

Houghton Main Energy Centre
Section 73 Application
Transport Assessment
181102/SK21847/TA01(-03)

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1 Introduction

Background

- 1.1 SK has been instructed by Peel Environmental Limited to prepare a Transport Assessment (TA) for a Section 73 planning application that examines the impact of an increase in refuse derived fuel (RDF) import at a consented Energy Centre at Houghton Colliery in Barnsley.
- 1.2 The Site is brownfield land and is allocated as an 'Employment Policy Area and an 'Area of Investigation for Potential Employment Development' in Barnsley Metropolitan Borough Council's (BMBC) current Statutory Development Plan (UDP Saved Policies).
- 1.3 The Site is located on the south side of the A6195 Park Spring Road, west of the settlements of Little Houghton and Great Houghton and north of Darfield. The Site is accessed from an existing roundabout junction on Park Spring Road.
- 1.4 The Site benefits from two previous consents, one for the development of a 150,000tpa timber resource recovery centre granted in 2015 (ref: 2015/0137), and the other for the development of 10,607sqm of employment granted in 2008 and renewed in 2011 (ref: 2008/1426). Both the 2011 and the 2015 planning consent have an implemented status. By virtue of these consents the principle of developing employment uses on the Site has been established and the suitability of the highway network to serve employment uses on the Site set. The previous consents form the baseline position against which the current Proposed Development will be assessed.
- 1.5 The Section 73 application seeks, inter alia, to increase the throughput of RDF to be treated at the centre from 150,000tpa consented in 2015 to 260,000tpa, an increase of 110,000tpa.
- 1.6 The centre will now treat RDF. The consented access arrangements are retained from the spur road off the roundabout junction on Park Spring Road.
- 1.7 The TA assesses the traffic, transport, parking and accessibility impact of the Proposed Development. The TA has been prepared in accordance with the guidance set out in the National Planning Policy Framework (NPPF), National Planning Practice Guidance (NPPG) and Department for Transport (DfT) 'Guidance on Transport Assessment'. The scope of the assessment acknowledges that previously used in the TA for the 2015 consented planning application.
- 1.8 The previously submitted Framework Travel Plan has been updated to acknowledge the Section 73 proposals. The Framework is attached as Appendix B.
- 1.9 Based on the above, the TA considers the following elements:
 - Baseline transport conditions adjacent to the Site
 - Proposed Development access, servicing and parking strategies
 - Accessibility impact
 - Traffic impact
 - Accordance with prevailing policy

2 Baseline Situation

Site Location

- 2.1 The Site forms part of the disused Houghton Main Colliery. Figure 2.1 shows that the Site is located on the west side of the A6195 Park Spring Road, just over 1km of the settlements of Little Houghton and Great Houghton, some 6.5km from the centre of Barnsley and 1.5km from Darfield.



Figure 2.1: Site Location

2.2 Vehicle access to the Site is available via an existing roundabout on Park Spring Road, known as the Houghton Main Colliery Roundabout. The junction also provides access to the ASOS Fulfilment Centre on the eastern side of Park Spring Road and its supplementary car park to the west side.

2008 Planning Consent (2008/1426)

2.3 Prior to the 2015 Energy Centre consent, planning consent was granted for the development of 19 employment units (10,607sqm of B1, B2 and B8) and 208 parking spaces. The consent was granted in 2008 and renewed in 2011.

2.4 Table 2.1 shows the total agreed traffic flows associated with the 2008 consent.

	All Vehicles (in veh)			Heavy Vehicles (in veh)			All Vehicles (in PCU)		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
AM Peak Hour	55	25	80	1	3	4	56	28	84
PM Peak Hour	13	47	60	1	0	1	13	47	60
DAILY (12HR)	378	389	768	26	26	53	405	416	820

Table 2.1: Employment Units Consented Traffic Flows

2.5 It was agreed during consideration of the planning application that the development would not result in a significant impact on local highway network operation.

2015 Planning Consent (2015/0137)

2.6 The planning consent in 2015 permitted the delivery of an Energy Centre comprising of a timber resource recovery centre treating up to 150,000tpa of waste wood and virgin timber through a gasification process.

2.7 The agreed trip generation for the consented development is replicated in Tables 2.2, 2.3 and 2.3.

	Total Traffic (in veh)		
	IN	OUT	TOTAL
AM Peak Hour	6	3	9
PM Peak Hour	0	4	5
Daily	38	38	76

Table 2.2: Energy Centre Consented Traffic Flows [not corrected for rounding errors]

	Total Traffic (in veh)		
	IN	OUT	TOTAL
AM Peak Hour	3	3	6
PM Peak Hour	0	1	2
Daily	30	30	60

Table 2.3: Energy Centre Consented Heavy Vehicle Traffic Flows [not corrected for rounding errors]

	Total Traffic (in PCU)		
	IN	OUT	TOTAL
AM Peak Hour	9	5	14
PM Peak Hour	1	6	6
Daily	68	68	136

Table 2.4: Energy Centre Consented Traffic Flows [not corrected for rounding errors]

- 2.8 The Transport Assessment submitted with the application demonstrated that there would be no significant impact from the traffic generated by the Energy Centre on surrounding highway network operation.
- 2.9 It was also agreed that the type of development proposed, whilst not generating substantial volumes of traffic, will include heavy vehicle traffic required for the transport of materials to the site, and to a lesser extent, exports from the site. The operator agreed to institute management strategies to minimise the impact of heavy vehicle movements on residential amenity and highway operation during critical periods. The consented scheme is based on deliveries to and from the Site between 07:00 and 19:00 (Monday to Friday).

2017 Planning Consent (2017/0782)

- 2.10 In November 2017 planning consent was granted for the construction of a 370-space car park on land opposite the existing ASOS facility, adjacent to the proposed Energy Centre. This car park has now been constructed and is in use by ASOS, in addition to the existing 553-space car park located adjacent to the facility.
- 2.11 The Transport Statement (TS) produced by RPS for the planning application states that the car park is provided to reduce congestion on the ASOS site and surrounding highway network during shift change over periods. The RPS TS states that as a result of this the new car park will not generate any additional traffic on to the highway network, and is merely to be provided to alleviate shift change over congestion and associated road safety concerns. The relevant extract of the TS is attached as Appendix C.

Local Highway Network

- 2.12 The A6195 Park Spring Road is a single carriageway road subject to the national speed limit. The road is of good construction and is of a high standard. The route is a bus corridor with typical service provision of two buses per hour in each direction during the day. Bus stops with good standard shelters are located on Park Spring Road adjacent to the site, footway connections to these are provided from the Houghton Main Colliery Roundabout.

- 2.13 The Site relates well to the strategic highway network, with both the A1(M) and M1 approximately 9km to the east and west of the site, respectively. Access to strategic routes and the local area can be gained via the A6195 and other A class routes including the A635 which routes east-west between the M1 and A1(M) via Barnsley town centre and meets the A6195 at the Cathill Roundabout some 2.5km south-east of the site.
- 2.14 The Cathill Roundabout connects the A6195 with the A635, the Broomhill Roundabout is the next junction to the south on the A6195, 2km south of the Cathill Roundabout, and provides access to Broomhill via Highgate and areas of Brampton and Wath Upon Dearne via Manvers Way.
- 2.15 Height, width and weight restrictions are in place on local routes to prevent large vehicles from using inappropriate routes to access the A1 and M1. This is detailed further in Section 6.

Road Safety

- 2.16 The DfT accident database has been reviewed to allow an understanding of the road safety patterns over the most recent three-year period available, on the roads immediately serving the Site. The DfT data is attached as Appendix D.
- 2.17 Appendix D shows that there has been a single accident at the Houghton Colliery Roundabout during the period assessed. The accident occurred within the ASOS entrance at 02:15 in the morning. It involved a pedestrian stood in the carriageway, but not crossing. The accident was classified as slight.
- 2.18 While all accidents are regrettable, the very low frequency and slight severity of accidents immediately adjacent to the Site does not indicate a prevailing safety issue.

Traffic Growth Trends

- 2.19 The TA that was prepared for the 2015 application included traffic surveys at the following locations:
 - Site Access/Park Spring Road 'Houghton Colliery Roundabout'
 - A6195/A635 'Cathill Roundabout'
 - A6195/Manvers Way/Highgate 'Broomhill Roundabout'
- 2.20 The TA included modelling assessments at the Houghton Colliery Roundabout only, as it was demonstrated that the net change in traffic flows at the other two locations resulting from the Proposed Development would not be significant and would not substantially change highway operation from the baseline position.
- 2.21 Later in this TA it is shown that the proposed increase in RDF import associated with the Section 73 application will not result in a substantial change in traffic activity. Notwithstanding this and to allow an understanding of any changes in prevailing traffic conditions since 2015, new AM and PM peak surveys have been undertaken at the Houghton Colliery Roundabout and the Cathill Roundabout. These surveys have been undertaken at the request of BMBC to examine the changes in background traffic flows since the preparation of the previous TA.
- 2.22 The survey flows are attached as Appendix E, with a summary of the changes in traffic flow provided in Table 2.5.

	Houghton Roundabout	Cathill Roundabout
AM Peak	+82	-374
PM Peak	+14	-207

Table 2.5: Background Traffic Growth (2014-2018) (in PCU)

- 2.23 Table 2.5 shows that there has been an increase in traffic flows at the Houghton Colliery Roundabout since 2014 in both the AM and PM peak hours. This is likely to be a result of

increased activity at the ASOS site. Table 2.5 also shows that there has been a substantial decrease in traffic flows at the Cathill Roundabout since 2014.

Comparison of Weekday & Weekend Traffic Flows

- 2.24 To coincide with the manual traffic counts a seven-day Automatic Traffic Count (ATC) was also undertaken of traffic conditions on Park Spring Road to the south of the Houghton Colliery Roundabout. The survey data is attached as Appendix E.
- 2.25 Table 2.8 shows a comparison of average weekday daily flows and average weekend daily flows.

	Weekday Average	Weekend Average
Northbound	6922	4691
Southbound	6590	4691
Total	13512	9382

Table 2.8: Park Spring Road South Average Daily Traffic Flows (in veh)

- 2.26 Table 2.8 shows that, as would be expected, the traffic flows occurring at the weekend are considerably lower than the situation that occurs on a weekday.

Existing Local Area Travel Patterns

- 2.27 In line with the previous TA, mode share information for commuting trips in the area around the Site has been obtained from the 2011 Census.

Mode	Share
Car (driver)	71%
Sustainable	29%

Table 2.9: Census Local Commuter Mode Share

3 Proposed Development

Development Description

- 3.1 The Section 73 planning application seeks to vary the nature in the feedstock and to increase the amount of RDF material treated at the centre from the consented situation of 150,000tpa imported RDF to 260,000tpa of imported RDF. An increase in imported RDF of 110,000tpa.
- 3.2 The Energy Centre will treat refuse derived fuel (RDF) and will generate up to 22MWe of low carbon electricity.
- 3.3 From a transport and access perspective, the layout is the same as the consented Energy Centre. The layout is attached as Appendix A.
- 3.4 In line with the consented scheme for the Site, access will still be taken from the existing spur on the Houghton Main Colliery Roundabout. This access has been constructed as part of the condition discharge for the consented use, the relevant access layouts are attached as Appendix A.
- 3.5 Parking is provided at a level required to meet the operational needs of the facility. In line with this, 12 parking spaces are provided, including two disabled spaces. A cycle shelter is provided with three cycle stands (six spaces).

Operation

- 3.6 The facility will have the capability to deal with 260,000tpa of import RDF material, an increase of 110,000tpa when compared to the consented centre.
- 3.7 The facility will generate approximately 52,000tpa export material (ash). The facility will operate continuously throughout the year between Monday and Sunday, with a presumed average four weeks of downtime for maintenance.
- 3.8 Heavy vehicle movements will occur between 07:00 and 19:00 Monday to Friday and between 08:00 and 18:00 on Saturday and Sunday.
- 3.9 Table 3.1 provides a summary of the total heavy vehicle movements associated with 260,000tpa import levels. For the purposes of the assessment it has been assumed that deliveries and export will be undertaken in 25t payload vehicles. In reality vehicles up to 28t payload could be used. The use of 25t vehicles provides a robust estimate of vehicle movements.
- 3.10 Table 3.1 includes the traffic flows already consented at the centre (150,000tpa) and associated with the increase in traffic flows and changes in delivery hours and shift patterns associated with the Section 73 application (+110,000tpa). The net change in traffic is discussed in Section 6.

	TPA	Payload (t)	Total Weekly Tonnage	Total Weekly Heavy Vehicles
Import	260,000	25	5,417	217
Export	52,000	25	1,083	43

Table 3.1: Total Centre Import & Export Heavy Vehicle Loads

- 3.11 Deliveries to the facility will occur between 07:00 and 19:00 Monday to Friday, a total of 60 delivery hours over five days. At the weekend deliveries will occur between 08:00 and 18:00 on Saturday and Sunday, a total of 20 delivery hours over two days. Table 3.2 shows the weekend and weekday heavy vehicle loads.

	Weekday Day Heavy Vehicles	Weekend Day Heavy Vehicles
Import	33	27
Export	7	5

Table 3.2: Weekday & Weekend Heavy Vehicle Loads (in veh)

- 3.12 In line with the TA prepared for the consented Energy Centre, a TRICS arrival/departure profile (adjusted to fit with the proposed delivery hours) for a landfill site has been used to forecast the heavy vehicle access and egress patterns. These movements are summarised in Tables 3.3 and 3.4.

	IN	OUT	TOTAL
AM	4	3	7
PM	0	2	2
Daily	39	39	78

Table 3.3: Weekday Heavy Vehicle Daily & Peak Hour Movements (in veh)

	IN	OUT	TOTAL
AM	4	3	7
PM	0	2	2
Daily	33	33	66

Table 3.4: Weekend Heavy Vehicle Daily & Peak Hour Movements (in veh)

- 3.13 The Energy Centre will employ 20 staff, including four management staff and 16 shift staff. A maximum of four shift staff will be on Site at any one time. The facility will operate three eight hour shifts per day (08:00 to 16:00, 16:00 to 24:00 and 00:00 to 08:00). Management staff will work between 08:00 and 17:00, or other shifts to reduce coincidence with ASOS shift change-overs.
- 3.14 In line with the TA prepared for the consented Energy Centre, car driver mode share data from the Barnsley Census has been used. This shows that 71% of commuters travel to work by car.
- 3.15 Table 3.5 shows the car traffic associated with staff movements. For the assessment, it has been assumed that the 08:00 shift start and finish and the 16:00 start/finish will coincide with the network peak hour.

	Staff Shift Movements			Management Staff Movements		
	IN	OUT	TOTAL	IN	OUT	TOTAL
AM	3	3	6	3	0	3
PM	3	3	6	0	3	3
Daily	9	9	18	3	3	6

Table 3.5: Staff Car Movements (in veh)

- 3.16 Table 3.6 shows the total vehicle traffic that will be generated by the Energy Centre on a weekday. The weekday is presented as this represents the worst-case traffic flow situation, both in terms of development traffic and also in terms of background highway network traffic. As shown previously in Table 2.8, traffic flows on the highway network are considerably higher on a weekday than at the weekend.

	Heavy Vehicles			Shift Staff Cars			Management Staff Cars			Total Traffic		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
AM Peak	4	3	8	3	3	6	3	0	3	10	6	16
PM Peak	0	2	2	3	3	6	0	3	3	3	8	11
Daily	39	39	78	9	9	18	3	3	6	51	51	102

Table 3.6: Total Weekday Development Traffic Flows (in vehs)

Travel Plan & Heavy Vehicle Management Strategy

- 3.17 The changes resulting from the Section 73 application are expected to generate very low levels of traffic but in order to ensure opportunities for sustainable trip making are taken up where possible a Framework Travel Plan has been prepared. The Framework is an updated version of the document submitted and agreed with BMBC as part of the 2015 planning application. The Framework is attached as Appendix B.
- 3.18 The focus of the Framework Travel Plan is to promote take-up of alternative modes of travel to the car for staff accessing the Site. Given the site's location and availability of existing bus services the realistic options to minimise car journeys are considered to be bus, cycle and car sharing.

- 3.19 The Framework Travel Plan also includes the management strategy for the movement of heavy vehicles to and from the Site. At this stage this identifies existing restrictions on the highway network and the routes that will be used by large vehicles, together with proposed restrictions on the timing of movements.
- 3.20 Peel has agreed to work closely with ASOS to ensure that feedstock deliveries and Energy Centre shift changes work well and will seek to avoid clashes with ASOS shift changes and peak periods of activity. The small number of additional movements proposed for the Energy Centre and the relative flexibility in shift planning for the much smaller workforce at the proposal site (when compared to ASOS) should ensure this is possible to achieve.
- 3.21 The heavy vehicle management strategy will be developed in more detail with specific delivery patterns as part of the implementation of the full Travel Plan.
- 3.22 The effects of the Framework Travel Plan and heavy vehicle management strategy on traffic movements associated with the Proposed Development have not been considered in the traffic forecast to allow a robust assessment. In reality, these strategies will reduce the traffic impact during critical peak hour periods.

4 Traffic Forecast

Study Area

- 4.1 The review of background traffic growth in the area shows that, other than at the Houghton Colliery Roundabout, growth on other routes has either been static or negative.
- 4.2 The study area for the current application has been set in line with that previously accepted by BMBC when considering the consented Energy Centre TA, e.g. an assessment of the operation of the Houghton Colliery Roundabout and a review of the net change in traffic flows at the Cathill and Broomhill Roundabouts resulting from the Proposed Development.

2023 Base Traffic Flows

- 4.3 The 2018 observed traffic flows have been growthed to 2023 (the assessment year) using TEMPRO locally adjusted NTEM growth factors. The following growth factors have been applied:
- AM Peak 2018-2023: 1.0653
 - PM Peak 2018-2023: 1.0667
- 4.4 The 2023 background traffic flows are attached as Appendix F.
- 4.5 ASOS was granted planning consent for the construction of a 370-space car park in 2017. This car park will be accessed off the same roundabout arm as the Proposed Development.
- 4.6 The TS prepared by RPS and submitted with the planning application demonstrates that the new ASOS car park will not generate any 'new' traffic and is to be provided to allow better management of cars already accessing ASOS during shift change over periods.
- 4.7 The TS prepared for the application does not provide any traffic flow charts or indication of how the existing ASOS traffic would reassign following the opening of the car park. To allow for this in this TA, the surveyed traffic accessing ASOS has been split between to the two car parks proportionally (e.g. 60% in the existing ASOS car park and 40% in the new ASOS car park). The ASOS traffic surveyed using the existing car park has been reduced by 40% and this traffic has been reassigned to the new ASOS car park. This forecast has then been included in the 2023 base flow scenario as shown in Appendix F.
- 4.8 The consented Energy Centre (150,000tpa) has an implemented status and therefore the flows generated by this use are also included in the base traffic scenario. The consented Energy Centre traffic flows are attached as Appendix F. These flows have been combined with the background traffic flows to form the 2023 base traffic flow scenario.

Development Trip Generation

- 4.9 The total Energy Centre traffic forecast is outlined in Section 3 and a summary is provided in Table 4.1. The forecast includes the traffic associated with the 150,000tpa consented Energy Centre on the Site.
- 4.10 The weekday development flows are presented as this represents the worst-case in terms of development traffic and also impact on the highway network operation, as background highway network traffic flows are significantly higher on a weekday and this is the period of the week when the most pressure is put on highway operation.

	Heavy Vehicles			Shift Staff Cars			Management Staff Cars			Total Traffic		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
AM Peak	4	3	8	3	3	6	3	0	3	10	6	16
PM Peak	0	2	2	3	3	6	0	3	3	3	8	11
Daily	39	39	78	9	9	18	3	3	6	51	51	102

Table 4.1: Total Weekday Development Traffic Flows (in veh)

- 4.11 Table 4.2 shows the total development traffic flows converted to passenger car units (PCU) using the same conversion factors used in the consented TA:

- Car: 1.0
- Heavy Vehicle: 2.0

	IN	OUT	TOTAL
AM Peak	14	9	24
PM Peak	4	9	13
Daily	89	89	179

Table 4.2: Total Development Traffic Flows (in PCU)

Development Trip Distribution

- 4.12 The traffic has been assigned to the highway network in line with the previously accepted distribution for the Site. This is replicated in Appendix F.

2023 Base & Development Traffic Flows

- 4.13 The weekday development traffic forecast has been combined with the 2023 weekday background traffic flows to derive the 2023 base with development traffic flows. These flows are shown in Appendix F.

5 Accessibility

Walking

- 5.1 Two-thirds of all journeys in the UK are under-five miles and short distance trips offer the greatest opportunity for changes in travel behaviour. DfT best practice guidance states that walking has the potential to substitute for car trips under 2km, which equates to a 25-minute walk.
- 5.2 Figure 5.1 shows 25-minute walking isochrones from the Proposed Development, based on a walking speed of 4.8kph.

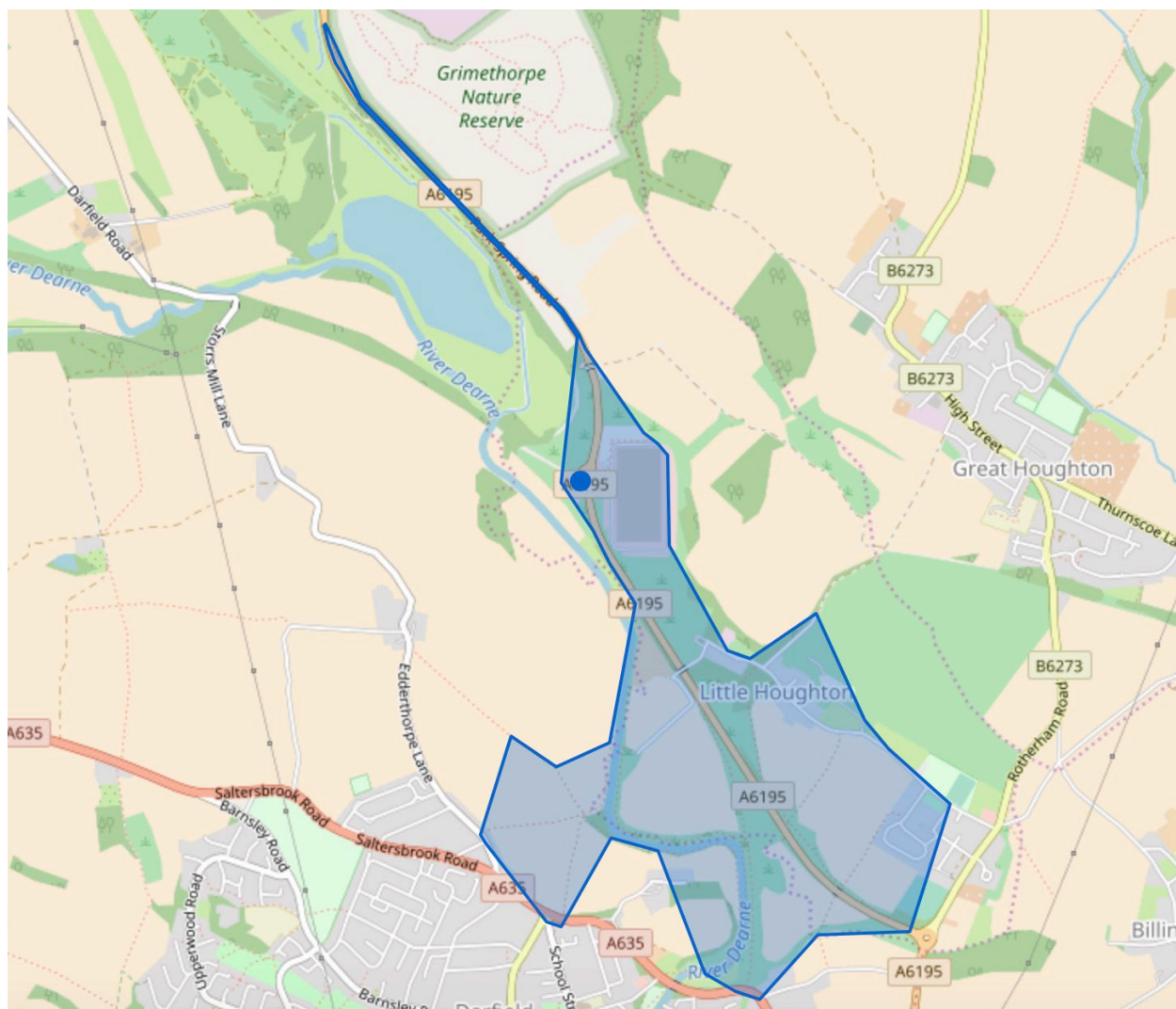


Figure 5.1: 25 Minute Walking Isochrones

- 5.3 The settlements of Little Houghton lie within the accepted maximum walking distance of 2km for commuting trips and footways are present connecting to this area.
- 5.4 The northern part of Darfield is also within 2km of the site and footpath connections are again present between Darfield and the A6195 via Ings Lane, to the south of the Site.
- 5.5 Given the limited population within an acceptable walking distance of the Site it is considered that walking is unlikely to make a significant contribution to travel to the site, but routes are available from the nearest settlement areas.
- 5.6 The suitability of the Site as an employment destination has been previously accepted by BMBC when considering the previous planning consents.

Cycle

- 5.7 The section of Park Spring Road between the site access junction and Ings Lane is designated as part of the local cycle network with a cycle connection available to Middlecliff Lane. To the north of the site further off-road cycle connections are available from the A6195 to Great Houghton and Cudworth.
- 5.8 National cycle network routes 62 and 67 run to the west and south of the site.
- 5.9 Cycling England recommends 8km as a maximum cycling distance in the document 'Integrating Cycling into Development Proposals' and the CIHT document 'Planning for Cycling' states that cycling has the potential to substitute for car trips under five miles (8km). Figure 5.3 shows an

8km cycling catchment from the Site.

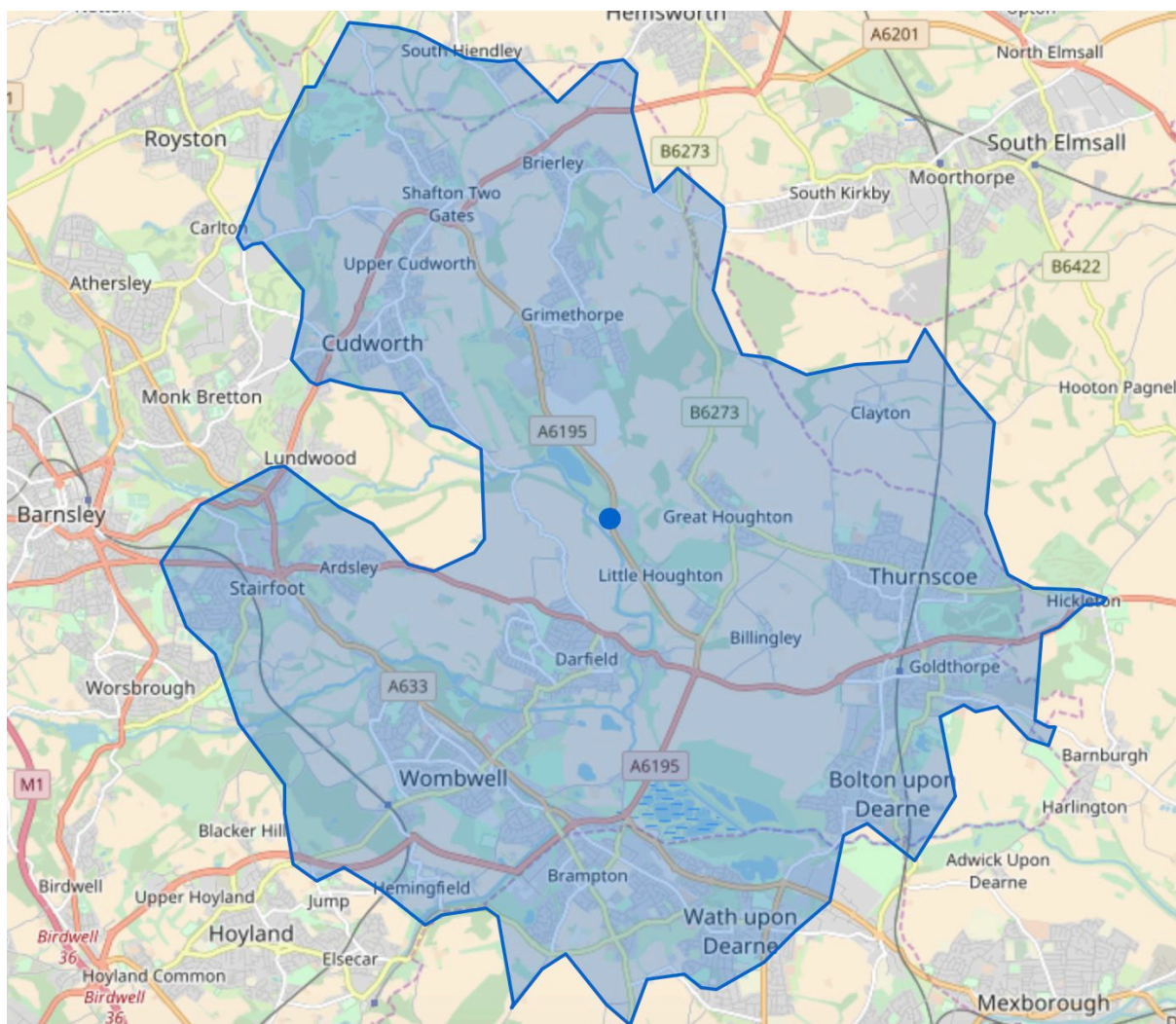


Figure 5.2: 8km Cycling Catchment

- 5.10 Figure 5.2 shows that the communities of Little Houghton, Great Houghton, Thurnscoe, Bolton upon Dearne, Wombwell, Cudworth and Stairfoot are all within an acceptable cycle distance of the Site.
- 5.11 The Proposed Development includes a cycle shelter with three stands (six spaces).
- 5.12 The suitability of the Site as an employment destination has been previously accepted by BMBC when considering the previous planning consents.

Public Transport

- 5.13 Bus stops are available on both sides of Park Spring Road adjacent to the Site. These are of a good standard with shelters, timetable information and footway connections. Figure 5.3 shows the bus services that provide access to the Site.

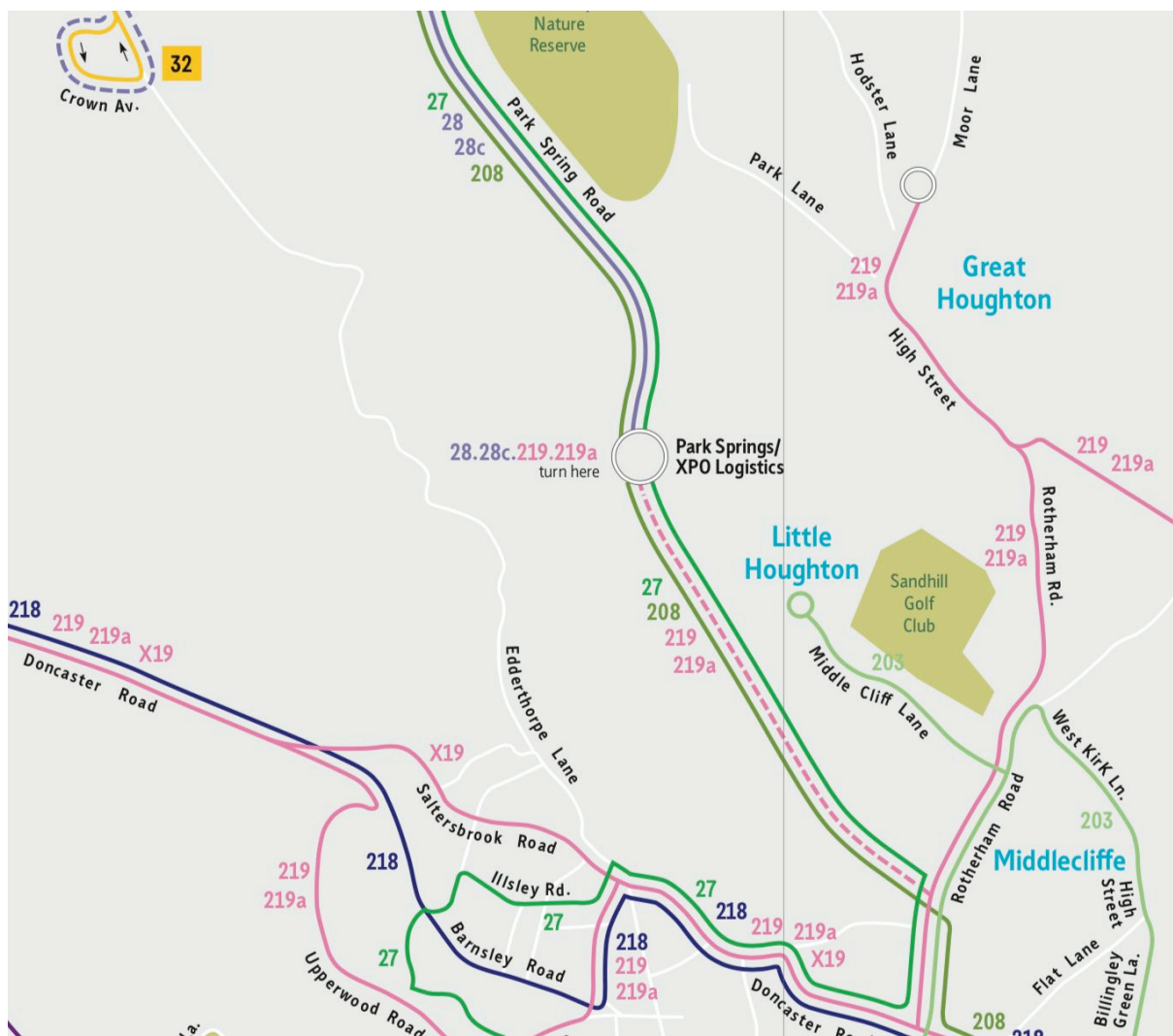


Figure 5.3: Existing Bus Routes

5.14 A number of bus services currently use the stops adjacent to the Site. These are summarised in Table 5.1.

No.	Route	One-way Frequency (per hour)			
		AM	Daytime	PM	Evening
27	Barnsley - Shafton - Grimethorpe - Wombwell	1	2	2	1
28/28c	Barnsley - Cudworth - Brierley - Hemsworth - Pontefract	1	1	1	1
208	Rotherham - Swinton - Mexborough - Billingley - Grimethorpe	3 per day: 1 early morning, 1 mid-afternoon and 1 late evening			
219/219a	Barnsley - Ardsley - Great Houghton - Barnburgh - Doncaster	2 early morning and 2 late evening			

Table 5.1: Local Bus Services

5.15 The existing bus services offer a good level of coverage of surrounding residential areas. The timings of the services will cover the proposed shift patterns and regular services are available during the day.

- 5.16 The number and frequency of existing bus services currently available offer a realistic option for travel to the Site. This was accepted by BMBC during previous applications for the Site. Local bus services will be promoted in the Travel Plan.

6 Impact

Net Change in Site Traffic

- 6.1 Table 6.1 shows the level of additional weekday traffic associated with the Section 73 application. The weekday flow scenario is used in the assessments as this represents the worst-case flow scenario in terms of both development and background highway network traffic flows, which are both higher on a weekday than a weekend day.

	All Vehicles			Heavy Vehicles		
	IN	OUT	TOTAL	IN	OUT	TOTAL
AM	+4	+4	+8	+1	+1	+2
PM	+3	+3	+6	0	+1	+1
Daily	+12	+12	+24	+9	+9	+18

Table 6.1: Net Change in Site Traffic (in veh)

- 6.2 Table 6.1 shows that the Proposed Development will result in an insignificant increase in traffic flows when compared to the consented 150,000tpa situation.
- 6.3 The level of change is well below DfT significance thresholds of 30+ vehicles per hour and 100+ vehicles per day. Therefore, the Proposed Development will not result in a severe effect on highway capacity and operation, or road safety levels, when compared to that already deemed acceptable by BMBC when considering the consented situation.

Net Change in Highway Traffic

- 6.4 Appendix F shows the net change in highway network traffic when compared to the consented situation. Appendix F shows that a maximum increase of 7 vehicles (9 pcu) in the AM peak is forecast at the Houghton Colliery Roundabout. This is not a significant difference in terms of traffic flows or when compared to the consented situation and will not have a severe impact on highway operation.
- 6.5 Appendix F shows that a maximum increase of 4 vehicles (5 pcu) in the AM peak will occur at the Cathill Roundabout and a maximum increase of 2 vehicles (2 pcu) in the AM peak will occur at the Broomhill Roundabout. This level of change is well beneath accepted significance thresholds and will be imperceptible to other road users. This means that the findings of the previous TA are still pertinent and that the Proposed Development will not have an impact at this location when examined in the context of NPPF.

Highway Assessment

- 6.6 The change in traffic flows has been soundly demonstrated to be insignificant when compared to the consented situation. However, the traffic flows at the Houghton Colliery Roundabout (the access) have slightly increased since the previous TA. The operation of this junction has been assessed to test that it will continue to work within capacity thresholds.
- 6.7 The roundabout has been assessed using ARCADY. The ARCADY output is attached as Appendix G with a summary provided in Table 6.2 below.

Approach	2023 Base		2023 with Development	
	RFC	Queue	RFC	Queue
<i>AM Peak</i>				
A6195 (N)	0.337	1	0.348	1
ASOS	0.023	0	0.040	0
A6195 (S)	0.416	1	0.418	1
Site Access	0.023	0	0.013	0
<i>PM Peak</i>				
A6195 (N)	0.454	1	0.456	1
ASOS	0.021	0	0.045	0
A6195 (S)	0.375	1	0.379	1
Site Access	0.030	0	0.019	0

Table 6.2: Houghton Colliery Roundabout Assessment

- 6.8 The assessment shows that there are no capacity issues at this junction and that the S73 application will not significantly change the operation at this location, when compared to the consented situation.

Large Vehicle Routing Strategy

- 6.9 The Site is well located for access by heavy vehicles, with immediate highway access routes of good standard and construction. The Site already benefits from a live consent for an Energy Centre, with associated heavy vehicle movements, and adjacent land uses have similar large vehicle access requirements as the proposal. The previous consent included a commitment to introducing a large vehicle routing strategy. This has been retained in the current Proposed Development.
- 6.10 The Transport Assessment soundly demonstrates that the increase in large vehicle traffic associated with the Section 73 application is minimal. It is also shown that the total level of large vehicle traffic generated by the entire Energy Centre will not be substantial and will not have a noticeable effect on the operation of the junctions in the study area during the critical network peak hours.
- 6.11 As shown in Appendix H, a number of local roads within the vicinity of the Site benefit from height, width and weight restrictions to restrict the use of these roads by large vehicles accessing the A1 and M1. The large vehicles will only be permitted to use A Class roads to access the A1 and M1, as shown in Appendix H.
- 6.12 Access to the site by large vehicles will be restricted to the between 07:00 and 19:00 (Monday to Friday) and between 08:00 and 18:00 (Saturday and Sunday). In addition to the routing strategy that will be used to influence the routes taken by large vehicles, it is also planned to co-ordinate the timing of large vehicle movements with the neighbouring ASOS facility to ensure that any impact on shift change-over at the ASOS facility is minimised.
- 6.13 Peel has agreed to work closely with ASOS to ensure that feedstock deliveries and Energy Centre shift changes work well and will seek to avoid clashes with ASOS shift changes and peak periods of activity. The small number of additional movements proposed for the Energy Centre and the relative flexibility in shift planning for the much smaller workforce at the proposal site (when compared to ASOS) should ensure this is possible to achieve.

Policy Compliance

- 6.14 The National Planning Policy Framework (NPPF), originally published in 2012 and updated in 2018, consolidates previous national planning policy guidance into one document. At the heart of the policy is the presumption in favour of sustainable development that supports economic growth and vibrant communities. NPPF supports development that balances economic, social and environmental gains, while considering local circumstances and opportunities.
- 6.15 Paragraph 109 of NPPF also states that:

'Development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe.'

- 6.16 NPPF does not provide development scale thresholds for the assessment of transport impact or significance. Best practice has typically supported the use of DfT 'Guidance on Transport Assessment'. DfT guidance sets a threshold of development significance of 30 vehicles per hour. Junctions have been included in the assessment where a change in traffic flows will be at or above this threshold. The assessment shows that the Proposed Development will not generate anywhere near this level of traffic, even when the no account is made of the current consent for the Site. As a result, the Proposed Development is found to have an insignificant impact on the surrounding highway network.
- 6.17 The Proposed Development accords with NPPF and provides safe and suitable access for all people and offers opportunities for sustainable trip making. The Proposed Development includes measures that are commensurate with the scale, impact and nature of the proposal to facilitate access by sustainable modes and reduce the impact of large vehicle movements.

7 Conclusions

- 7.1 SK has been instructed by Peel Environmental Limited to prepare a Transport Assessment in support of a Section 73 planning application for an increase in throughput at a consented Energy Centre at Houghton Colliery in Barnsley.
- 7.2 The Site benefits from previous consents for the development of an Energy Centre (150,000tpa timber resource recovery centre), granted in 2015 (ref: 2015/0137), and 10,607sqm of employment units, granted in 2008 and renewed in 2011 (ref: 2008/1426). Both the 2011 and 2015 planning consents have an implemented status.
- 7.3 The Section 73 application seeks to increase the throughput at the centre from 150,000tpa to 260,000tpa. An increase of 110,000tpa. The centre will treat refuse derived fuel. The Proposed Development retains the access arrangements as previously consented from the spur road off the roundabout junction on Park Spring Road.
- 7.4 In November 2017 planning consent was granted for the construction of a 370-space car park on land opposite the existing ASOS facility. This car park has now been constructed for use by ASOS, in addition to the existing 553-space car park located adjacent to the facility. This has been considered within the assessment work.
- 7.5 The Proposed Development is expected to generate very low levels of traffic but in order to ensure opportunities for sustainable trip making are taken up where possible a Framework Travel Plan has been prepared.
- 7.6 The Transport Assessment and Framework Travel Plan include a management strategy for the movement of heavy vehicles to and from the Site.
- 7.7 The assessment examines the changes in traffic flows that will result from the Proposed Development and the impact these vehicles will have on the local highway network. The assessment shows that the Proposed Development will not result in a significant impact on transport networks, when assessed using standard appraisal methods. The operation of the site access junction has been tested using the forecast traffic movements associated with the development, including traffic associated with all the ASOS facility parking areas, and is shown to be suitable.
- 7.8 It is concluded that the proposal meets the requirements of local and national policy, and that the impact of the proposal will not be significant when tested against NPPF.

Appendix A



- NOTE
1. THIS DRAWING IS COPYRIGHT GSDA LTD.
 2. THE CONTRACTOR MUST NOT SCALE FROM THE DRAWING ALL DIMENSIONS TO BE TAKEN FROM DIMENSION STRINGS.
 3. WHERE ANY DISCREPANCIES ARE FOUND BETWEEN DIMENSIONS THESE MUST BE BROUGHT TO THE ATTENTION OF THE ARCHITECTS FOR RESOLUTION.
 4. WHERE DISCREPANCIES EXIST BETWEEN REFERENCE OR ASSEMBLY DRAWINGS & DETAIL DRAWINGS, THE LATTER TAKE REFERENCE.

NORTH

KEY

- Site boundary
- Adjacent site
- 2.5m wide hedge/tree line perimeter
- For details of proposed landscaping and planting please refer to PL036-37

A	150130	Issued for planning
-	150123	Issued for planning

FOR INFORMATION

GSDA
 Highlands House, Office 101A, 105 The Broadway, Wimbledon, London, SW19 1NE
 T: 020 8544 8085

HOUGHTON MAIN REC PROJECT		
Proposed Site Layout DRAWING		
1:500@A1	150130	DATE
1:1000@A3		
1313_PL003	A	GS
DWG. NO.	REVISION	CHECKED

Appendix B

Houghton Main Energy Centre
Section 73 Application
Framework Travel Plan
181102/SK21847/FTP01(-02)

Contents

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1 Introduction	1
2 Audit	3
3 Management	8
4 Toolkit	8
5 Monitoring	10

Plans

- 1 Large Vehicle Movement Strategy

Project	Document	Rev	Notes	Authorised by	Signed	Date
SK21847	FTP01	00	-	L Speers	LGS	14/09/2018
SK21847	FTP01	01	Updated delivery hours & staff shifts	L Speers	LGS	23/10/2018
SK21847	FTP01	02	Final	L Speers	LGS	02/11/2018

1 Introduction

Background

- 1.1 SK has been instructed by Peel Environmental Limited to update the Framework Travel Plan for the Energy Centre at Houghton Colliery in Barnsley to support a Section 73 planning application. The Section 73 application seeks to allow an increase in refuse derived fuel (RDF) feedstock import at the consented Energy Centre.
- 1.2 The Site is brownfield land and is allocated as an 'Employment Policy Area and an 'Area of Investigation for Potential Employment Development' in Barnsley Metropolitan Borough Council's (BMBC) current Statutory Development Plan (UDP Saved Policies).
- 1.3 The Site is located on the south side of the A6195 Park Spring Road, west of the settlements of Little Houghton and Great Houghton and north of Darfield. The Site is accessed from an existing roundabout junction on Park Spring Road.
- 1.4 This Framework is an update to the document prepared in support of the 2015 energy centre planning application.

Proposed Development

- 1.5 The Site benefits from a previous consent for the development of an Energy Centre (150,000tpa timber resource recovery centre), granted in 2015 (ref: 2015/0137), and 10,607sqm of employment units, granted in 2008 and renewed in 2011 (ref: 2008/1426). Both the 2011 and the 2015 planning consents have an implemented status. By virtue of these consents the principle of developing employment uses on the Site has been established and the suitability of the highway network to serve employment uses on the Site set. The previous consents form the baseline position against which the current Proposed Development will be assessed.
- 1.6 The Section 73 application seeks, inter alia, to increase the throughput of RDF to be treated at the centre from 150,000tpa consented in 2015 to 260,000tpa, an increase of 110,000tpa.
- 1.7 The centre will now treat RDF. The consented access arrangements are retained from the spur road off the roundabout junction on Park Spring Road.
- 1.8 From a transport and access perspective, the layout is the same as the consented energy centre. The layout is attached as Appendix A of the Transport Assessment.
- 1.9 In line with the consented scheme for the Site, access will still be taken from the existing spur on the Houghton Main Colliery Roundabout.
- 1.10 Parking is provided at a level required to meet the operational needs of the facility. In line with this, 12 parking spaces are provided, including two disabled spaces. A cycle shelter is provided with three cycle stands (six spaces).

Operation

- 1.11 The facility will have the capability to deal with 260,000tpa of import waste material, an increase of 110,000tpa when compared to the consented centre. The facility will generate approximately 52,000tpa export material (ash). The facility will operate continuously throughout the year between Monday and Sunday, with a presumed average four weeks of downtime for maintenance.
- 1.12 Heavy vehicle movements will occur between 07:00 and 19:00 Monday to Friday and between 08:00 and 18:00 on Saturday and Sunday.
- 1.13 The Energy Centre will employ 20 staff, including four management staff and 16 shift staff. A maximum of four shift staff will be on Site at any one time. The facility will operate three 8 hour shifts per day (08:00 to 16:00, 16:00 to 24:00 and 00:00 to 08:00, or similar to accommodate shift change-over at the neighbouring ASOS facility). Management staff will work between 08:00 and 17:00.

- 1.14 Full details of the traffic forecast associated with the energy centre and the changes that will occur as a result of the Section 73 application are provided in Section 3 of the Transport Assessment.

Travel Plan Structure

- 1.15 The Framework Travel Plan outlines policy interventions and measures that are commensurate with the scale and impact of the Proposed Development. In summary, the following information is included in the plan:
- Information on existing transport services to the Site and travel patterns
 - Proposed Development measures included to reduce car use and manage large vehicle movements
 - Identification of a travel plan co-ordinator
 - Mechanisms for monitoring and reviewing the travel plan

Process

- 1.16 A Travel Plan is a tool for managing access to a development that aims to promote access by sustainable modes. It contains a package of measures designed to meet the objective to reduce the environmental impact of a development by supporting sustainable modes of transport and outlining measures that will build on the good location of the Proposed Development.
- 1.17 The Travel Plan process is not a one-off, static event, but a constantly evolving strategy that should grow and adapt to meet the travel patterns and needs of the end users of the Proposed Development. As such, this Framework sets out the existing accessibility level of the Site, the transport strategy that has been developed to serve the Proposed Development, and promotional measures that will be considered for adoption on occupation.

Benefits

- 1.18 Travel Plans result in a variety of benefits to the occupiers of a development and the wider community, including:
- Promoting active and healthy lifestyles
 - Reducing road safety and congestion issues
 - Reducing single occupancy car trips
 - Reducing carbon emissions and improving local air quality issues
 - Reducing the impact of large vehicle movements

Objectives

- 1.19 The principal aim of a Travel Plan is to reduce the environmental effects of transport associated with new developments, particularly those associated with the private car such as air quality and vehicle emissions. There are also secondary benefits to the introduction of Travel Plans, which include improvements to quality of life, reduction in congestion, improvements to health, travel cost savings and improvements to road safety. The Travel Plan will also consider the co-ordination required to ensure that shift change-overs at the Site and ASOS minimise potential impacts.
- 1.20 Initial key aims of the Framework Travel Plan are set as follows:
- To provide clear guidance on the methods to be used to assess the impact of the travel plan
 - To develop a toolkit of strategy measures to complement the site operation and location
 - To outline the strategy for monitoring and reviewing the plan

1.21 This Framework includes an initial package of measures to be taken forward by the travel plan co-ordinator upon occupation of the development. The key objectives of framework have been initially set as:

- Reducing single occupancy car use
- Promoting access by public transport
- Promoting suitable HV routes and delivery/export times

2 Audit

Location

2.1 The Site forms part of the disused Houghton Main Colliery. Figure 2.1 shows that the Site is located on the westside of the A6195 Park Spring Road, just over 1km of the settlements of Little Houghton and Great Houghton, some 6.5km from the centre of Barnsley and 1.5km from Darfield.



Figure 2.1: Site Location

2.2 Vehicle access to the Site is available via an existing roundabout on Park Spring Road, known as the Houghton Main Colliery Roundabout. The junction also provides access to the ASOS Fulfilment Centre on the eastern side of Park Spring Road and the ASOS supplementary car park to the western side.

Local Highway Network

2.3 The A6195 Park Spring Road is a single carriageway road subject to the national speed limit. The road is of good construction and is of a high standard. The route is a bus corridor with typical service provision of two buses per hour in each direction during the day. Bus stops with good standard shelters are located on Park Spring Road adjacent to the site, footway connections to these are provided from the Houghton Main Colliery Roundabout.

2.4 The Site relates well to the strategic highway network, with both the A1(M) and M1 approximately 9km to the east and west of the site, respectively. Access to strategic routes and the local area can be gained via the A6195 and other A class routes including the A635 which routes east-west

between the M1 and A1(M) via Barnsley town centre and meets the A6195 at the Cathill Roundabout some 2.5km south-east of the site.

- 2.5 The Cathill Roundabout connects the A6195 with the A635, the Broomhill Roundabout is the next junction to the south on the A6195, 2km south of the Cathill Roundabout, and provides access to Broomhill via Highgate and areas of Brampton and Wath Upon Dearne via Manvers Way.
- 2.6 The Site is well located for access by heavy vehicles, with immediate highway access routes of good standard and construction. The Site already benefits from a live consent for an energy centre, with associated heavy vehicle movements, and adjacent land uses have similar large vehicle access requirements as the proposal. The previous consent included a commitment to introducing a large vehicle routing strategy. This has been retained in the current Proposed Development.
- 2.7 There are a number of locations where height, width and weight restrictions are in place on local roads to minimise large vehicle impacts on local amenity levels. A large vehicle routing strategy is proposed for the Site and is detailed later in this Framework.
- 2.8 The DfT accident database has been reviewed to allow an understanding of the road safety patterns over the most recent three-year period available, on the roads immediately serving the Site. The accident data is included in Appendix D of the Transport Assessment.
- 2.9 The accident data shows that there has been a single accident at the Houghton Colliery Roundabout during the period assessed. The accident occurred within the ASOS entrance at 02:15 in the morning. It involved a pedestrian stood in the carriageway, but not crossing. The accident was classified as slight.
- 2.10 While all accidents are regrettable, the very low frequency and slight severity of accidents immediately adjacent to the Site does not indicate a prevailing safety issue.

Access on Foot

- 2.11 Two-thirds of all journeys in the UK are under-five miles and short distance trips offer the greatest opportunity for changes in travel behaviour. DfT best practice guidance states that walking has the potential to substitute for car trips under 2km, which equates to a 25-minute walk.
- 2.12 Figure 2.2 shows 25-minute walking isochrones from the Proposed Development, based on a walking speed of 4.8kph.

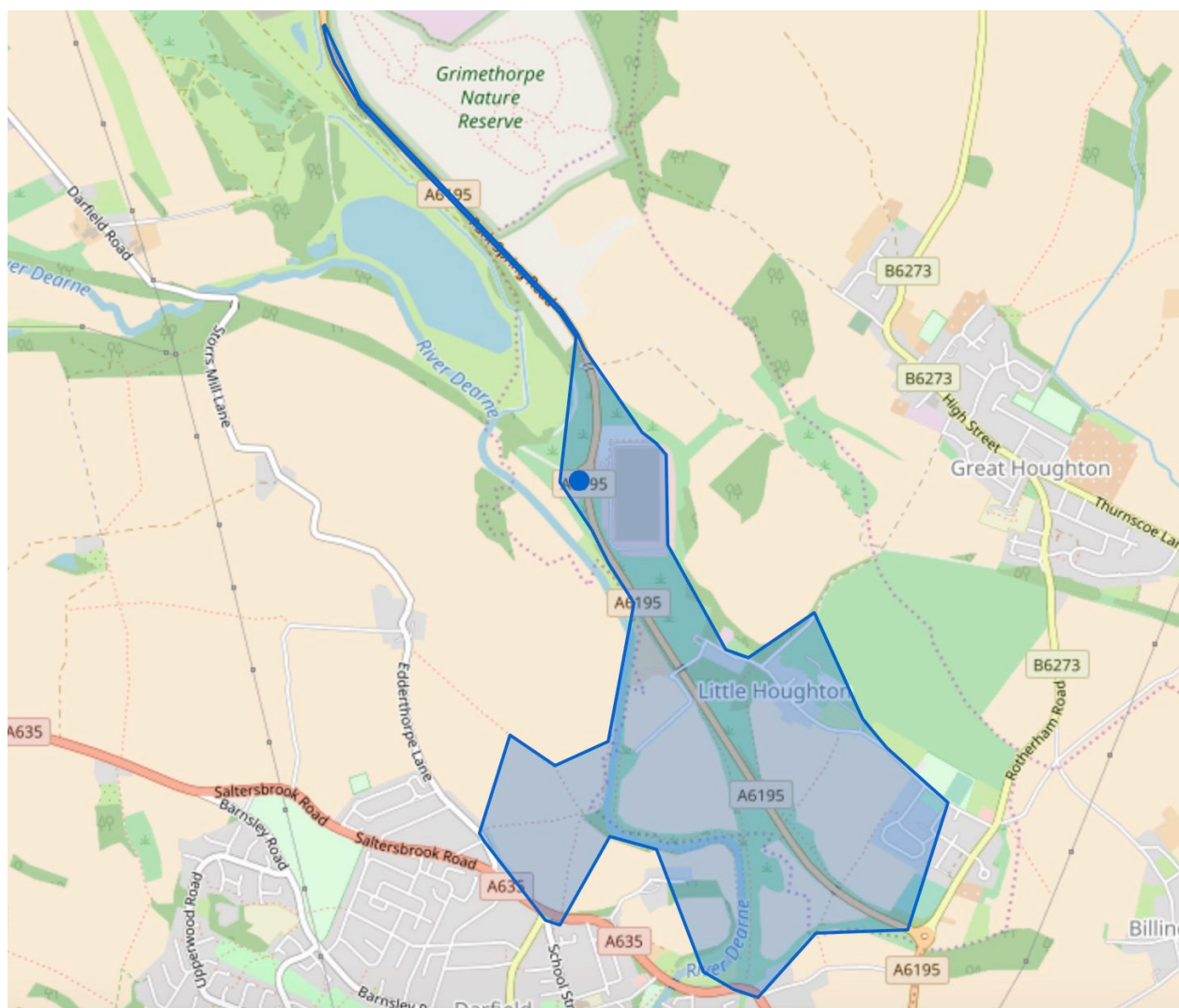


Figure 2.2: 25 Minute Walking Isochrones

- 2.13 The settlements of Little Houghton lie within the accepted maximum walking distance of 2km for commuting trips and footways are present connecting to this area.
- 2.14 The northern part of Darfield is also within 2km of the site and footpath connections are again present between Darfield and the A6195 via Ings Lane, to the south of the Site.
- 2.15 Given the limited population within an acceptable walking distance of the Site it is considered that walking is unlikely to make a significant contribution to travel to the site, but routes are available from the nearest settlement areas.
- 2.16 The suitability of the Site as an employment destination has been previously accepted by BMBC when considering the previous planning consents.

Access by Bike

- 2.17 The section of Park Spring Road between the site access junction and Ings Lane is designated as part of the local cycle network with a cycle connection available to Middlecliff Lane. To the north of the site further off-road cycle connections are available from the A6195 to Great Houghton and Cudworth.
- 2.18 National cycle network routes 62 and 67 run to the west and south of the site.
- 2.19 Cycling England recommends 8km as a maximum cycling distance in the document 'Integrating Cycling into Development Proposals' and the CIHT document 'Planning for Cycling' states that cycling has the potential to substitute for car trips under five miles (8km). Figure 2.3 shows an 8km cycling catchment from the Site.

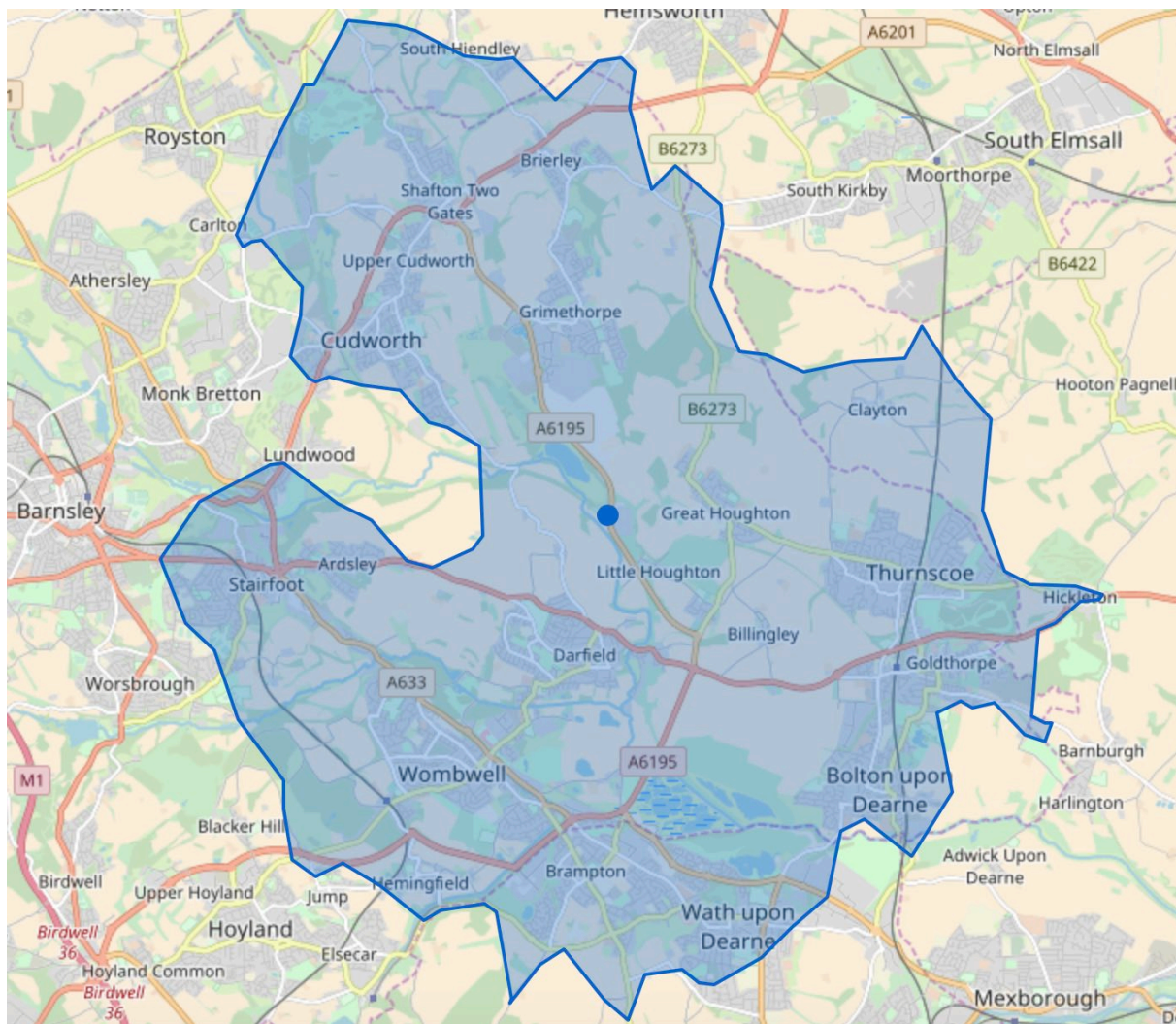


Figure 2.3: 8km Cycling Catchment

- 2.20 Figure 2.3 shows that the communities of Little Houghton, Great Houghton, Thurnscoe, Bolton upon Dearne, Wombwell, Cudworth and Stairfoot are all within an acceptable cycle distance of the Site.
- 2.21 The suitability of the Site as an employment destination has been previously accepted by BMBC when considering the previous planning consents.

Access by Public Transport

- 2.22 Bus stops are available on both sides of Park Spring Road adjacent to the Site. These are of a good standard with shelters, timetable information and footway connections. Figure 2.4 shows the bus services that provide access to the Site.

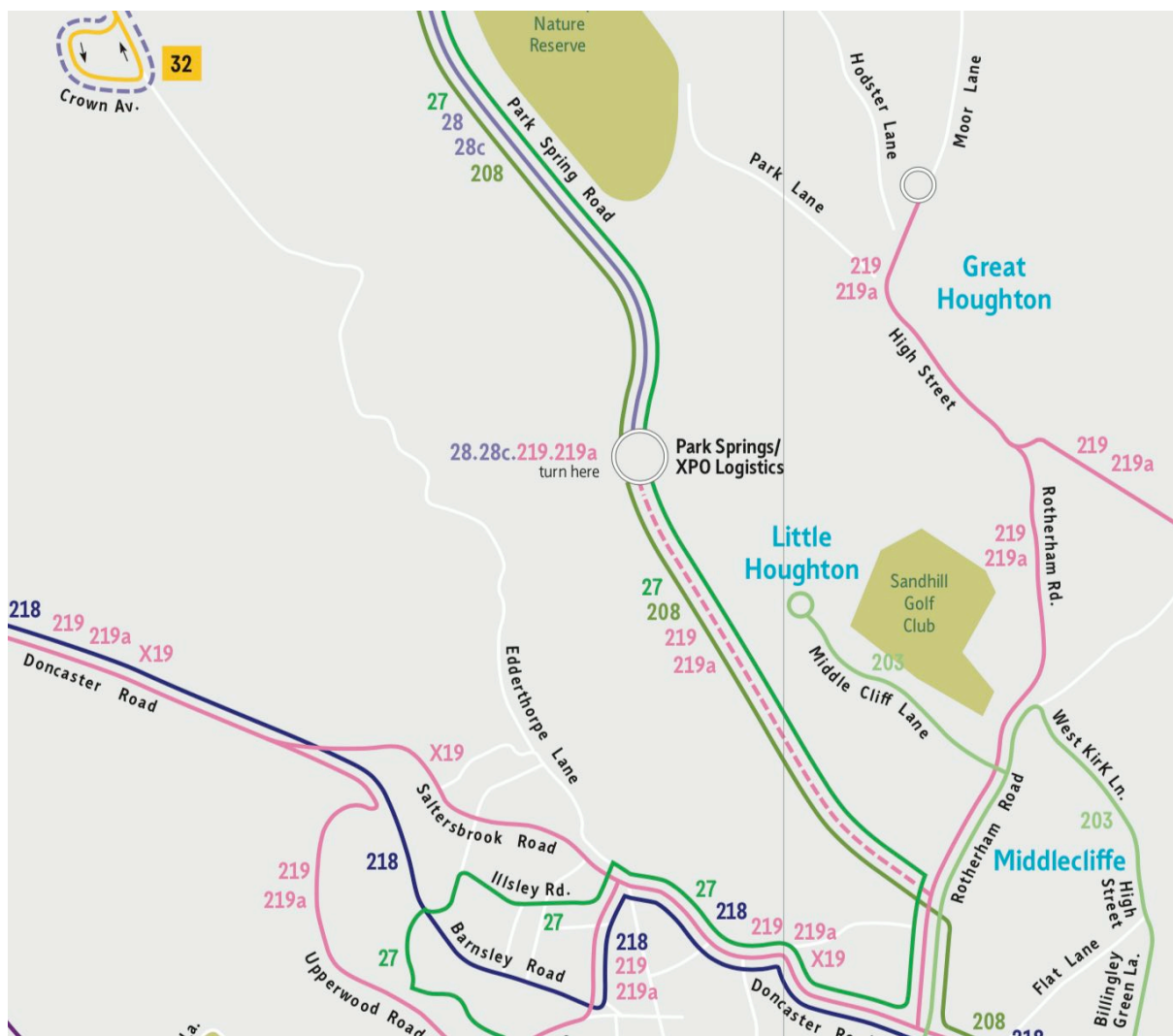


Figure 2.4: Existing Bus Routes

2.23 A number of bus services currently use the stops adjacent to the Site. These are summarised in Table 2.1.

No.	Route	One-way Frequency (per hour)			
		AM	Daytime	PM	Evening
27	Barnsley - Shafton - Grimethorpe - Wombwell	1	2	2	1
28/28c	Barnsley - Cudworth - Brierley - Hemsworth - Pontefract	1	1	1	1
208	Rotherham - Swinton - Mexborough - Billingley - Grimethorpe	3 per day: 1 early morning, 1 mid-afternoon and 1 late evening			
219/219a	Barnsley - Ardsley - Great Houghton - Barnburgh - Doncaster	2 early morning and 2 late evening			

Table 2.1: Local Bus Services

2.24 The existing bus services offer a good level of coverage of surrounding residential areas. The timings of the services will likely cover two of the three proposed shift patterns and regular services are available during the day.

- 2.25 The number and frequency of existing bus services currently available offer a realistic option for travel to the Site. This was accepted by BMBC during previous applications for the Site.

3 Management

Travel Plan Co-ordinator

- 3.1 An effective Travel Plan needs a clear hierarchy of responsibility. Travel Plan Co-ordinators play an important role in developing the Plan.
- 3.2 Three months prior to the occupation of the Proposed Development, the applicant will identify the Travel Plan Co-ordinator and issue contact details to BMBC. The contact details will also be included in the travel pack for staff.
- 3.3 The Travel Plan Co-ordinator will be responsible for the day-to-day running of the Travel Plan and will also develop, implement and monitor the Travel Plan's effectiveness. The Co-ordinator will form the main point of contact for the local authority, staff and the local community.
- 3.4 In summary, the Travel Plan Co-ordinator's main responsibilities are to:
- Encourage the use of sustainable modes of travel
 - Liaise with relevant third parties, such as BMBC and bus operators
 - Promote the Travel Plan to staff and provide updates, as required
 - Provide point of contact for staff
 - Raise awareness of local and national travel campaigns
 - Monitor the success of the Travel Plan
 - Manage parking space allocation

4 Travel Toolkit

Marketing & Promotion

- 4.1 Good communication is a vital component of the Travel Plan to ensure that staff are fully aware of the travel options available to them.
- 4.2 All new staff will be provided with a travel pack on initial appointment. The travel pack will include information on sustainable travel modes, including information on public transport routes and frequencies.
- 4.3 A travel noticeboard will be maintained in a prominent location within the development. This board will contain information sustainable transport routes, local initiatives and Travel Plan updates. The board will be maintained by the Travel Plan Co-ordinator.
- 4.4 The Travel Plan Co-ordinator will also promote local and national travel campaigns, such as the initiatives in Table 4.1.

Initiative	Date	Details	Contact
Big Pedal	March	UK's biggest cycle/scoot to school event organised by Sustrans	www.bigpedal.co.uk
National Walking Month	May	Living Streets' initiative to encourage people to take to their feet	www.livingstreets.org.uk
Walk to Work Week	May	Raising awareness of benefits for walking to school and work	www.livingstreets.org.uk
World Environment Day	June	A global day for positive environmental action	www.unep.org
Bike Week	June	Promoting how cycling can be part of everyday life	www.bikeweek.org.uk
Green Transport Week	June	Raising awareness of the impact of travel to make people think about the way they travel	www.eta.co.uk/trust/green-transport-week
Cycle to Work Day	Sept	Aims to encourage everyone to take two wheels to work for just one day	www.cycletoworkday.org
European Mobility Week	Sept	European festival promoting sustainable transport and raising awareness of issues with the private car	www.mobilityweek.eu
World Car Free Day	Sept	Encourage people to live a day without using their cars	www.worldcarfree.net
National Liftshare Week	Oct	Encourage people to car share	www.liftshare.com
National Commute Smart Week	Nov	Raising awareness of smarter working practices	www.workwiseuk.org
Road Safety Week	Nov	Annual community event aimed at inspiring people to promote road safety	www.roadsafetyweek.org.uk

Table 4.1: Local & National Travel Plan Campaigns

Walking & Cycling

- 4.5 The Proposed Development is accessible on foot and by bike. The Proposed Development includes a cycle shelter with three stands (parking for six bikes).
- 4.6 Information on local walking and cycling route information resources will be provided to staff in the travel pack and on the travel noticeboard. In addition, website links will be provided to [Walkit](#) and [CycleStreets](#) journey planning software.
- 4.7 The Travel Plan Co-ordinator will also promote [WalkBudi](#) and [BikeBudi](#) as a method of encouraging personal safety for staff travelling after dark.
- 4.8 BMBC also offer free cycle training sessions for adults. These cycle training sessions will be promoted to by the Travel Plan Co-ordinator and information relating to this will also be included in the travel pack.

Public Transport

- 4.9 The Proposed Development is accessible by bus.
- 4.10 Public transport information will be provided to staff in the travel pack and on the staff noticeboard. Staff will be encouraged to use the [Travel South Yorkshire Journey Planner](#). Information will also be provided on season ticketing arrangements that are available for travel around the area.

Efficient Car Use

- 4.11 The Travel Plan Co-ordinator will set up a simple car share database or promote [Liftshare](#) to encourage, where shift patterns permit, staff to car share. Staff who car share will be offered priority parking spaces.

Heavy Vehicle Strategy

- 4.12 The Transport Assessment soundly demonstrates that the increase in large vehicle traffic associated with the Section 73 application is minimal. It is also shown that the total level of large vehicle traffic generated by the entire energy centre will not be substantial and will not have a noticeable effect on the operation of the junctions in the study area during the network peak hours. Notwithstanding this, a large vehicle route strategy has been developed for the site and it is planned to co-ordinate the timing of large vehicle movements with the neighbouring ASOS facility to ensure any impact at shift change-over at the ASOS facility is minimised.
- 4.13 The local highway network already has in place height, weight and width restrictions to prevent large vehicles using inappropriate routes to access the A1 and M1. The location of these restrictions is shown on Plan 1.
- 4.14 Access to the site by large vehicles will be restricted to the between 07:00 and 19:00 (Monday to Friday) and between 08:00 and 18:00 (Saturday and Sunday).
- 4.15 It is planned to coordinate the timing of large vehicle movements with the neighbouring ASOS facility to ensure any impact on shift change-over at the ASOS facility is minimised.
- 4.16 The large vehicles will only be permitted to use A Class roads to access the A1 and M1, as shown Plan 1.

5 Monitoring

Travel Surveys

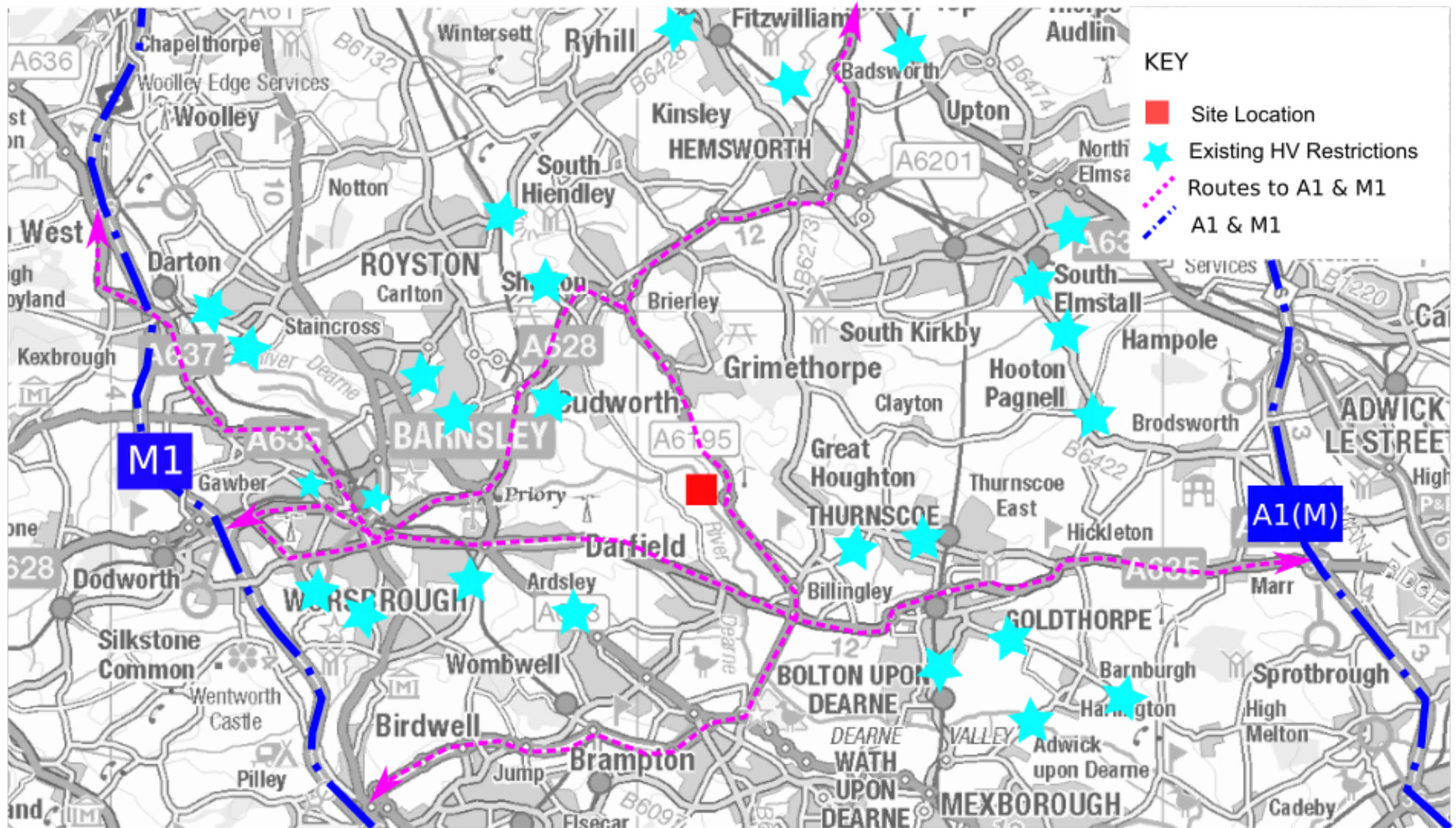
- 5.1 The best way to establish the effectiveness of a Travel Plan and parking demand is to survey the behaviour of staff when the Proposed Development is occupied. The travel surveys will enable the baseline travel choices of staff to be established and against this the success of the measures in the Plan can then be assessed.
- 5.2 The travel surveys will be undertaken within six months of the Proposed Development being occupied and the results from the survey will be then used to set the targets for the plan and to update the measures, if required.

Target Setting

- 5.3 For the effectiveness of the Travel Plan to be established it is important that specific and measurable targets are set and subsequently monitored on a regular basis. It is not possible to set quantifiable targets at the Framework stage of the Travel Plan.
- 5.4 In the meantime, the following action-based targets have been set for the Framework:


1. To appoint the Travel Plan Co-ordinator three months prior to occupation

2. To produce the travel packs ready for issue on initial occupation of the Proposed Development
3. To prepare a travel noticeboard on initial occupation of the Proposed Development



- KEY**
- Site Location
 - ★ Existing HV Restrictions
 - - - Routes to A1 & M1
 - - - A1 & M1

Note: Existing HV restrictions taken from Freight Journey Planner

	SK Transport Planning Ltd Albion Wharf Manchester M1 5LN www.sktransport.co.uk 0161 234 6509		Ref. SK218477_PL01	Project Houghton Main Energy Centre	Rev. 0
	Scale NTS	Date 23.10.18	Drawn KT	Check LS	
	Title PLAN 1: Large Vehicle Movement Strategy				

Appendix C

4 DEVELOPMENT PROPOSALS

4.1 Proposal

- 4.1.1 Whilst the 4,000 staff at the 70,605sqm B8 warehouse displays a lower than average car use by their 4,000 staff, the previous survey suggests that during the AM shift 561 cars could be on site and the cross over to the PM shift would see another 510 cars. To enable operational flexibility during this period (and also the crossovers between the PM shift, the night shift and subsequent AM shift) further parking capacity is required and to ensure there is no overspill on to the highway network at these times.
- 4.1.2 The existing car park for the entire ASOS site has the capacity for 553 cars including 12 disabled cars and an element dedicated to car sharing, 50 cycles at the aforementioned secure and covered cycle park and 20 motorcycles.
- 4.1.3 The proposals are to provide this extra capacity through a new 370 spaces car park on land to the north west of the existing roundabout access as shown by the Drawing 6057-001 in **Appendix C**.
- 4.1.4 The proposal will allow for an effective parking management scheme to be implemented in the area.

4.2 Parking Standards

- 4.2.1 The Barnsley Metropolitan Borough Council (BMBC) Supplementary Planning Document (SPD) to the Local Development Framework (LDF) 'Parking', adopted March 2012, considers that for a B8 use a maximum 1 parking space per every 3 employees is appropriate the proposals provide less than 1 space per 4 employees and are below this maximum standard and therefore considered compliant.

4.3 Trip Attraction/Generation

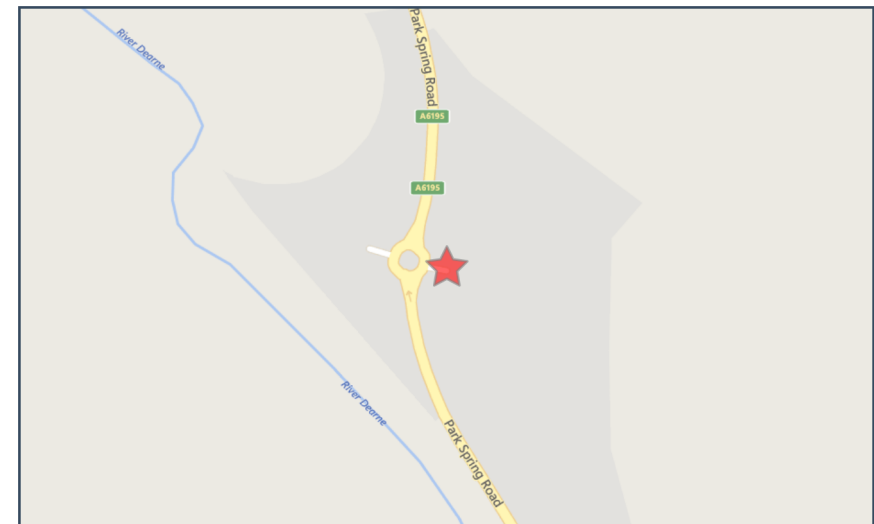
- 4.3.1 As stated above the proposals are not expected to result in an increase of staff numbers and therefore existing car borne trips will not increase and there will be no net impact.
- 4.3.2 Nothing directly influencing the demonstrated sustainable travel behaviour of employees will change.
- 4.3.3 As has been demonstrated ASOS already encourage sustainable travel behaviour by their employees providing secure cycle storage, showering, changing, locker facilities and actively promote car share and cycle to work schemes. Furthermore those trips do not occur during the traditional AM and PM peak hours.

Appendix D



Crash Date: Friday, October 21, 2016 **Time of Crash:** 2:15:00 AM **Crash Reference:** 2016140122926

Highest Injury Severity:	Slight	Road Number:	U0	Number of Casualties:	1
Highway Authority:	Barnsley			Number of Vehicles:	2
Local Authority:	Barnsley Metropolitan Borough			OS Grid Reference:	441810 406352
Weather Description:	Unknown				
Road Surface Description:	Dry				
Speed Limit:	30				
Light Conditions:	Darkness: street lights present and lit				
Carriageway Hazards:	None				
Junction Detail:	Not at or within 20 metres of junction				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Not Applicable				



For more information about the data please visit: www.crashmap.co.uk/home/aboutthedata and www.crashmap.co.uk/home/definitions



Vehicles involved

Vehicle Ref	Vehicle Type	Vehicle Age	Driver Gender	Driver Age Band	Vehicle Maneouvre	First Point of Impact	Journey Purpose	Hit Object - On Carriageway	Hit Object - Off Carriageway
1	Good vehicles of unknown weight	-1	Unknown	Unknown	Vehicle is parked in the carriageway	Nearside	Other	None	None
2	Van or goods vehicle 3.5 tonnes mgw and under	4	Male	26 - 35	Vehicle is parked in the carriageway	Offside	Other	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Pedestrian	Male	26 - 35	In carriageway, not crossing	Unknown or other

For more information about the data please visit: www.crashmap.co.uk/home/aboutthedata and www.crashmap.co.uk/home/definitions

Appendix E

Houghton Main Colliery: Comparison of Survey Flows

2014 Surveyed Access Flows (in pcu)

	AM Peak: 7.30am- 8.30am				PM Peak: 4.15pm-5.15pm			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	0	26	398	0	0	12	503	0
ASOS	12	0	14	0	26	0	39	0
A6195 S	471	35	0	0	543	10	0	0
Access	0	0	0	0	0	0	0	0

2018 Surveyed Access Flows (in pcu)

	AM Peak: 7.30am- 8.30am				PM Peak: 4.30pm- 5.30pm			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	6	29	370	6	11	9	541	0
ASOS	12	0	27	2	15	0	28	0
A6195 S	496	77	8	3	526	6	0	1
Access	0	1	2	0	3	3	3	1

Net Change (2018-2014)

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	6	3	-28	6	11	-3	38	0
ASOS	0	0	13	2	-11	0	-11	0
A6195 S	25	42	8	3	-17	-4	0	1
Access	0	1	2	0	3	3	3	1

Change	
AM Peak	82
PM Peak	14

2014 Surveyed Flows (in pcu): Rotherham Road/Doncaster Road

	AM Peak: 7.30am- 8.30am				PM Peak: 4.45pm-5.45pm			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	132	437	46	0	172	523	116
A635 E	214	0	523	510	192	0	561	661
A6195 S	510	521	0	103	580	323	0	173
A635 W	59	540	219	0	60	476	140	0

2018 Surveyed Flows (in pcu): Rotherham Road/Doncaster Road

	AM Peak: 7.30am- 8.30am				PM Peak: 4.45pm-5.45pm			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	124	390	71	0	192	498	116
A635 E	177	10	539	471	208	1	555	528
A6195 S	511	270	0	88	531	367	0	127
A635 W	34	553	200	0	75	425	147	0

Net Change (2018-2014)

	AM Peak				PM Peak			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	-8	-47	25	0	20	-25	0
A635 E	-37	10	16	-39	16	1	-6	-133
A6195 S	1	-251	0	-15	49	44	0	-46
A635 W	-25	13	-19	0	15	-51	7	0

Change	
AM Peak	-374
PM Peak	-207

Automatic Traffic Count (Springfield Road South)

	2014		2018		Net Change (2018-2014)	
	Tues AM	Tues PM	Tues AM	Tues PM	Tues AM	Tues PM
Northbound	433	505	434	520	1	15
Southbound	396	483	398	462	2	-21
Total	829	988	832	982	3	-6

Automatic Traffic Count (Comparison of Weekday & Weekend Flows)

	2018	
	Weekday Average	Weekend Average
Northbound	6922	4691
Southbound	6590	4691
Total	13512	9382

Appendix F

Houghton Main Colliery: Weekday Assessment Traffic TEMPRO 2018-2023 AM 1.053 PM 1.067

2018 Site Access Flows (in pcu)

	AM Peak 7.30am-8.30am				PM Peak 4.30pm-5.30pm			
	A6195 N	A6195 S	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	8	29	370	0	11	0	541	0
ASOS	12	0	27	2	15	0	28	0
A6195 S	46	17	8	3	228	6	0	1
Access	0	1	2	0	3	3	0	1

2023 Site Access Background Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	3	31	394	0	12	10	577	0
ASOS	13	0	29	2	16	0	30	0
A6195 S	528	82	9	3	561	6	0	1
Access	0	1	2	0	3	3	0	1

Site Access TRRC Consented Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	0	0	0	0	0	0	0	0
ASOS	0	0	0	0	0	0	0	0
A6195 S	0	0	0	0	0	0	0	0
Access	0	0	0	0	0	0	0	0

Site Access ASOS Car Park Adjustment Main CP 553 New CP 370 Factor 40%

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	8	12	394	13	12	4	577	2
ASOS	8	0	15	2	8	0	15	0
A6195 S	528	46	9	3	561	3	0	1
Access	0	0	14	0	10	1	15	0

2023 Site Access Base Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	8	12	394	23	12	4	577	4
ASOS	8	0	15	2	8	0	15	0
A6195 S	528	46	9	3	561	3	0	1
Access	0	0	16	0	12	1	16	0

Site Access Development Distribution

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	0%	0%	0%	0%	0%	0%	0%	0%
ASOS	0%	0%	0%	0%	0%	0%	0%	0%
A6195 S	40%	0%	0%	11%	0%	0%	0%	11%
Access	0%	0%	11%	0%	49%	0%	11%	0%

Site Access Development Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N				7				2
ASOS								
A6195 S				7				2
Access	5		5		5		5	

Site Access Net Change from Consented TRRC (in pcu)

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	0	0	0	2	0	0	0	1
ASOS	0	0	0	0	0	0	0	0
A6195 S	0	0	0	2	0	0	0	2
Access	2	0	2	0	2	0	2	0

Net Change Summary

	Consented TRRC (in pcu)		Proposed (in pcu)		Net Change (in pcu)	
	AM	PM	AM	PM	AM	PM
Site Access	14	6	24	13	9	7
Rotherham Rd/Doncaster Rd	7	3	12	7	5	4
Manvers Rd/Highgate	3	1	5	3	2	2

2023 Site Access Base & Development Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	ASOS	A6195 S	Access	A6195 N	ASOS	A6195 S	Access
A6195 N	8	31	394	13	12	10	577	2
ASOS	13	0	29	2	16	0	30	0
A6195 S	528	82	9	3	561	6	0	1
Access	0	1	7	0	6	3	6	1

2018 Rotherham Road/Doncaster Road Flows (in pcu)

	AM Peak 7.30am-8.30am				PM Peak 4.30pm-5.30pm			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	124	390	71	0	192	498	116
A635 E	127	357	539	471	208	565	528	448
A6195 S	511	270	0	88	537	367	0	127
A635 W	34	953	200	0	76	425	147	0

2023 Rotherham Road/Doncaster Road Background Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	132.9972	415.467	75.6963	0	204.8064	531.2166	123.7372
A635 E	188.5581	10.653	574.1967	501.7563	221.8736	0.0667	592.0185	563.2176
A6195 S	544.3683	287.631	0	93.7454	566.4177	391.4789	0	135.4709
A635 W	36.2202	589.1109	213.06	0	80.0025	453.3475	156.8549	0

Rotherham Road/Doncaster Road TRRC Consented Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	1	1	1	0	1	1	1
A635 E	1	0	0	0	0	0	0	0
A6195 S	2	0	0	0	0	0	0	0
A635 W	1	0	0	0	0	0	0	0

2023 Rotherham Road/Doncaster Road Base Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	133	417	76	0	206	532	125
A635 E	190	31	574	502	222	1	592	563
A6195 S	546	288	0	94	566	391	0	135
A635 W	38	589	213	0	80	453	157	0

Rotherham Road/Doncaster Road Development Distribution

	AM Peak				PM Peak			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0%	12%	22%	16%	0%	12%	22%	16%
A635 E	12%	0%	0%	0%	12%	0%	0%	0%
A6195 S	22%	0%	0%	0%	22%	0%	0%	0%
A635 W	16%	0%	0%	0%	16%	0%	0%	0%

Rotherham Road/Doncaster Road Development Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	1	1	0	0	1	2	0	0
A635 E	2	0	0	0	0	0	0	0
A6195 S	3	0	0	0	1	0	0	0
A635 W	2	0	0	0	1	0	0	0

Rotherham Road/Doncaster Road Net Change from Consented TRRC (in pcu)

	AM Peak				PM Peak			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	1	1	1	0	0	1	1
A635 E	1	0	0	0	0	0	0	0
A6195 S	1	0	0	0	1	0	0	0
A635 W	1	0	0	0	0	0	0	0

Rotherham Road/Doncaster Road Base & Development Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A635 E	A6195 S	A635 W	A6195 N	A635 E	A6195 S	A635 W
A6195 N	0	133	418	77	0	206	533	125
A635 E	190	31	574	502	222	1	592	563
A6195 S	548	288	0	94	567	391	0	135
A635 W	38	589	213	0	81	453	157	0

2018 Manvers Road/Highgate Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A633	A6195 S	Highgate	A6195 N	A633	A6195 S	Highgate
A6195 N	0	596	572	0	0	552	877	20
A633	519	0	432	0	517	0	488	60
A6195 S	862	510	0	0	536	524	0	17
Highgate	13	20	12	0	0	1	0	0

2023 Manvers Road/Highgate Background Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A633	A6195 S	Highgate	A6195 N	A633	A6195 S	Highgate
A6195 N	0	635	609	0	0	588	722	22
A633	553	0	460	0	551	0	518	64
A6195 S	706	544	0	0	678	659	0	18
Highgate	14	21	13	0	0	1	0	0

Manvers Road/Highgate TRRC Consented Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A633	A6195 S	Highgate	A6195 N	A633	A6195 S	Highgate
A6195 N			1				1	
A633								
A6195 S	2				0			
Highgate								

2023 Manvers Road/Highgate Base Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A633	A6195 S	Highgate	A6195 N	A633	A6195 S	Highgate
A6195 N	0	635	610	0	0	588	723	22
A633	553	0	460	0	551	0	518	64
A6195 S	709	544	0	0	678	659	0	18
Highgate	14	21	13	0	0	1	0	0

Manvers Road/Highgate Development Distribution Flows (in pcu)

	AM Peak				PM Peak			
	A6195 N	A633	A6195 S	Highgate	A6195 N	A633	A6195 S	Highgate
A6195 N			22%				22%	
A633								
A6195 S	25%				25%			
Highgate								

Manvers Road/Highgate Development Flows (in pcu)

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Appendix G

Junctions 8
ARCADY 8 - Roundabout Module
Version: 8.0.4.487 [15039,24/03/2014] © Copyright TRL Limited, 2018
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Filename: HMCR.arc8
Path: C:\Users\John\Documents\SKTP\Temp\HMCR
Report generation date: 24/10/2018 15:59:30

- » **HMCR - 2018 Observed, AM**
- » **HMCR - 2018 Observed, PM**
- » **HMCR - 2023 Base, AM**
- » **HMCR - 2023 Base, PM**
- » **HMCR - 2023 with Development, AM**
- » **HMCR - 2023 with Development, PM**

Summary of junction performance

AM					
	Queue (PCU)	Delay (s)	RFC	LOS	Junction Delay (s)
HMCR - 2018 Observed					
Arm A	0.47	3.75	0.32	A	3.60
Arm B	0.04	3.01	0.04	A	
Arm C	0.63	3.54	0.39	A	
Arm D	0.00	0.00	0.00	A	

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Junction LOS and Junction Delay are demand-weighted averages.

- "D1 - 2018 Observed, AM" model duration: 07:15 - 08:45
- "D2 - 2018 Observed, PM" model duration: 16:15 - 17:45
- "D3 - 2023 Base, AM" model duration: 07:15 - 08:45
- "D4 - 2023 Base, PM" model duration: 16:15 - 17:45
- "D5 - 2023 with Development, AM" model duration: 07:15 - 08:45
- "D6 - 2023 with Development, PM" model duration: 16:15 - 17:45

Run using Junctions 8.0.4.487 at 24/10/2018 15:59:27

File summary

Title	Houghton Main Colliery Roundabout
Location	Barnsley
Site Number	
Date	01/08/2018
Version	
Status	
Identifier	
Client	
Jobnumber	SK21847
Enumerator	
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	RFC Threshold	Average Delay Threshold (s)	Queue Threshold (PCU)
5.75			N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	s	-Min	perMin

HMCR - 2018 Observed, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
HMCR	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relatic
2018 Observed, AM	2018 Observed	AM		ONE HOUR	07:15	08:45	90	15				✓		

Junction Network

Junctions

Junction	Name	Junction Type	Arm Order	Grade Separated	Large Roundabout	Do Geometric Delay	Junction Delay (s)	Junction LOS
1	untitled	Roundabout	A,B,C,D				3.60	A

Junction Network Options

Driving Side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Arm	Name	Description
A	A	A6195 (north)	
B	B	ASOS	
C	C	A6195 (south)	
D	D	Site Access	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
A	0.00	99999.00		0.00
B	0.00	99999.00		0.00
C	0.00	99999.00		0.00
D	0.00	99999.00		0.00

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
A	3.65	6.20	5.50	20.00	60.00	21.00	
B	3.65	6.00	5.50	20.00	60.00	18.00	
C	3.65	7.00	9.00	30.00	60.00	15.00	
D	3.65	7.00	5.00	20.00	60.00	19.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Enter slope and intercept directly	Entered slope	Entered intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
A		(calculated)	(calculated)	0.524	1461.301
B		(calculated)	(calculated)	0.527	1465.316
C		(calculated)	(calculated)	0.571	1676.463
D		(calculated)	(calculated)	0.530	1483.340

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
			✓	HV Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)
A	ONE HOUR	✓	411.00	100.000
B	ONE HOUR	✓	41.00	100.000
C	ONE HOUR	✓	584.00	100.000
D	ONE HOUR	✓	3.00	100.000

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
07:15-07:30	A	309.42	309.42		
07:15-07:30	B	30.87	30.87		
07:15-07:30	C	439.67	439.67		
07:15-07:30	D	0.00	0.00		
07:30-07:45	A	369.48	369.48		
07:30-07:45	B	36.86	36.86		
07:30-07:45	C	525.00	525.00		
07:30-07:45	D	0.00	0.00		
07:45-08:00	A	452.52	452.52		
07:45-08:00	B	45.14	45.14		
07:45-08:00	C	643.00	643.00		
07:45-08:00	D	0.00	0.00		
08:00-08:15	A	452.52	452.52		
08:00-08:15	B	45.14	45.14		
08:00-08:15	C	643.00	643.00		
08:00-08:15	D	0.00	0.00		
08:15-08:30	A	369.48	369.48		
08:15-08:30	B	36.86	36.86		
08:15-08:30	C	525.00	525.00		
08:15-08:30	D	0.00	0.00		
08:30-08:45	A	309.42	309.42		
08:30-08:45	B	30.87	30.87		
08:30-08:45	C	439.67	439.67		
08:30-08:45	D	0.00	0.00		

Turning Proportions

Turning Counts / Proportions (PCU/hr) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	6.000	29.000	370.000	6.000
	B	12.000	0.000	27.000	2.000
	C	496.000	77.000	8.000	3.000
	D	0.000	1.000	2.000	0.000

Turning Proportions (PCU) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	0.01	0.07	0.90	0.01
	B	0.29	0.00	0.66	0.05
	C	0.85	0.13	0.01	0.01
	D	0.00	0.33	0.67	0.00

Vehicle Mix

Average PCU Per Vehicle - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	1.000	1.000	1.000	1.000
	B	1.000	1.000	1.000	1.000
	C	1.000	1.000	1.000	1.000
	D	1.000	1.000	1.000	1.000

Heavy Vehicle Percentages - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	0.0	0.0	0.0	0.0
	B	0.0	0.0	0.0	0.0
	C	0.0	0.0	0.0	0.0
	D	0.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Total Queueing Delay (PCU-min)	Inclusive Average Queueing Delay (s)
A	0.32	3.75	0.47	A	377.14	565.71	32.78	3.48	0.36	32.78	3.48
B	0.04	3.01	0.04	A	37.62	56.43	2.74	2.91	0.03	2.74	2.91
C	0.39	3.54	0.63	A	535.89	803.83	43.29	3.23	0.48	43.29	3.23
D	0.00	0.00	0.00	A	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Main Results for each time segment

Main results: (07:15-07:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	309.42	77.36	308.32	385.71	63.78	0.00	1427.88	1051.14	0.217	0.00	0.28	3.212	A
B	30.87	7.72	30.77	79.54	292.57	0.00	1311.04	741.46	0.024	0.00	0.02	2.811	A
C	439.67	109.92	438.24	303.83	19.51	0.00	1665.33	1514.40	0.264	0.00	0.36	2.931	A
D	0.00	0.00	0.00	8.25	449.49	0.00	1245.32	562.50	0.000	0.00	0.00	0.000	A

Main results: (07:30-07:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	369.48	92.37	369.18	461.72	76.35	0.00	1421.30	1051.14	0.260	0.28	0.35	3.421	A
B	36.86	9.21	36.84	95.22	350.32	0.00	1280.58	741.46	0.029	0.02	0.03	2.893	A
C	525.00	131.25	524.60	363.80	23.36	0.00	1663.13	1514.40	0.316	0.36	0.46	3.162	A
D	0.00	0.00	0.00	9.88	538.07	0.00	1198.41	562.50	0.000	0.00	0.00	0.000	A

Main results: (07:45-08:00)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	452.52	113.13	452.04	565.33	93.49	0.00	1412.32	1051.14	0.320	0.35	0.47	3.746	A
B	45.14	11.29	45.11	116.59	428.95	0.00	1239.12	741.46	0.036	0.03	0.04	3.014	A
C	643.00	160.75	642.32	445.45	28.60	0.00	1660.13	1514.40	0.387	0.46	0.63	3.535	A
D	0.00	0.00	0.00	12.10	658.82	0.00	1134.47	562.50	0.000	0.00	0.00	0.000	A

Main results: (08:00-08:15)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	452.52	113.13	452.51	565.92	93.59	0.00	1412.27	1051.14	0.320	0.47	0.47	3.750	A
B	45.14	11.29	45.14	116.71	429.39	0.00	1238.89	741.46	0.036	0.04	0.04	3.015	A
C	643.00	160.75	642.99	445.91	28.63	0.00	1660.12	1514.40	0.387	0.63	0.63	3.538	A
D	0.00	0.00	0.00	12.11	659.50	0.00	1134.11	562.50	0.000	0.00	0.00	0.000	A

Main results: (08:15-08:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	369.48	92.37	369.95	462.66	76.51	0.00	1421.22	1051.14	0.260	0.47	0.35	3.427	A
B	36.86	9.21	36.89	95.41	351.05	0.00	1280.20	741.46	0.029	0.04	0.03	2.897	A
C	525.00	131.25	525.67	364.54	23.40	0.00	1663.11	1514.40	0.316	0.63	0.46	3.168	A
D	0.00	0.00	0.00	9.90	539.17	0.00	1197.84	562.50	0.000	0.00	0.00	0.000	A

Main results: (08:30-08:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	309.42	77.36	309.72	387.33	64.05	0.00	1427.74	1051.14	0.217	0.35	0.28	3.222	A
B	30.87	7.72	30.89	79.88	293.90	0.00	1310.34	741.46	0.024	0.03	0.02	2.815	A
C	439.67	109.92	440.08	305.20	19.59	0.00	1665.28	1514.40	0.264	0.46	0.36	2.938	A
D	0.00	0.00	0.00	8.29	451.38	0.00	1244.32	562.50	0.000	0.00	0.00	0.000	A

Queueing Delay Results for each time segment
Queueing Delay results: (07:15-07:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	4.05	0.27	3.212	A	A
B	0.36	0.02	2.811	A	A
C	5.25	0.35	2.931	A	A
D	0.00	0.00	0.000	A	A

Queueing Delay results: (07:30-07:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	5.17	0.34	3.421	A	A
B	0.44	0.03	2.893	A	A
C	6.78	0.45	3.162	A	A
D	0.00	0.00	0.000	A	A

Queueing Delay results: (07:45-08:00)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	6.91	0.46	3.746	A	A
B	0.56	0.04	3.014	A	A
C	9.25	0.62	3.535	A	A
D	0.00	0.00	0.000	A	A

Queueing Delay results: (08:00-08:15)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	7.04	0.47	3.750	A	A
B	0.57	0.04	3.015	A	A
C	9.44	0.63	3.538	A	A
D	0.00	0.00	0.000	A	A

Queueing Delay results: (08:15-08:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	5.38	0.36	3.427	A	A
B	0.45	0.03	2.897	A	A
C	7.07	0.47	3.168	A	A
D	0.00	0.00	0.000	A	A

Queueing Delay results: (08:30-08:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	4.23	0.28	3.222	A	A
B	0.37	0.02	2.815	A	A
C	5.48	0.37	2.938	A	A
D	0.00	0.00	0.000	A	A

HMCR - 2018 Observed, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
HMCR	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relatio
2018 Observed, PM	2018 Observed	PM		ONE HOUR	16:15	17:45	90	15				✓		

Junction Network

Junctions

Junction	Name	Junction Type	Arm Order	Grade Separated	Large Roundabout	Do Geometric Delay	Junction Delay (s)	Junction LOS
1	untitled	Roundabout	A,B,C,D				3.81	A

Junction Network Options

Driving Side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Arm	Name	Description
A	A	A6195 (north)	
B	B	ASOS	
C	C	A6195 (south)	
D	D	Site Access	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
A	0.00	99999.00		0.00
B	0.00	99999.00		0.00
C	0.00	99999.00		0.00
D	0.00	99999.00		0.00

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
A	3.65	6.20	5.50	20.00	60.00	21.00	
B	3.65	6.00	5.50	20.00	60.00	18.00	
C	3.65	7.00	9.00	30.00	60.00	15.00	
D	3.65	7.00	5.00	20.00	60.00	19.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Enter slope and intercept directly	Entered slope	Entered intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
A		(calculated)	(calculated)	0.524	1461.301
B		(calculated)	(calculated)	0.527	1465.316
C		(calculated)	(calculated)	0.571	1676.463
D		(calculated)	(calculated)	0.530	1483.340

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	HV Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)
A	ONE HOUR	✓	561.00	100.000
B	ONE HOUR	✓	43.00	100.000
C	ONE HOUR	✓	533.00	100.000
D	ONE HOUR	✓	7.00	100.000

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
16:15-16:30	A	422.35	422.35		
16:15-16:30	B	32.37	32.37		
16:15-16:30	C	401.27	401.27		
16:15-16:30	D	5.27	5.27		
16:30-16:45	A	504.33	504.33		
16:30-16:45	B	38.66	38.66		
16:30-16:45	C	479.16	479.16		
16:30-16:45	D	6.29	6.29		
16:45-17:00	A	617.67	617.67		
16:45-17:00	B	47.34	47.34		
16:45-17:00	C	586.84	586.84		
16:45-17:00	D	7.71	7.71		
17:00-17:15	A	617.67	617.67		
17:00-17:15	B	47.34	47.34		
17:00-17:15	C	586.84	586.84		
17:00-17:15	D	7.71	7.71		
17:15-17:30	A	504.33	504.33		
17:15-17:30	B	38.66	38.66		
17:15-17:30	C	479.16	479.16		
17:15-17:30	D	6.29	6.29		
17:30-17:45	A	422.35	422.35		
17:30-17:45	B	32.37	32.37		
17:30-17:45	C	401.27	401.27		
17:30-17:45	D	5.27	5.27		

Turning Proportions

Turning Counts / Proportions (PCU/hr) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	11.000	9.000	541.000	0.000
	B	15.000	0.000	28.000	0.000
	C	526.000	6.000	0.000	1.000
	D	3.000	0.000	3.000	1.000

Turning Proportions (PCU) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	0.02	0.02	0.96	0.00
	B	0.35	0.00	0.65	0.00
	C	0.99	0.01	0.00	0.00
	D	0.43	0.00	0.43	0.14

Vehicle Mix

Average PCU Per Vehicle - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	1.000	1.000	1.000	1.000
	B	1.000	1.000	1.000	1.000
	C	1.000	1.000	1.000	1.000
	D	1.000	1.000	1.000	1.000

Heavy Vehicle Percentages - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	0.0	0.0	0.0	0.0
	B	0.0	0.0	0.0	0.0
	C	0.0	0.0	0.0	0.0
	D	0.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Total Queueing Delay (PCU-min)	Inclusive Average Queueing Delay (s)
A	0.42	4.30	0.73	A	514.78	772.18	49.85	3.87	0.55	49.85	3.87
B	0.04	3.29	0.04	A	39.46	59.19	3.08	3.12	0.03	3.08	3.12
C	0.35	3.35	0.55	A	489.09	733.64	37.86	3.10	0.42	37.86	3.10
D	0.01	3.13	0.01	A	6.42	9.64	0.48	3.00	0.01	0.48	3.00

Main Results for each time segment

Main results: (16:15-16:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	422.35	105.59	420.73	416.51	7.50	0.00	1457.37	1283.07	0.290	0.00	0.41	3.473	A
B	32.37	8.09	32.27	11.25	416.98	0.00	1245.43	629.03	0.026	0.00	0.03	2.967	A
C	401.27	100.32	400.01	428.99	20.26	0.00	1664.90	1490.66	0.241	0.00	0.32	2.843	A
D	5.27	1.32	5.25	1.50	418.76	0.00	1261.59	565.96	0.004	0.00	0.00	2.864	A

Main results: (16:30-16:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	504.33	126.08	503.85	498.57	8.98	0.00	1456.59	1283.07	0.346	0.41	0.53	3.776	A
B	38.66	9.66	38.63	13.47	499.36	0.00	1202.00	629.03	0.032	0.03	0.03	3.093	A
C	479.16	119.79	478.81	513.73	24.25	0.00	1662.62	1490.66	0.288	0.32	0.40	3.041	A
D	6.29	1.57	6.29	1.80	501.27	0.00	1217.91	565.96	0.005	0.00	0.01	2.970	A

Main results: (16:45-17:00)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	617.67	154.42	616.85	610.48	11.00	0.00	1455.54	1283.07	0.424	0.53	0.73	4.287	A
B	47.34	11.84	47.30	16.50	611.36	0.00	1142.93	629.03	0.041	0.03	0.04	3.285	A
C	586.84	146.71	586.28	628.96	29.70	0.00	1659.51	1490.66	0.354	0.40	0.54	3.352	A
D	7.71	1.93	7.70	2.20	613.78	0.00	1158.33	565.96	0.007	0.01	0.01	3.128	A

Main results: (17:00-17:15)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	617.67	154.42	617.66	611.06	11.01	0.00	1455.53	1283.07	0.424	0.73	0.73	4.296	A
B	47.34	11.84	47.34	16.52	612.16	0.00	1142.51	629.03	0.041	0.04	0.04	3.286	A
C	586.84	146.71	586.84	629.77	29.73	0.00	1659.49	1490.66	0.354	0.54	0.55	3.355	A
D	7.71	1.93	7.71	2.20	614.36	0.00	1158.02	565.96	0.007	0.01	0.01	3.128	A

Main results: (17:15-17:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	504.33	126.08	505.13	499.51	9.00	0.00	1456.59	1283.07	0.346	0.73	0.53	3.788	A
B	38.66	9.66	38.70	13.50	500.63	0.00	1201.32	629.03	0.032	0.04	0.03	3.098	A
C	479.16	119.79	479.71	515.02	24.30	0.00	1662.59	1490.66	0.288	0.55	0.41	3.044	A
D	6.29	1.57	6.30	1.80	502.21	0.00	1217.40	565.96	0.005	0.01	0.01	2.974	A

Main results: (17:30-17:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	422.35	105.59	422.84	418.20	7.53	0.00	1457.35	1283.07	0.290	0.53	0.41	3.483	A
B	32.37	8.09	32.40	11.30	419.07	0.00	1244.33	629.03	0.026	0.03	0.03	2.972	A
C	401.27	100.32	401.62	431.12	20.35	0.00	1664.85	1490.66	0.241	0.41	0.32	2.850	A
D	5.27	1.32	5.27	1.51	420.46	0.00	1260.69	565.96	0.004	0.01	0.00	2.866	A

Queueing Delay Results for each time segment
Queueing Delay results: (16:15-16:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	5.95	0.40	3.473	A	A
B	0.39	0.03	2.967	A	A
C	4.66	0.31	2.843	A	A
D	0.06	0.00	2.864	A	A

Queueing Delay results: (16:30-16:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	7.76	0.52	3.776	A	A
B	0.49	0.03	3.093	A	A
C	5.96	0.40	3.041	A	A
D	0.08	0.01	2.970	A	A

Queueing Delay results: (16:45-17:00)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	10.73	0.72	4.287	A	A
B	0.64	0.04	3.285	A	A
C	8.02	0.54	3.352	A	A
D	0.10	0.01	3.128	A	A

Queueing Delay results: (17:00-17:15)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	11.00	0.73	4.296	A	A
B	0.65	0.04	3.286	A	A
C	8.17	0.54	3.355	A	A
D	0.10	0.01	3.128	A	A

Queueing Delay results: (17:15-17:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	8.15	0.54	3.788	A	A
B	0.51	0.03	3.098	A	A
C	6.20	0.41	3.044	A	A
D	0.08	0.01	2.974	A	A

Queueing Delay results: (17:30-17:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	6.26	0.42	3.483	A	A
B	0.41	0.03	2.972	A	A
C	4.85	0.32	2.850	A	A
D	0.06	0.00	2.866	A	A

HMCR - 2023 Base, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
HMCR	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
2023 Base, AM	2023 Base	AM		ONE HOUR	07:15	08:45	90	15				✓		

Junction Network

Junctions

Junction	Name	Junction Type	Arm Order	Grade Separated	Large Roundabout	Do Geometric Delay	Junction Delay (s)	Junction LOS
1	untitled	Roundabout	A,B,C,D				3.74	A

Junction Network Options

Driving Side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Arm	Name	Description
A	A	A6195 (north)	
B	B	ASOS	
C	C	A6195 (south)	
D	D	Site Access	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
A	0.00	99999.00		0.00
B	0.00	99999.00		0.00
C	0.00	99999.00		0.00
D	0.00	99999.00		0.00

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
A	3.65	6.20	5.50	20.00	60.00	21.00	
B	3.65	6.00	5.50	20.00	60.00	18.00	
C	3.65	7.00	9.00	30.00	60.00	15.00	
D	3.65	7.00	5.00	20.00	60.00	19.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Enter slope and intercept directly	Entered slope	Entered intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
A		(calculated)	(calculated)	0.524	1461.301
B		(calculated)	(calculated)	0.527	1465.316
C		(calculated)	(calculated)	0.571	1676.463
D		(calculated)	(calculated)	0.530	1483.340

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	HV Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)
A	ONE HOUR	✓	435.00	100.000
B	ONE HOUR	✓	25.00	100.000
C	ONE HOUR	✓	624.00	100.000
D	ONE HOUR	✓	24.00	100.000

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
07:15-07:30	A	327.49	327.49		
07:15-07:30	B	18.82	18.82		
07:15-07:30	C	469.78	469.78		
07:15-07:30	D	18.07	18.07		
07:30-07:45	A	391.06	391.06		
07:30-07:45	B	22.47	22.47		
07:30-07:45	C	560.96	560.96		
07:30-07:45	D	21.58	21.58		
07:45-08:00	A	478.94	478.94		
07:45-08:00	B	27.53	27.53		
07:45-08:00	C	687.04	687.04		
07:45-08:00	D	26.42	26.42		
08:00-08:15	A	478.94	478.94		
08:00-08:15	B	27.53	27.53		
08:00-08:15	C	687.04	687.04		
08:00-08:15	D	26.42	26.42		
08:15-08:30	A	391.06	391.06		
08:15-08:30	B	22.47	22.47		
08:15-08:30	C	560.96	560.96		
08:15-08:30	D	21.58	21.58		
08:30-08:45	A	327.49	327.49		
08:30-08:45	B	18.82	18.82		
08:30-08:45	C	469.78	469.78		
08:30-08:45	D	18.07	18.07		

Turning Proportions

Turning Counts / Proportions (PCU/hr) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	6.000	12.000	394.000	23.000
	B	8.000	0.000	15.000	2.000
	C	528.000	46.000	9.000	41.000
	D	8.000	0.000	16.000	0.000

Turning Proportions (PCU) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	0.01	0.03	0.91	0.05
	B	0.32	0.00	0.60	0.08
	C	0.85	0.07	0.01	0.07
	D	0.33	0.00	0.67	0.00

Vehicle Mix

Average PCU Per Vehicle - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	1.000	1.000	1.000	1.000
	B	1.000	1.000	1.000	1.000
	C	1.000	1.000	1.000	1.000
	D	1.000	1.000	1.000	1.000

Heavy Vehicle Percentages - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	0.0	0.0	0.0	0.0
	B	0.0	0.0	0.0	0.0
	C	0.0	0.0	0.0	0.0
	D	0.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Total Queueing Delay (PCU-min)	Inclusive Average Queueing Delay (s)
A	0.34	3.82	0.51	A	399.16	598.75	35.24	3.53	0.39	35.24	3.53
B	0.02	3.06	0.02	A	22.94	34.41	1.69	2.94	0.02	1.69	2.94
C	0.42	3.73	0.71	A	572.59	858.89	48.23	3.37	0.54	48.23	3.37
D	0.02	3.25	0.02	A	22.02	33.03	1.70	3.09	0.02	1.70	3.09

Main Results for each time segment

Main results: (07:15-07:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	327.49	81.87	326.31	412.68	53.27	0.00	1433.39	1171.92	0.228	0.00	0.29	3.249	A
B	18.82	4.71	18.76	43.52	336.07	0.00	1288.10	630.95	0.015	0.00	0.01	2.835	A
C	469.78	117.44	468.21	325.57	29.26	0.00	1659.76	1487.77	0.283	0.00	0.39	3.017	A
D	18.07	4.52	18.01	49.52	447.95	0.00	1246.14	631.81	0.015	0.00	0.01	2.930	A

Main results: (07:30-07:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	391.06	97.76	390.73	494.03	63.78	0.00	1427.89	1171.94	0.274	0.29	0.38	3.471	A
B	22.47	5.62	22.46	52.10	402.41	0.00	1253.12	630.95	0.018	0.01	0.02	2.924	A
C	560.96	140.24	560.50	389.84	35.03	0.00	1656.46	1487.77	0.339	0.39	0.51	3.282	A
D	21.58	5.39	21.56	59.28	536.25	0.00	1199.38	631.81	0.018	0.01	0.02	3.055	A

Main results: (07:45-08:00)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	478.94	119.74	478.42	604.87	78.09	0.00	1420.39	1171.92	0.337	0.38	0.51	3.819	A
B	27.53	6.88	27.51	63.79	492.72	0.00	1205.49	630.94	0.023	0.02	0.02	3.055	A
C	687.04	171.76	686.25	477.33	42.90	0.00	1651.97	1487.77	0.416	0.51	0.71	3.724	A
D	26.42	6.61	26.40	72.59	656.56	0.00	1135.67	631.81	0.023	0.02	0.02	3.244	A

Main results: (08:00-08:15)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	478.94	119.74	478.94	605.55	78.17	0.00	1420.35	1171.92	0.337	0.51	0.51	3.823	A
B	27.53	6.88	27.53	63.86	493.25	0.00	1205.21	630.94	0.023	0.02	0.02	3.056	A
C	687.04	171.76	687.03	477.84	42.94	0.00	1651.95	1487.77	0.416	0.71	0.71	3.729	A
D	26.42	6.61	26.42	72.67	657.30	0.00	1135.28	631.81	0.023	0.02	0.02	3.245	A

Main results: (08:15-08:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	391.06	97.76	391.57	495.12	63.91	0.00	1427.82	1171.94	0.274	0.51	0.38	3.477	A
B	22.47	5.62	22.49	52.21	403.27	0.00	1252.67	630.95	0.018	0.02	0.02	2.925	A
C	560.96	140.24	561.74	390.66	35.10	0.00	1656.42	1487.77	0.339	0.71	0.51	3.290	A
D	21.58	5.39	21.60	59.41	537.43	0.00	1198.75	631.81	0.018	0.02	0.02	3.059	A

Main results: (08:30-08:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	327.49	81.87	327.82	414.48	53.50	0.00	1433.27	1171.92	0.228	0.38	0.30	3.259	A
B	18.82	4.71	18.84	43.71	337.61	0.00	1287.29	630.95	0.015	0.02	0.01	2.837	A
C	469.78	117.44	470.25	327.06	29.39	0.00	1659.68	1487.77	0.283	0.51	0.40	3.027	A
D	18.07	4.52	18.08	49.74	449.90	0.00	1245.10	631.81	0.015	0.02	0.01	2.933	A

Queueing Delay Results for each time segment
Queueing Delay results: (07:15-07:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	4.33	0.29	3.249	A	A
B	0.22	0.01	2.835	A	A
C	5.78	0.39	3.017	A	A
D	0.22	0.01	2.930	A	A

Queueing Delay results: (07:30-07:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	5.55	0.37	3.471	A	A
B	0.27	0.02	2.924	A	A
C	7.52	0.50	3.282	A	A
D	0.27	0.02	3.055	A	A

Queueing Delay results: (07:45-08:00)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	7.45	0.50	3.819	A	A
B	0.35	0.02	3.055	A	A
C	10.40	0.69	3.724	A	A
D	0.35	0.02	3.244	A	A

Queueing Delay results: (08:00-08:15)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	7.60	0.51	3.823	A	A
B	0.35	0.02	3.056	A	A
C	10.63	0.71	3.729	A	A
D	0.36	0.02	3.245	A	A

Queueing Delay results: (08:15-08:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	5.78	0.39	3.477	A	A
B	0.28	0.02	2.925	A	A
C	7.86	0.52	3.290	A	A
D	0.28	0.02	3.059	A	A

Queueing Delay results: (08:30-08:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	4.53	0.30	3.259	A	A
B	0.23	0.02	2.837	A	A
C	6.04	0.40	3.027	A	A
D	0.22	0.01	2.933	A	A

HMCR - 2023 Base, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
HMCR	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
2023 Base, FM	2023 Base	FM		ONE HOUR	16:15	17:45	90	15				✓		

Junction Network

Junctions

Junction	Name	Junction Type	Arm Order	Grade Separated	Large Roundabout	Do Geometric Delay	Junction Delay (s)	Junction LOS
1	untitled	Roundabout	A,B,C,D				3.99	A

Junction Network Options

Driving Side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Arm	Name	Description
A	A	A6195 (north)	
B	B	ASOS	
C	C	A6195 (south)	
D	D	Site Access	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
A	0.00	99999.00		0.00
B	0.00	99999.00		0.00
C	0.00	99999.00		0.00
D	0.00	99999.00		0.00

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
A	3.65	6.20	5.50	20.00	60.00	21.00	
B	3.65	6.00	5.50	20.00	60.00	18.00	
C	3.65	7.00	9.00	30.00	60.00	15.00	
D	3.65	7.00	5.00	20.00	60.00	19.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Enter slope and intercept directly	Entered slope	Entered intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
A		(calculated)	(calculated)	0.524	1461.301
B		(calculated)	(calculated)	0.527	1465.316
C		(calculated)	(calculated)	0.571	1676.463
D		(calculated)	(calculated)	0.530	1483.340

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	HV Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)
A	ONE HOUR	✓	597.00	100.000
B	ONE HOUR	✓	21.00	100.000
C	ONE HOUR	✓	567.00	100.000
D	ONE HOUR	✓	31.00	100.000

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
16:15-16:30	A	449.45	449.45		
16:15-16:30	B	15.81	15.81		
16:15-16:30	C	426.87	426.87		
16:15-16:30	D	23.34	23.34		
16:30-16:45	A	536.69	536.69		
16:30-16:45	B	18.88	18.88		
16:30-16:45	C	509.72	509.72		
16:30-16:45	D	27.87	27.87		
16:45-17:00	A	657.31	657.31		
16:45-17:00	B	23.12	23.12		
16:45-17:00	C	624.28	624.28		
16:45-17:00	D	34.13	34.13		
17:00-17:15	A	657.31	657.31		
17:00-17:15	B	23.12	23.12		
17:00-17:15	C	624.28	624.28		
17:00-17:15	D	34.13	34.13		
17:15-17:30	A	536.69	536.69		
17:15-17:30	B	18.88	18.88		
17:15-17:30	C	509.72	509.72		
17:15-17:30	D	27.87	27.87		
17:30-17:45	A	449.45	449.45		
17:30-17:45	B	15.81	15.81		
17:30-17:45	C	426.87	426.87		
17:30-17:45	D	23.34	23.34		

Turning Proportions

Turning Counts / Proportions (PCU/hr) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	12.000	4.000	577.000	4.000
	B	6.000	0.000	15.000	0.000
	C	561.000	3.000	0.000	3.000
	D	12.000	1.000	18.000	0.000

Turning Proportions (PCU) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	0.02	0.01	0.97	0.01
	B	0.29	0.00	0.71	0.00
	C	0.99	0.01	0.00	0.01
	D	0.39	0.03	0.58	0.00

Vehicle Mix

Average PCU Per Vehicle - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	1.000	1.000	1.000	1.000
	B	1.000	1.000	1.000	1.000
	C	1.000	1.000	1.000	1.000
	D	1.000	1.000	1.000	1.000

Heavy Vehicle Percentages - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	0.0	0.0	0.0	0.0
	B	0.0	0.0	0.0	0.0
	C	0.0	0.0	0.0	0.0
	D	0.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Total Queueing Delay (PCU-min)	Inclusive Average Queueing Delay (s)
A	0.45	4.55	0.83	A	547.82	821.73	55.48	4.05	0.62	55.49	4.05
B	0.02	3.31	0.02	A	19.27	28.90	1.51	3.14	0.02	1.51	3.14
C	0.38	3.47	0.60	A	520.29	780.43	41.34	3.18	0.46	41.34	3.18
D	0.03	3.24	0.03	A	28.45	42.67	2.19	3.08	0.02	2.19	3.08

Main Results for each time segment

Main results: (16:15-16:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	449.45	112.36	447.67	443.50	16.51	0.00	1452.65	1278.43	0.309	0.00	0.45	3.576	A
B	15.81	3.95	15.76	6.00	458.18	0.00	1223.71	625.42	0.013	0.00	0.01	2.979	A
C	426.87	106.72	425.50	457.44	16.50	0.00	1667.04	1554.88	0.256	0.00	0.34	2.897	A
D	23.34	5.83	23.26	5.25	436.75	0.00	1252.07	556.11	0.019	0.00	0.02	2.929	A

Main results: (16:30-16:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	536.69	134.17	536.14	530.89	19.76	0.00	1450.95	1278.43	0.370	0.45	0.58	3.932	A
B	18.88	4.72	18.87	7.19	548.72	0.00	1175.97	625.42	0.016	0.01	0.02	3.110	A
C	509.72	127.43	509.34	547.83	19.76	0.00	1665.18	1554.88	0.306	0.34	0.44	3.114	A
D	27.87	6.97	27.85	6.29	522.81	0.00	1206.50	556.11	0.023	0.02	0.02	3.053	A

Main results: (16:45-17:00)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	657.31	164.33	656.35	650.04	24.20	0.00	1448.62	1278.42	0.454	0.58	0.82	4.538	A
B	23.12	5.78	23.10	8.80	671.75	0.00	1111.09	625.42	0.021	0.02	0.02	3.308	A
C	624.28	156.07	623.64	670.66	24.19	0.00	1662.65	1554.88	0.375	0.44	0.60	3.463	A
D	34.13	8.53	34.10	7.70	640.14	0.00	1144.37	556.11	0.030	0.02	0.03	3.241	A

Main results: (17:00-17:15)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	657.31	164.33	657.29	650.70	24.22	0.00	1448.61	1278.42	0.454	0.82	0.83	4.549	A
B	23.12	5.78	23.12	8.81	672.71	0.00	1110.58	625.42	0.021	0.02	0.02	3.309	A
C	624.28	156.07	624.27	671.61	24.22	0.00	1662.63	1554.88	0.375	0.60	0.60	3.466	A
D	34.13	8.53	34.13	7.71	640.79	0.00	1144.02	556.11	0.030	0.03	0.03	3.242	A

Main results: (17:15-17:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	536.69	134.17	537.63	531.95	19.80	0.00	1450.93	1278.43	0.370	0.83	0.59	3.947	A
B	18.88	4.72	18.90	7.20	550.23	0.00	1175.17	625.42	0.016	0.02	0.02	3.115	A
C	509.72	127.43	510.35	549.32	19.81	0.00	1665.15	1554.88	0.306	0.60	0.44	3.118	A
D	27.87	6.97	27.90	6.30	523.85	0.00	1205.95	556.11	0.023	0.03	0.02	3.057	A

Main results: (17:30-17:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	449.45	112.36	450.01	445.34	16.58	0.00	1452.62	1278.43	0.309	0.59	0.45	3.591	A
B	15.81	3.95	15.82	6.03	460.56	0.00	1222.45	625.42	0.013	0.02	0.01	2.985	A
C	426.87	106.72	427.26	459.80	16.58	0.00	1667.00	1554.88	0.256	0.44	0.35	2.904	A
D	23.34	5.83	23.36	5.28	438.56	0.00	1251.11	556.11	0.019	0.02	0.02	2.931	A

Queueing Delay Results for each time segment
Queueing Delay results: (16:15-16:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	6.53	0.44	3.576	A	A
B	0.19	0.01	2.979	A	A
C	5.04	0.34	2.897	A	A
D	0.28	0.02	2.929	A	A

Queueing Delay results: (16:30-16:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	8.59	0.57	3.932	A	A
B	0.24	0.02	3.110	A	A
C	6.49	0.43	3.114	A	A
D	0.35	0.02	3.053	A	A

Queueing Delay results: (16:45-17:00)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	12.06	0.80	4.538	A	A
B	0.31	0.02	3.308	A	A
C	8.81	0.59	3.463	A	A
D	0.45	0.03	3.241	A	A

Queueing Delay results: (17:00-17:15)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	12.38	0.83	4.549	A	A
B	0.32	0.02	3.309	A	A
C	8.98	0.60	3.466	A	A
D	0.46	0.03	3.242	A	A

Queueing Delay results: (17:15-17:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	9.05	0.60	3.947	A	A
B	0.25	0.02	3.115	A	A
C	6.76	0.45	3.118	A	A
D	0.36	0.02	3.057	A	A

Queueing Delay results: (17:30-17:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	6.88	0.46	3.591	A	A
B	0.20	0.01	2.985	A	A
C	5.26	0.35	2.904	A	A
D	0.29	0.02	2.931	A	A

HMCR - 2023 with Development, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
HMCR	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship
2023 with Development, AM	2023 with Development	AM		ONE HOUR	07:15	08:45	90	15				✓	

Junction Network

Junctions

Junction	Name	Junction Type	Arm Order	Grade Separated	Large Roundabout	Do Geometric Delay	Junction Delay (s)	Junction LOS
1	untitled	Roundabout	A,B,C,D				3.78	A

Junction Network Options

Driving Side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Arm	Name	Description
A	A	A6195 (north)	
B	B	ASOS	
C	C	A6195 (south)	
D	D	Site Access	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
A	0.00	99999.00		0.00
B	0.00	99999.00		0.00
C	0.00	99999.00		0.00
D	0.00	99999.00		0.00

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
A	3.65	6.20	5.50	20.00	60.00	21.00	
B	3.65	6.00	5.50	20.00	60.00	18.00	
C	3.65	7.00	9.00	30.00	60.00	15.00	
D	3.65	7.00	5.00	20.00	60.00	19.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Enter slope and intercept directly	Entered slope	Entered intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
A		(calculated)	(calculated)	0.524	1461.301
B		(calculated)	(calculated)	0.527	1465.316
C		(calculated)	(calculated)	0.571	1676.463
D		(calculated)	(calculated)	0.530	1483.340

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	HV Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)
A	ONE HOUR	✓	444.00	100.000
B	ONE HOUR	✓	44.00	100.000
C	ONE HOUR	✓	629.00	100.000
D	ONE HOUR	✓	13.00	100.000

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
07:15-07:30	A	334.27	334.27		
07:15-07:30	B	33.13	33.13		
07:15-07:30	C	473.54	473.54		
07:15-07:30	D	9.79	9.79		
07:30-07:45	A	399.15	399.15		
07:30-07:45	B	39.56	39.56		
07:30-07:45	C	565.46	565.46		
07:30-07:45	D	11.69	11.69		
07:45-08:00	A	488.85	488.85		
07:45-08:00	B	48.44	48.44		
07:45-08:00	C	692.54	692.54		
07:45-08:00	D	14.31	14.31		
08:00-08:15	A	488.85	488.85		
08:00-08:15	B	48.44	48.44		
08:00-08:15	C	692.54	692.54		
08:00-08:15	D	14.31	14.31		
08:15-08:30	A	399.15	399.15		
08:15-08:30	B	39.56	39.56		
08:15-08:30	C	565.46	565.46		
08:15-08:30	D	11.69	11.69		
08:30-08:45	A	334.27	334.27		
08:30-08:45	B	33.13	33.13		
08:30-08:45	C	473.54	473.54		
08:30-08:45	D	9.79	9.79		

Turning Proportions

Turning Counts / Proportions (PCU/hr) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	6.000	31.000	394.000	13.000
	B	13.000	0.000	29.000	2.000
	C	528.000	82.000	9.000	10.000
	D	5.000	1.000	7.000	0.000

Turning Proportions (PCU) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	0.01	0.07	0.89	0.03
	B	0.30	0.00	0.66	0.05
	C	0.84	0.13	0.01	0.02
	D	0.38	0.08	0.54	0.00

Vehicle Mix

Average PCU Per Vehicle - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	1.000	1.000	1.000	1.000
	B	1.000	1.000	1.000	1.000
	C	1.000	1.000	1.000	1.000
	D	1.000	1.000	1.000	1.000

Heavy Vehicle Percentages - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	0.0	0.0	0.0	0.0
	B	0.0	0.0	0.0	0.0
	C	0.0	0.0	0.0	0.0
	D	0.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Total Queueing Delay (PCU-min)	Inclusive Average Queueing Delay (s)
A	0.35	3.93	0.53	A	407.42	611.13	36.78	3.61	0.41	36.79	3.61
B	0.04	3.08	0.04	A	40.38	60.56	2.99	2.96	0.03	2.99	2.96
C	0.42	3.74	0.72	A	577.18	865.77	48.71	3.38	0.54	48.71	3.38
D	0.01	3.28	0.01	A	11.93	17.89	0.93	3.11	0.01	0.93	3.11

Main Results for each time segment

Main results: (07:15-07:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	334.27	83.57	333.04	414.18	74.28	0.00	1422.38	1161.14	0.235	0.00	0.31	3.302	A
B	33.13	8.28	33.02	85.53	321.80	0.00	1295.63	720.69	0.026	0.00	0.03	2.850	A
C	473.54	118.39	471.96	329.31	25.51	0.00	1661.90	1507.83	0.285	0.00	0.40	3.021	A
D	9.79	2.45	9.76	18.76	478.71	0.00	1229.85	576.53	0.008	0.00	0.01	2.950	A

Main results: (07:30-07:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	399.15	99.79	398.81	495.83	88.93	0.00	1414.71	1161.14	0.282	0.31	0.39	3.543	A
B	39.56	9.89	39.53	102.40	385.33	0.00	1262.12	720.69	0.031	0.03	0.03	2.943	A
C	565.46	141.36	564.99	394.32	30.54	0.00	1659.03	1507.83	0.341	0.40	0.51	3.288	A
D	11.69	2.92	11.68	22.46	573.07	0.00	1179.88	576.53	0.010	0.01	0.01	3.080	A

Main results: (07:45-08:00)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	488.85	122.21	488.29	607.07	108.88	0.00	1404.26	1161.13	0.348	0.39	0.53	3.927	A
B	48.44	12.11	48.41	125.37	471.80	0.00	1216.53	720.69	0.040	0.03	0.04	3.081	A
C	692.54	173.14	691.74	482.81	37.40	0.00	1655.11	1507.83	0.418	0.51	0.71	3.733	A
D	14.31	3.58	14.30	27.49	701.64	0.00	1111.80	576.53	0.013	0.01	0.01	3.279	A

Main results: (08:00-08:15)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	488.85	122.21	488.85	607.75	109.00	0.00	1404.20	1161.13	0.348	0.53	0.53	3.932	A
B	48.44	12.11	48.44	125.51	472.33	0.00	1216.25	720.69	0.040	0.04	0.04	3.082	A
C	692.54	173.14	692.53	483.34	37.43	0.00	1655.09	1507.83	0.418	0.71	0.72	3.739	A
D	14.31	3.58	14.31	27.53	702.44	0.00	1111.38	576.53	0.013	0.01	0.01	3.280	A

Main results: (08:15-08:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	399.15	99.79	399.70	496.92	89.12	0.00	1414.61	1161.14	0.282	0.53	0.40	3.550	A
B	39.56	9.89	39.59	102.63	386.19	0.00	1261.67	720.69	0.031	0.04	0.03	2.947	A
C	565.46	141.36	566.25	395.18	30.60	0.00	1658.99	1507.83	0.341	0.72	0.52	3.296	A
D	11.69	2.92	11.70	22.50	574.34	0.00	1179.21	576.53	0.010	0.01	0.01	3.082	A

Main results: (08:30-08:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	334.27	83.57	334.61	415.99	74.61	0.00	1422.22	1161.14	0.235	0.40	0.31	3.310	A
B	33.13	8.28	33.15	85.91	323.31	0.00	1294.83	720.69	0.026	0.03	0.03	2.852	A
C	473.54	118.39	474.02	330.84	25.62	0.00	1661.84	1507.83	0.285	0.52	0.40	3.031	A
D	9.79	2.45	9.80	18.84	480.80	0.00	1228.74	576.53	0.008	0.01	0.01	2.955	A

Queueing Delay Results for each time segment
Queueing Delay results: (07:15-07:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	4.49	0.30	3.302	A	A
B	0.39	0.03	2.850	A	A
C	5.83	0.39	3.021	A	A
D	0.12	0.01	2.950	A	A

Queueing Delay results: (07:30-07:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	5.78	0.39	3.543	A	A
B	0.48	0.03	2.943	A	A
C	7.59	0.51	3.288	A	A
D	0.15	0.01	3.080	A	A

Queueing Delay results: (07:45-08:00)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	7.81	0.52	3.927	A	A
B	0.61	0.04	3.081	A	A
C	10.51	0.70	3.733	A	A
D	0.19	0.01	3.279	A	A

Queueing Delay results: (08:00-08:15)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	7.97	0.53	3.932	A	A
B	0.62	0.04	3.082	A	A
C	10.74	0.72	3.739	A	A
D	0.20	0.01	3.280	A	A

Queueing Delay results: (08:15-08:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	6.03	0.40	3.550	A	A
B	0.49	0.03	2.947	A	A
C	7.94	0.53	3.296	A	A
D	0.15	0.01	3.082	A	A

Queueing Delay results: (08:30-08:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	4.70	0.31	3.310	A	A
B	0.40	0.03	2.852	A	A
C	6.10	0.41	3.031	A	A
D	0.12	0.01	2.955	A	A

HMCR - 2023 with Development, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set (s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
HMCR	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship
2023 with Development, FM	2023 with Development	FM		ONE HOUR	16:15	17:45	90	15				✓	

Junction Network

Junctions

Junction	Name	Junction Type	Arm Order	Grade Separated	Large Roundabout	Do Geometric Delay	Junction Delay (s)	Junction LOS
1	untitled	Roundabout	A,B,C,D				4.00	A

Junction Network Options

Driving Side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Arm	Name	Description
A	A	A6195 (north)	
B	B	ASOS	
C	C	A6195 (south)	
D	D	Site Access	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
A	0.00	99999.00		0.00
B	0.00	99999.00		0.00
C	0.00	99999.00		0.00
D	0.00	99999.00		0.00

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
A	3.65	6.20	5.50	20.00	60.00	21.00	
B	3.65	6.00	5.50	20.00	60.00	18.00	
C	3.65	7.00	9.00	30.00	60.00	15.00	
D	3.65	7.00	5.00	20.00	60.00	19.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Enter slope and intercept directly	Entered slope	Entered intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
A		(calculated)	(calculated)	0.524	1461.301
B		(calculated)	(calculated)	0.527	1465.316
C		(calculated)	(calculated)	0.571	1676.463
D		(calculated)	(calculated)	0.530	1483.340

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	HV Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)
A	ONE HOUR	✓	601.00	100.000
B	ONE HOUR	✓	46.00	100.000
C	ONE HOUR	✓	570.00	100.000
D	ONE HOUR	✓	20.00	100.000

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
16:15-16:30	A	452.46	452.46		
16:15-16:30	B	34.63	34.63		
16:15-16:30	C	429.13	429.13		
16:15-16:30	D	15.06	15.06		
16:30-16:45	A	540.29	540.29		
16:30-16:45	B	41.35	41.35		
16:30-16:45	C	512.42	512.42		
16:30-16:45	D	17.98	17.98		
16:45-17:00	A	661.71	661.71		
16:45-17:00	B	50.65	50.65		
16:45-17:00	C	627.58	627.58		
16:45-17:00	D	22.02	22.02		
17:00-17:15	A	661.71	661.71		
17:00-17:15	B	50.65	50.65		
17:00-17:15	C	627.58	627.58		
17:00-17:15	D	22.02	22.02		
17:15-17:30	A	540.29	540.29		
17:15-17:30	B	41.35	41.35		
17:15-17:30	C	512.42	512.42		
17:15-17:30	D	17.98	17.98		
17:30-17:45	A	452.46	452.46		
17:30-17:45	B	34.63	34.63		
17:30-17:45	C	429.13	429.13		
17:30-17:45	D	15.06	15.06		

Turning Proportions

Turning Counts / Proportions (PCU/hr) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	12.000	10.000	577.000	2.000
	B	16.000	0.000	30.000	0.000
	C	561.000	6.000	0.000	3.000
	D	8.000	3.000	8.000	1.000

Turning Proportions (PCU) - Junction 1 (for whole period)

		To			
		A	B	C	D
From	A	0.02	0.02	0.96	0.00
	B	0.35	0.00	0.65	0.00
	C	0.98	0.01	0.00	0.01
	D	0.40	0.15	0.40	0.05

Vehicle Mix

Average PCU Per Vehicle - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	1.000	1.000	1.000	1.000
	B	1.000	1.000	1.000	1.000
	C	1.000	1.000	1.000	1.000
	D	1.000	1.000	1.000	1.000

Heavy Vehicle Percentages - Junction 1 (for whole period)

		To			
From		A	B	C	D
	A	0.0	0.0	0.0	0.0
	B	0.0	0.0	0.0	0.0
	C	0.0	0.0	0.0	0.0
	D	0.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Total Queueing Delay (PCU-min)	Inclusive Average Queueing Delay (s)
A	0.46	4.56	0.83	A	551.49	827.23	55.97	4.06	0.62	55.98	4.06
B	0.05	3.37	0.05	A	42.21	63.32	3.37	3.19	0.04	3.37	3.19
C	0.38	3.50	0.61	A	523.04	784.56	41.85	3.20	0.46	41.85	3.20
D	0.02	3.23	0.02	A	18.35	27.53	1.41	3.07	0.02	1.41	3.07

Main Results for each time segment

Main results: (16:15-16:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	452.46	113.12	450.67	447.99	13.51	0.00	1454.22	1279.90	0.311	0.00	0.45	3.581	A
B	34.63	8.66	34.52	14.25	449.92	0.00	1228.06	670.98	0.028	0.00	0.03	3.015	A
C	429.13	107.28	427.74	461.18	23.25	0.00	1663.19	1510.48	0.258	0.00	0.35	2.912	A
D	15.06	3.76	15.01	4.50	446.49	0.00	1246.91	550.59	0.012	0.00	0.01	2.921	A

Main results: (16:30-16:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	540.29	135.07	539.73	536.28	16.17	0.00	1452.83	1279.90	0.372	0.45	0.59	3.940	A
B	41.35	10.34	41.32	17.07	538.84	0.00	1181.18	670.98	0.035	0.03	0.04	3.157	A
C	512.42	128.10	512.03	552.32	27.84	0.00	1660.57	1510.48	0.309	0.35	0.44	3.134	A
D	17.98	4.49	17.97	5.39	534.48	0.00	1200.32	550.59	0.015	0.01	0.02	3.044	A

Main results: (16:45-17:00)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	661.71	165.43	660.74	656.63	19.80	0.00	1450.93	1279.89	0.456	0.59	0.83	4.550	A
B	50.65	12.66	50.60	20.89	659.65	0.00	1117.47	670.97	0.045	0.04	0.05	3.373	A
C	627.58	156.90	626.93	676.16	34.09	0.00	1657.00	1510.48	0.379	0.44	0.61	3.493	A
D	22.02	5.51	22.00	6.60	654.43	0.00	1136.80	550.59	0.019	0.02	0.02	3.228	A

Main results: (17:00-17:15)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	661.71	165.43	661.70	657.30	19.82	0.00	1450.92	1279.89	0.456	0.83	0.83	4.561	A
B	50.65	12.66	50.65	20.92	660.60	0.00	1116.97	670.97	0.045	0.05	0.05	3.375	A
C	627.58	156.90	627.57	677.11	34.13	0.00	1656.98	1510.48	0.379	0.61	0.61	3.496	A
D	22.02	5.51	22.02	6.61	655.10	0.00	1136.45	550.59	0.019	0.02	0.02	3.229	A

Main results: (17:15-17:30)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	540.29	135.07	541.24	537.36	16.20	0.00	1452.81	1279.90	0.372	0.83	0.60	3.953	A
B	41.35	10.34	41.40	17.11	540.33	0.00	1180.39	670.98	0.035	0.05	0.04	3.162	A
C	512.42	128.10	513.06	553.82	27.91	0.00	1660.53	1510.48	0.309	0.61	0.45	3.140	A
D	17.98	4.49	18.00	5.40	535.56	0.00	1199.75	550.59	0.015	0.02	0.02	3.048	A

Main results: (17:30-17:45)

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)	Delay (s)	LOS
A	452.46	113.12	453.03	449.87	13.56	0.00	1454.20	1279.90	0.311	0.60	0.45	3.599	A
B	34.63	8.66	34.66	14.32	452.27	0.00	1226.82	670.98	0.028	0.04	0.03	3.019	A
C	429.13	107.28	429.52	463.57	23.36	0.00	1663.13	1510.48	0.258	0.45	0.35	2.918	A
D	15.06	3.76	15.07	4.52	448.36	0.00	1245.92	550.59	0.012	0.02	0.01	2.926	A

Queueing Delay Results for each time segment
Queueing Delay results: (16:15-16:30)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	6.58	0.44	3.581	A	A
B	0.43	0.03	3.015	A	A
C	5.10	0.34	2.912	A	A
D	0.18	0.01	2.921	A	A

Queueing Delay results: (16:30-16:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	8.66	0.58	3.940	A	A
B	0.54	0.04	3.157	A	A
C	6.57	0.44	3.134	A	A
D	0.22	0.01	3.044	A	A

Queueing Delay results: (16:45-17:00)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	12.17	0.81	4.550	A	A
B	0.70	0.05	3.373	A	A
C	8.93	0.60	3.493	A	A
D	0.29	0.02	3.228	A	A

Queueing Delay results: (17:00-17:15)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	12.50	0.83	4.561	A	A
B	0.71	0.05	3.375	A	A
C	9.11	0.61	3.496	A	A
D	0.30	0.02	3.229	A	A

Queueing Delay results: (17:15-17:30)

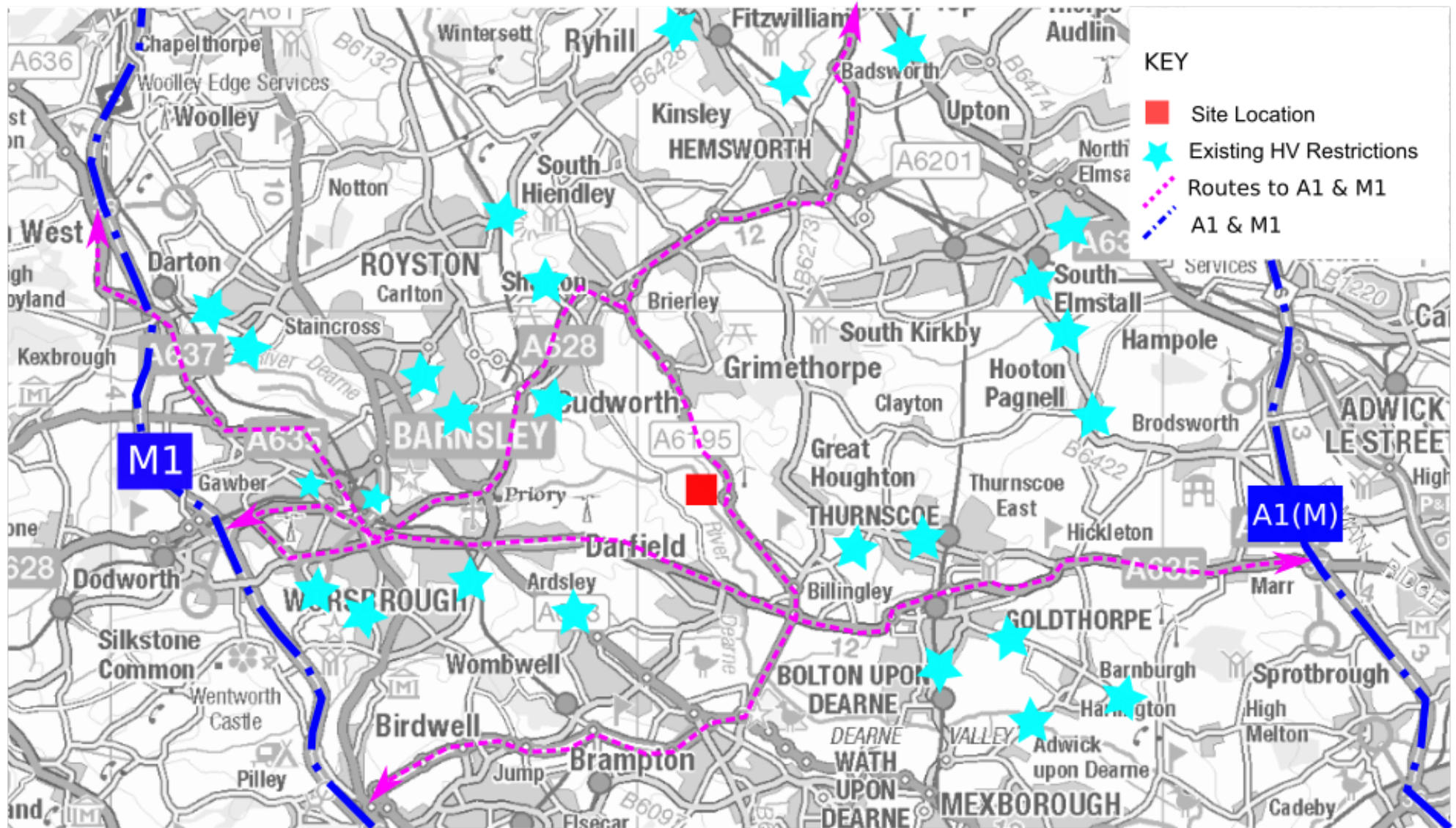
Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	9.13	0.61	3.953	A	A
B	0.55	0.04	3.162	A	A
C	6.84	0.46	3.140	A	A
D	0.23	0.02	3.048	A	A

Queueing Delay results: (17:30-17:45)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
A	6.93	0.46	3.599	A	A
B	0.44	0.03	3.019	A	A
C	5.31	0.35	2.918	A	A
D	0.19	0.01	2.926	A	A




Appendix H



- KEY**
- Site Location
 - ★ Existing HV Restrictions
 - - - Routes to A1 & M1
 - - - A1 & M1

Note: Existing HV restrictions taken from Freight Journey Planner

 SK Transport Planning Ltd Albion Wharf Manchester M1 5LN www.sktransport.co.uk 0161 234 6509	Ref. SK218477_PL01	Project Houghton Main Energy Centre		Rev. 0
	Scale NTS	Date 23.10.18	Drawn KT	Check LS
	Title PLAN 1: Large Vehicle Movement Strategy			