

5 ACCESS BY SUSTAINABLE MODES

5.1 Introduction to Sustainable Modes of Transport

5.1.1 National and local transport planning policy centres on the importance of sustainable development meaning that new developments should be located in areas where realistic alternatives to car travel exist or can be implemented. These alternatives are walking, cycling and public transport. This section of the report will describe how accessible the site is by these sustainable modes of transport.

5.2 Access on Foot

5.2.1 The site is located adjacent to existing residential areas and close to the amenities of Hayling Island. As stated in **Section 4**, together with the vehicular access, the development proposals include three pedestrian only accesses will be provided on the western side of the site, which will enable access on to the existing PRow network.

5.2.2 The development proposals include uncontrolled crossings on St Mary's Road, Elm Grove and Church Road. These will encourage walking to and from the site and will not only benefit future residents of the site but existing local residents. They will be particularly beneficial for walking trips to/from the local schools, creating safer routes.

5.2.3 Research has indicated that acceptable walking distances depend on a number of factors, including the quality of the development, the type of amenity offered, the surrounding area, and other local facilities. The Chartered Institution of Highways and Transportation (CIHT) document entitled *Providing for Journeys on Foot* (2000) suggests walking distances which are relevant to this application. These distances are shown in **Table 5.1**.

Table 5.1: Suggested Acceptable Walking Distances

Criteria	Town Centres (m)	Commuting/School/Sightseeing (m)	Elsewhere/Local Services (m)
Desirable	200	500	400
Acceptable	400	1000	800
Preferred Maximum	800	2000	1200

Source: CIHT Document 'Providing for Journeys on Foot' (2000)

5.2.4 In order to illustrate the site's accessibility on foot, an indicative walking isochrone has been produced using the Geographic Information System (GIS) software Visography TRACC. **Figure 2** in **Appendix B**, represents the site's walking catchment for local service and commuting/school trips. The walking catchment is based on the distances of 400m, 800m and 1200m which are termed '*Desirable*', '*Acceptable*' and the '*Preferred Maximum*' by the CIHT for local service trips.

5.2.5 Shown within the figure is a selection of local schools, local amenities and places of employment. In order to provide an accurate representation of the future highway and footway network in the area, the site's proposed vehicular access, as well as the pedestrian and pedestrian/cycle only

accesses have been manually added to the network used for the isochrone, as have local PRoWs. The local bus stops are also shown in **Figure 2**.

5.2.6 **Table 5.2** below summarises the distance and the typical time it would take to walk from the centre of the site to the local amenities and centres of employment and education, identified in **Figure 2** of **Appendix B** via the road and/or PRoW network. It provides a comparison against those distances recommended in the CIHT's *Providing for Journeys on Foot*. The time it takes is based on a walking speed of 4.8kph which corresponds with the TRACC default, which itself is based on advice in the DfT document *Transport Connectivity Travel Time Indicators: Guidance Notes*.

Table 5.2: Distance and Walking Time Taken from Site to Local Amenities

Employment/ Education/ Amenity	Distance from Site (m)	Preferred Max Walk Distance (m)	Walk Time (mm:ss)
Co-Operative Foodstore	313	1200	03:57
Indian Restaurant/Takeaway	364	1200	04:35
Recreation Ground	476	1200	06:01
Mengham Infant School	480	2000	06:03
Childsplay Nursery School	508	2000	06:23
Fire Station	522	2000	06:37
St Mary C of E Church	525	1200	06:36
Library	605	1200	07:36
Elm Grove Free Church	681	1200	08:33
The Hayling College	708	2000	08:56
Mengham Junior School	711	2000	08:58
Police Station	741	1200/2000	09:20
Health Centre	794	1200	09:58
South Hayling District Centre	928	1200/2000	11:37
West Town District Centre	991	1200/2000	12:23
Tesco Express	996	1200	12:29
Hayling Island Community Centre	1023	1200	12:50
Sainsbury's	1052	1200	13:12
Tournerbury Golf Course	1053	1200	13:13
Pharmacy	1059	1200	13:16
Tennis Club	1233	1200	15:31
Amusement Park	1336	1200	16:48
Mill Rythe Junior School	1350	2000	16:58
Mill Rythe Infant School	1422	2000	17:58
Bus Stops			
Tournerbury Lane, S-bound	330	-	04:08
Tournerbury Lane, N-bound	357	-	04:29
Hayling School, N-bound	526	-	06:35
Hayling School, S-bound	573	-	07:11
West Lane, N-bound	608	-	07:37
Elm Grove, N-bound	648	-	08:07
West Lane, S-bound	650	-	08:08
Elm Grove, S-bound	667	-	08:21

- 5.2.7 The results in **Table 5.2** show that some amenities are within a 'desirable' walking distance (400m) from the site, these include a Co-Operative foodstore and Indian restaurant/takeaway. Most amenities fall within an 'acceptable' walking distance (800m) from the site, including a nursery, health centre, library, police station, fire station, recreation ground and two churches. Outside of this distance but within the preferred maximum (1200m) are the South Hayling and West Town district centres which includes numerous amenities including shops, restaurants, banks and a post office, Tesco Express, Sainsbury's Local, pharmacy, community centre and Tournurbury Golf Course. Of the five schools/colleges listed, Mengham Infant School falls within a desirable walking distance (500m), while Mengham Junior School and The Hayling College fall within an acceptable walking distance (1000m). The two Mill Rythe schools fall within the 'preferred maximum' of 2000m. It is useful to note the majority of amenities can be reached on foot within 15-minutes, while the remaining amenities listed can be reached within 18-minutes.
- 5.2.8 The local highway network provides good standard road-side and off-road footways that are naturally conducive to safe walking environments. This is particularly important to walking routes to and from schools. As shown in **Table 5.2** all of the local schools are within an 18-minute walk and less than one mile away from the centre of the site, with all but the Mill Rythe schools being less than a 9-minute and ½ mile walk away.
- 5.2.9 School travel plan information provided by HCC shows that in 2015, close to 60% of trips to/from The Hayling College were made on foot with over 50% of all trips to/from the Mengham Infant and Junior Schools being made via the same mode of travel. The equivalent percentages to/from the two Mill Rythe Schools were lower reflecting their larger catchment and less densely populated location. Clearly many existing trips to these schools will be made from much further away than the site, but there should be no reason why the vast majority of trips from the site to the local school cannot be made on foot.
- 5.2.10 Table NTS0614 of the DfT's *National Travel Survey 2015* available from <https://www.gov.uk/government/statistical-data-sets/nts06-age-gender-and-modal-breakdown>, reports that 78% of children aged 5-10 years walk to/from school for journeys under one mile with the equivalent figure for 11-16 year olds being 87%. Given the close proximity of the site to the local schools and the good quality local pedestrian network, which will be enhanced, particularly on routes to the local schools, as part of the development proposals detailed in **Section 4**, there should be no reason why walking will not be the most popular mode of travel for trips to/from school. Encouragement of walking to school will also complement the travel plans of the respective schools.
- 5.2.11 **Table 5.2** also shows that the closest pair of bus stops that facilitate access to local bus services, which are on Church Road opposite and adjacent to Tournurbury Lane, are less than a 5-minute walk away. Other pairs of stops on Church Road outside of Hayling School (College), Elm Grove and

Manor Road (West Lane) may be more convenient for some future residents of the site depending on where their properties are located.

- 5.2.12 Given the evidence presented in **Figure 2** of **Appendix B** and **Table 5.2**, walking can be considered to be a realistic and viable method of travel indicating that the site's location is accessible via this sustainable mode.

5.3 Access by Cycle

- 5.3.1 It is widely recognised that cycling can offer an attractive alternative to short car trips, particularly those under 5km, but also as part of longer journeys by public transport.

- 5.3.2 The DfT's *Local Transport Note 2/08 Cycle Infrastructure Design* states that:

'The road is the most basic (and important) cycling facility available, and the preferred way of providing for cyclists is to create conditions on the carriageway where cyclists are content to use it, particularly in urban areas.'

- 5.3.3 The generally flat topography of Hayling Island is naturally conducive to cycling. Shared cycleways are also present on the bridge which allows cyclists to avoid the carriageway which is not only safer for cyclists but it means that they do not impact upon the capacity of the carriageway.

- 5.3.4 A cycling isochrone showing the site's catchment has also been produced using TRACC and is shown as **Figure 3** in **Appendix B**. The figure illustrates 2000m and 5000m catchment ranges which equate to 10-minute and 25-minute journey times respectively which are based on the somewhat conservative or leisurely cycle speed of 12kph. Anecdotally, commuting cyclists are generally thought to travel at speeds between 15-20kph so a greater catchment may be more realistic. The cycling distances and times to a selection of key local centres of education, employment and amenities, as well as neighbouring areas, are shown in **Table 5.3**, although the cycle times detailed in the table are based on a cycling speed of 16kph which corresponds with the TRACC default, which the software developer has based on DfT advice. It should be noted that some of the cycle distances differ from the walking distances as cycling along PRow's is typically not allowed unless designated as cycleways, bridleways or byways.

Table 5.3: Distance and Cycling Time Taken from Site to Local Centres of Employment, Education, Amenities and Neighbouring Settlements

Employment/ Education/ Amenity/ Settlement	Distance from Site (m)	Cycle Time (mm:ss)
Co-Operative Foodstore	375	01:43
Indian Restaurant/Takeaway	426	01:53
Recreation Ground	538	02:41
Mengham Infant School	541	02:24
Childsplay Nursery School	569	02:28
Fire Station	583	02:42
St Mary C of E Church	587	02:45
Library	666	02:49
Elm Grove Free Church	742	03:05
The Hayling College	770	03:23
Mengham Junior School	772	03:25
Health Centre	855	03:35
District Centre	990	03:52
Police Station	1056	04:23
Sainsbury's	1113	04:33
Tournerbury Golf Course	1115	04:31
Pharmacy	1120	04:31
Mill Rythe Junior School	1411	05:49
Tesco Express	1427	05:43
Mill Rythe Infant School	1487	06:35
Hayling Island Community Centre	1496	05:56
Tennis Club	1547	06:25
West Town District Centre	1555	05:59
Amusement Park	1746	07:09
Hayling Golf Course	2962	11:19
Stoke	3258	12:22
Hayling Ferry Terminal	4406	16:50
North Hayling	4532	17:10
Langstone	6182	23:22
Solent Retail Park	7457	28:07
Langstone Technology Park	7468	28:10
Havant Town Centre	7494	29:03
Tesco Extra	7681	29:17
Solent Trade Park	7782	29:20

- 5.3.5 **Figure 3 in Appendix B** and **Table 5.3** above illustrate that there is a considerable range of local amenities, places of employment, places of education and settlements within the cycle catchment. All of the amenities and centres of employment and education mentioned in the Access on Foot section are within the 2000m catchment. Most of Hayling Island is within the 5000m catchment including the residential areas of Stoke and North Hayling as well as the Hayling Ferry Terminal.
- 5.3.6 Outside of the 5000m catchment but within a 30-minute cycle time, which may be feasible for some residents of the site, particularly given the cycle-friendly topography of the island, are Solent Retail

Park, Langstone Technology Park, Havant Town Centre, Tesco Extra and Solent Trade Park, all major places of employment.

- 5.3.7 Connection can be made to National Rail services at Havant station which is in the town centre and around a 30-minute cycle ride from the site. The station has 160 CCTV protected cycle storage spaces (source: <http://www.nationalrail.co.uk/stations/HAV/details.html>).
- 5.3.8 The catchment plan and **Table 5.3** suggest that cycling will be a viable mode of travel for access to a range of local amenities and places of employment and education.
- 5.3.9 Clearly the site location and the surrounding infrastructure will mean that travel on foot and by cycle will be realistic and convenient modes of travel for some future residents of the site. The potential numbers of walking and cycling trips that the site will generate will be discussed in **Section 6** of this report, but clearly the scale of the site is not such that it will disadvantage existing pedestrians and cyclists.
- 5.3.10 The proposed site access point and pedestrian/cycle connections will complement the existing pedestrian and cycle infrastructure and provide convenient routes that will follow natural desire lines for future residents of the site.

5.4 Access by Public Transport

- 5.4.1 The Chartered Institute of Highways and Transportation (CIHT) document, '*Planning for Public Transport in Development*' recommends that developments should ideally be located within 400m of a bus stop. As **Table 5.2** shows, the stops on Church Road opposite and adjacent to Tournurbury Lane are within this distance. Both stops have flag poles with timetables, while the northbound bus stop comprises seating and shelter to protect waiting passengers from inclement weather. Other stops are located close to the site and provide access to the same services.
- 5.4.2 **Table 5.4** below summarises the services that can be accessed via these stops. Timetable information for all the services mentioned above can be downloaded from <http://www.travelinesoutheast.org.uk/> with the timetables referenced at the time of writing available on request.

Table 5.4: Summary of Bus Services in the Vicinity of the Site

Bus Service	Route	Weekday (Mon-Fri)	Weekend	
30	Havant – Hayling Island Circular	2-3 services per hour	1-2 services per hour	1 service per hour
31	Havant – Hayling Island Circular	1-2 services per hour	1-2 services per hour	1 service per hour

- 5.4.3 Both circular services link the main residential areas of Hayling Island to Havant town centre with a single service of the number 30 continuing to/from Oaklands School in Purbrook during school

opening and closing times. The two services combined provide up to four services per hour in the weekday peak periods. The two services should be convenient modes of travel for future residents of the site who work at Langstone Technology Park, Solent Retail Park or in Havant town centre. Connection can also be made to National Rail services at Havant station which is a short walk from Havant bus station.

- 5.4.4 To demonstrate the accessibility of bus services, an isochrone has been produced using TRACC and is shown as **Figure 4** in **Appendix B** which highlights the destinations served by the regular daily bus services in Hayling Island. The calculation involved in producing the catchment plan includes only direct services to destinations within one hour's journey time. A greater range of destinations will be available if passengers make connections to other bus services. The isochrone was produced for the typical commuter hours of 0600-0900 using the National Public Transport Data Repository (NPTDR) dataset for the third quarter of 2016 for a typical Monday and includes services accessible only from the six closest bus stops to the site.
- 5.4.5 **Figure 4** in **Appendix B** demonstrates that the bus services adjacent to the site provide convenient connections to a number of destinations. As illustrated, the majority of the main population centres on Hayling Island centre can be reached within a 15-minute journey time, while residents will be able to reach Havant, including the train station, within 30-minutes when travelling by bus. Bus travel may therefore be a viable mode of transport and provides a reasonable choice for a number of residents of the site.
- 5.4.6 As mentioned above, Havant train station may be within a reasonable cycling distance for some residents of the site with secure cycle storage available. The station provides regular services to London Waterloo and Victoria, Portsmouth, Southampton, Littlehampton, Bristol Temple Meads and Brighton.
- 5.4.7 Hayling Ferry Terminal, which resumed operations in August 2016, is within a 16:30-minute cycle time from the site. The current (at the time of writing) winter timetable available on <http://www.haylingferry.net/> provides Monday to Friday services to Eastney every 40-minutes from 0650 to 0840 then one per hour from 0930 until 1830, with the last return service being 1845. Services also run at weekend starting a 0840 from Hayling Island. This service enables Hayling Island residents to commute to/from Portsmouth with the ferry licenced to carry up to 64 passengers. The current fare for two crossings for an adult is £5.50 with discount available for 10 and 20 crossing tickets and for concessions. Bicycles can be carried free of charge.

5.5 Travel Plan

- 5.5.1 A residential Travel Plan (TP) has been produced as part of the package of documents supporting the planning application. The document forms the start of an ongoing process to encourage and monitor the use of sustainable modes of travel. As many aspects of the TP will be applicable to this TA, a summary of the key points is as follows:

- Outlines the key local and national objectives of the TP process;
- Sets targets for the reduction of car or van driver trips by 10%;
- Indicates potential measures that can be implemented to achieve these targets; and
- Provides details of how the TP will be managed, monitored and reviewed.

5.5.2 It should however be noted that in order to provide a robust assessment, the traffic impact assessment detailed in **Section 6** of this TA, does not take into account any trip reduction as part of the TP.

5.6 Summary

5.6.1 This section of the report has demonstrated that the site is in a sustainable location where a range of local amenities and centres of employment and education are within nationally recognised acceptable walking and cycling distances. The local bus services provide connections to some of the main employment areas and schools making bus travel a viable option for some of the residents of the site.

5.6.2 This section has also explained that a TP produced in support of the development will help to encourage the use of these sustainable modes. It is hoped that a combination of the site's sustainable location and design and adoption of the TP will help to maximise the use of sustainable modes of transport.

5.6.3 A key theme of national and local transport planning policy is that development should be located where the need to travel will be minimised and the use of sustainable transport modes can be maximised. As detailed in **Section 2** of this report, the NPPF states that the '*transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice about how they travel*' and developments should provide '*safe and suitable*' access for all. It can be concluded that the proposed development accords to this NPPF guidance as well as the principles of Paragraph 35 in terms of exploiting opportunities for sustainable travel and it is located and designed to give priority to pedestrian, cycle and public transport movements. Furthermore, the production of a TP is seen by the NPPF as being a '*key tool*' to facilitate the guidance in Paragraph 36. It is felt that, in relation to Paragraph 32 of the NPPF, '*the opportunities for sustainable transport modes have been taken up*'.

5.6.4 It has also been demonstrated that the site location, design and pedestrian improvements conform to Main Priority 3 of the LTP, TfSH LTP policies A, G, H and M, HBC Core Strategy policies DM11 and DM12.

6 TRAFFIC FORECASTING

6.1 Introduction

- 6.1.1 This section of the report details the methodology used to predict the demand associated with the development on two future base years whilst considering traffic growth and traffic associated with committed developments and a potential allocated site.
- 6.1.2 It should be noted that this assessment has been based on up to 230 dwellings only with the proposed development mix changed to up to 210 dwellings and 0.6ha for apartments with care following completion of the assessment. Further details will be provided on why the assessment remains robust in **Section 6.4**.

6.2 Traffic Growth

- 6.2.1 In accordance with GTA, the forecast year of assessment is 2021 which represents the year of application (2016) plus five years. It is expected that the site would be fully built-out and occupied by this forecast year. The impact on junction 1 the A27/A3023 Langstone Road/Park Road South grade separated roundabout will also be assessed at 2026 (year of application plus ten years) in line with DfT Circular 02/13 as the junction is managed by Highways England (HE), forming part of the strategic road network (SRN).
- 6.2.2 The 2016 observed traffic flows were factored to the assessment years using the DfT software TEMPro (Trip End Model Presentation Program) version 7.0. This package allows access to data used in the National Trip End Model (NTEM) and can be used to *'provide summaries of traffic growth using data from the National Transport Model (NTM)'* (<https://www.gov.uk/government/collections/tempro>).
- 6.2.3 The latest version of the TEMPro software provides traffic growth figures at the mid layer super output area (MSOA) level. Averages of the growth factors between the three MSOAs (Havant 015-017) that constitute Hayling Island have been used. Trip end growth factors for car drivers were derived and adjusted by NTM dataset AF15 for 'rural' area types and 'principal' road types, primarily to reflect the nature of the A3023.
- 6.2.4 DfT derived Road Traffic Forecast (RTF) growth factors for the South East England region have been applied to heavy vehicles as TEMPro is not applicable to such vehicle classes as detailed in WebTAG guidance. The RTF calculation for heavy vehicles is provided in **Appendix F**.
- 6.2.5 Before applying the traffic growth factors derived from the above method, the trips from local committed development have been considered.

6.3 Committed Developments

6.3.1 Following a telephone conversation with a local highway officer the following consented developments have been treated as committed:

- APP/12/00966: 131 dwellings on land south of Beech Grove (Bellway Homes); and
- App/13/00639: 59 dwellings and 1,250m² of light-industrial accommodation on land north of Station Road/Furniss Way (Barratt Homes).

6.3.2 At the time of writing, the Bellway Homes site was under construction and a telephone conversation with a member of staff at the sales office confirmed that the site was over 75% occupied at the time of the traffic surveys, therefore the site has been treated as being 75% occupied for assessment purposes. The Barratt Homes site is under construction but it is understood that no dwellings were occupied at the time of the traffic surveys, nor was the light-industrial accommodation in use.

6.3.3 As TEMPro includes government derived planning forecasts, it is necessary to manually adjust the planning assumptions within the database software to remove the numbers of dwellings associated with the committed development which would otherwise result in double-counting. The Bellway Homes site is geographically located in the Havant 017 MSOA which contains 115 additional households between 2016 and 2021 so only 115 dwellings have been removed from it with the full 131 households removed between 2016 and 2026. The Barratt Homes site is located in the Havant 015 MSOA so the associated 60 households have been removed from both forecast years. The application site is located in the Havant 016 MSOA and with it being unlikely that other large scale developments will take place in the MSOA in the next five years, the 108 households in TEMPro between 2016 and 2021 have been removed while the available 202 dwellings have been removed between 2016 and 2026. The planning assumptions related to jobs have not been adjusted and the growth factors will still contain background (demographic) growth. A comparative summary of this reduction in the household planning assumptions is shown in **Tables 6.1 and 6.2**.

Table 6.1: TEMPro Default and Alternative Planning Assumptions between 2016 and 2021

Area	Default Assumptions			Alternative Assumptions		
	Base HH	Future HH	Difference	Base HH	Future HH	Difference
Havant 015	2690	2795	105	2690	2735	45
Havant 016	2764	2872	108	2764	2764	0
Havant 017	2970	3085	115	2970	2970	0

Table 6.2: TEMPro Default and Alternative Planning Assumptions between 2016 and 2026

Area	Default Assumptions			Alternative Assumptions		
	Base HH	Future HH	Difference	Base HH	Future HH	Difference
Havant 015	2690	2886	196	2690	2826	136
Havant 016	2764	2966	202	2764	2764	0
Havant 017	2970	3186	216	2970	3055	85

- 6.3.4 The subsequent growth factors derived from the above and the RTF data to be applied to the 2016 Observed flows are shown in **Table 6.3**.

Table 6.3: Traffic Growth Factors

Source:	TEMPro		RTF
Area	AM	PM	Both
2016 - 2021			
Havant 015	1.081	1.075	1.042
Havant 016	1.068	1.059	
Havant 017	1.064	1.057	
Average	1.071	1.064	1.042
2016 - 2026			
Havant 015	1.154	1.148	1.077
Havant 016	1.131	1.119	
Havant 017	1.140	1.131	
Average	1.142	1.133	1.077

- 6.3.5 The flows factored to 2021, referred to as the 2021 Base flows, are shown in **Traffic Flow Diagrams 4-6**, with those factored to 2026 shown in **Traffic Flow Diagrams 7 and 8**.
- 6.3.6 The land south of Beech Grove flows have been enumerated based on the traffic flow diagrams presented in the supporting TA but with the flows reduced by 75% to avoid double-counting based on the level of occupancy at the time of the traffic surveys. The flows are illustrated in **Traffic Flow Diagrams 10 and 11**.
- 6.3.7 The land north of Station Road/Furniss Way was accompanied by a Transport Statement rather than TA so traffic flow diagrams were not available. The forecast number of trips associated with it have been distributed through the study area based on the distribution detailed below but with some localised adjustments due to the geographic location of the site. The distribution is shown in **Traffic Flow Diagram 12** with the distributed flows in **Traffic Flow Diagrams 13-15**.
- 6.3.8 The base and committed development traffic flow elements have been combined to form the 2021 Without Development Flows and are shown in **Traffic Flow Diagrams 16-18** for 2021 and **19-20** for 2026. All Traffic Flow Diagrams are included in **Appendix C**.

6.4 Vehicular Trip Generation

- 6.4.1 During scoping discussions (**Appendix A**) it was agreed with HCC that the average trip rates used in the land south of Beech Grove (Bellway Homes) TA would be suitable for the assessment of the impact of the application site. The TRICS sample has been reconstructed and the TRICS report output is included as **Appendix G**.
- 6.4.2 The trip rates were then applied to the 230 dwellings assessed as this results in a higher trip generation than that proposed and therefore provides a robust assessment. The likely 12-hour (residential sites in TRICS are only surveyed between 7am and 7pm) trip generation of the site is

shown in **Table 6.4** with the AM and PM peak hours, used in the traffic impact assessment detailed later in this section, highlighted in bold font.

Table 6.4: 12 Hour TRICS Derived Average Trip Rates and Trip Generation – 230 Dwellings

Time	Average Trip Rates			Average Trip Generation		
	Arrivals	Departures	Totals	Arrivals	Departures	Totals
07:00-08:00	0.088	0.267	0.355	20	61	82
08:00-09:00	0.161	0.447	0.608	37	103	140
09:00-10:00	0.195	0.253	0.448	45	58	103
10:00-11:00	0.181	0.184	0.365	42	42	84
11:00-12:00	0.186	0.189	0.375	43	43	86
12:00-13:00	0.24	0.235	0.475	55	54	109
13:00-14:00	0.235	0.207	0.442	54	48	102
14:00-15:00	0.237	0.24	0.477	55	55	110
15:00-16:00	0.296	0.209	0.505	68	48	116
16:00-17:00	0.377	0.218	0.595	87	50	137
17:00-18:00	0.437	0.27	0.707	101	62	163
18:00-19:00	0.307	0.282	0.589	71	65	135
Daily (12hr)	2.94	3.001	5.941	676	690	1366

6.4.3 As the above table shows, the site is likely to generate in the region of 140 and 163 two-way trips in the AM and PM peak hours respectively which equate to less than three vehicles every minute. The 12-hour trip generation is likely to be circa 1366 two-way (total) trips. It should be noted that no allowance has been made for any future reduction in car travel based on any potential increase in the use of sustainable modes of travel which may arise as a result of the implementation of TP initiatives, therefore the trip generation figures can be described as being robust for assessment purposes.

6.4.4 As previously stated, while this assessment has been based on up to 230 dwellings, the application will be for up to 210 dwellings, a difference of 20 dwellings. The applicant has advised that the up to 0.6ha for apartments with care is likely to allow for the construction of up to 60 apartments with care. In order to demonstrate that the assessment of the 230 dwellings is more robust, trip rates for the apartments with care have been derived. As TRICS is somewhat limited with regards to this land use, trip rates for 'retirement flats' have been derived as this land use tends to have higher trip rates than the two C2 uses related to care homes in the database. The rates and the associated trip generation along with that for 210 dwellings shown in **Table 6.5**. The TRICS report outputs are also included in **Appendix G**.

Table 6.5: Peak Hour TRICS Derived Average Trip Rates and Trip Generation – 210 Dwellings and 60 Retirement Apartments

Peak	Land Use	Trip Rates			Trip Generation		
		Arrivals	Departures	Totals	Arrivals	Departures	Totals
AM	210 Dwellings	0.161	0.447	0.608	34	94	128
	60 Retirement Apts	0.100	0.066	0.166	6	4	10
	Total	-	-	-	40	98	138
PM	210 Dwellings	0.437	0.270	0.707	92	57	148
	60 Retirement Apts	0.068	0.094	0.162	4	6	10
	Total	-	-	-	96	63	158

6.4.5 The trip generation in **Table 6.5** shows that the assessment based on 230 dwellings is more robust, resulting in an additional two trips in the AM peak and five in the PM peak. It should be noted that the TRICS derived trip rates for the retirement flats are higher than those used in the consented development at the former Hayling Billy public house opposite the site (APP/16/00568) by McCarthy and Stone, which used bespoke trip rates based on existing sites by the same developer. Use of the McCarthy and Stone trip rates shown in Table 4 of the associated Transport Statement would result in six trips in each peak hour, some four trips less than use of the TRICS trip rates.

6.4.6 As it was agreed during scoping discussions that the school PM peak (1530-1630) should be assessed, averages of the TRICS 1500-1600 and 1600-1700 trip rates have been calculated. The trips rates and associated trip generation for the school PM peak are shown in **Table 6.6**.

Table 6.6: School PM Peak TRICS Derived Average Trip Rates and Trip Generation

Time	Trip Rates			Trip Generation		
	Arrivals	Departures	Totals	Arrivals	Departures	Totals
15:30-16:30	0.337	0.214	0.550	77	49	127

6.4.7 **Table 6.6** shows that the site is likely to generate 127 two-way trips in the school PM peak which is equivalent to slightly more than two trips per minute.

6.5 Person Trip Generation

6.5.1 The number of non-car trips likely to be generated by the residential element of the site has been forecast using 2011 Census Method of Travel to Work data. The MSOA Havant 016 (E02004777) has been selected as it includes the site and the surrounding residential area. The trip ends for each method of travel have been downloaded from Nomis (<http://www.nomisweb.co.uk>).

6.5.2 Several of the transport mode categories have been manually removed from the data for reasons including the observed census trips being very low (e.g. taxi), it being unrealistic that they will be used by residents of the site (i.e. underground, metro, light rail) or they will not generate a trip (i.e. not in employment and working from home).

- 6.5.3 As the vehicular trips were calculated using TRICS, factors have been derived between them and the census car driver trips (1,461). The factors equate to 9.6% for the AM peak and 11.2% for the PM peak. They have then been applied to the other census modes to forecast the likely number of multimodal trips generated by the site. A summary of these multimodal trips is shown in **Table 6.7**.

Table 6.7: Forecast Multimodal Person Trips

Method of Travel to Work	Census Trips	Mode %	AM Trips	PM Trips	AM Mode %	PM Mode %
Train	58	3%	6	6	3.3%	2.8%
Bus, minibus or coach	74	4%	7	8	3.8%	3.7%
Motorcycle, scooter or moped	28	1%	3	3	1.6%	1.4%
Driving a car or van	1,461	76%	140	163	76.1%	76.2%
Passenger in a car or van	77	4%	7	9	3.8%	4.2%
Bicycle	63	3%	6	7	3.3%	3.3%
On foot	158	8%	15	18	8.2%	8.4%
All Modes	1,919	100%	184	214	100.0%	100.0%
Factors			9.6%	11.2%	-	-

- 6.5.4 Based on the results in **Table 6.7**, the site is forecast to generate 184 and 214 total people trips in the AM and PM peaks respectively. Following driving a car being the most frequent method of travel likely to be used by residents of the site, equating to 76%, walking trips will account for 15 and 18 trips in the AM and PM peaks respectively equating to 8% of trips. Car or van passengers will account for 7 and 9 trips equating to 4% of trips. Train passengers and cyclists will account for between 6 and 7 trips each (3%) while the remainder will consist of users of motorised two-wheelers. As the nearest train station, Havant, is around 7.5km away, it is likely that the initial part of the journey will be made as a car driver, car passenger, bus passenger or cyclist. It is not expected that the number of non-car trips will be of a level that would cause capacity issues associated with the respective method of transportation.

6.6 Trip Distribution

- 6.6.1 Traffic generated by the development proposal has been distributed on to the highway network based on 2011 Census MTW data for car drivers using the same MSOA used to forecast the person trip generation. Origin-destination pairs containing two trips or less were removed from the data, accounting for less than 11.5% of trips, to make the data more manageable and to eliminate less common and generally longer distance trips from the dataset.
- 6.6.2 The main commuter destinations/origins (urban areas, industrial estates, business parks, hospitals etc.) within each workplace MSOA were identified and the most likely route from/to the site, referred to as the primary route, was derived using web based route planning software (Google Maps). Whilst some destinations may have more than one suitable route available, the most obvious routes (based on travel time and distance) have been chosen in order to concentrate the traffic forming a worst-case assessment. For the local MSOAs where it is clear that multiple routes exist,

secondary and, in some cases, tertiary routes were identified with the trips split based on assumed trip attractor/generator weightings.

- 6.6.3 The distribution exercise identified 8 routes through the study area and are shown in **Table 6.8** with a summary of the percentage of development trips that will be distributed along each also shown.

Table 6.8: Distribution Summary

Route	Example Origin/Destination	Total
A27 W	Portsmouth, Southampton	45.7%
A27 E	Chichester	10.7%
B2149	Havant, Bedhampton	11.8%
Manor Rd	West Town	5.6%
Beach Rd	South Hayling (part of)	3.8%
Elm Grove	Eastoke, Mengham, South Hayling (part of)	13.1%
L'stone Tech Park	Langstone Technology Park	6.8%
A3023 island	Stoke, North Hayling	2.4%
Total		100.0%

- 6.6.4 The distribution is shown diagrammatically in **Traffic Flow Diagram 21** in **Appendix C** with details of the distribution calculation and data provided in **Appendix H**. The distributed residential development traffic is shown in **Traffic Flow Diagrams 22-24**. The development traffic has been added to the Without Development flows to form the 2021 and 2026 With Development Flows which are shown in **Traffic Flow Diagrams 25-29**.

6.7 Sensitivity Test Flows – Potential Allocated Site off North Shore Road

- 6.7.1 As part of the scoping discussions, HCC has requested that consideration is given to a site to be potentially allocated for 161 dwellings on land off North Shore Road as part of the emerging Local Plan. No further details of the site have been provided so the trip rates presented in **Tables 6.4 and 6.5** have been applied to the proposed number of dwellings. The same distribution as the land north of Station Road/Furniss Way committed development has been used with the distributed trips shown in **Traffic Flow Diagrams 30-32**. These have been added to the 2021 and 2026 With Development Flows and are shown in **Traffic Flow Diagrams 33-37**.

6.8 Summary

- 6.8.1 This section has explained the traffic forecasting methodology which will be used to determine the impact of the development traffic as described in the following section. As part of this forecasting it has described the trip generation associated with all modes of transportation including vehicle trips. The methodology has been largely agreed with HCC (**Appendix A**).

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7 IMPACT ASSESSMENT

7.1 Absolute and Percentage Impact

7.1.2 **Table 7.1** below provides a comparison of flows in the forecast year for the AM and PM peaks of the Without and With Development 2021 scenarios summarising the difference. This exercise has been carried out for each of the 7 junctions surveyed in the study area.

Table 7.1: Comparison of Two-way Traffic Flows through Study Area Junctions at 2021 With and Without Development During the AM and PM Peaks

Junction	2021 AM Peak				2021 PM Peak			
	Without Dev	With Dev	Abs Diff	% Diff	Without Dev	With Dev	Abs Diff	% Diff
1. A27/ A3023 Langstone Road/ Park Road South	4506	4601	95	2.1%	4656	4767	111	2.4%
2. A3023 Langstone Road/ Langstone Technology Park Access/ Southbrook Road	2863	2968	105	3.7%	2952	3074	122	4.1%
3. A3023 Havant Road/ Church Road	1918	2027	109	5.7%	1970	2096	126	6.4%
4. A3023 Manor Road/ St Mary's Road/ Station Road	847	861	14	1.7%	906	922	16	1.8%
5. Elm Grove/ Cherrywood Gardens	1239	1256	17	1.4%	1284	1305	21	1.6%
6. St Mary's Road/ Cherrywood Gardens	350	364	14	4.0%	302	318	16	5.3%
7. Church Road/ Tournurbury Lane/ Elm Grove/ St Mary's Road	1582	1708	126	8.0%	1553	1700	147	9.5%

7.1.3 Based on the flow differences in **Table 7.1**, the greatest impact of the development will be on junction 7: Church Road/Tournurbury Lane/Elm Grove/St Mary's Road with the development forecast to add 126 and 147 two way trips through it in the AM and PM peaks respectively equivalent to percentage impacts of 8% and 9.5%. Following this, the next largest impact in both absolute and percentage terms will be at junction 3: A3023 Havant Road/Church Road with increases of 109 and 126 two-way trips forecast, being equivalent to percentage increases of 5.7% and 6.4% in the AM and PM peaks respectively. The percentage impact at all of the other five junctions will be less than 5% in both peaks with the exception of junction 6 in the PM peak, but the 5.3% increase is equivalent to only 16 trips.

7.1.4 The percentage impact on the A27 junction (junction 1) will be less than 2.5%. At 2026 the impact will be less due to the additional five years of traffic growth. The equivalent percentage impact values at 2026 will be 2% and 2.2% in the AM and PM peaks respectively.

7.1.5 The impact of the development during the school PM peak on the five island junctions is shown in **Table 7.2**.

Table 7.2: Comparison of Two-way Traffic Flows through Island Study Area Junctions at 2021 With and Without Development During the School PM Peak

Junction	2021 School PM Peak			
	Without Dev	With Dev	Abs Diff	% Diff
3. A3023 Havant Road/ Church Road	1968	2066	98	5.0%
4. A3023 Manor Road/ St Mary's Road/ Station Road	950	963	13	1.4%
5. Elm Grove/ Cherrywood Gardens	1311	1327	16	1.2%
6. St Mary's Road/Cherrywood Gardens	310	322	12	3.9%
7. Church Road/Tournerbury Lane/Elm Grove/St Mary's Road	1581	1695	114	7.2%

7.1.6 **Table 7.2** shows that the impact of the development during the school PM peak is less than the AM and PM peaks as shown in **Table 7.1**.

7.1.7 Traditionally, GTA suggests that 30 two-way trips can be seen as the threshold for where capacity assessments are required as any level below this is unlikely to cause a material impact. Whilst junctions 4, 5 and 6 are expected to experience an increase in trips notably less than this threshold, HCC did express some concerns regarding the operational performance of these junctions. Capacity assessments have therefore been undertaken for all 7 junctions.

7.2 Capacity Assessments

7.2.1 In order to convert the traffic flows into PCUs, which is the requisite input flow unit required in the modelling software, a factor of 2.0 has been applied to the heavy vehicle user class which includes HGVs and buses/coaches. Cars effectively have a factor of 1.0. These factors are commonly accepted in transport modelling. All model report outputs are included in **Appendix I**.

7.2.2 Junction geometry has been coded into the models based on a mixture of on-site measurements, OS mapping, topographical surveys and aerial photography. Industry standard software has been used to model the junctions with the ARCADY module of Junctions 9 (version 9.0.1.4646) used for the roundabouts and LinSig 3 (version 3.2.33.0) used for the traffic signal controlled junctions.

7.2.3 When interpreting the Junctions (ARCADY) results, the capacity of each arm or movement is calculated as the Ratio of Flow to Capacity (RFC) with 0.85 representing the practical capacity threshold of the arm and 1.00 representing the theoretical capacity threshold. It is above the practical capacity threshold where capacity problems begin to occur while exceeding the theoretical capacity means that arms are over capacity. Traffic flows have been input based on the 'ONE HOUR' (ODTAB) option which synthesises a 'peak within a peak' at the middle of the time period modelled and is generally seen as being the worst-case form of assessment in terms of impact.

- 7.2.4 When interpreting LinSig results, the capacity of each lane is calculated as a degree of saturation (DoS) with 90% representing the practical capacity threshold of the lane and 100% representing the theoretical capacity threshold. The capacity of the junction as a whole is indicated by the practical reserve capacity (PRC) with negative values indicating that the practical capacity threshold has been exceeded and a PRC less than -10% indicating that a junction is operating above the theoretical capacity threshold. Queues are the mean maximum queue (MMQ) over the hour modelled.
- 7.2.5 It is well-known in the industry that the correct input of geometric measurements and traffic flows do not always result in models accurately representing the existing operation of junctions, therefore adjustments have been made where required so that modelled queue lengths reflect observed queue lengths. It should be noted that it is not always possible to fully reflect the observed queue lengths given the differences in how observed queues are measured and how the modelling software calculates the values with local driver behaviour also being a variable factor.
- 7.2.6 It should also be noted that a limitation exists in ARCADY software algorithms which are unable to reflect uneven lane usage where multiple approach lanes are present. Capacity adjustments at junction 3: A3023 Havant Road/Church Road have been investigated with calculated adjustments to the capacity (slope and intercept values) applied where applicable based on the methodology outlines by B. Chard in the technical article '*ARCADY Health Warning*'.
- 7.2.7 This section of the report will describe the results of the capacity assessments addressing each junction in turn.

1. A27/A3023 Langstone Road/Park Road South

- 7.2.8 The existing layout has been assessed for all scenarios including 2026. Traffic signal controller specifications were obtained from Kier, who until recently managed the junction on behalf of HE. This, and a telephone conversation with HCC's ITS department, confirmed that the junction operates on an 80 second cycle time with two controllers in operation linked via SCOOT. The SCOOT control will mean that stage timings and off-sets will vary per cycle depending on traffic demand. This is something that the LinSig software cannot fully replicate but it will still be a suitable tool to assess the impact of the development, committed development and traffic growth.
- 7.2.9 A LinSig model of the existing junction layout has been produced and calibrated to queue lengths recorded at the time of the turning count surveys. Saturation flows of 1900 PCUs/hr have been used for the circulatory lanes, as per the best-practice advice of the software manufacturer, with RR67 used for the entry lanes. Green times were manually adjusted to match the observed queue lengths as closely as possible. The results of the calibrated model for the 2016 Observed flows are shown in **Table 7.3**.

Table 7.3: Junction Capacity Assessment Results – 1. A27/Langstone Road/Park Road South 2016 Observed (calibration)

Lane Ref	Lane Description	AM		PM	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
Network:		89.70%	-	95.90%	-
J1: A27 Langstone RB (Northside)		82.00%	-	78.90%	-
1/1+1/2	A27 EB Off-slip Ahead Left	82.0 : 82.0%	12.1	78.9 : 78.9%	10.4
1/3	A27 EB Off-slip Ahead	55.60%	9.4	51.40%	8.2
2/1	Park Road South Left	41.70%	3.9	43.10%	5.7
2/3+2/2	Park Road South Ahead	79.9 : 79.9%	9.4	73.8 : 73.8%	9.9
3/1	N Circulatory Ahead	23.70%	6.2	24.90%	4.9
3/2	N Circulatory Ahead Right	15.00%	1.8	51.30%	5.7
3/3	N Circulatory Right	46.80%	5.9	57.00%	6.2
4/1	W Circulatory Ahead	31.60%	5.3	18.30%	2.9
4/2	W Circulatory Ahead	44.30%	4.0	42.40%	3.3
4/3	W Circulatory Right	37.10%	6.6	26.40%	4.8
J2: A27 Langstone RB (Southside)		89.70%	-	95.90%	-
1/2+1/1	A3023 Ahead Left	89.6 : 89.7%	16.0	95.8 : 95.9%	18.1
1/3	A3023 Ahead	63.50%	8.7	69.90%	8.2
2/1	A27 WB Off-slip Ahead Left	81.80%	6.3	94.00%	10.3
2/2	A27 WB Off-slip Ahead	76.10%	5.9	70.50%	5.6
3/1	S Circulatory Ahead	3.80%	0.0	15.20%	1.5
3/2	S Circulatory Right Ahead	35.00%	0.5	35.30%	4.0
3/3	S Circulatory Right	19.20%	0.3	17.30%	0.2
4/1	E Circulatory Ahead	27.00%	2.7	47.10%	3.5
4/2	E Circulatory Right Ahead	41.90%	5.9	51.90%	3.8
4/3	E Circulatory Right	25.30%	3.4	30.50%	6.0
PRC (%)		0.4		-6.6	
Delay (pcuHr)		51.43		59.98	

7.2.10 The results show a very close level of calibration indicating that the model is suitable as an assessment tool. However, further examination has revealed that a better level of optimisation can be achieved by adjusting the green times and offsets with no adjustment to lane allocations or saturation flows. The results for the 2016 Observed flows manually optimised are shown in Table 7.4. The manual optimisation involved all entry arms having higher DoS' than the opposing circulatory arms with no queues exceeding the available storage. It should be noted that the automated optimisation features in the software are not suitable for signalised roundabouts.

Table 7.4: Junction Capacity Assessment Results – 1. A27/Langstone Road/Park Road South 2016 Observed (manual optimisation)

Lane Ref	Lane Description	AM		PM	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
Network		68.20%	-	69.00%	-
J1: A27 Langstone RB (Northside)		68.20%	-	69.00%	-
1/1+1/2	A27 EB Off-slip Ahead Left	68.2 : 68.2%	7.6	60.3 : 60.3%	6.3
1/3	A27 EB Off-slip Ahead	39.00%	5.8	37.30%	5.6
2/1	Park Road South Left	28.80%	3.2	37.60%	5.1
2/3+2/2	Park Road South Ahead	55.8 : 55.8%	5.6	69.0 : 69.0%	9.1
3/1	N Circulatory Ahead	29.00%	6.5	28.90%	4.9
3/2	N Circulatory Ahead Right	21.70%	1.6	57.90%	3.9
3/3	N Circulatory Right	53.70%	4.1	67.90%	5.1
4/1	W Circulatory Ahead	62.50%	6.5	50.30%	5.3
4/2	W Circulatory Ahead	65.40%	7.3	58.30%	3.4
4/3	W Circulatory Right	62.50%	6.4	47.20%	5.1
J2: A27 Langstone RB (Southside)		58.40%	-	60.80%	-
1/2+1/1	A3023 Ahead Left	58.4 : 58.4%	8.4	54.8 : 54.8%	8.2
1/3	A3023 Ahead	33.60%	5.0	28.50%	4.0
2/1	A27 WB Off-slip Ahead Left	53.30%	4.9	60.80%	6.0
2/2	A27 WB Off-slip Ahead	40.00%	3.8	40.00%	4.0
3/1	S Circulatory Ahead	16.70%	1.6	29.30%	1.2
3/2	S Circulatory Right Ahead	56.90%	6.0	53.20%	4.1
3/3	S Circulatory Right	30.80%	4.0	25.50%	0.4
4/1	E Circulatory Ahead	33.20%	3.0	55.40%	5.7
4/2	E Circulatory Right Ahead	49.40%	4.6	60.10%	5.4
4/3	E Circulatory Right	24.00%	2.3	31.50%	7.7
PRC (%)		32.0		30.5	
Delay (pcuHr)		36.59		41.47	

7.2.11 The results in **Table 7.4** show markedly better performance than those in **Table 7.3**. This may imply that the existing signal timings could be improved but it does suggest that number of lanes at the junction is sufficient for the current level of demand with a good amount of spare capacity available.

7.2.12 Each subsequent flow scenario has been manually optimised using the same methodology and same 80 second cycle time. A summary of the PRC and highest DoS at the junction for each scenario is provided in **Table 7.5**. Full results are available in **Appendix I**.

Table 7.5: Junction Capacity Assessment Results – 1. A27/Langstone Road/Park Road South Summary (manual optimisation)

Scenario	AM Peak		PM Peak	
	PRC (%)	Highest DoS (%)	PRC (%)	Highest DoS (%)
Without Development 2021	16.6	72.2	20.6	74.6
With Development 2021	16.5	77.3	18.2	76.1
With Development 2021 Sensitivity Test	15.8	77.7	15.5	77.9
Without Development 2026	11.0	81.0	13.0	79.7
With Development 2026	9.9	81.9	9.0	82.6
With Development 2026 Sensitivity Test	9.3	82.4	6.6	84.4

7.2.13 The results show that the junction is forecast to operate with spare practical capacity in all scenarios with signal optimisation. Whilst the results of each scenario are not directly comparable given the manual optimisation and the lane choice available in the model, the results demonstrate that the proposed development, committed development, potential allocated development and up to 10 years of traffic growth can be accommodated by the existing junction layout, although adjustments to the signal timings may be required. The greatest impact on the PRC by the development is 4.0% which occurs in the PM peak at 2026.

7.2.14 The proposed access arrangement therefore provides sufficient capacity to serve the development and the forecast demand for the junction.

2. A3023 Langstone Road/Langstone Technology Park Access/Southbrook Road

7.2.15 **Table 7.6** presents a summary of the model results for the Langstone Technology Park access including Southbrook Road.

Table 7.6: Junction Capacity Assessment Results – 2. A3023 Langstone Road/Langstone Technology Park Access/Southbrook Road

Arm	AM		PM	
	RFC	Q (PCU)	RFC	Q (PCU)
2016 Observed				
Tech Park Access Left	0.09	0.1	0.65	1.8
Tech Park Access Ahead & Right	0.10	0.1	0.33	0.5
A3032 S	0.00	0.0	0.01	0.0
Woodbury Avenue	0.22	0.3	0.22	0.3
A3023 N	0.60	1.5	0.13	0.1
2021 Without Development				
Tech Park Access Left	0.11	0.1	0.74	2.7
Tech Park Access Ahead & Right	0.23	0.3	0.45	0.8
A3032 S	0.00	0.0	0.02	0.0
Woodbury Avenue	0.28	0.4	0.31	0.5
A3023 N	0.70	2.2	0.15	0.2
2021 With Development				
Tech Park Access Left	0.13	0.1	0.79	3.3
Tech Park Access Ahead & Right	0.43	0.6	0.57	1.2
A3032 S	0.00	0.0	0.02	0.0
Woodbury Avenue	0.32	0.5	0.39	0.7
A3023 N	0.73	2.6	0.15	0.2
2021 With Development Sensitivity Test				
Tech Park Access Left	0.25	0.3	0.83	4.3
Tech Park Access Ahead & Right	0.73	1.5	0.68	1.8
A3032 S	0.00	0.0	0.02	0.0
Woodbury Avenue	0.35	0.5	0.48	0.9
A3023 N	0.76	3.0	0.15	0.2

- 7.2.16 It is acknowledged that the model does not fully reflect the observed queue lengths. Adjustments have been considered and tested but these make little difference to the modelled queues, therefore the geometry coded reflects the actual dimensions and level of visibility available at the junction. It should be noted that the queues recorded may have been caused by traffic blocking the 'keep clear' markings. The results indicate that the junction will continue to operate with spare capacity with the development in place, including the Sensitivity Test.

3. A3023 Havant Road/Church Road

- 7.2.17 Capacity adjustments based on uneven lane usage on all approaches to the roundabout have been calculated and applied to all scenarios in the model. These adjustments are shown in **Appendix J**. **Table 7.7** presents a summary of the model results for the roundabout.

Table 7.7: Junction Capacity Assessment Results – 3. A3023 Havant Road/Church Road

Arm	AM		PM		School PM	
	RFC	Q (PCU)	RFC	Q (PCU)	RFC	Q (PCU)
2016 Observed						
1 - A3023 (E)	0.43	0.8	0.73	2.7	0.73	2.8
2 - Church Road	0.74	2.8	0.42	0.7	0.43	0.8
3 - A3023 (W)	0.29	0.4	0.25	0.3	0.29	0.4
2021 Without Development						
1 - A3023 (E)	0.47	0.9	0.79	3.7	0.79	3.7
2 - Church Road	0.81	4.2	0.46	0.8	0.48	0.9
3 - A3023 (W)	0.34	0.5	0.30	0.4	0.33	0.5
2021 With Development						
1 - A3023 (E)	0.50	1.0	0.86	5.9	0.84	5.3
2 - Church Road	0.89	7.4	0.51	1.0	0.51	1.1
3 - A3023 (W)	0.36	0.6	0.30	0.4	0.34	0.5
2021 With Development Sensitivity Test						
1 - A3023 (E)	0.50	1.0	0.86	5.9	0.84	5.3
2 - Church Road	0.90	7.9	0.52	1.1	0.52	1.1
3 - A3023 (W)	0.43	0.8	0.34	0.5	0.37	0.6

7.2.18 The results show that the junction will continue to operate with spare capacity with the development traffic in place including the sensitivity test. The development traffic will cause no greater than a 0.08 increase in RFC which occurs on the Church Road arm in the AM peak. This increase is only marginally greater than the 0.07 increase associated with the traffic growth and committed development.

4. A3023 Manor Road/St Mary's Road/Station Road

7.2.19 **Table 7.8** presents a summary of the model results for the staggered crossroads.

Table 7.8: Junction Capacity Assessment Results – 4. A3023 Manor Road/St Mary's Road/Station Road

Arm	AM		PM		School PM	
	RFC	Q (PCU)	RFC	Q (PCU)	RFC	Q (PCU)
2016 Observed						
Station Road	0.30	0.5	0.30	0.5	0.40	0.7
Beach Road	0.07	0.1	0.04	0.0	0.03	0.0
St Mary's Road Left	0.10	0.1	0.07	0.1	0.07	0.1
St Mary's Road Ahead & Right	0.20	0.3	0.20	0.3	0.19	0.2
Manor Road	0.14	0.3	0.15	0.3	0.15	0.3
2021 Without Development						
Station Road	0.33	0.5	0.33	0.5	0.44	0.8
Beach Road	0.07	0.1	0.04	0.0	0.04	0.0
St Mary's Road Left	0.11	0.1	0.08	0.1	0.07	0.1
St Mary's Road Ahead & Right	0.23	0.3	0.22	0.3	0.22	0.3
Manor Road	0.15	0.3	0.17	0.3	0.17	0.3
2021 With Development						
Station Road	0.34	0.5	0.34	0.5	0.45	0.8
Beach Road	0.07	0.1	0.05	0.1	0.04	0.0
St Mary's Road Left	0.12	0.1	0.08	0.1	0.08	0.1
St Mary's Road Ahead & Right	0.24	0.3	0.24	0.3	0.23	0.3
Manor Road	0.15	0.3	0.17	0.3	0.17	0.3
2021 With Development Sensitivity Test						
Station Road	0.37	0.6	0.36	0.6	0.47	0.9
Beach Road	0.07	0.1	0.05	0.1	0.04	0.0
St Mary's Road Left	0.12	0.1	0.09	0.1	0.08	0.1
St Mary's Road Ahead & Right	0.25	0.3	0.24	0.3	0.23	0.3
Manor Road	0.15	0.3	0.17	0.3	0.17	0.3

- 7.2.20 The results show that the junction will continue to operate with a considerable level of spare capacity with the development traffic in place including the sensitivity test. The development traffic will result in no greater than a 0.02 increase in RFC which is less than the impact of the traffic growth and committed development.

5. Elm Grove/Cherrywood Gardens

- 7.2.21 The results are presented in **Table 7.9**.

Table 7.9: Capacity Assessment Results – 5. Elm Grove/Cherrywood Gardens

Arm	AM		PM		School PM	
	RFC	Q (PCU)	RFC	Q (PCU)	RFC	Q (PCU)
2016 Observed						
Cherrywood Gardens	0.21	0.3	0.21	0.3	0.25	0.3
Elm Grove	0.11	0.2	0.14	0.4	0.12	0.3
2021 Without Development						
Cherrywood Gardens	0.24	0.3	0.24	0.3	0.28	0.4
Elm Grove	0.12	0.3	0.15	0.4	0.13	0.3
2021 With Development						
Cherrywood Gardens	0.24	0.3	0.24	0.3	0.28	0.4
Elm Grove	0.12	0.3	0.16	0.5	0.13	0.3
2021 With Development Sensitivity Test						
Cherrywood Gardens	0.25	0.3	0.25	0.3	0.29	0.4
Elm Grove	0.12	0.3	0.16	0.5	0.13	0.3

7.2.22 The results show that the junction will continue to operate with a considerable level of spare capacity with the development traffic in place including the sensitivity test. The development traffic will result in no greater than a 0.01 increase in RFC which is less than the impact of the traffic growth and committed development.

6. St Mary's Road/Cherrywood Gardens

7.2.23 The results are presented in **Table 7.10**.

Table 7.10: Capacity Assessment Results – 6. St Mary's Road/Cherrywood Gardens

Arm	AM		PM		School PM	
	RFC	Q (PCU)	RFC	Q (PCU)	RFC	Q (PCU)
2016 Observed						
St Mary's Rd N Left	0.04	0.0	0.07	0.1	0.06	0.1
St Mary's Rd N Right	0.14	0.2	0.15	0.2	0.14	0.2
Cherrywood Gardens	0.12	0.2	0.04	0.1	0.05	0.1
2021 Without Development						
St Mary's Rd N Left	0.05	0.0	0.08	0.1	0.07	0.1
St Mary's Rd N Right	0.15	0.2	0.16	0.2	0.15	0.2
Cherrywood Gardens	0.13	0.2	0.04	0.1	0.05	0.1
2021 With Development						
St Mary's Rd N Left	0.05	0.0	0.08	0.1	0.07	0.1
St Mary's Rd N Right	0.17	0.2	0.17	0.2	0.16	0.2
Cherrywood Gardens	0.13	0.2	0.04	0.1	0.05	0.1
2021 With Development Sensitivity Test						
St Mary's Rd N Left	0.05	0.0	0.08	0.1	0.07	0.1
St Mary's Rd N Right	0.17	0.2	0.18	0.2	0.17	0.2
Cherrywood Gardens	0.13	0.2	0.04	0.1	0.05	0.1

7.2.24 The results show that the junction will continue to operate with a considerable level of spare capacity with the development traffic in place including the sensitivity test. The development traffic

will result in no greater than a 0.02 increase in RFC which is comparable with the impact of the traffic growth and committed development.

7. Church Road/Tournerbury Lane/Elm Grove/St Mary's Road

7.2.25 **Table 7.11** presents a summary of the model results for the staggered crossroads. The Tournerbury Lane arm has been treated as one lane plus flare which is based on the available width and on site observations of vehicles being able to queue side-by-side.

Table 7.11: Junction Capacity Assessment Results – 7. Church Road/Tournerbury Lane/Elm Grove/St Mary's Road

Arm	AM		PM		School PM	
	RFC	Q (PCU)	RFC	Q (PCU)	RFC	Q (PCU)
2016 Observed						
St Mary's Road	0.34	0.5	0.16	0.2	0.19	0.2
Elm Grove	0.14	0.2	0.20	0.3	0.19	0.2
Tournerbury Ln Ahead & Left	0.16	0.2	0.27	0.4	0.24	0.3
Tournerbury Ln Right	0.47	0.9	0.37	0.6	0.35	0.5
Church Road	0.17	0.2	0.18	0.2	0.18	0.2
2021 Without Development						
St Mary's Road	0.38	0.6	0.18	0.2	0.21	0.3
Elm Grove	0.16	0.2	0.23	0.3	0.21	0.3
Tournerbury Ln Ahead & Left	0.20	0.3	0.31	0.4	0.27	0.4
Tournerbury Ln Right	0.61	1.5	0.47	0.9	0.44	0.8
Church Road	0.19	0.2	0.20	0.3	0.20	0.3
2021 With Development						
St Mary's Road	0.63	1.6	0.32	0.5	0.32	0.5
Elm Grove	0.16	0.2	0.24	0.3	0.22	0.3
Tournerbury Ln Ahead & Left	0.22	0.3	0.34	0.5	0.29	0.4
Tournerbury Ln Right	0.67	1.9	0.54	1.1	0.49	0.9
Church Road	0.25	0.4	0.35	0.6	0.32	0.5
2021 With Development Sensitivity Test						
St Mary's Road	0.63	1.7	0.33	0.5	0.32	0.5
Elm Grove	0.16	0.2	0.24	0.3	0.22	0.3
Tournerbury Ln Ahead & Left	0.23	0.3	0.34	0.5	0.29	0.4
Tournerbury Ln Right	0.67	1.9	0.54	1.1	0.50	0.9
Church Road	0.26	0.4	0.35	0.6	0.32	0.5

7.2.26 The results show that the junction will continue to operate with a good level of spare capacity with the development traffic in place including the sensitivity test. The queue on St Mary's Road is not forecast to block-back across the site access meaning that it will remain clear allowing for turning movements in and out of the site. It is noted that geometry will change very slightly based on the improvements shown in **Drawings P16031-001D and P16031-002** but these will make very little difference to the capacity available at the junction.

Proposed Site Access

- 7.2.27 The results of the capacity assessment of the proposed site access shown in **Drawing P16031-001D** in **Appendix E** are shown in **Table 7.12**. It has been assessed for the 2021 With Development Scenario Sensitivity Test which has higher flows than the non-Sensitivity Test equivalent and is therefore robust.

Table 7.12: Junction Capacity Assessment Results – Proposed Site Access

Arm	AM		PM		School PM	
	RFC	Q (PCU)	RFC	Q (PCU)	RFC	Q (PCU)
2021 With Development Sensitivity Test						
Proposed Site Access	0.20	0.2	0.12	0.1	0.09	0.1
St Mary's Road	0.06	0.1	0.16	0.2	0.13	0.2

- 7.2.28 The results show that the proposed site access will provide sufficient capacity to serve the development and operate with a considerable level of spare capacity.

7.3 Impact on Langstone Bridge

- 7.3.1 Given that the capacity of Langstone Bridge was been raised as a potential issue during pre-application discussions, the impact of the site on it has been considered by undertaking a link capacity assessment, following on from the observed link capacities based on DMRB TA 79/99 as mentioned in Section 3. Using the same forecasting methodology described in Section 6 but using the ATC flows as a base, TEMPro and RTF growth has been added to the 2016 flows shown in **Table 3.3** to produce 2021 Base flows. The flows from the two committed developments have been added to this to form the 2021 Without Development flows. The forecast development flows have then been added to derive the 2021 With Development flows with the Sensitivity Test flows also added. These flows along with the associated link capacity difference between them and the link flow threshold of 1345 vehicles are shown in **Table 7.10**.

Table 7.10: Langstone Bridge Link Capacity Assessment Results

2021 Without Development						
Direction	AM Peak (0900-1000)					
	Lights	Heavies	Total	Heavy %	Direction %	Link Cap. Diff.
Northbound	1221	39	1260	3.1%	68.3%	85
Southbound	564	21	585	3.6%	31.7%	760
Two-way	1785	60	1845	3.3%	100.0%	-
Direction	PM Peak (1700-1800)					
	Lights	Heavies	Total	Heavy %	Direction %	Link Cap. Diff.
Northbound	667	18	685	2.6%	36.9%	660
Southbound	1149	23	1172	2.0%	63.1%	173
Two-way	1816	41	1857	2.2%	100.0%	-
2021 With Development						
Direction	AM Peak (0900-1000)					
	Lights	Heavies	Total	Heavy %	Direction %	Link Cap. Diff.
Northbound	1298	39	1337	2.9%	68.6%	8
Southbound	592	21	613	3.4%	31.4%	732
Two-way	1890	60	1950	3.1%	100.0%	-
Direction	PM Peak (1700-1800)					
	Lights	Heavies	Total	Heavy %	Direction %	Link Cap. Diff.
Northbound	713	18	731	2.5%	36.9%	614
Southbound	1225	23	1248	1.8%	63.1%	97
Two-way	1938	41	1979	2.1%	100.0%	-
2021 With Development Sensitivity Test						
Direction	AM Peak (0900-1000)					
	Lights	Heavies	Total	Heavy %	Direction %	Link Cap. Diff.
Northbound	1352	39	1391	2.8%	68.7%	-46
Southbound	612	21	633	3.3%	31.3%	712
Two-way	1964	60	2024	3.0%	100.0%	-
Direction	PM Peak (1700-1800)					
	Lights	Heavies	Total	Heavy %	Direction %	Link Cap. Diff.
Northbound	745	18	763	2.4%	37.0%	582
Southbound	1278	23	1301	1.8%	63.0%	44
Two-way	2023	41	2064	2.0%	100.0%	-

- 7.3.2 The link capacity assessment results indicate that a limited amount of spare capacity will be available in the northbound direction in the AM peak with the development in place and with a good amount of spare capacity available in the southbound direction and in both directions in the PM peak. The development traffic accounts for 77 northbound trips and 28 southbound trips in the AM peak with the equivalent figures in the PM peak being 46 and 76. The two heaviest flows in the respective peaks will be equivalent to little more than one trip per minute and are highly unlikely to affect the journey times reported in Table 3.5.
- 7.3.3 The addition of the flows associated with the potential allocated site off North Shore Road may see the threshold exceeded by 46 trips in the northbound direction in the AM peak but with spare capacity in the southbound direction and in both directions in the PM. It should be noted that there are no guarantees that this potential allocation will come forward and for the number of dwellings

assessed. It should also be remembered that the link capacity thresholds reported in TA 79/99 are somewhat historic and along with the low proportion of HGVs, meaning that there is likely to be spare operational capacity along the bridge in five-years' time.

- 7.3.4 During scoping discussions, HCC did request link capacity assessments at other points along the A3023 but the bridge is clearly the busiest point of the road with traffic collecting or dissipating either side of it. Sufficient link capacity is therefore more than likely to be available at other locations.
- 7.3.5 As stated earlier in this report, the main capacity issue on the A3023 appears to be at the point where two lanes southbound merge to a single lane to the south of the Langstone Technology Park access. Given that it has been demonstrated that traffic flows into Woodbury Avenue are low, with only one right turn observed in the AM peak and 6 in the PM peak (2016 Observed) the taper and deceleration lane lengths for the associated ghost island right turn could be slightly shortened and narrowed to increase the merge length. The traffic island between this junction and Langbrook Close could be located further south to maximise this distance. The existing ghost island right turns for both junctions do not appear to fully conform with DMRB TD 42/95 for the 40mph speed limit in terms of the tapers and deceleration lane lengths and it is unlikely that a further reduction would result in any capacity or safety issues. Whilst it is difficult to quantify the operational capacity benefits of this improvement, the proposals will allow for greater stacking capacity and more opportunities for traffic to merge. Gladman will be willing to fund these improvements should they be desired by HCC Highways. PRIME will happily design such an arrangement should the principal of the proposals be welcomed by HCC Highways.

7.4 Summary

- 7.4.1 This section has provided an assessment of the impact of the development traffic in terms of the absolute increase in traffic flow, percentage impact, link capacity on the Langstone Bridge and junction impact using traditional capacity assessment software.
- 7.4.2 Using the above methods it has been demonstrated that the impact of the development on local junctions, including the A27/A3023/Park Road South junction will be minimal and not require mitigation.
- 7.4.3 Gladman acknowledges that the main capacity issue in the area is the southbound merge from two lanes to one on the A3023 with queues commonly forming as the merge takes place. As such Gladman is willing to fund the design and construction of the lengthening of the available two-lane merge subject to any hidden costs, such as utilities diversions, being commensurate to the scale of the development. The abovementioned improvements are in addition to the pedestrian improvements at the Church Road/Tournerbury Lane/Elm Grove/St Mary's Road junction.
- 7.4.4 It has been demonstrated that the residual cumulative impact of the development is certainly not severe meaning that according to paragraph 32 of the NPPF, as described in **Section 2** of this report,