 (10%) with electric charging points (min 3kW) to achieve BREEAM credits and meet local authority requirements.

4.15 The proposed multi-storey car park will have a total of 265 spaces. This will consist of the 231 spaces for the Research and Development Building, and an additional 34 spaces to replace existing spaces being removed from within the campus.

4.16 The relocation of spaces on campus to the multi-storey car park aligns with the emerging Masterplan strategy to provide car parking in hubs close to the entrance of Culham Science Centre, as part of achieving an objective to shift the priority from car travel to more sustainable travel modes for all movements within the campus.

4.17 Covered 'Sheffield' type cycle stands to accommodate 70 cycles will be provided on Main Avenue adjacent to the building, which meets minimum BREEAM standards of 1 space for every 10 staff, for the 600-700 staff. Changing facilities, with lockers and showers, and a drying room will be provided within the proposed building to further encourage active modes of sustainable travel (these are shown on the ground floor plan provided in **Appendix E**). Six showers are provided within the building, including 2 accessible showers for those with disabilities. The changing facilities and drying room are to be BREEAM compliant.

5.0 Trip Generation and Distribution

5.1 The Research and Development Building is proposed to be 9,870sqm including a large rig hall. The office element of the building has a NIA of 6,428sqm. The original TS utilised the residual trips remaining from the Phase 1 planning permission, to offset some of the trips associated with the proposed building, however these residual trips have now been allocated to another development proposed on campus, and therefore the full number of proposed trips are calculated below and are used in the capacity assessment work.

5.2 Various methodologies for establishing the expected trip generation associated with the proposed building were reviewed in detail with OCC. It was agreed that use of trip rates from the TRICS database with peak spreading data from CSC was the most appropriate method for the proposed development at this site.

5.3 The following table, **Table 5.1**, demonstrates peak spreading that has been recorded at CSC. The data has been calculated from traffic counts completed in 2018, as documented in previous transport assessment work. A summary of the data is provided in **Appendix F**. Annual surveys have been completed at the site access of CSC as part of Travel Plan monitoring. Surveys were completed in 2019, however there was an incident on the A415 in the PM peak hour that affected flows. Surveys have been on hold due to COVID-19 and therefore the 2018 data is the most reliable recent data source.

Table 5.1: Peak Spreading at CSC

AM Time Period	Percentage of Trips	PM Time Period	Percentage of Trips
7-8AM	42.7%	3-4PM	23.5%
8-9AM	41.8%	4-5PM	53.1%
9-10AM	15.5%	5-6PM	23.4%
Total 7-10AM	**100.0%**	**Total 3-6PM**	**100.0%**

5.4 The TRICS database has been used to establish trip rates for offices and warehousing based on floor area. The sites have been filtered using the following parameters:

- Sites in England (excluding Greater London)
- Sites Surveys 2013 or later
- Sites with a floor area of between 2,000sqm and 15,000sqm
- 'Town centre', 'edge of town centre' and 'neighbourhood centre' sites have been excluded leaving sites within 'edge of town' or 'suburban' areas only

5.5 The resulting vehicular trip rates and generation is summarised in **Table 5.2** below. The full TRICS output data is included in **Appendix F** for information. Firstly, the trip rates and generation for the periods 7am-10am and 3pm-6pm have been calculated for the floor area of office space (6,428sqm) and the rig hall space (3,442sqm) using the warehousing category as discussed with OCC. The peak spreading proportions at CSC have then been applied to calculate the peak hour trips. The number of daily trips has also been calculated for the time periods where data was available, 0700-1900 for offices and 0500-2100 for warehousing, assuming there would be minimal if any trips outside of these times in a 24-hour period.

Table 5.2: Vehicular Trip Rate and Generation Summary

	AM Peak Period 0700-1000		PM Peak Period 1500-1800		Daily Period 0500-2100	
	In	Out	In	Out	In	Out
TRICS Trip Rate – Offices (per 100sqm)	4.011	0.523	0.536	3.533	7.194	6.569
Office Trip Generation (6,428sqm)	258	34	35	227	462	422
TRICS Trip Rate – Rig Hall (per 100sqm)	0.755	0.452	0.442	0.746	3.057	2.877
Rig Hall Trip Generation (3,442sqm)	26	16	15	26	105	99
Total Trips	**284**	**50**	**50**	**253**	**567**	**521**
	AM Peak Hour 0800-0900		PM Peak Hour 1700-1800		Daily Period 0500-2100	
	In	Out	In	Out	In	Out
Peak Spreading %	41.8%		23.4%		n/a	
Trip Generation	119	21	12	59	567	521

5.6 It was suggested by OCC that sensitivity tests using two other methods were also completed. This involved a trip rate based on the proposed number of car parking spaces (slightly less peak hour trips) and the use of the standard TRICS trip rates (slightly more peak hour trips). These are discussed below as Sensitivity Test A and B, respectively, in the capacity and impact assessment work.

Sensitivity Test A

5.7 **Table 5.3** shows the calculation of expected trip rates associate with the development proposals based on the total number of parking spaces. The vehicular trip generation for the 8-9am and 5-6pm peak hour periods needed for the assessment work have been calculated by applying the peak hour spreading to the total movements expected between 7am-10am and 3pm-6pm, at the start and end of the working day.

Table 5.3: Vehicular Trips based on Peak Spreading

Time Period	Percentage of Trips	Number of Trips
Total 7-10AM	**100.0%**	**231**
8-9AM	41.8%	97
Total 3-6PM	**100.0%**	**231**
5-6PM	23.4%	54

5.8 For robustness, off-peak direction movements have been calculated as an additional 5% of the peak direction movements. **Table 5.4** shows the proposed two-way vehicular movements. For the estimated daily movements, an additional 5% has also been added. There are very few trips off-site during the working day, due to the various facilities on-site e.g. a large restaurant, cafeteria and coffee bar, leisure facilities, etc. However, this allows for some potential movements in addition to the car park filling and emptying at the start and end of the working day.

Table 5.4 Sensitivity Test A Vehicular Trip Generation

	AM Peak Hour 0800-0900		PM Peak Hour 1700-1800		Daily Period	
	In	Out	In	Out	In	Out
Trip Generation (based on total parking spaces)	97	5	3	54	243	243

5.9 The numbers of trips are lower but reasonably similar to TRICS using this method, and it is not anticipated that the off-peak direction flows or daily flows will be as high as TRICS in reality. There are very few trips off-site during the working day, due to the various facilities on-site e.g. a large restaurant, cafeteria and coffee bar, leisure facilities, etc. TRICS will therefore provide an over-estimate of the daily movement.

Sensitivity Test B

5.10 **Table 5.5** below shows the calculated trip generation using standard TRICS trip rates for the traditional AM and PM peak hours.

Table 5.5: Sensitivity Test B TRICS Trip Rate and Generation Summary

	AM Peak Period 0800-0900		PM Peak Period 1700-1800		Daily Period 0500-2100	
	In	Out	In	Out	In	Out
TRICS Trip Rate – Offices (per 100sqm)	1.824	0.163	0.181	1.679	7.194	6.569
Office Trip Generation (6,428sqm)	117	10	12	108	462	422
TRICS Trip Rate – Rig Hall (per 100sqm)	0.250	0.167	0.145	0.280	3.057	2.877
Rig Hall Trip Generation (3,442sqm)	7	6	5	10	105	99
Total Trips	**124**	**16**	**17**	**118**	**567**	**521**

5.11 There is minimal difference between the use of TRICS peak hour trip rates and applying the CSC peak spreading calculations to the TRICS trip rates, with only the only notable different being in the PM peak hour. This is primarily due to employees at CSC tending to finish earlier than the traditional PM peak hour.

Trip Distribution

5.12 Postcode data from existing employees at CSC in 2021 have been used to establish a distribution model, to assign the proposed development trips onto the local highway network during the AM and PM peak hours, 8-9am and 5-6pm.

5.13 The initial results demonstrated a notable bias to/from the east that appeared to be unrealistic, with a 40/60 split at the CSC site access which is known to consistently be closer to 50/50 based on annual traffic surveys. It was noted that journeys to/from the A34 to travel north beyond Oxford, and even westbound along the A40 were consistently being routed via Golden Balls and the A4074. However, an alternative and commonly used route choice for such journeys is via the next junction on the A34-Oxford Road-Vinyard Road. A few of the destinations allocated to the Golden Balls route, had a very similar length alternative journey via Wooton Road and B4017, which would also leave the study area network off Stratton Way. Therefore, we slightly adjusted the route choice for destinations beyond the local area using the strategic network that were initially assigned to use the northern arm of the Golden Balls junction.

5.14 The home postcode locations within Oxford and to the west of Oxford (OX1, OX3 and OX4) were fixed as using the Golden Balls route and the remaining destination were split 50/50 over the two alternative routes, Golden Balls and Stratton Way. This resulted in a more even distribution at the site access, in line with previous data. This results in the proposed distribution of development traffic with 51.8% travelling to/from the east and 48.2% to and from the west. The post code data and summary of the proportions using each route are provided in **Appendix G**.

5.15 The latest available traffic survey data (pre-COVID) showing all turning movements at the CSC site access junction onto the A415, was used to validate the distribution model. The survey data and a summary are also provided in **Appendix G**.

5.16 The 2019 survey data shows very similar proportions in each direction on a daily basis (51.2% E, 48.8% W) and 8-9am (50.4% E, 49.6% W). We also reviewed just the turning movements entering CSC 8-9am (51.2% E, 48.8% W) which match the daily movements in each direction.

5.17 The 5-6pm period was disrupted by an incident on the A415, so has been disregarded, but the turning movements over the previous hour, 4-5pm which is the peak period for vehicles exiting CSC, also confirms a similar split. Total movements E = 52.3% and W= 47.7%, and movements just out of CSC in the PM peak to the E = 51.9%, to the W = 48.1%.

5.18 Therefore, the proposed development traffic distribution using postcode data from 2021 is validated by the latest turning movement count available from 2019, and this has been agreed with OCC.

5.19 The development traffic distribution is shown on Flow Diagram 7 for the existing highway network. The distribution model has been applied to the proposed development trips, and the resulting flows are shown on Flow Diagram 23, 23A and 23B (with 23A and 23B showing the flows using the trip methodology for Sensitivity Test A and B).

5.20 For the post-HIF scenarios, the distribution model based on CSC employee postcodes was adjusted to reflect the new HIF infrastructure. This is provided on Flow Diagram 24. The post-HIF development traffic flows are shown on the revised highway network on Flow Diagram 25, 25A and 25B. For robustness, all development traffic is still routed over the existing river crossings.

6.0 Junction Capacity and Impact Assessment

6.1 Junction capacity assessments have been completed to determine the existing capacity on the local highway network during the application year (2021) and assess the highway impacts of the development proposals in the anticipated opening year (2024), both pre and post HIF, and the plus 10-year horizon year (2034).

6.2 The 2021 "existing scenario" flows are shown on Flow Diagram 9 and where applicable includes for committed traffic growth since traffic surveys were completed.

6.3 The 2024 + committed pre-HIF traffic flows are shown on Flow Diagram 14.

6.4 The development traffic shown on Flow Diagrams 23, 23A and 23B, using the existing highway network, has been added to the 2024 pre-HIF traffic flows shown on Flow Diagram 14, to provide a provide a "2024 pre-HIF with development" scenario which is shown on Flow Diagram 26, 26A and 26B.

6.5 The 2024 + committed post-HIF traffic flows are shown on Flow Diagram 17.

6.6 The development traffic shown on Flow Diagram 25, 25A and 25B, using the proposed HIF1 highway network, has been added to the 2024 post -HIF traffic flows shown on Flow Diagram 17, to provide a provide a "2024 post-HIF with development" scenario which is shown on Flow Diagram 27, 27A and 27B.

6.7 The 2034 + committed pre-HIF traffic flows are shown on Flow Diagram 19.

6.8 The development traffic shown on Flow Diagram 23, 23A and 23B, using the existing highway network, has been added to the 2034 pre-HIF traffic flows shown on Flow Diagram 19, to provide a provide a "2034 pre-HIF with development" scenario which is shown on Flow Diagram 28, 28A and 28B.

6.9 The 2034 + committed post-HIF traffic flows are shown on Flow Diagram 22.

6.10 The development traffic shown on Flow Diagram 25, 25A and 25B, using the proposed HIF1 highway network, has also been added to the 2034 post -HIF traffic flows shown on Flow Diagram 22, to provide a provide a "2034 post-HIF with development" scenario which is shown on Flow Diagram 29, 29A and 29B.

6.11 JUNCTIONS has been used to assess the priority-controlled junctions and mini-roundabouts. The program provides output in the form of Ratio of Flow to Capacity (RFC). An RFC below 0.85 indicates that a priority-controlled junction operates comfortably within capacity. An RFC value between 0.85 and 1.00 indicates that there may be occasions during the period modelled when queues will develop, and delays may begin to occur. An RFC value greater than 1.00 indicates that a junction operates over its full theoretical capacity.

6.12 LinSig has been used to assess the signal-controlled junctions, and some small networks of junctions, within the study area. The program provides output in the form of Practical Reserve Capacity (PRC). Ideally the PRC values should be greater than zero, although the theoretical capacity is at -10%. The PRC is calculated from the maximum degree of saturation on a signal-controlled link and is a measure of how much additional traffic could pass through a signal-controlled junction whilst maintaining a maximum degree of saturation of 90% on all links.

Site Access

6.13 The results of the capacity assessments at the existing site access in 2021 and 2024 pre-HIF are summarised in **Table 6.1** whilst the full output report is included within **Appendix H.** The traffic count data used for this junction did not include queue data, however, based on the geometries of the junction the Junctions model identifies that a mitigation scheme is required to accommodate the development traffic.

Table 6.1: Site Access / A415 (Existing Priority Junction) - Capacity Assessment Results

AM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Site Access – A415 (E)	0.06	0.1	0.07	0.1	0.10	0.1	0.08	0.1	0.09	0.1
Site Access – A415 (W)	0.11	0.1	0.19	0.2	0.54	1.0	0.33	0.5	0.52	0.9
A415 (E)	0.63	1.6	0.97	12.9	1.15	69.3	1.12	54.5	1.16	72.3

PM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Site Access – A415 (E)	0.28	0.4	0.40	0.7	0.47	0.9	0.46	0.8	0.54	1.1
Site Access – A415 (W)	0.45	0.8	0.58	1.4	0.65	1.8	0.64	1.7	0.72	2.4
A415 (E)	0.03	0.0	0.03	0.0	0.04	0.0	0.03	0.0	0.05	0.0

6.14 In 2024 the existing junction is over capacity in the AM peak hour with an RFC value of 0.97 prior to the addition of any development traffic. The results suggest that in 2024 a queue of 12.9 PCUs forms on the eastern approach of the A415 as the right turn lane becomes too short to accommodate the volume of traffic turning into the site. In the "with development" scenarios, this worsens exponentially as the RFC is already at almost 100% capacity (0.97). In all of the 3 "with development" scenarios, the RFC value goes over 1 and the queue is anticipated to reach between 54.5 and 72.3 PCUs on the A415 approach

from the east. There is no perceivable impact on the other arms of the junction in the AM peak hour, with increase in queue of 0 to 0.8 PCUs.

6.15 There is shown to be very little impact on queues in the PM peak hour, with a maximum increase of 1.0 PCUs, and there continues to be no calculated queue expected on the A415. However, the model does not account for queuing back from the Clifton Hampden signal junction, which has been known to happen intermittently in the past. Although it is not understood to be a current issue, the PM results of the existing priority junction model based on geometries appear to be optimistic. There is no queue data available to calibrate the model using the surveyed flows, but the AM peak hour results show that mitigation is required. It was previously proposed to consider installing a yellow box marking at the site access junction, to assist operation if there is queuing back from Clifton Hampden. The distance from the Clifton Hampden signals to the CC site access is 1.3km, and so could accommodate approximately 226-236 vehicles. This is shown to potentially be exceeded in the PM peak hour 2024 and 2034 pre-HIF scenarios (see section below), and therefore a yellow box marking will be incorporated into the proposed site access junction improvements.

6.16 In the post-HIF scenarios, the access to CSC will be gained from a new roundabout on the Clifton Hampden bypass. Further details are provided in the Transport Assessment which accompanies the Didcot Garden Town Housing Infrastructure Fund HIF1 planning application (Application Ref R3.0138/21). The new junction is shown to resolve existing capacity issues in 2024.

6.17 Although the Research and Development Building is expected to be first occupied in 2024 it is unlikely to be fully occupied straight the way, and this could reasonably take a least a year. Although expected to open for traffic by the end of 2024, if the HIF1 infrastructure scheme is significantly delayed, then a capacity improvement scheme at the existing site access junction to address this issue could be implemented.

6.18 A sketch of a proposed layout, which utilises the existing kerblines is provided in **Appendix I**. Should the HIF infrastructure be delayed, and the proposals be required, a detailed design would be prepared, and would consider aspects such as the potential to relocate the existing bus stop and reduce the speed limit. However, the initial assessment work assumes use of the existing length of left turn lane from the A415 and has a suitable right turn lane taper for the existing speed limit.

6.19 Capacity checks to confirm the suitability of upgrading the existing junction to provide signal control is provided below, using the 2024 and 2034 pre-HIF scenarios. A summary of the capacity assessment results is provided in **Table 6.2** below and the full output report is provided in **Appendix I**.

Table 6.2: Site Access Potential Signalisation Scheme - Capacity Assessment Results

AM Peak Hour	Pre-HIF					
	2024 + C + Dev (CSC)		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (east) Ahead Right	64.0%	7	62.4%	7	64.2%	7
Abingdon Road (west) Ahead Left	67.4%	8	66.6%	8	67.6%	9
CSC Site Access Left	18.8%	1	15.4%	1	17.5%	1
CSC Site Access Right	23.3%	1	18.0%	1	21.3%	1
PRC	33.6%		35.1%		33.1%	
Total Delay (pcuHr)	6.82		6.35		6.76	
Cycle Time (s)	120		120		120	

AM Peak Hour	Pre-HIF					
	2034 + C + Dev (CSC)		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (east) Ahead Right	69.2%	9	67.5%	9	69.5%	9
Abingdon Road (west) Ahead Left	71.7%	11	71.1%	11	71.8%	11
CSC Site Access Left	18.8%	1	15.4%	1	17.5%	1
CSC Site Access Right	23.3%	1	18.0%	1	21.3%	1
PRC	25.6%		26.5%		25.3%	
Total Delay (pcuHr)	7.95		7.44		7.88	
Cycle Time (s)	120		120		120	

PM Peak Hour	Pre-HIF					
	2024 + C + Dev (CSC)		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (east) Ahead Right	51.5%	11	51.2%	11	53.5%	12
Abingdon Road (west) Ahead Left	41.6%	8	41.2%	8	43.2%	9
CSC Site Access Left	37.0%	6	36.7%	6	39.9%	7
CSC Site Access Right	51.1%	8	50.5%	8	53.2%	9
PRC	74.7%		75.8%		68.3%	
Total Delay (pcuHr)	11.02		10.91		11.87	
Cycle Time (s)	120		120		120	

PM Peak Hour	Pre-HIF					
	2034 + C + Dev (CSC)		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (east) Ahead Right	54.9%	12	54.6%	12	56.9%	13
Abingdon Road (west) Ahead Left	44.3%	9	44.0%	9	45.9%	10
CSC Site Access Left	39.7%	7	39.3%	6	42.6%	7
CSC Site Access Right	55.4%	9	54.9%	9	57.5%	10
PRC	62.4%		64.1%		56.6%	
Total Delay (pcuHr)	11.83		11.72		12.78	
Cycle Time (s)	120		120		120	

6.20 The above results demonstrate that upgrading the site access junction to signal control would enable it to operate with spare capacity in 2024 and 2034 with the development traffic.

6.21 OCC have commented that they would prefer an alternative solution to traffic signals, as they have some concerns that signals could add to delays on the A415 which is part of the strategic highway network. However, the results demonstrate reduced anticipated queues on the A415 and generally improve the overall capacity at the junction and therefore is considered to be a suitable interim mitigation ahead of a significant delay in/or absence of, the HIF1 infrastructure. The priority junction model gives an AM peak hour queue on the A415(E) of 13 PCUs in 2024 with no development traffic and 55-72 PCUs in 2024 with development traffic, but the proposed signalised junction has a queue of 9 PCUs in 2034 with the development traffic.

6.22 However, the details of the mitigation solution would be subject to a S278 and approval process, and an alternative option could be considered if OCC have further justification for an alternative junction arrangement to the proposed signalisation scheme.

Clifton Hampden Signals

6.23 The results of the capacity assessments at the Clifton Hampden Signals are summarised in **Table 6.3** whilst the full output report is included within **Appendix H.** The LinSig model uses the validated junction model used in the HIF1 Transport Assessment work.

Table 6.3: Clifton Hampden Signals - Capacity Assessment Results

AM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (west) Ahead Right Left	185.0%	145	196.8%	165	200.4%	171	197.7%	166	199.7%	170
Abingdon Road (internal eastbound) Ahead Left	62.7%	2	62.7%	2	62.6%	2	62.0%	2	62.6%	2
Abingdon Road (east) Ahead Right	314.7%	179	340.8%	201	347.7%	207	347.0%	206	348.4%	207
Abingdon Road (internal westbound) Ahead L R	55.2%	6	55.1%	6	55.0%	6	56.5%	7	55.0%	6
High Street Right Left Ahead	164.0%	122	171.2%	134	171.2%	134	183.5%	145	171.2%	134
Watery Lane Left Right Ahead	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Oxford Road Left Right	121.9%	33	157.3%	75	171.6%	92	153.4%	77	172.0%	92
PRC	-249.7%		-278.7%		-286.3%		-285.6%		-287.1%	
Total Delay (pcuHr)	464.03		557.46		585.64		577.36		585.63	
Cycle Time (s)	90		90		90		90		90	

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (west) Ahead Right Left	236.5%	213	240.2%	219	237.2%	214	239.2%	217
Abingdon Road (internal eastbound) Ahead Left	62.6%	2	62.5%	2	62.6%	2	62.5%	2
Abingdon Road (east) Ahead Right	380.0%	233	386.9%	239	385.5%	238	386.9%	239
Abingdon Road (internal westbound) Ahead L R	57.0%	6	56.9%	6	56.9%	6	56.9%	6
High Street Right Left Ahead	180.0%	159	180.0%	159	180.0%	159	180.0%	159
Watery Lane Left Right Ahead	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Oxford Road Left Right	171.1%	91	185.3%	108	182.5%	105	185.8%	109
PRC	-322.2%		-329.9%		-328.3		-329.9%	
Total Delay (pcuHr)	677.99		706.18		696.89		705.13	
Cycle Time (s)	90		90		90		90	

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (west) Ahead Right Left	41.7%	2	43.4%	2	41.9%	2	42.7%	2
Abingdon Road (internal eastbound) Ahead Left	32.7%	1	32.9%	1	32.7%	1	32.8%	1
Abingdon Road (east) Ahead Right	66.2%	4	71.2%	5	69.8%	4	71.0%	5
Abingdon Road (internal westbound) Ahead L R	27.2%	1	28.9%	2	28.5%	1	28.9%	2
High Street Right Left Ahead	67.4%	6	67.4%	7	67.4%	7	67.4%	7
Watery Lane Left Right Ahead	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Oxford Road Left Right	30.4%	2	30.4%	2	30.4%	2	30.4%	2
PRC	33.5%		26.4%		28.9%		26.8%	
Total Delay (pcuHr)	8.76		9.25		9.07		9.20	
Cycle Time (s)	90		90		90		90	
AM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (west) Ahead Right Left	29.0%	1	31.3%	1	29.5%	1	30.7%	1
Abingdon Road (internal eastbound) Ahead Left	31.0%	1	31.2%	1	31.0%	1	31.1%	1
Abingdon Road (east) Ahead Right	39.8%	2	45.3%	2	44.2%	2	45.3%	2
Abingdon Road (internal westbound) Ahead L R	18.5%	0	20.1%	1	19.8%	0	20.1%	1
High Street Right Left Ahead	80.6%	9	80.6%	9	80.6%	9	80.6%	9
Watery Lane Left Right Ahead	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Oxford Road Left Right	30.9%	2	30.9%	2	30.9%	2	30.9%	2
PRC	11.7%		11.7%		11.7%		11.7%	
Total Delay (pcuHr)	8.43		8.75		8.63		8.72	
Cycle Time (s)	90		90		90		90	

PM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (west) Ahead Right Left	180.1%	195	213.1%	259	191.2%	242	190.5%	240	197.9%	259
Abingdon Road (internal eastbound) Ahead Left	53.3%	2	52.7%	2	54.0%	2	54.0%	2	54.0%	2
Abingdon Road (east) Ahead Right	341.3%	199	357.8%	212	317.5%	202	311.0%	201	279.9%	191
Abingdon Road (internal westbound) Ahead L R	51.7%	7	54.5%	8	48.6%	6	49.1%	6	51.5%	6
High Street Right Left Ahead	161.5%	63	169.7%	71	169.7%	71	169.7%	71	169.7%	71
Watery Lane Left Right Ahead	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Oxford Road Left Right	142.2%	68	139.6%	70	183.4%	106	182.0%	104	183.9%	107
PRC	-279.2%		-297.5%		-252.7%		-245.5%		-211.0%	
Total Delay (pcuHr)	508.47		593.78		603.72		598.47		610.00	
Cycle Time (s)	90		90		90		90		90	

PM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (west) Ahead Right Left	265.2%	337	212.8%	298	212.4%	297	219.4%	314
Abingdon Road (internal eastbound) Ahead Left	52.8%	2	54.1%	2	54.1%	2	54.0%	2
Abingdon Road (east) Ahead Right	402.5%	250	353.1%	239	362.8%	241	323.2%	230
Abingdon Road (internal westbound) Ahead L R	58.9%	9	49.0%	6	48.3%	6	50.9%	6
High Street Right Left Ahead	169.6%	79	190.8%	91	190.8%	91	190.8%	91
Watery Lane Left Right Ahead	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Oxford Road Left Right	145.6%	85	205.2%	132	204.3%	131	205.7%	133
PRC	-347.2%		-292.3%		-303.1%		-259.1%	
Total Delay (pcuHr)	729.40		738.81		738.67		747.38	
Cycle Time (s)	90		90		90		90	

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (west) Ahead Right Left	45.2%	3	48.3%	3	48.3%	3	51.5%	4
Abingdon Road (internal eastbound) Ahead Left	24.3%	1	24.9%	1	24.9%	1	25.4%	1
Abingdon Road (east) Ahead Right	75.5%	6	76.3%	6	75.9%	6	77.5%	6
Abingdon Road (internal westbound) Ahead L R	45.8%	4	45.6%	5	45.8%	5	45.9%	5
High Street Right Left Ahead	59.6%	3	59.6%	3	59.6%	3	59.6%	3
Watery Lane Left Right Ahead	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Oxford Road Left Right	71.9%	6	71.9%	6	71.9%	6	71.9%	6
PRC	19.1%		18.0%		18.6%		16.1%	
Total Delay (pcuHr)	11.40		11.69		11.65		12.03	
Cycle Time (s)	90		90		90		90	
PM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (west) Ahead Right Left	34.4%	2	39.4%	2	39.4%	2	42.3%	2
Abingdon Road (internal eastbound) Ahead Left	18.0%	1	18.7%	1	18.7%	1	18.8%	1
Abingdon Road (east) Ahead Right	87.6%	7	89.5%	8	89.0%	8	83.1%	7
Abingdon Road (internal westbound) Ahead L R	63.4%	9	63.5%	10	63.4%	10	63.5%	9
High Street Right Left Ahead	76.0%	5	76.0%	5	76.0%	5	76.0%	5
Watery Lane Left Right Ahead	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Oxford Road Left Right	85.7%	11	85.7%	11	85.7%	11	90.7%	12
PRC	2.7%		0.6%		1.1%		-0.8%	
Total Delay (pcuHr)	16.86		17.52		17.40		17.85	
Cycle Time (s)	90		90		90		90	

6.24 The Clifton Hampden signals are over capacity in the 2021 scenario (and 2024 and 2034 pre-HIF scenarios) prior to the addition of development traffic. In the AM peak hour, there is a slightly increased queue on the Abingdon Road (west) and Abingdon Road (east) approaches and Oxford Road with the addition of development traffic in 2024 and 2034. On all other arms there is no real change in queue

length, except in Sensitivity Test A where there is an increase in the queue on High Street, but less change on Abingdon Road (west) and Oxford Road.

6.25 In the PM peak hour, pre-HIF, the changes in flows resulting from the development traffic have some positive impact on the balancing of flows approaching the signals and have a positive effect on the overall practical reserve capacity (PRC). There is an increased queue on the the Oxford Road arm but on all other arms there is no change, or a reduction in queue length, on the other arms to off-set the increase on the minor arm.

6.26 On balance, the impact in the pre-HIF scenarios is not considered to be severe and would be a very short-term scenario given that the HIF network is expected to be implemented by 2024 or soon after.

6.27 It should be noted that the building is unlikely to be fully staffed in 2024, and therefore the full impact is unlikely to be realised until later, which allows time for the HIF1 network to be implemented. The HIF1 by-pass is expected to be open to traffic in 2024, but even if delayed should be open to traffic well before 2034.

6.28 In terms of considering interim mitigation, there are land constraints which prevent any physical works to increase capacity at this junction, and the signal timings are understood to be reviewed and optimised regularly. Previous studies have identified the need for the by-pass and additional river crossing infrastructure to address the existing capacity issues. The UKAEA are committed to a land transfer to dedicate the land required by OCC to the highway authority to enable them to deliver the HIF1 roundabout located at the entrance of CSC.

6.29 The UKAEA are also committed to continuing to provide S106 contributions towards public transport and sustainable transport schemes targeted at achieving modal shift and reducing the level of car traffic on the local highway network. Further details of the proposals are provided in the summary of capacity assessment results and mitigation proposals at the end of this chapter of the report. This will provide an interim mitigation solution if the HIF infrastructure is delayed and compliment the HIF1 scheme.

6.30 In the post-HIF scenarios, the signals operate well within operational capacity in both the AM and PM peak hours, with high levels of practical reserve capacity. There is no significant impact from the development traffic with very little change to the degrees of saturation on the lane approaches and no increase in the mean max queue above 1 PCU, which would be unperceivable.

Clifton Hampden Bridge Signals

6.31 The results of the capacity assessments at the Clifton Hampden Bridge traffic signals are summarised in **Table 6.4** whilst the full output report is included within **Appendix H.** The LinSig model has been calibrated using the queue data recorded at the time of the traffic count survey. The traffic count and queue data is provided in **Appendix A** and a summary table of the calibration is provided with the model output report in **Appendix H**.

Table 6.4: Clifton Hampden Bridge Signals - Capacity Assessment Results

AM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
High Street (N)	69.8%	7	77.3%	8	78.8%	9	77.7%	8	78.4%	8
High Street (S)	70.2%	18	76.6%	21	79.0%	22	78.5%	21	79.1%	22
PRC	28.2		16.4		14.0		14.6		13.8	
Total Delay (pcuHr)	9.32		11.06		11.72		11.48		11.70	
Cycle Time (s)	120		120		120		120		120	

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
High Street (N)	86.6%	10	87.8%	11	87.4%	11	87.4%	11
High Street (S)	85.2%	25	87.6%	27	87.7%	27	87.7%	27
PRC	3.9%		2.5%		2.7%		2.7%	
Total Delay (pcuHr)	14.72		15.82		15.78		15.78	
Cycle Time (s)	120		120		120		120	

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
High Street (N)	33.0%	4	35.3%	4	34.5%	4	35.0%	4
High Street (S)	33.2%	6	35.2%	7	34.7%	6	35.4%	7
PRC	171.1		154.9		159.2		154.4	
Total Delay (pcuHr)	3.72		3.97		3.88		3.96	
Cycle Time (s)	120		120		120		120	

AM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
High Street (N)	37.8%	4	39.0%	4	38.1%	4	38.7%	4
High Street (S)	37.4%	7	39.9%	8	39.4%	8	40.0%	8
PRC	138.1		125.4		128.2		124.7	
Total Delay (pcuHr)	4.12		4.38		4.29		4.38	
Cycle Time (s)	120		120		120		120	

PM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
High Street (N)	62.9%	14	68.2%	16	69.5%	16	69.3%	16	69.3%	16
High Street (S)	64.0%	8	66.9%	9	67.5%	9	67.2%	9	70.7%	9
PRC	40.6		32.0		29.6		29.8		27.4	
Total Delay (pcuHr)	8.48		9.43		9.66		9.61		9.88	
Cycle Time (s)	120		120		120		120		120	

PM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
High Street (N)	76.4%	19	77.8%	19	79.1%	20	79.1%	20
High Street (S)	75.4%	10	75.9%	11	76.2%	11	76.2%	11
PRC	17.7%		15.6%		13.8%		13.8%	
Total Delay (pcuHr)	11.67		12.00		12.29		12.29	
Cycle Time (s)	120		120		120		120	

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
High Street (N)	37.9%	7	38.3%	8	38.2%	8	39.4%	8
High Street (S)	36.0%	3	38.8%	3	38.5%	3	39.2%	4
PRC	137.7		131.7		134.0		128.2	
Total Delay (pcuHr)	3.81		3.91		3.88		4.01	
Cycle Time (s)	120		120		120		120	

PM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
High Street (N)	51.5%	11	52.5%	12	52.5%	12	53.7%	12
High Street (S)	50.0%	4	50.8%	5	50.4%	4	51.2%	5
PRC	74.9		71.3		71.3		67.4	
Total Delay (pcuHr)	5.50		5.65		5.62		5.78	
Cycle Time (s)	120		120		120		120	

6.32 In all scenarios, the signals are shown to operate well within operational capacity in both the AM and PM peak hours. There is extremely limited impact on the base scenarios, with an increased mean max queue of just 0-1 PCUs pre-HIF or post-HIF when the development traffic is added, other than the increase of 2 PCUs on High Street south in the AM peak in 2034 pre-HIF, but the HIF network is expected to be open to traffic well before 2034.There were no notable differences between the capacity results using the agreed trip rates or either of the sensitivity tests (an additional 17-22 vehicles traveling to the site in the AM and 10-22 vehicles leaving in the PM peak).

6.33 It is acknowledged that the model does not reflect potential queuing back from the Clifton Hampden signals, but demonstrates that the signals themselves operate effectively in isolation. The distance from the Clifton Hampden signals to the Clifton Hampden Bridge signals is 210m so approximately 36-38 vehicles. This is shown to be exceed in the 2024 base scenario, but can only be resolved by increasing capacity or removing traffic from the Clifton Hampden signals. Therefore, the mitigation associated with the above junction in Clifton Hampden would also address potential knock on affects at the Clifton Hampden Bridge signals, which would otherwise operate well. The HIF1 network also includes an additional river crossing, which will significantly reduce traffic using this bridge.

Berinsfield Roundabout

6.34 The results of the capacity assessments at the Berinsfield roundabout are summarised in **Table 6.5** whilst the full output report is included within **Appendix H**. The Junctions model has been calibrated using the queue data recorded at the time of the traffic count survey. The traffic count and queue data is provided in **Appendix A** and a summary table of the calibration is provided with the model output report in **Appendix H**.

6.35 Adjustments have been applied directly to the intercept, and represent changes to the maximum flow that would be possible across the give-way line in the absence of any circulating traffic, in order for the base model to reflect the observed queues when the base turning count survey was undertaken. Some caution should be used when reviewing the results for future scenarios, as calibration is for a single recorded scenario and the junction may react differently to changes in flows and other factors.

Table 6.5: Berinsfield Roundabout - Capacity Assessment Results

AM Peak Hour	Pre-HIF			
	2017		2021	
	RFC	Q	RFC	Q
A4074 (N)	0.53	1.2	0.57	1.4
Wimblestraw Road	0.62	1.7	0.69	2.3
A4074 (S)	0.74	3.0	0.79	4.1
A415	0.81	4.1	0.92	8.0

AM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.60	1.6	0.60	1.6	0.60	1.6	0.60	1.6
Wimblestraw Road	0.74	2.9	0.74	3.0	0.74	2.9	0.74	2.9
A4074 (S)	0.85	6.0	0.86	6.3	0.86	6.4	0.86	6.4
A415	1.03	16.6	1.04	17.2	1.04	16.9	1.04	16.9

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.66	2.1	0.66	2.1	0.66	2.1	0.66	2.1
Wimblestraw Road	0.88	6.4	0.88	6.5	0.88	6.5	0.88	6.5
A4074 (S)	0.98	19.0	0.99	21.2	0.98	20.7	0.99	21.2
A415	1.36	58.2	1.36	58.5	1.36	58.1	1.36	57.9

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.45	0.9	0.45	0.9	0.45	0.9	0.45	0.9
Wimblestraw Road	0.35	0.6	0.35	0.6	0.35	0.6	0.35	0.6
A4074 (S)	0.64	2.0	0.65	2.0	0.65	2.0	0.65	2.0
A415	0.21	0.3	0.22	0.3	0.22	0.3	0.22	0.3
AM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.54	1.3	0.54	1.3	0.54	1.3	0.54	1.3
Wimblestraw Road	0.44	0.9	0.45	0.9	0.45	0.9	0.45	0.9
A4074 (S)	0.73	2.9	0.74	3.0	0.73	3.0	0.74	3.0
A415	0.71	2.5	0.72	2.6	0.72	2.5	0.71	2.5

PM Peak Hour	Pre-HIF			
	2017		2021	
	RFC	Q	RFC	Q
A4074 (N)	0.80	4.2	0.86	6.1
Wimblestraw Road	0.76	3.3	0.87	5.8
A4074 (S)	0.62	1.8	0.67	2.2
A415	0.64	1.9	0.71	2.6
PM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.91	9.5	0.92	9.7	0.92	9.7	0.92	10.0
Wimblestraw Road	0.98	11.4	0.99	11.8	0.99	11.8	0.99	12.4
A4074 (S)	0.70	2.5	0.70	2.5	0.70	2.5	0.70	2.5
A415	0.80	3.9	0.81	4.1	0.81	4.1	0.82	4.4
PM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	1.06	43.4	1.06	44.0	1.06	44.0	1.06	44.8
Wimblestraw Road	1.23	42.3	1.24	43.4	1.24	43.4	1.24	44.7
A4074 (S)	0.79	3.9	0.79	3.9	0.79	3.9	0.78	3.7
A415	0.99	13.7	1.00	14.8	1.00	14.8	1.01	16.3

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.70	2.5	0.70	2.5	0.70	2.5	0.70	2.5
Wimblestraw Road	0.45	0.9	0.46	0.9	0.46	0.9	0.46	0.9
A4074 (S)	0.53	1.2	0.53	1.2	0.53	1.2	0.53	1.2
A415	0.08	0.1	0.09	0.1	0.09	0.1	0.11	0.1
PM Peak Hour	**Post-HIF**							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.83	5.2	0.83	5.2	0.83	5.2	0.84	5.3
Wimblestraw Road	0.67	2.1	0.67	2.2	0.67	2.2	0.68	2.2
A4074 (S)	0.63	1.9	0.63	1.9	0.63	1.9	0.63	1.9
A415	0.25	0.4	0.26	0.4	0.26	0.4	0.28	0.4

6.36 The junction is shown to be currently operating at around full capacity, with an RFC of 0.92 in the AM peak hour and 0.87 in the PM peak hour in the 2021 base scenario. The RFC on the A415 arm exceeds 1 in the AM peak hour in 2024 before the addition of development traffic, and the Wimblestraw Road arm has an RFC value of 0.98. However the impact of the development traffic results in an imperceptible increase in queue on all arms of less than 1 PCU in 2024 and 3 PCUs in 2034.

6.37 In the post-HIF scenarios, the roundabout is shown to operate within operational capacity in both the AM and PM peak hours. There is extremely limited impact when the development traffic is added, with no increase in queues in 2024 and no effect on most arms, other than an increased queue of just 0.1 PCUs on one or two arms in 2034. The difference in flows using the sensitivity test trip generation methods was extremely minimal, meaning that there were only minor differences between the capacity results.

Golden Balls Roundabout

6.38 The results of the capacity assessments at the Golden Balls roundabout are summarised in **Table 6.6** whilst the full output report is included within **Appendix H.** The Junctions model has been calibrated using the queue data recorded at the time of the traffic count survey. The traffic count and queue data is provided in **Appendix A** and a summary table of the calibration is provided with the model output report in **Appendix H**.

6.39 Adjustments have been applied directly to the intercept, and represent changes to the maximum flow that would be possible across the give-way line in the absence of any circulating traffic, in order for the base model to reflect the observed queues when the base turning count survey was undertaken. Some caution should be used when reviewing the results for future scenarios, as calibration is for a single recorded scenario and the junction may react differently to changes in flows and other factors.

Table 6.6: Golden Balls Roundabout - Capacity Assessment Results

AM Peak Hour	Pre-HIF			
	2017		2021	
	RFC	Q	RFC	Q
A4074 (N)	0.31	0.5	0.33	0.5
B4015	0.55	1.3	0.63	1.8
A4074 (S)	0.85	5.8	0.94	12.2
Oxford Road	0.91	8.7	1.01	21.0

AM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.37	0.6	0.38	0.7	0.38	0.7	0.38	0.7
B4015	0.74	3.0	0.78	3.5	0.77	3.4	0.78	3.5
A4074 (S)	1.06	41.7	1.09	53.1	1.09	50.8	1.10	53.5
Oxford Road	1.06	32.9	1.05	30.2	1.05	29.5	1.05	29.7

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.41	0.8	0.42	0.8	0.42	0.8	0.42	0.8
B4015	0.90	7.3	0.94	9.8	0.93	9.2	0.94	9.8
A4074 (S)	1.25	121.1	1.29	134.8	1.28	132.2	1.29	135.2
Oxford Road	1.16	70.5	1.15	66.2	1.15	65.3	1.14	64.8

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.41	0.8	0.42	0.8	0.42	0.8	0.43	0.8
B4015	0.97	13.2	1.02	18.5	1.01	17.3	1.05	23.5
A4074 (S)	1.24	104.2	1.28	115.4	1.27	113.3	1.30	124.6
Oxford Road	1.34	191.0	1.33	183.7	1.32	182.0	1.31	170.4
AM Peak Hour	**Post-HIF**							
	2034 + Com		2034 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.56	1.4	0.57	1.5	0.57	1.4	0.57	1.5
B4015	2.33	339.1	2.44	363.0	2.42	357.9	2.45	363.6
A4074 (S)	1.69	399.1	1.72	414.2	1.72	411.4	1.72	414.8
Oxford Road	1.82	727.3	1.81	723.7	1.81	720.2	1.81	721.9

PM Peak Hour	Pre-HIF			
	2017		2021	
	RFC	Q	RFC	Q
A4074 (N)	0.47	1.0	0.50	1.1
B4015	0.90	7.0	1.03	17.6
A4074 (S)	0.68	2.2	0.73	2.9
Oxford Road	0.60	1.6	0.65	2.0
PM Peak Hour	**Pre-HIF**							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.53	1.2	0.53	1.2	0.53	1.2	0.53	1.2
B4015	1.16	36.4	1.16	36.7	1.15	35.7	1.16	36.9
A4074 (S)	0.76	3.4	0.76	3.4	0.76	3.4	0.76	3.4
Oxford Road	0.73	2.9	0.77	3.5	0.75	3.2	0.77	3.5
PM Peak Hour	**Pre-HIF**							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.60	1.6	0.60	1.7	0.60	1.7	0.60	1.7
B4015	1.62	103.1	1.63	104.3	1.61	102.8	1.62	104.0
A4074 (S)	0.83	5.0	0.84	5.4	0.84	5.3	0.84	5.4
Oxford Road	0.86	5.9	0.89	7.2	0.88	7.0	0.91	8.3

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.60	1.7	0.60	1.7	0.60	1.7	0.61	1.7
B4015	1.91	171.7	1.92	173.6	1.91	171.7	1.92	174.1
A4074 (S)	0.84	5.3	0.84	5.3	0.84	5.3	0.84	5.4
Oxford Road	0.86	6.1	0.88	7.0	0.88	6.9	0.90	8.1
PM Peak Hour	**Post-HIF**							
	2034 + Com		2034 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A4074 (N)	0.82	5.0	0.82	5.0	0.82	4.9	0.82	5.0
B4015	11.64	844.4	11.78	846.9	11.62	844.2	11.84	847.3
A4074 (S)	1.11	52.5	1.11	53.1	1.11	52.6	1.11	53.4
Oxford Road	1.49	321.1	1.51	339.2	1.51	337.0	1.52	357.6

6.40 The results show the junction to be at capacity in 2017 and over capacity in 2021 and 2024, prior to the addition of development traffic. However, despite this, there is very limited impact from the development. This is particularly the case in the PM periods pre-HIF where there is no real impact on RFC or queue. In the AM peak hour periods pre-HIF, there is an increase in queue on the A4074 (S) and slight reduction in the queue on Oxford Road, with minor increase in queue on the B4015 in 2034. The RFC on the A4074 (S) increases by 0.03-0.04 and decreases by 0.01-0.02 on Oxford Road in the AM peak hour pre-HIF. There is even less impact in the PM peak hour pre-HIF.

6.41 The junction is shown to be even further over capacity in the base post-HIF scenarios, as more traffic uses the junction once the Clifton Hampden bypass is open to traffic. However, again the impact of the development traffic remains relatively small, particularly in the PM peak hour. In the AM peak hour periods, there is an increase in queue on the A4074 (S) and on the B4015, with a slight reduction in the queue on Oxford Road.

6.42 It is anticipated that capacity improvement works to the Golden Balls roundabout are required now to accommodate existing traffic flows, and will be more urgently required a result of the proposed HIF network and associated additional growth, including Local Plan developments. However, the impact of this proposed development is demonstrated to have extremely limited effect on the junction even when it becomes severely over capacity as a result of other traffic growth assumptions.

A415 / Tollgate Road, Culham River Crossing and Abingdon Road / Appleford Road

6.43 The results of the capacity assessments for the combination of the signal-controlled junction at the A415 / Tollgate Road and the Culham river crossing traffic signals, and the Abingdon Road / Appleford Road priority junction are summarised in **Table 6.7** whilst the full output report is included within **Appendix H.** The LinSig model uses the validated junction model used in the HIF1 Transport Assessment work. Note that the PCR over all lanes is the lowest recorded value.

Table 6.7: A415 / Tollgate Road, Culham River Crossing and Abingdon Road / Appleford Road - Capacity Assessment Results

AM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (E) Ahead Left	78.0%	11	81.7%	12	83.1%	13	82.0%	12	82.9%	13
Tollgate Road Right Left	85.8%	14	85.7%	14	86.2%	14	86.1%	14	86.2%	14
Abingdon Road (W) Ahead Right	89.5%	11	95.9%	14	95.9%	15	95.9%	15	95.9%	15
PRC	0.6%		-6.6%		-6.6%		-6.6%		-6.6%	
Total Delay (pcuHr)	17.31		19.13		19.98		19.62		19.95	
Cycle Time (s)	111		111		111		111		111	
Culham Bridge Northbound	119.7%	75	141.8%	138	146.6%	147	145.8%	144	146.9%	147
Culham Bridge Southbound	50.2%	11	53.6%	12	54.2%	13	53.7%	13	54.0%	13
PRC	-33.0%		-57.6%		-62.9%		-62.0%		-63.2%	
Total Delay (pcuHr)	66.44		124.56		137.22		134.88		137.81	
Cycle Time (s)	154		154		154		154		154	
Appleford Road (E) Right Ahead	15.6%	0	20.2%	0	20.2%	0	20.2%	0	20.2%	0
Appleford Road (W) Left Ahead	31.9%	0	36.6%	0	37.8%	0	37.6%	0	37.9%	0
Culham Bridge Southbound	30.5%	8	34.9%	10	35.3%	11	35.0%	11	35.2%	11

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (E) Ahead Left	75.3%	11	74.2%	11	73.3%	10	73.9%	11
Tollgate Road Right Left	150.8%	100	158.7%	108	158.4%	108	158.7%	108
Abingdon Road (W) Ahead Right	106.7%	60	109.6%	74	108.7%	70	109.9%	75
PRC	-67.6%		-76.3%		-76.0%		-76.4%	
Total Delay (pcuHr)	143.16		163.42		159.48		164.63	
Cycle Time (s)	111		111		111		111	
Culham Bridge Northbound	156.6%	181	161.4%	194	160.6%	192	161.6%	195
Culham Bridge Southbound	58.1%	14	57.9%	14	57.7%	14	57.9%	14
PRC	-74.0%		-79.4%		78.4%		-79.6%	
Total Delay (pcuHr)	170.31		183.38		180.88		183.97	
Cycle Time (s)	154		154		154		154	
Appleford Road (E) Right Ahead	22.3%	0	22.3%	0	22.3%	0	22.3%	0
Appleford Road (W) Left Ahead	40.7%	0	41.9%	0	41.7%	0	41.9%	0
Culham Bridge Southbound	39.5%	14	39.4%	14	39.2%	14	39.4%	14

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (E) Ahead Left	56.5%	8	57.5%	8	53.8%	7	54.6%	7
Tollgate Road Right Left	38.5%	2	55.5%	3	52.5%	2	52.5%	3
Abingdon Road (W) Ahead Right	47.8%	8	50.3%	9	47.6%	7	48.2%	8
PRC	59.3%		56.4%		67.4%		64.9%	
Total Delay (pcuHr)	5.53		6.68		5.50		5.68	
Cycle Time (s)	111		111		111		111	
Culham Bridge Northbound	24.4%	4	35.5%	6	28.1%	5	29.2%	5
Culham Bridge Southbound	13.0%	3	13.5%	3	13.1%	3	13.8%	3
PRC	269.4%		153.8%		220.7%		208.7%	
Total Delay (pcuHr)	2.43		3.30		2.71		2.84	
Cycle Time (s)	154		154		154		154	
Appleford Road (E) Right Ahead	20.7%	0	20.7%	0	20.7%	0	20.7%	0
Appleford Road (W) Left Ahead	32.5%	0	35.3%	0	33.4%	0	33.7%	0
Culham Bridge Southbound	15.9%	0	16.7%	0	16.1%	0	17.0%	1

AM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (E) Ahead Left	76.7%	13	77.9%	14	76.9%	13	77.7%	14
Tollgate Road Right Left	82.8%	9	84.5%	10	84.2%	10	84.6%	10
Abingdon Road (W) Ahead Right	69.4%	17	72.3%	19	71.8%	19	72.5%	19
PRC	8.7%		6.5%		6.8%		6.4%	
Total Delay (pcuHr)	15.31		16.42		16.09		16.43	
Cycle Time (s)	111		111		111		111	
Culham Bridge Northbound	81.8%	17	86.6%	19	85.7%	19	86.8%	19
Culham Bridge Southbound	16.2%	3	16.8%	3	16.4%	3	16.7%	3
PRC	10.0%		3.9%		5.0%		3.7%	
Total Delay (pcuHr)	8.88		10.15		9.86		10.21	
Cycle Time (s)	154		154		154		154	
Appleford Road (E) Right Ahead	34.0%	0	34.0%	0	34.0%	0	34.0%	0
Appleford Road (W) Left Ahead	39.1%	0	40.3%	0	40.1%	0	40.4%	0
Culham Bridge Southbound	24.6%	3	26.4%	3	25.6%	3	26.1%	3

PM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (E) Ahead Left	85.8%	16	96.7%	28	100.0%	35	99.8%	35	102.0%	44
Tollgate Road Right Left	90.2%	11	97.7%	16	97.8%	16	97.7%	16	100.8%	19
Abingdon Road (W) Ahead Right	88.8%	9	99.1%	16	99.1%	16	99.1%	16	99.1%	16
PRC	-0.2%		-10.1%		-11.1%		-10.9%		-13.4%	
Total Delay (pcuHr)	20.90		38.76		44.97		44.42		54.19	
Cycle Time (s)	111		111		111		111		111	
Culham Bridge Northbound	79.0%	16	85.7%	19	86.2%	19	85.7%	19	86.4%	19
Culham Bridge Southbound	71.6%	19	81.3%	23	82.8%	24	82.8%	24	83.3%	24
PRC	14.0%		5.0%		4.5%		5.0%		4.2%	
Total Delay (pcuHr)	14.02		17.50		18.01		17.88		18.22	
Cycle Time (s)	154		154		154		154		154	
Appleford Road (E) Right Ahead	13.8%	0	16.4%	0	16.4%	0	16.4%	0	16.4%	0
Appleford Road (W) Left Ahead	33.9%	0	37.2%	0	37.3%	0	37.2%	0	37.4%	0
Culham Bridge Southbound	50.3%	19	61.0%	23	63.1%	23	63.1%	23	63.6%	24

PM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (E) Ahead Left	116.1%	98	117.9%	107	117.7%	106	119.9%	117
Tollgate Road Right Left	109.5%	32	110.1%	35	110.1%	35	110.4%	35
Abingdon Road (W) Ahead Right	110.4%	35	110.4%	35	110.4%	35	120.4%	53
PRC	-29.0%		-31.0%		-30.8%		-33.8%	
Total Delay (pcuHr)	140.63		153.78		152.42		181.49	
Cycle Time (s)	111		111		111		111	
Culham Bridge Northbound	113.6%	51	117.7%	58	117.5%	58	118.0%	59
Culham Bridge Southbound	113.0%	60	111.2%	57	111.1%	56	108.4%	50
PRC	-26.3%		-30.8%		-30.5%		-31.1%	
Total Delay (pcuHr)	88.93		92.21		91.56		85.76	
Cycle Time (s)	154		154		154		154	
Appleford Road (E) Right Ahead	18.4%	0	18.4%	0	18.4%	0	18.4%	0
Appleford Road (W) Left Ahead	41.7%	0	41.8%	0	41.8%	0	41.9%	0
Culham Bridge Southbound	57.7%	20	59.2%	20	59.2%	20	59.4%	20

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (E) Ahead Left	60.7%	9	63.4%	9	63.2%	9	66.1%	10
Tollgate Road Right Left	61.1%	2	61.1%	2	61.1%	2	61.1%	2
Abingdon Road (W) Ahead Right	37.5%	3	37.5%	3	37.5%	3	37.5%	3
PRC	47.4%		41.9%		42.5%		36.1%	
Total Delay (pcuHr)	5.12		5.25		5.25		5.43	
Cycle Time (s)	111		111		111		111	
Culham Bridge Northbound	19.8%	3	20.2%	3	20.0%	3	20.5%	3
Culham Bridge Southbound	14.4%	3	16.1%	3	15.9%	3	17.7%	4
PRC	354.6%		344.8%		349.7%		340.1%	
Total Delay (pcuHr)	2.22		2.37		2.34		2.50	
Cycle Time (s)	154		154		154		154	
Appleford Road (E) Right Ahead	21.3%	0	21.3%	0	21.3%	0	21.3%	0
Appleford Road (W) Left Ahead	23.8%	0	23.9%	0	23.8%	0	23.9%	0
Culham Bridge Southbound	13.7%	0	15.4%	0	15.3%	0	17.1%	0

PM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Abingdon Road (E) Ahead Left	79.7%	16	82.7%	18	82.4%	17	84.5%	19
Tollgate Road Right Left	78.7%	5	78.7%	5	78.7%	5	84.7%	6
Abingdon Road (W) Ahead Right	53.7%	7	53.7%	7	53.7%	7	53.7%	7
PRC	012.9%		8.8%		9.2%		6.3%	
Total Delay (pcuHr)	10.98		11.61		11.51		12.69	
Cycle Time (s)	111		111		111		111	
Culham Bridge Northbound	45.3%	8	45.7%	8	45.3%	8	45.9%	8
Culham Bridge Southbound	20.2%	4	21.9%	4	21.7%	4	23.5%	5
PRC	98.9%		97.0%		98.9%		96.1%	
Total Delay (pcuHr)	4.59		4.75		4.70		4.89	
Cycle Time (s)	154		154		154		154	
Appleford Road (E) Right Ahead	36.2%	0	36.2%	0	36.2%	0	36.2%	0
Appleford Road (W) Left Ahead	34.0%	0	34.1%	0	34.0%	0	34.2%	0
Culham Bridge Southbound	40.8%	6	44.7%	6	44.4%	6	48.6%	7

6.44 In the 2024 pre-HIF scenario, in the AM peak hour, the western arm of the A415 / Tollgate Road signalised junction has a degree of saturation of over 95% and the northbound approach to the Culham bridge signals also exceed operational capacity prior to the addition of development traffic.

6.45 The `with development' scenario increases the queue on the A415 (W) by just 0-1 PCUs in 2024, but when the base is further over capacity in 2034 it increases by 10-15 PCUs depending on the trip generation methodology used. In 2034 there is also an increase in base queues on the Tollgate Road arm, which increases from 100 PCUs to 108 PCUs when the development traffic is added. There is no impact on Abingdon Road (E).

6.46 The `with development' scenario increases the queue on the northbound approach to the Culham River Crossing by 6-9 PCUs in 2024, but when the base is further over capacity in 2034 it increases by 11-14 PCUs depending on the trip generation methodology used.

6.47 In the 2024 pre-HIF scenario, in the PM peak hour, all arms of the A415 / Tollgate Road signalised junction, have a degree of saturation of over 95%, prior to the addition of development traffic. The with development scenario increases the queue on the A415 (E) by 7-16 PCUs in 2024, but when the base is further over capacity in 2034 it increases by 8-19 PCUs depending on the trip generation methodology

used. There is an increase of just 0-3 PCUs on the other arms, except for sensitivity test B which has more of an impact than the other trip generation methods.

6.48 The with development scenario increases the queue on the northbound approach to the Culham River Crossing by 6-9 PCUs in 2024, but when the base is further over capacity in 2034 it increases by 11-14 PCUs depending on the trip generation methodology used.

6.49 In the 2034 pre-HIF scenario, in the PM peak hour, all arms of the A415 / Tollgate Road signalised junction, and both approaches to the Culham bridge signals have a degree of saturation of over 95%, prior to the addition of development traffic. However, there is a similar impact from the development traffic in terms of queue lengths.

6.50 There is no capacity issue identified at the Appleford Road junction in terms of DOS, although a queue of up to 23 PCUs does start to form on the approach from Culham river crossing in the base scenarios pre-HIF. There is no impact from the development traffic (increases of 0-1 PCU). Post-HIF, the queues reduce significantly in the base scenarios, and still no perceivable impact from the development traffic.

6.51 As the base scenario is over capacity, the impact of the development traffic is exacerbated. Again, the building is unlikely to be fully staffed in 2024, and the introduction of the new river crossing would alleviate short term impact of the development on the existing network. Land constraints prevent a physical mitigation solution and have led to the by-pass solution proposed as part of the HIF network. The UKAEA are committed to continuing to provide S106 contributions towards public transport and sustainable transport schemes targeted at achieving modal shift and reducing the level of car traffic on the local highway network. This would provide an interim mitigation solution if the HIF infrastructure was delayed.

6.52 Post-HIF there are no capacity issues identified in the AM or PM peak hour, in 2024 or 2034 in the base scenarios or with the development traffic added.

6.53 On balance, the impact pre-HIF is not considered to be severe and would be a very short-term scenario given that the HIF network is expected to be implemented by 2024 or soon after.

6.54 It should be noted that the building is unlikely to be fully staffed in 2024, and therefore the full impact is unlikely to be realised until later, which allows time for the HIF1 network to be implemented. The HIF1 by-pass is expected to be open to traffic in 2024 but even if delayed should be open to traffic well before 2034.

6.55 In terms of considering interim mitigation, there are land constraints which prevent any physical works to increase capacity at this junction, and the signal timings are understood to be reviewed and optimised regularly.

6.56 Previous studies have identified the need for the by-pass and additional river crossing infrastructure to address the existing capacity issues. The UKAEA are committed to a land transfer to dedicate the land required by OCC to the highway authority to enable them to deliver the HIF1 roundabout located at the entrance of CSC.

6.57 In addition, a contribution of £100,000 (index linked Jan 2022 prices) is proposed towards enhancing the existing Tollgate / Abingdon Road signal junction by providing an integral pedestrian and cycling crossing facility. Improving these facilities will further promote walking and cycling to CSC and has been identified by local members as a key improvement to be sought in the local area.

6.58 The UKAEA are also committed to continuing to provide S106 contributions towards public transport and sustainable transport schemes targeted at achieving modal shift and reducing the level of car traffic on the local highway network. Further details of the proposals are provided in the summary of capacity assessment results and mitigation proposals the end of this chapter of the report. This will provide an interim mitigation solution if the HIF infrastructure is delayed and compliment the HIF1 scheme.

Bridge Street / High Street / Stert Street, Abingdon

6.59 The road network at Bridge Street/High Street/Stert Street has been modelled in LinSig. The results of the capacity assessments are summarised in **Table 6.8** whilst the full output report is included within **Appendix H.** The LinSig model has been validated using the queue data recorded at the time of the traffic count survey. The traffic count and queue data is provided in **Appendix A** and a summary table of the calibration is provided with the model output report in **Appendix H**.

Table 6.8: Bridge Street / High Street / Stert Street - Capacity Assessment Results

AM Peak Hour	Pre-HIF			
	2017		2021	
Arm & Lane	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	64.9%	1	69.8%	1
Left (into High Street)	32.0%	0	33.2%	0
Stert Street (Southbound) Ahead	39.4%	0	43.6%	0
Bridge Street Entry Ahead Left	96.7%	8	104.6%	60
PRC	-7.4%		-16.2%	
Total Delay (pcuHr)	9.87		26.74	

AM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	73.8%	1	73.8%	1	73.8%	1	73.8%	1
Left (into High Street)	33.2%	0	33.2%	0	33.2%	0	33.2%	0
Stert Street (Southbound) Ahead	49.8%	1	51.6%	1	51.3%	1	51.7%	1
Bridge Street Entry Ahead Left	113.0%	88	113.9%	91	113.3%	89	113.7%	91
PRC	-25.6%		-26.5%		-25.9%		-26.4%	
Total Delay (pcuHr)	54.84		57.94		55.89		57.43	

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	79.1%	2	79.1%	2	79.1%	2	79.1%	2
Left (into High Street)	33.2%	0	33.2%	0	33.2%	0	33.2%	0
Stert Street (Southbound) Ahead	53.0%	1	54.9%	1	54.6%	1	55.0%	1
Bridge Street Entry Ahead Left	121.0%	117	121.8%	120	121.1%	118	121.5%	119
PRC	-34.4%		-35.4%		-34.6%		-35.0%	
Total Delay (pcuHr)	83.91		87.12		84.48		86.07	

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	73.8%	1	73.8%	1	73.8%	1	73.8%	1
Left (into High Street)	33.1%	0	33.1%	0	33.1%	0	33.1%	0
Stert Street (Southbound) Ahead	55.8%	0	47.7%	1	47.4%	0	47.8%	1
Bridge Street Entry Ahead Left	105.2%	62	106.1%	64	105.5%	63	105.9%	64
PRC	-16.9%		-17.9%		-17.2%		-17.7%	
Total Delay (pcuHr)	28.74		31.44		29.65		30.99	

AM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	80.0%	2	80.0%	2	80.0%	2	80.0%	2
Left (into High Street)	33.2%	0	33.2%	0	33.2%	0	33.2%	0
Stert Street (Southbound) Ahead	54.1%	1	55.9%	1	55.6%	1	56.0%	1
Bridge Street Entry Ahead Left	118.9%	110	119.8%	113	119.2%	111	119.7%	112
PRC	-32.1%		-33.1%		-32.5%		-32.9%	
Total Delay (pcuHr)	76.66		79.86		77.75		79.34	

PM Peak Hour	Pre-HIF			
	2017		2021	
Arm & Lane	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	86.2%	3	92.4%	4
Left (into High Street)	31.3%	0	32.8%	0
Stert Street (Southbound) Ahead	31.5%	0	34.1%	0
Bridge Street Entry Ahead Left	95.5%	7	102.9%	55
PRC	-6.1%		-14.3%	
Total Delay (pcuHr)	10.39		24.71	

PM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	97.8%	6	97.8%	6	97.8%	6	97.8%	6
Left (into High Street)	32.8%	0	32.8%	0	32.8%	0	32.8%	0
Stert Street (Southbound) Ahead	36.9%	0	37.1%	0	36.9%	0	37.2%	0
Bridge Street Entry Ahead Left	114.5%	93	116.9%	102	116.8%	102	119.7%	112
PRC	-27.2%		-29.9%		-29.7%		-32.9%	
Total Delay (pcuHr)	64.68		74.48		72.95		83.42	

PM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	105.3%	23	105.3%	23	105.3%	23	105.3%	23
Left (into High Street)	32.8%	0	32.8%	0	32.8%	0	32.8%	0
Stert Street (Southbound) Ahead	39.6%	0	39.8%	0	39.6%	0	39.9%	0
Bridge Street Entry Ahead Left	122.7%	124	125.3%	133	125.0%	132	127.7%	142
PRC	-36.3%		-39.2%		-38.9%		-41.9%	
Total Delay (pcuHr)	100.02		109.56		108.50		118.62	

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	97.8%	6	97.8%	6	97.8%	6	97.8%	6
Left (into High Street)	32.7%	0	32.7%	0	32.7%	0	32.7%	0
Stert Street (Southbound) Ahead	36.9%	0	37.1%	0	36.9%	0	37.2%	0
Bridge Street Entry Ahead Left	104.9%	61	107.4%	69	107.2%	68	110.1%	78
PRC	-16.5%		-19.3%		-19.1%		-22.4%	
Total Delay (pcuHr)	32.66		40.35		39.88		49.52	

PM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stert Street (Westbound) Ahead	106.7%	24	106.7%	24	106.7%	24	106.7%	24
Left (into High Street)	32.9%	0	32.9%	0	32.9%	0	32.9%	0
Stert Street (Southbound) Ahead	49.8%	1	49.9%	1	49.8%	1	50.0%	1
Bridge Street Entry Ahead Left	128.8%	146	131.2%	156	131.1%	155	134.0%	166
PRC	-43.1%		-45.8%		-45.6%		-48.8%	
Total Delay (pcuHr)	123.73		132.82		132.28		142.99	

6.60 The Bridge Street arm is over capacity in 2021 with a DOS over 100% in the AM and PM peak hours, and so is already over capacity in the assessment years before development traffic is added. There is very little change in the AM peak hour (max 3 PCUs), and the impact is still relatively minor in the PM peak hour (7-19 in 2024 and 8--20 PCUs in 2034) given that the Bridge Street arm is already so over capacity in the base scenario.

6.61 Capacity improvements appear to be needed prior to 2024, to accommodate existing traffic, but the impact of the development traffic is small. Proposed mitigation to encourage modal shift in the local area will assist with the future operation of this junction.

A415 Ock Street / Stratton Way, Abingdon

6.62 The results of the capacity assessments at the A415 Ock Street / Stratton Way junction are summarised in **Table 6.9** whilst the full output report is included within **Appendix H.** The LinSig model has been validated using the queue data recorded at the time of the traffic count survey. The traffic count and queue data is provided in **Appendix A** and a summary table of the calibration is provided with the model output report in **Appendix H**.

A theoretical LinSig model will never exactly replicate situations on the ground as the model formulas may prioritise different streams in order to minimise queues across the whole junction. When the observed average queuing across the whole junction is compared against the results of LINSIG model there is only 1 to 4 PCUs difference with a 120 cycle time, which is considered to validate well and provide a representative picture of junction performance.

Table 6.9: A415 Ock Street / Stratton Way - Capacity Assessment Results

AM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stratton Way Right	49.7%	7	54.4%	8	54.4%	8	54.4%	8	54.4%	8
Ock Street (E) Ahead	21.2%	4	22.4%	4	22.5%	4	22.4%	4	22.5%	4
Ock Street (E) Right	72.1%	17	77.2%	19	78.2%	19	77.7%	19	78.1%	20
Ock Street (W) Left	70.6%	13	78.1%	15	78.4%	15	78.4%	15	78.4%	15
PRC	24.8%		15.3%		14.8%		14.8%		14.8%	
Total Delay (pcuHr)	14.43		16.68		16.93		16.83		16.91	
Cycle Time (s)	120		120		120		120		120	

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Straton Way Right	58.2%	8	58.2%	8	58.2%	8	58.2%	8
Ock Street (E) Ahead	23.9%	4	24.1%	4	24.0%	4	24.1%	4
Ock Street (E) Right	82.7%	22	83.6%	22	83.2%	22	83.5%	22
Ock Street (W) Left	83.7%	17	84.1%	17	83.9%	17	84.1%	17
PRC	7.5%		7.1%		7.3%		7.1%	
Total Delay (pcuHr)	19.38		19.73		19.55		19.70	
Cycle Time (s)	120		120		120		120	

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Straton Way Right	52.7%	8	52.7%	8	52.7%	8	52.7%	8
Ock Street (E) Ahead	21.3%	4	21.4%	4	21.3%	4	21.4%	4
Ock Street (E) Right	74.0%	17	75.0%	18	74.5%	18	74.9%	18
Ock Street (W) Left	75.2%	14	75.6%	14	75.4%	14	75.6%	14
PRC	19.6%		19.1%		19.3%		19.1%	
Total Delay (pcuHr)	15.60		15.82		15.71		15.80	
Cycle Time (s)	120		120		120		120	
AM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Straton Way Right	57.2%	8	57.2%	8	57.2%	8	57.2%	8
Ock Street (E) Ahead	23.1%	4	23.3%	4	23.2%	4	23.3%	4
Ock Street (E) Right	80.5%	20	81.5%	21	81.0%	20	81.4%	21
Ock Street (W) Left	81.8%	16	82.1%	17	82.1%	17	82.1%	17
PRC	10.0%		9.6%		9.6%		9.6%	
Total Delay (pcuHr)	18.45		18.77		18.65		18.74	
Cycle Time (s)	120		120		120		120	

PM Peak Hour	Pre-HIF									
	2021		2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Stratton Way Right	69.3%	12	75.6%	13	78.0%	13	78.0%	13	78.0%	13
Ock Street (E) Ahead	26.2%	5	28.3%	6	28.4%	6	28.4%	6	28.9%	6
Ock Street (E) Right	73.0%	16	79.4%	19	79.5%	20	79.4%	20	80.9%	20
Ock Street (W) Left	71.4%	14	77.9%	16	80.2%	16	80.0%	16	80.2%	16
PRC	23.3%		13.3%		12.3%		12.5%		11.2%	
Total Delay (pcuHr)	17.10		20.07		20.72		20.65		21.04	
Cycle Time (s)	120		120		120		120		120	
PM Peak Hour	Pre-HIF									
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B			
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ		
Straton Way Right	81.5%	15	84.0%	15	84.0%	15	84.0%	15		
Ock Street (E) Ahead	30.4%	6	30.5%	6	30.5%	6	30.9%	6		
Ock Street (E) Right	85.2%	22	85.2%	22	85.0%	22	86.7%	23		
Ock Street (W) Left	83.8%	18	86.0%	18	86.0%	18	86.2%	19		
PRC	5.7%		4.6%		4.6%		3.8%			
Total Delay (pcuHr)	23.83		24.81		24.77		25.37			
Cycle Time (s)	120		120		120		120			

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Straton Way Right	73.4%	13	73.4%	13	73.4%	13	75.6%	13
Ock Street (E) Ahead	27.2%	5	27.7%	5	27.6%	5	27.7%	5
Ock Street (E) Right	75.8%	17	77.4%	18	77.2%	18	77.4%	18
Ock Street (W) Left	76.0%	15	76.1%	15	76.0%	15	78.1%	16
PRC	18.4%		16.3%		16.5%		15.2%	
Total Delay (pcuHr)	18.81		19.14		19.09		19.66	
Cycle Time (s)	120		120		120		120	
PM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
Arm & Lane	DOS	MMQ	DOS	MMQ	DOS	MMQ	DOS	MMQ
Straton Way Right	80.0%	15	80.0%	15	80.0%	15	82.5%	15
Ock Street (E) Ahead	29.7%	6	30.1%	6	30.1%	6	30.2%	6
Ock Street (E) Right	82.7%	21	84.3%	21	84.1%	21	84.1%	22
Ock Street (W) Left	82.9%	18	83.0%	18	83.0%	18	85.2%	18
PRC	8.6%		6.8%		7.0%		5.7%	
Total Delay (pcuHr)	22.75		22.23		23.19		24.08	
Cycle Time (s)	120		120		120		120	

6.63 In all scenarios, the signals are shown to operate well within operational capacity in both the AM and PM peak hours. There is extremely limited impact on the base scenarios, with an increased mean max queue of just 0-1 PCUs. The difference in flows using the sensitivity test trip generation methods was extremely minimal, meaning that there was no notable difference between the capacity results.

A415 Marcham Road / A415 Ock Street / B4017 / Spring Road, Abingdon

6.64 The results of the capacity assessments at the A415 Marcham Road / A415 Ock Street / B4017 / Spring Road junction are summarised in **Table 6.10** whilst the full output report is included within **Appendix H**. The double-mini roundabout is difficult to model and the initial model suggested extensive queues in the 2021 "existing" scenario. Therefore, the model was adjusted to more closely replicate queues where these were significantly higher than those observed at the time of the traffic survey. The traffic flows and queue data is provided in **Appendix A**.

Table 6.10: A415 Marcham Road / A415 Ock Street / B4017 / Spring Road - Capacity Assessment Results

AM Peak Hour	Pre-HIF			
	2021 Survey		2021 Base + Com	
	RFC	Q	RFC	Q
A415 Ock Street	0.604	21	0.609	22
B4017 Drayton Road	0.547	7	0.545	6
Northern Mini-Link	0.449	1	0.447	1
Spring Road	0.423	1	0.426	1
Southern Mini Link	0.669	1	0.663	1
A415 Marcham Road	0.723	10	0.724	9

AM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A415 Ock Street	0.623	49	0.641	48	0.621	47	0.624	48
B4017 Drayton Road	0.590	10	0.580	10	0.583	11	0.586	10
Northern Mini-Link	0.573	1	0.564	1	0.573	1	0.571	1
Spring Road	0.896	26	0.884	25	0.884	25	0.904	27
Southern Mini Link	0.667	1	0.686	1	0.682	1	0.675	1
A415 Marcham Road	0.731	38	0.723	41	0.734	41	0.729	41

Note: RFCs & queues recorded at 8:30-8:45am and 5:45-6:00pm

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A415 Ock Street	0.628	77	0.611	77	0.617	76	0.622	75
B4017 Drayton Road	0.640	19	0.629	19	0.619	19	0.620	19
Northern Mini-Link	0.576	1	0.571	1	0.577	1	0.581	1
Spring Road	0.961	41	0.960	41	0.981	43	0.985	42
Southern Mini Link	0.700	1	0.687	1	0.696	1	0.696	1
A415 Marcham Road	0.737	58	0.733	73	0.741	72	0.745	74

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A415 Ock Street	0.625	37	0.619	36	0.627	34	0.636	39
B4017 Drayton Road	0.588	9	0.587	10	0.588	10	0.588	10
Northern Mini-Link	0.571	1	0.571	1	0.565	1	0.559	1
Spring Road	0.890	26	0.903	27	0.893	27	0.857	25
Southern Mini Link	0.679	1	0.675	1	0.676	1	0.687	1
A415 Marcham Road	0.733	41	0.731	39	0.726	38	0.717	40
AM Peak Hour	**Post-HIF**							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A415 Ock Street	0.627	67	0.625	65	0.628	69	0.614	69
B4017 Drayton Road	0.650	21	0.650	22	0.640	20	0.631	20
Northern Mini-Link	0.573	1	0.570	1	0.581	1	0.573	1
Spring Road	0.979	45	0.954	44	1.001	44	0.959	44
Southern Mini Link	0.696	1	0.699	1	0.700	1	0.696	1
A415 Marcham Road	0.742	80	0.735	75	0.747	76	0.730	79

PM Peak Hour	Pre-HIF			
	2021 Survey		2021 Base + Com	
	RFC	Q	RFC	Q
A415 Ock Street	0.620	50	0.609	51
B4017 Drayton Road	0.641	19	0.631	17
Northern Mini-Link	0.746	1	0.755	1
Spring Road	0.415	4	0.419	3
Southern Mini Link	0.694	1	0.691	1
A415 Marcham Road	0.492	20	0.501	18

PM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A415 Ock Street	0.612	84	0.622	90	0.614	91	0.618	91
B4017 Drayton Road	0.668	30	0.543	29	0.573	27	0.542	32
Northern Mini-Link	0.775	1	0.699	1	0.700	1	0.704	1
Spring Road	0.468	6	0.329	5	0.330	6	0.325	5
Southern Mini Link	0.707	1	0.675	1	0.676	1	0.686	1
A415 Marcham Road	0.510	40	0.464	43	0.471	39	0.469	44

PM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A415 Ock Street	0.613	152	0.621	154	0.608	149	0.606	161
B4017 Drayton Road	0.597	52	0.585	53	0.571	52	0.591	54
Northern Mini-Link	0.770	1	0.771	1	0.767	1	0.770	1
Spring Road	0.410	7	0.416	8	0.410	7	0.410	9
Southern Mini Link	0.692	1	0.704	1	0.706	1	0.703	1
A415 Marcham Road	0.515	85	0.516	83	0.512	85	0.508	87

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A415 Ock Street	0.617	74	0.626	74	0.607	70	0.623	78
B4017 Drayton Road	0.558	28	0.548	26	0.558	29	0.553	27
Northern Mini-Link	0.707	1	0.702	1	0.702	1	0.700	1
Spring Road	0.326	5	0.326	5	0.335	6	0.327	5
Southern Mini Link	0.684	1	0.678	1	0.675	1	0.679	1
A415 Marcham Road	0.469	42	0.466	41	0.469	43	0.469	41
PM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
A415 Ock Street	0.610	138	0.611	142	0.610	139	0.623	145
B4017 Drayton Road	0.603	57	0.600	53	0.594	56	0.598	56
Northern Mini-Link	0.777	1	0.787	1	0.779	1	0.766	1
Spring Road	0.418	9	0.422	9	0.437	9	0.414	9
Southern Mini Link	0.702	1	0.700	1	0.709	1	0.706	1
A415 Marcham Road	0.518	96	0.526	89	0.523	93	0.514	94

6.65 In 2024, the results show queues on the A415 Ock Street, Spring Road and A415 Marcham Road in the AM peak hour and the A415 arms and the Drayton Road arm in the PM peak hour.

6.66 Pre-HIF, the impact of the development traffic results in AM peak hour impact of minus 2 to plus 3 in 2024. In 2034 pre-HIF there is still minimal impact other than an increase queue on the A415 Marcham Road of 14-16 PCUs, despite the RFC remaining below 0.75. The post-HIF impact is notably less, with changes in queues of between minus 5 and plus 2 in the AM peak hour.

6.67 Pre-HIF the impact of the development traffic results in PM peak hour impact of minus 3 and plus 7 in 2024. In 2034 there is still minimal impact other than an increase queue on the A415 Ock Street of 2-9 PCUs. The post-HIF impact is notably less, with changes in queues of between minus 7 and plus 7 in the PM peak hour.

6.68 Where the impact is greatest, the change is queues are relatively small as the arm is already over capacity with significant queues in the base scenario. Capacity improvements appear to be needed at the double mini-roundabout prior to 2024, to accommodate existing traffic, but the impact of the development traffic is small and the worst queues improve when the HIF network is provided. Proposed mitigation to encourage modal shift in the local area will assist with the future operation of this junction.

A415 Marcham Road / Colwell Drive, Abingdon

6.69 The results of the capacity assessments at the A415 Marcham Road / Colwell Drive junction are summarised in **Table 6.11** whilst the full output report is included within **Appendix H.** The Junctions model has been calibrated using the queue data recorded at the time of the traffic count survey. The traffic count and queue data is provided in **Appendix A** and a summary table of the calibration is provided with the model output report in **Appendix H**.

6.70 Adjustments have been applied directly to the intercept, and represent changes to the maximum flow that would be possible across the give-way line in the absence of any circulating traffic, in order for the base model to reflect the observed queues when the base turning count survey was undertaken. Some caution should be used when reviewing the results for future scenarios, as calibration is for a single recorded scenario and the junction may react differently to changes in flows and other factors.

Table 6.11: A415 Marcham Road / Colwell Drive - Capacity Assessment Results

AM Peak Hour	Pre-HIF			
	2021 Survey		2021	
	RFC	Q	RFC	Q
Marcham Road (W)	0.56	1.4	0.56	1.4
Colwell Drive	0.94	11.8	0.94	11.8
Marcham Road (E)	0.89	7.7	0.89	7.7

AM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Marcham Road (W)	0.59	1.6	0.59	1.6	0.59	1.6	0.59	1.6
Colwell Drive	1.04	30.1	1.04	30.1	1.04	30.1	1.04	30.1
Marcham Road (E)	0.95	13.2	0.95	13.4	0.95	13.2	0.95	13.4

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Marcham Road (W)	0.64	1.9	0.64	1.9	0.64	1.9	0.64	1.9
Colwell Drive	1.17	71.9	1.18	72.3	1.17	71.9	1.18	72.3
Marcham Road (E)	1.01	25.4	1.01	25.6	1.01	25.7	1.01	25.6

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Marcham Road (W)	0.59	1.6	0.59	1.6	0.59	1.6	0.59	1.6
Colwell Drive	1.04	28.9	1.04	29.2	1.04	29.2	1.04	29.2
Marcham Road (E)	0.93	11.1	0.94	11.2	0.93	11.1	0.94	11.2
AM Peak Hour	**Post-HIF**							
	2034 + Com		2034 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Marcham Road (W)	0.65	2.0	0.65	2.0	0.65	2.0	0.65	2.0
Colwell Drive	1.20	80.3	1.20	80.3	1.20	80.3	1.20	80.3
Marcham Road (E)	1.00	23.1	1.00	23.4	1.00	23.1	1.00	23.4

PM Peak Hour	Pre-HIF			
	2021 Survey		2021	
	RFC	Q	RFC	Q
Marcham Road (W)	0.57	1.5	0.57	0.61
Colwell Drive	0.98	16.4	0.98	1.09
Marcham Road (E)	0.85	5.6	0.85	0.90
PM Peak Hour	**Pre-HIF**							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Marcham Road (W)	0.61	1.7	0.61	1.7	0.61	1.7	0.61	1.7
Colwell Drive	1.09	42.1	1.09	42.1	1.09	42.1	1.09	42.1
Marcham Road (E)	0.90	8.5	0.91	8.7	0.91	8.7	0.91	9.0
PM Peak Hour	**Pre-HIF**							
	2034 + Com		2034 + Com + Development		2034 + C + Dev Sensitivity A		2034 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Marcham Road (W)	0.66	2.1	0.66	2.1	0.66	2.1	1.10	0.66
Colwell Drive	1.26	91.0	1.26	91.0	1.26	91.0	0.74	1.26
Marcham Road (E)	0.96	14.8	0.96	15.3	0.96	15.3	1.02	0.96

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Marcham Road (W)	0.61	1.7	0.61	1.7	0.61	1.7	0.61	1.7
Colwell Drive	1.09	42.1	1.09	42.1	1.09	42.1	1.09	42.1
Marcham Road (E)	0.88	7.3	0.89	7.5	0.89	7.5	0.89	7.7
PM Peak Hour	**Post-HIF**							
	2034 + Com		2034 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Marcham Road (W)	0.67	2.2	0.67	2.2	0.67	2.2	0.67	2.2
Colwell Drive	1.30	102.4	1.30	102.4	1.30	102.4	1.30	102.4
Marcham Road (E)	0.95	13.4	0.96	14.4	0.95	13.7	0.96	14.4

6.71 The junction is shown to be currently operating over capacity with an RFC of over 0.90 on Colwell Drive, and 0.85 or over on Marcham Road (E) in 2021 base scenario before the addition of development traffic or background growth.

6.72 However, the impact of the development traffic results in an imperceptible increase in queue on all arms of less than 1 PCU in 2024 in both the AM and PM pre-HIF in 2024, and between 0 and 1.4 PCUs in 2034 on the arms which are already over capacity in the base scenarios. Post-HIF there are slight improvements in queue length and still minimal impact, with 0-1PCU queue increases even in 2034.

6.73 Capacity improvements appear to be needed prior to 2024, to accommodate existing traffic, but the impact of the development traffic is unperceivable. Proposed mitigation to encourage modal shift in the local area will assist with the future operation of this junction.

A415 Marcham Road / Nuffield Way, Abingdon

6.74 The results of the capacity assessments at the A415 Marcham Road / Nuffield Way junction are summarised in **Table 6.12** whilst the full output report is included within **Appendix H**. The Junctions model has been calibrated using the queue data recorded at the time of the traffic count survey. The traffic count and queue data is provided in **Appendix A** and a summary table of the calibration is provided with the model output report in **Appendix H**.

6.75 Adjustments have been applied directly to the intercept, and represent changes to the maximum flow that would be possible across the give-way line in the absence of any circulating traffic, in order for the base model to reflect the observed queues when the base turning count survey was undertaken. Some caution should be used when reviewing the results for future scenarios, as calibration is for a single recorded scenario and the junction may react differently to changes in flows and other factors.

Table 6.12: A415 Marcham Road / Nuffield Way - Capacity Assessment Results

AM Peak Hour	Pre-HIF			
	2021 Survey		2021	
	RFC	Q	RFC	Q
Nuffield Way	0.45	0.9	0.45	0.9
Marcham Road (E)	0.76	3.4	0.76	3.4
Access Road	0.49	1.0	0.49	1.0
Marcham Road (W)	0.75	3.2	0.75	3.2

AM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Nuffield Way	0.56	1.3	0.56	1.3	0.56	1.3	0.56	1.3
Marcham Road (E)	0.81	4.6	0.81	9.2	0.81	4.6	0.81	4.6
Access Road	0.55	1.3	0.55	1.3	0.55	1.3	0.55	1.3
Marcham Road (W)	0.81	4.4	0.81	4.4	0.81	4.4	0.81	4.4

AM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Nuffield Way	0.81	3.6	0.81	3.6	0.81	3.6	0.81	3.6
Marcham Road (E)	0.88	7.3	0.88	7.4	0.88	7.4	0.88	7.4
Access Road	0.64	1.9	0.64	1.9	0.64	1.9	0.64	1.9
Marcham Road (W)	0.89	7.7	0.89	7.7	0.89	7.7	0.89	7.7

AM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Nuffield Way	0.55	1.3	0.55	1.3	0.55	1.3	0.55	1.3
Marcham Road (E)	0.80	4.3	0.80	4.3	0.80	4.3	0.80	4.3
Access Road	0.54	1.3	0.54	1.3	0.54	1.3	0.54	1.3
Marcham Road (W)	0.80	4.3	0.80	4.3	0.80	4.3	0.80	4.3
AM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Nuffield Way	0.81	3.9	0.83	4.0	0.83	3.9	0.83	4.0
Marcham Road (E)	0.88	7.4	0.88	7.5	0.88	7.4	0.88	7.5
Access Road	0.64	2.0	0.65	2.0	0.65	2.0	0.65	2.0
Marcham Road (W)	0.89	8.1	0.89	8.2	0.89	8.1	0.89	8.2

PM Peak Hour	Pre-HIF			
	2021 Survey		2021	
	RFC	Q	RFC	Q
Nuffield Way	1.03	14.9	1.03	14.9
Marcham Road (E)	0.80	4.2	0.80	4.2
Access Road	0.77	3.4	0.77	3.4
Marcham Road (W)	0.68	2.3	0.68	2.3
PM Peak Hour	Pre-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Nuffield Way	1.27	41.0	1.27	40.9	1.27	41.0	1.27	40.9
Marcham Road (E)	0.84	5.6	0.85	5.8	0.85	5.7	0.85	5.8
Access Road	0.83	5.0	0.84	5.2	0.84	5.1	0.84	5.2
Marcham Road (W)	0.73	2.9	0.73	2.9	0.73	2.9	0.73	2.9
PM Peak Hour	Pre-HIF							
	2034 + Com		2034 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Nuffield Way	1.76	83.3	1.75	83.3	1.75	83.3	1.75	83.2
Marcham Road (E)	0.89	8.3	0.90	8.4	0.90	8.4	0.90	8.6
Access Road	0.91	8.9	0.92	9.1	0.92	9.0	0.92	9.3
Marcham Road (W)	0.80	4.3	0.80	4.3	0.80	4.3	0.80	4.3

PM Peak Hour	Post-HIF							
	2024 + Com		2024 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Nuffield Way	1.27	41.1	1.27	41.0	1.27	41.0	1.27	41.0
Marcham Road (E)	0.83	5.2	0.83	5.2	0.83	5.2	0.84	5.3
Access Road	0.82	4.6	0.82	4.7	0.82	4.6	0.82	4.7
Marcham Road (W)	0.73	2.9	0.73	2.9	0.73	2.9	0.73	2.9
PM Peak Hour	Post-HIF							
	2034 + Com		2034 + Com + Development		2024 + C + Dev Sensitivity A		2024 + C + Dev Sensitivity B	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
Nuffield Way	1.90	92.9	1.89	92.9	1.89	92.9	1.89	92.8
Marcham Road (E)	0.89	7.9	0.89	8.1	0.89	8.1	0.89	8.2
Access Road	0.91	8.8	0.91	9.0	0.91	9.0	0.92	9.2
Marcham Road (W)	0.82	4.7	0.82	4.7	0.82	4.7	0.82	4.7

6.76 The junction is shown to be currently operating over capacity in the PM peak hour, with an RFC of over 1 and a notable queue on Nuffield Way in 2021. In 2034, Marcham Road (E) and the access to the hospital have an RFC over 0.85 in the base scenarios before the additional of development traffic, and Nuffield Way has a RFC value of up to 1.89. The AM peak hour reaches RFC values of 0.80 on the two Marcham Road arms in 2024 and they exceed 0.85 in 2034.

6.77 However, the development traffic has no perceivable impact on capacity. Most arms experience no change in RFC or queue length, even where the arms is already significantly over capacity in the base scenarios. The difference in flows using the sensitivity test trip generation methods was extremely minimal, meaning that there were minimal differences in the capacity results.

6.78 Capacity improvements appear to be needed prior to 2024, to accommodate existing traffic, but the impact of the development traffic is unperceivable. Proposed mitigation to encourage modal shift in the local area will assist with the future operation of this junction.

Summary of Capacity Assessment Results and Mitigation Proposals

6.79 A summary of the impact at the various junctions within the study area is provided below.

Table 6.13: Summary of Capacity Assessment Results

Junction	Pre-HIF	Post-HIF
Site Access	Capacity issues prior to addition of development traffic. Interim mitigation scheme required if HIF1 significantly delayed. Proposal subject to detailed design and S278 agreement.	New access via HIF1 roundabout.
Clifton Hampden signals (A415 / Oxford Road / High Street / Watery Lane)	Capacity issues prior to addition of development traffic. Some impact but short-term scenario resolved by HIF network. Interim and complimentary mitigation in the form of land dedication for HIF infrastructure, S106 contributions towards public transport and sustainable transport improvements.	Well within operational capacity. Extremely limited / unperceivable impact.
Clifton Hampden Bridge signals	Well within operational capacity as standalone signals, and proposals to mitigate capacity issues at Clifton Hampden signals. Extremely limited / unperceivable impact.	Well within operational capacity. Extremely limited / unperceivable impact.
Berinsfield roundabout (A4074 / A415 / Wimblestraw Rd)	Over operational capacity in base scenarios. Extremely limited / unperceivable impact.	Within operational capacity. Extremely limited / unperceivable impact.
Golden Balls roundabout junction (A4074 / B4015 / Oxford Rd)	Over operational capacity in base scenarios. Very limited impact.	Significantly over capacity prior to addition of development traffic. Relatively small impact.
Waggon Horse signal junction (A415 / Tollgate Road)	Capacity issues prior to addition of development traffic. Very limited impact. Interim and complimentary mitigation in the form of land dedication for HIF infrastructure, S106 contributions towards public transport and sustainable transport improvements.	Well within operational capacity. Extremely limited / unperceivable impact.
Culham river crossing signals	Capacity issues prior to addition of development traffic. Some impact but very short-term scenario resolved by HIF network, including new river crossing. Interim and complimentary mitigation in the form of land dedication for HIF infrastructure, S106 contributions towards public transport and sustainable transport improvements.	Well within operational capacity. Extremely limited / unperceivable impact.
Appleford Road (B4016) / Abingdon Road	Well within operational capacity. Extremely limited / unperceivable impact.	Well within operational capacity. Extremely limited / unperceivable impact.
A415 / High Street / Stert Street	Capacity issues prior to addition of development traffic. Extremely limited / unperceivable impact.	Capacity issues prior to addition of development traffic. Extremely limited / unperceivable impact.

Ock Street / Stratton Way	Within operational capacity. Extremely limited / unperceivable impact.	Within operational capacity. Extremely limited / unperceivable impact.
Ock Street / Marcham Road / B4017 / Spring Road	Capacity issues prior to addition of development traffic. Limited impact.	Capacity issues prior to addition of development traffic. Limited impact.
Marcham Road / Colwell Drive	Capacity issues prior to addition of development traffic. Extremely limited / unperceivable impact.	Capacity issues prior to addition of development traffic Extremely limited / unperceivable impact.
Marcham Road / Nuffield Way	Capacity issues prior to addition of development traffic. Extremely limited / unperceivable impact.	Capacity issues prior to addition of development traffic Extremely limited / unperceivable impact.

6.80 Pre-HIF there is no severe impact from the development traffic. The only notable impact is at the site access junction, where a mitigation solution is proposed if the HIF infrastructure is significantly delayed, Clifton Hampden signals and Culham river crossing, and to a lesser extent the Waggon Horse/Tollgate Road signalised junction, where capacity is already an issue, and where the proposed HIF1 bypass and river crossing infrastructure will particularly alleviate pressure. The currently anticipated timescale for first occupation of the Research and Development Building is from January 2024, and it is not anticipated to be fully staffed in 2024. Therefore, the small impact of the development will be very short term.

6.81 The most notable off-site impact is evident at the signalised junction on the A415 in Clifton Hampden and the Culham river crossing, which both have land constraints which prevent physical works to increase capacity, and the timings are understood to be regularly review and optimised. This existing situation is a key justification for the by-pass infrastructure and additional river crossing proposed by the HIF scheme which will particularly alleviate pressure in at these locations.

6.82 The HIF infrastructure also has a positive effect on the operation of the Berinsfield roundabout which goes from operating over capacity pre-HIF to within capacity post-HIF, both in the base and with development scenarios in 2024 and 2034. It will also alleviate the potential knock on effect of queueing back from the Clifton Hampden signals on the CSC access and Clifton Hampden river crossing.

6.83 The UKAEA have committed to a land transfer to dedicate the land required by OCC to enable them to deliver the HIF1 infrastructure.

6.84 Capacity improvements appear to be needed at the Golden Balls roundabout, and the A415 / High Street / Stert Street junction, the double mini-roundabout, Colwell Drive and Nuffield Way roundabouts in Abingdon by 2024, with or without HIF, to accommodate existing traffic, general background growth and committed developments. However, the impact of the development traffic is either unperceivable or very small and limited to already congested arms. Proposed mitigation to encourage modal shift in the local area, as set out below, will assist with the future operation of these junctions.

6.85 Should the HIF infrastructure be delayed, land constraints prevent a physical interim mitigation solution to increase capacity at the off-site junctions experiencing notable impact in the pre-HIF scenarios (and have led to the by-pass solution proposed as part of the HIF network). As an alternative interim and complimentary solution, the UKAEA are committed to continuing to provide S106 contributions towards public transport and sustainable transport schemes targeted at achieving modal shift and reducing the level of car traffic on the local highway network.

6.86 The specific S106 contributions proposed are as follows:

- A contribution of £325,000 (index linked Jan 2022) to improve the existing footway on the south side of the A415 to a 3m shared footway/cycleway facility with a 1m verge / landscaped (buffer) area within the existing public highway, from the CSC site entrance towards the train station (approximately 900m). These specific pedestrian and cycle improvements are proposed to promote active travel, in the local area, including for journeys to and from CSC.
- A contribution of £100,000 (index linked Jan 2022) towards enhancing the existing Tollgate / Abingdon Road signalised junction by providing an integral pedestrian and cycling crossing facility to further promote active travel in the local area, including for journeys to and from CSC.
- A Public Transport contribution of £309,544.82 (index linked December 2020) (spilt into two payments) to be used for improvements to local bus services.
- A Travel Plan Monitoring fee of £2,379 (index linked December 2020) will be made via the S106 agreement to monitor progress in terms of the Travel Plan targets for modal shift for journeys to and from CSC.

6.87 Post-HIF there is no severe impact from the development traffic. There is no perceivable impact across all junctions within the study area, other than at the Golden Balls roundabout and the double mini-roundabout in Abingdon by 2024, where the impact of the development traffic is small and limited to already congested arms.

6.88 For simplicity, the development traffic (and committed development traffic added manually) has not be diverted to use the proposed new river crossing. Therefore, the post-HIF results (2024 ad 2034) at the Culham river crossing and Clifton Hampden bridge signals are robust, nonetheless there is no severe impact from the development traffic.

6.89 The 2034 post-HIF scenarios are generally very robust and flows are expected to be overestimated. They include for all Local Plan allocations, and there is potential for double counting through the combination of using data from a Paramics model plus traffic surveys and the addition of committed development traffic manually. They do not account for any changes in modal split and more flexible working practices

(such as increased working from home, increased peak spreading, more flexible working hours) that are anticipated to occur over the next 13 years, both at CSC and in general across the UK highway network. The extent of the effect of these positive changes on peak hour traffic flows is difficult to predict.

7.0 Conclusions

7.1 This Addendum Transport Assessment has been prepared on behalf of The United Kingdom Atomic Energy Authority (UKAEA), in respect of their planning application for a proposed Research and Development Building at Culham Science Centre (CSC), and provides additional assessment work requested by the local highway authority, Oxfordshire County Council.

7.2 The proposed Research and Development Building is to be located on the 'western flank' of the CSC campus. The proposed Research and Development Building has an overall GIA of 9,870sqm and comprises office space and a large rig hall. Car parking for staff using the Research and Development Building is to be provided in an adjacent multi-storey car park. The originally proposed number of car parking spaces for the building has been reduced by just over 20%. This will form one of the proposed car parking hubs on campus, in line with the overall strategy to have all car parking closest to the site entrance with non-car travel promoted within the campus. It also accommodates an additional 34 spaces, to replace existing spaces being removed from within the campus.

7.3 The site is considered to be in a sustainable location, accessible to pedestrians and cyclists, with recently improved access by public transport. There are various committed and proposed highway and transport schemes being developed in the local area and on campus, which will continue to improve opportunities to access Culham Science by sustainable modes of transport. These include local highway authority schemes, HIF funding, and planning contributions made by the UKAEA. The HIF highway improvements will also provide increased highway capacity in the local area.

7.4 The main highway and transport considerations, which have influenced the proposed design, are:

- provision of high-quality access and on-site facilities to support use of sustainable modes of travel and BREEAM accreditation
- provision of suitable operational access/delivery/servicing arrangements, including adequate turning areas
- provision of parking for cycles and cars including disabled badge holders, EV charging, and car sharers
- provision of a multi-storey car park, close to the campus entrance, to accommodate a reduce level of standard car parking for the proposed building, and to accommodate a proportion of spaces being removed from elsewhere on campus (in accordance with overall CSC strategy)

7.5 The main pedestrian entrance to the building is via a proposed public plaza located between the Research and Development Building and the STEP / UKAEA offices on the western side of Main Avenue. Vehicular

access to the multi-storey car park and to the service yard for the rig hall will be off Main Avenue. There also will be parking for disabled badge holders and cyclists on Main Avenue adjacent to the building. Footpaths and footways provide connections between the parking facilities and the building and tie into the existing pedestrian network on the campus.

7.6 In terms of construction access, it is anticipated that this will be from the Perimeter Road, with access potentially via the Car Park 11 area. A Construction Traffic Management Plan will be provided by the contractor in due course and will generally follow previously agreed arrangements for construction projects on campus.

7.7 Pre-HIF there is no severe impact from the development traffic. The only notable impact is at the site access junction, where a mitigation solution is proposed if the HIF infrastructure is significantly delayed, Clifton Hampden signals and Culham river crossing, and to a lesser extent the Waggon Horse/Tollgate Road signalised junction, where capacity is already an issue, and where the proposed HIF1 bypass and river crossing infrastructure will particularly alleviate pressure. The currently anticipated timescale for first occupation of the Research and Development Building is from January 2024, and it is not anticipated to be fully staffed in 2024. Therefore, the small impact of the development will be very short term.

7.8 The HIF infrastructure also has a positive effect on the operation of the Berinsfield roundabout which goes from operating over capacity pre-HIF to within capacity post-HIF, both in the base and with development scenarios in 2024 and 2034. It will also alleviate the potential knock on effect of queueing back from the Clifton Hampden signals on the CSC access and Clifton Hampden river crossing. The UKAEA have committed to a land transfer to dedicate the land required by OCC to enable them to deliver the HIF1 infrastructure.

7.9 Capacity improvements appear to be needed at the Golden Balls roundabout, and the A415 / High Street / Stert Street junction, the double mini-roundabout, Colwell Drive and Nuffield Way roundabouts in Abingdon by 2024, with or without HIF, to accommodate existing traffic, general background growth and committed developments. However, the impact of the development traffic is either unperceivable or very small and limited to already congested arms. Proposed mitigation to encourage modal shift in the local area, will assist with the future operation of these junctions.

7.10 The UKAEA are committed to dedicating land and liaising with OCC to enable the HIF project. Funding for the overall project is now secure and the new infrastructure is due to be open to traffic in 2024. Therefore, the impact of the development on the existing highway network, at its current levels of capacity, will be very temporary. The currently anticipated timescale for first occupation of the Research and Development Building is from January 2024, and the building is unlikely to be fully staffed within the first year. Therefore, the small impact of the development will be very short term.

7.11 It is acknowledged that a capacity improvement scheme would be required at the site access if the HIF1 infrastructure proposed for the end of 2024 is significantly delayed. It is demonstrated that this could be achieved by upgrading the existing junction to provide signal control, however the full details of the proposals would be subject to a S278 agreement.

7.12 Should the HIF infrastructure be delayed, land constraints prevent a physical interim mitigation solution to increase capacity at the off-site junctions experiencing notable impact in the pre-HIF scenarios (and have led to the by-pass solution proposed as part of the HIF network). As an alternative interim and complimentary solution, the UKAEA are committed to continuing to provide S106 contributions towards public transport and sustainable transport schemes targeted at achieving modal shift and reducing the level of car traffic on the local highway network.

7.13 A Travel Plan also accompanies the planning application, and alongside the CSC Site-Wide Travel Plan, is targeted to reduce single occupancy car drivers, and sets out how the UKAEA will continue to invest in measures to encourage the use of more sustainable travel options to access, and travel within, the campus. The building is also seeking to achieve BREEAM Excellent. This building will provide EV charging points, car share spaces, cycle storage, showers and changing facilities, amongst other measures to promote sustainable travel options. The UKAEA are committed to seeking modal shift through sustainable transport measures. The UKAEA have already provided S106 contributions to improve bus services, and the use of next amount of S106 funding is expected to be used to increase the frequency of the 45 service, but will be agreed with the OCC public transport department. The HIF1 infrastructure scheme also provides sustainable transport infrastructure improvements in terms of bus services and more direct access to rail services, cycling and walking.

7.14 The proposals also meet the requirements of OCC's strategy for assisting with the delivery of development prior to HIF1 funded infrastructure being open for public use, in that they will:

- Provide sustainable / active travel infrastructure at the beginning (early occupations) of the development to reduce traffic impact on the highway network prior to HIF 1 delivery.
- Provide a S106 contribution towards new services or enhancements to existing bus service arrangements to be implemented at the beginning (early occupations) of the development.
    - *£309,544.82 (index linked December 2020) (spilt into two payments) Public Transport contribution to be used for improvements to local bus services.*
- Deliver local off-site/on-site highway works at the early stages of the development to lessen the direct impact of a development site on the highway network, if applicable *–upgrade site access junction if HIF1 is significantly delayed.*

- Implement the building and Site-Wide Travel Plan, to be approved by OCC, with deliverable and monitored targets.
    - *A Travel Plan Monitoring fee of £2,379 (index linked December 2020) will be made via the S106 agreement to monitor progress in terms of the Travel Plan targets for modal shift for journeys to and from CSC.*
- Provide strategic transport / highway contributions if required, in accordance with Regulation 122 and the three Section 106 tests –
    - *£325,000 (index linked Jan 2022) to improve the existing footway on the south side of the A415 to a 3m shared footway/cycleway facility with a 1m verge / landscaped (buffer) area within the existing public highway, from the CSC site entrance towards the train station (approximately 900m). These specific pedestrian and cycle improvements are proposed to promote active travel, in the local area, including for journeys to and from CSC.*
    - *£100,000 (index linked Jan 2022) towards enhance the existing Tollgate / Abingdon Road signalised junction by providing an integral pedestrian and cycling crossing facility to further promote active travel in the local area, including for journeys to and from CSC.*
    - *UKAEA have also committed to a land transfer to dedicate the land required by OCC to enable them to deliver the HIF1 infrastructure.*

7.15 OCC's strategy recognises the value of development at proposed commercial sites in the area such as Culham Science Centre, and the role such development has in supporting the local and national economy. The UKAEA continues to provide and facilitate "excellent pedestrian, and/or cyclist provisions and enhanced frequent public transport service provisions" to help reduce the impact of on-site development at CSC on the local area. This provides benefits both pre-HIF1 and in the longer term.

7.16 In light of the above, we propose that the impact of the Research and Development Building is acceptable in highways and transport terms. On balance it is considered that the development traffic does not have a severe impact on the study area network that cannot be managed or addressed with the currently proposed infrastructure, as well as the interim and complimentary mitigation measures to be delivered via S106 contributions. The few junctions that are expected to see the most impact will only experience this for a very short period prior to the HIF1 infrastructure being open to traffic.

7.17 Although capacity improvements would need to be delivered by OCC at a number of junctions within the study area to accommodate existing and committed development traffic by 2024, the impact of the

development at these junctions is imperceivable or very limited, and is being mitigated via the proposed measures to encourage modal shift in the local area. Therefore, no interim off-site highway capacity or road safety improvements are proposed, other than at the site access if the HIF infrastructure is significantly delayed, to accommodate the development traffic. Nonetheless, there is a strong commitment from the UKAEA to continue to implement measures to maximise the opportunities for sustainable travel and minimise the traffic impact of development at CSC.

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