South Tees Development Corporation

South Industrial Zone

Transport Assessment

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1 Introduction

1.1 Background

Arup has been commissioned by the South Tees Development Corporation (STDC) to develop a Transport Assessment (TA), which incorporates a Travel Plan framework, in support of an outline planning application for the development of industrial (B2/B8) land use within part of the South Industrial Zone (SIZ) of the STDC site.

The application site is located in the south-western extent of the STDC area and comprises approximately 174 hectares. The site's history includes iron and steel industries, and the storage of material and freight rail infrastructure uses.

The site is located on the south bank of the River Tees, approximately 7km to the west of Redcar town centre and 4.5km to the east of Middlesbrough town centre. The site location is shown in **Figure 1** and an indicative site plan is attached in Appendix A**.**

Figure 1: Site Location

This document sets out the purpose, methodology, findings and recommendations of the TA. Arup has also prepared the traffic and transportation assessment chapter of the Environmental Statement (ES). This TA forms Appendix C1 of the ES.

The aim of this report is to demonstrate to Redcar and Cleveland Borough Council (RCBC), the local planning and highway authority, and Highways England (HE), that the development proposals are aligned with relevant planning policy and will not have a severe impact on surrounding transport networks.

1.2 Planning History

The most recent planning history for the site is the submission of a scoping opinion application for the development of a port-based development for the Offshore Marine Energy Sector (offshore wind turbines). This was submitted to RCBC in May 2019 (planning ref. no. R/2019/0331/SCP).

In terms of transport, the scoping response to the 2019 proposal specified that developing a Transport Statement, and a Traffic & Transport section as part of an Environmental Statement, would likely cover the requirements for the application based on the given information. HE and RCBC officers also indicated the requirement for the impact of the development on the A1053 roundabout to be considered through a Transport Assessment or Statement. The responses to the 2019 scoping opinion helped to inform the scope of the current assessment.

1.3 Consultation

A TA Scoping Report for the proposed development was shared with RCBC, Middlesbrough Council (as the neighbouring highway authority) and HE on 19 June 2020. The report aimed to agree the methodology and main parameters of the transport assessment of the proposed development and is attached in Appendix B.

Consultation responses are included in Appendix B of this TA. Some of the issues raised by the consultees have been addressed in this TA. However, there are some aspects that have not been completed prior to planning submission. Arup will continue to liaise with all parties on these matters following submission and throughout the determination of the application. It is expected that any outstanding issues can be addressed by way of an addendum (where required).

Arup is preparing the Transport Strategy for the South Tees Regeneration Masterplan, within which the proposed development is located. For the strategy development, Arup has held Transport Steering Group workshops (on 4th February and 21st May 2020) with representatives from the highway authorities and Tees Valley Combined Authority (TVCA). At these workshops the discussions have focussed on what stakeholders want to achieve, in terms of transport, as the site is developed, and these discussions have been used to inform the expected future transport conditions when the proposed development is operational.

2 Planning Policy and Strategy Context

This section outlines the national, regional and local transport policy context within which the development is assessed. Planning policies and strategies relevant to the development proposal are as follows:

- National Planning Policy Framework;
- Tees Valley Combined Authority Strategic Transport Plan;
- Tees Valley Design Guide and Specification – Residential and Industrial Estates Development;
- Transport for the North Strategic Transport Plan;
- Redcar and Cleveland Local Plan;
- Redcar and Cleveland Local Transport Plan 2011-2021; and
- Redcar and Cleveland South Tees Area Supplementary Planning Document; and
- South Tees Regeneration Masterplan.

2.1 National Planning Policy

2.1.1 National Planning Policy Framework (2019)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It prepares a framework in which locally prepared plans for development could be produced.

Core planning principles related to sustainable transport and relevant to the proposed development are outlined below:

108. In assessing sites that may be allocated for development in plans, or specific applications for development, it should be ensured that:

    a. Appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;

    b. Safe and suitable access to the site can be achieved for all users; and

    c. Any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.

109. 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.

110. Within this context, applications for development should:

a. Give priority first to pedestrians and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;

b. Address the needs of people with disabilities and reduced mobility in relation to all modes of transport;

c. Create places that are safe, secure and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;

d. Allow for the efficient delivery of goods, and access by service and emergency vehicles; and

e. Be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations.

111. All developments that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of proposal can be assessed.

National Planning Policy Compliance

The application for the proposed development is accompanied by a Transport Assessment to assess and mitigate, as far as reasonably possible, its forecast impact on the local highway network, as well as encourage sustainable travel behaviours. The development meets these stated objectives as it is will form part of the wider STDC site, a sustainable strategy for which is currently being developed. This TA also includes a Travel Plan framework with some initial measures that can be implemented at the development, in advance of the transport strategy being adopted.

The proposed development is therefore aligned with national transport policy.

2.2 Regional Policy

2.2.1 Tees Valley Combined Authority Strategic Transport Plan 2020-2030

The Strategic Transport Plan (STP) presents a package of transport improvements to transform the Tees Valley transport system and identifies the delivery of the South Tees Development Corporation masterplan as one of the key actions towards achieving this goal.

The transport vision for Tees Valley that is set out in the STP is as follows:

"To provide a high quality, quick, affordable, reliable, low carbon and safe transport network for people and freight to move within, to and from Tees Valley."

The STP outlines key issues within the region such as high car mode share, despite a high majority of local residents working within the Tees Valley region. The STP therefore identifies opportunities from these issues and focuses on providing an effective transport system for local people and businesses by connecting centres, improving journey times, upgrading major roads and enhancing existing rail links.

The Plan identifies the following two core principles for the STDC site:

- Use the regeneration opportunity to strengthen transport connections with Redcar town centre and other urban centres, to realise improved economic and community benefits; and
- Deliver efficient connectivity across the South Tees area through enhanced on-site transport infrastructure to realise optimal functionality.

2.2.2 Tees Valley Design Guide and Specification – Residential and Industrial Estates Development

The Design Guide and Specification presents the standards for car parking and cycle parking provisions for residential and industrial developments in the Tees Valley area.

For industrial developments, the maximum car parking and minimum cycle parking standards are as follows:

- Sufficient operational parking and area for manoeuvring within the site;
- 1 space per 45m² gross floor area or 4 spaces per 10 employees (whichever is the greater); and
- Provision for the parking of 2 cycles per 200m² gross floor area.

The document also specifies that disabled car parking spaces should be in addition to the maximum parking standards for each site, and provision for car parks associated with employment premises and provided for employees and visitors should be as follows:

- Up to 10 spaces 1 space;
- Between 10 and 200 spaces; 5% of capacity, subject to a minimum of 2 spaces, to be reserved; and
- Over 200 spaces: 2% plus 6 spaces.

2.2.3 Transport for the North Strategic Transport Plan

Transport for the North (TfN) published its Strategic Transport Plan in 2019. The document sets out the priorities for transport infrastructure investment for the next 30 years. TfN's vision is of *'a thriving North of England, where world class*

transport supports sustainable economic growth, excellent quality of life and improved opportunities for all'.

Supporting the vision are four pan-Northern transport objectives which align with the Government's Industrial Strategy:

- Transforming economic performance;
- Increasing efficiency, reliability, integration and resilience in the transport system;
- Improving inclusivity, health and access opportunities for all; and
- Promoting and enhancing the built, historic, and natural environment.

The Investment Programme for the Transport Plan includes the following outcomes and actions which are of relevance to the proposed development and the wider South Tees site:

Table 1: TfN Strategic Transport Plan Outcomes and Actions relevant to the Site

Outcome	Actions
Facilitating significant private sector investment to support economic growth and UK competitiveness	Allowing larger freight trains to access Tees Valley directly to/from the south through gauge enhancements and journey time improvements
Enhancing North-South strategic connections across the North to support UK competitiveness	Darlington Station Growth Hub, Northallerton to Newcastle capacity enhancements and New Tees Crossing
Improve connectivity and resilience to the Tees Valley City Region economic clusters, particularly the South Tees Development Corporation site	Journey time improvements on the Bishop and Saltburn railway lines, and between Middlesbrough and York A66 Darlington to Teesport capacity improvements A174 / A1053 Greystones Roundabout

The proposed development is expected to benefit from future improvements to the transport network delivered through the TfN Investment Programme.

Regional Planning Policy Compliance

The new site access at Smith's Dock Road / Dockside Road includes walking and cycling facilities to connect to the existing network on the local roads in the vicinity of the site. In addition, the proposed development will provide an internal active travel network, in accordance with the wider South Tees transport strategy that is currently being developed. Cycle parking and associated supporting facilities in exceedance of local standards will be provided within the site. The details of these provisions will be agreed as part of the reserved matters application.

The development is located in close proximity to South Bank railway station. The development will also benefit from new sustainable transport provisions across the wider site and improvements to existing provisions in the wider area, through the STDC transport strategy. The proposed development is therefore aligned with regional planning policy.

2.3 Local Planning Policy

2.3.1 Redcar and Cleveland Local Plan (2018)

The Redcar and Cleveland Local Plan was adopted in May 2018. The vision is that the Plan will ensure that by 2032 the needs and aspirations of local communities will be met through the delivery of sustainable development across the Borough.

Of particular relevance is Policy LS4: South Tees Spatial Strategy. With regards to transport, the policy seeks to:

- Improve links between South Tees and the Strategic Road Network;
- Support improvements to the road network to support economic growth;
- Deliver rail improvements to support rail freight;
- Investigate the feasibility of a new rail halt at Wilton International;
- Maintain and improve public transport connectivity;
- Support the extension of the road network to unlock the development potential of South Tees; and
- Maintain and enhance walking routes from nearby towns to the South Tees employment areas.

In March 2019, the Council agreed a motion which declared a climate emergency and made commitments to:

- Make the Borough carbon neutral by 2030 taking account of production and consumption emissions;

- Seek powers and resources from Government to make the 2030 target possible; and
- Work with other local and regional Governments (both within the UK and internationally).

The Local Plan also stresses the existing transport connectivity of the STDC site, which has access to a deep-water port, excellent road and rail links, access to energy and utilities. Specific policies of relevance include:

- Policy SD4 relates to the general development principles and includes the requirements for locating development on appropriate sites with compatible surroundings, ensuring development is located in a sustainable and safe location, and ensuring there is adequate infrastructure to serve the development.
- Policy LS4 includes the objective to improve the accessibility of employment sites by a range of transport methods.
- Policy TA1 relates to transport and new development and includes the requirement for new developments to encourage transport choice and non-car modes.
- Policies TA2 and TA3 relate to improving accessibility by bus across the borough and improving the walking cycling and public rights of way networks respectively.

With regards to connectivity opportunities, Policy TA2 identifies schemes for improving accessibility within and beyond the borough. One of the key actions included in the policy refers to the delivery of the South Tees Dockside Road access to the site.

2.3.2 Redcar and Cleveland Local Transport Plan 2011-2021

The South Tees area is included in the Local Transport Plan as an area to be promoted for major industry, which will help the regeneration of the area and will contribute to the delivery of sustainable, inclusive and cohesive communities.

Two of the key challenges identified in the plan are improving the quality of urban, regional and local transport networks and improving connectivity and access to labour markets of key business centres. Improving access to existing and proposed employment and regeneration sites throughout the Tees Valley, including the South Tees and Teesport sites, is one of the key actions for addressing these challenges. The Local Transport Plan states that a range of bus services to the South Tees development are needed to ensure that the emerging employment opportunities are accessible to everyone, regardless of whether they own a car, and to ensure that these developments do not add to congestion on important routes.

The Plan also indicates that the new developments on the South Tees site are likely to create pressures for vehicle movements on the strategic road network, particularly at roundabouts on and between the A66, A1053(T), A174(T) and A19(T). These potential pressures will need to be addressed to enable full

economic advantage to be taken of the regeneration, but in a manner that does not undermine strategies for the growth of sustainable transport use. A new Tees Crossing is a long-term proposal to improve access in the area by enabling vehicle movements to and from north of the river to avoid bottlenecks on the A66 and A19 around Middlesbrough and Stockton-on-Tees.

Local Planning Policy Compliance

Junction capacity assessments have been undertaken at key junctions in the vicinity of the site, to assess the impact of the proposed development on the local and Strategic Road Network. The assessment has identified significant effects on specific junctions. However, it is noted that the assessment represents a worst-case scenario in terms of future mode share and potentially development vehicle traffic distribution. It is expected that the physical walking and cycling measures and the public transport improvements that will be provided as part of the sustainable transport measures of the wider STDC site transport strategy will promote mode shift across the wider site.

The Dockside Road roundabout has now been delivered and the proposed development will benefit from a western site access through this new junction.

The proposed development is therefore aligned with local planning policy.

2.4 South Tees Area Specific Documents

2.4.1 Redcar and Cleveland South Tees Area Supplementary Planning Document (2018)

The SPD for the South Tees area was adopted in May 2018. One of the key objectives of the SPD is delivering efficient connectivity across the South Tees Area through making the best use of existing transport infrastructure, providing new and enhanced on-site transport infrastructure and creating an integrated and safe transport network, which takes account of the needs of a variety of users and includes sustainable travel measures.

In terms of phasing of the STDC site, the SPD indicates that early phases for the site should be the areas where transport access/egress is presently afforded.

With regards to transport infrastructure, Development Principle STDC5 states that the Council will, in partnership with the STDC and transport operators, other stakeholders and developers, seek to improve and enhance the transport infrastructure serving the South Tees Area. The Council will not support development proposals that may adversely impact on the delivery of the Infrastructure Corridor, and will ensure that all new developments will be required to have access to adequate infrastructure to meet their transport requirements.

The SPD also identifies a list of transport infrastructure schemes that will be supported, subject to confirmation of the need for each project and the avoidance of unacceptable environmental or amenity impacts. The following are of relevance to the proposed development:

- The provision of a four-arm roundabout at South Bank, giving improved access from the A66, via Dockside Road.
- The provision of new collector and local roads, providing access across and between development zones;
- The establishment of new rail connectivity at South Bank Wharf;
- The redevelopment of South Bank Wharf to bring this important river frontage back into beneficial use; and
- The provision of new and enhanced footpath and cycleway network identified within the Transport Strategy.

The SPD states that the presence of the existing passenger railway running through the South Tees Area is a major attribute for development and a key opportunity for improving access to significant employment opportunities by public transport. The existing South Bank railway station is optimally located to serve the South Industrial Zone. The SPD supports enhancements to the South Bank station to meet the anticipated future travel demands of the development.

Also, the SPD specifies that the area wide Transport Strategy for the STDC site will include new and enhanced footpath and cycleway networks enabling ease of movement across the industrial park by non-automated transport modes and development proposals that align with this strategy will be supported.

2.4.2 South Tees Regeneration Masterplan (November 2019)

The STDC masterplan stated that ease of access to the site by all travel modes will be an essential component of a successful regeneration, also stressing the need for the site to be equipped with adequate, modern infrastructure for efficiently handling freight imports and exports. As the STDC site will result in an increase in number and change in patterns of trips in the area, the masterplan stresses that it is vital to ensure effective and enhanced connectivity by road, rail and bus.

The masterplan provides details about the three accesses to the STDC site, the western one of which is the new access to the proposed development at the Dockside Road / Smith's Dock Road junction. The masterplan also discusses freight and passenger rail connectivity to the STDC site, referencing the opportunities for improvements at the under-used freight rail infrastructure, as well as the proposed improvements to the South Bank station to address the increase in passenger demand.

The masterplan also notes that consideration will be given to the impact on the local highway network of the planned major increases in traffic resulting from the STDC development, so that junction capacities are not adversely impacted.

Site-specific Policy and Strategy Compliance

The Dockside Road roundabout has now been delivered and the proposed development will benefit from a western access through this new roundabout.

The proposed development is aligned with the STDC site specific policies and the masterplan for the site, as it will provide improvements to the transport network to allow access to the development by sustainable and active travel modes, including physical measures (e.g. cycle parking and associated facilities, internal walking and cycling network), as well as other measures included in the transport strategy for the wider STDC site, currently being developed.

This Transport Assessment assesses the impact of the proposed development on the local and Strategic Road Network, to identify the impact of the proposed development on neighbouring junctions, and provides embedded mitigation, in the form of sustainable transport initiatives from the emerging site-wide transport strategy.

3 Baseline Conditions

3.1 Site Description and Location

The application site, which is currently vacant, is located within the STDC area and makes up part of the area known as the South Industrial Zone and extends to an area of approximately 174 hectares. The site's history includes iron and steel industries, and the storage of material and freight rail infrastructure uses. The site is located on the south bank of the River Tees, approximately 7km to the west of Redcar town centre and 4.5km to the east of Middlesbrough town centre.

The site is bordered by the River Tees to the north, Smith's Dock Road to the west, local access roads that run parallel to the railway line to the south, and the MGT site, currently under construction, to the east. Industrial estates are located to the west and to the south of the site, and the Prairie site is also located to the immediate south of the site. Residential areas are located to the south of the A66 in the vicinity of the site.

3.2 Sustainable Transport Networks

3.2.1 Walking and Cycling

Walking facilities in the vicinity of the site are currently limited. All roads have footways on at least one side of the carriageway and the footway on Smith's Dock Road connects the site to South Bank railway station via a footbridge which crosses the railway. The footbridge also provides a connection to the Teesdale Way Public Right of Way (PRoW) which runs parallel to the railway line.

The nearest National Cycle Route (NCR) is NCR1 which runs along Redcar Road and parallel to Middlesbrough Road, approximately 1.3km (linear distance) to the south of the site. NCR1 provides strategic connections between Saltburn, Marske, Redcar and Middlesbrough.

On-road local cycle routes are also provided through Eston, Grangetown and South Bank to the south of the site, (on-road signed routes in some locations and advisory routes through quiet streets in other locations).

An overview of local and NCRs in the wider area is shown in **Figure 2** and **Figure 3** respectively.

Figure 2: Local Cycle Routes

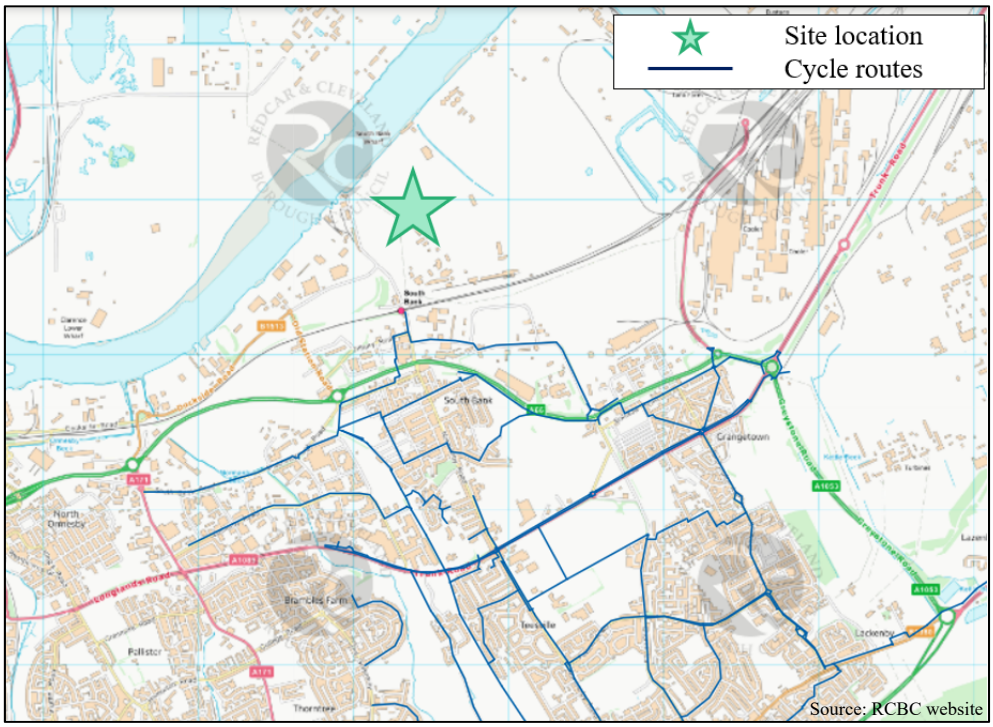
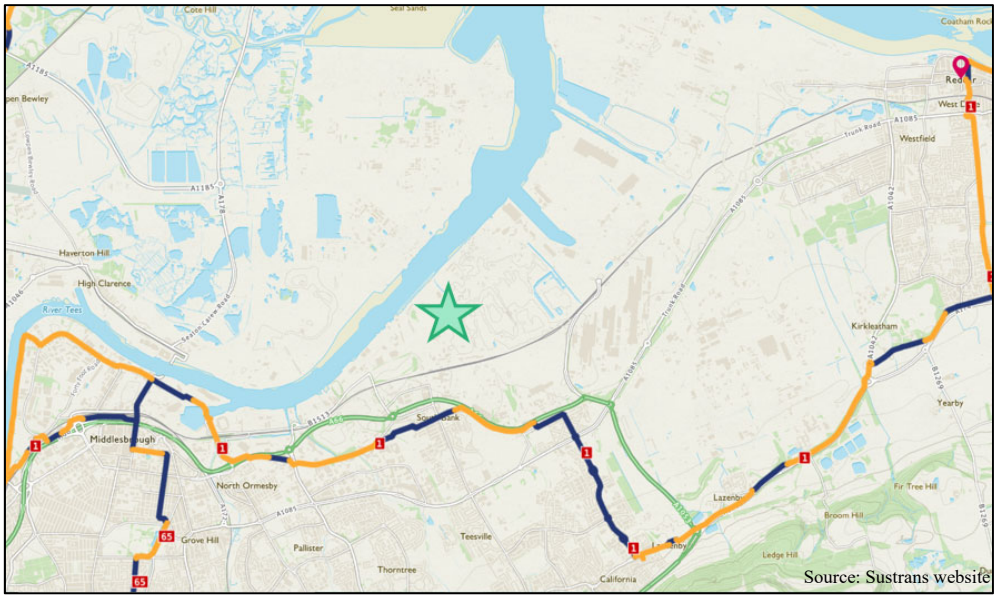


Figure 3: National Cycle Routes



3.2.2 Public Transport

Bus Services

There are currently no bus services in the immediate vicinity of the site, with the nearest bus stops located in the residential area of South Bank, approximately 1.3km walking distance to the south of the site. The bus stops are served by bus services 64 / 64A and 64B and the services are shown in **Table 2**.

Table 2: Bus Services in the South Bank Area

Route No.	Bus Stop	Route	Daytime frequency (minutes) per direction	
			Monday – Saturday	Sunday
64 / 64A	King George's Square	Eston – Redcar – Dormanstown – Grangetown - Bankfields – South Bank - Middlesbrough	Every 30 minutes	Every hour
64B	King George's Square	(Middlesbrough Bus station – South Bank Middlesbrough Road – Lazenby Village) – Eston Square – Normanby Top – South Bank Middlesbrough Road – Middlesbrough Bus station	Three AM services after 05:50 (Saturday only)	-
***Only key intermediate stops noted** ****Services shown above reflect timetable changes due to travel restrictions during the Covid 19 pandemic** **Sources: Arriva, Stagecoach**				

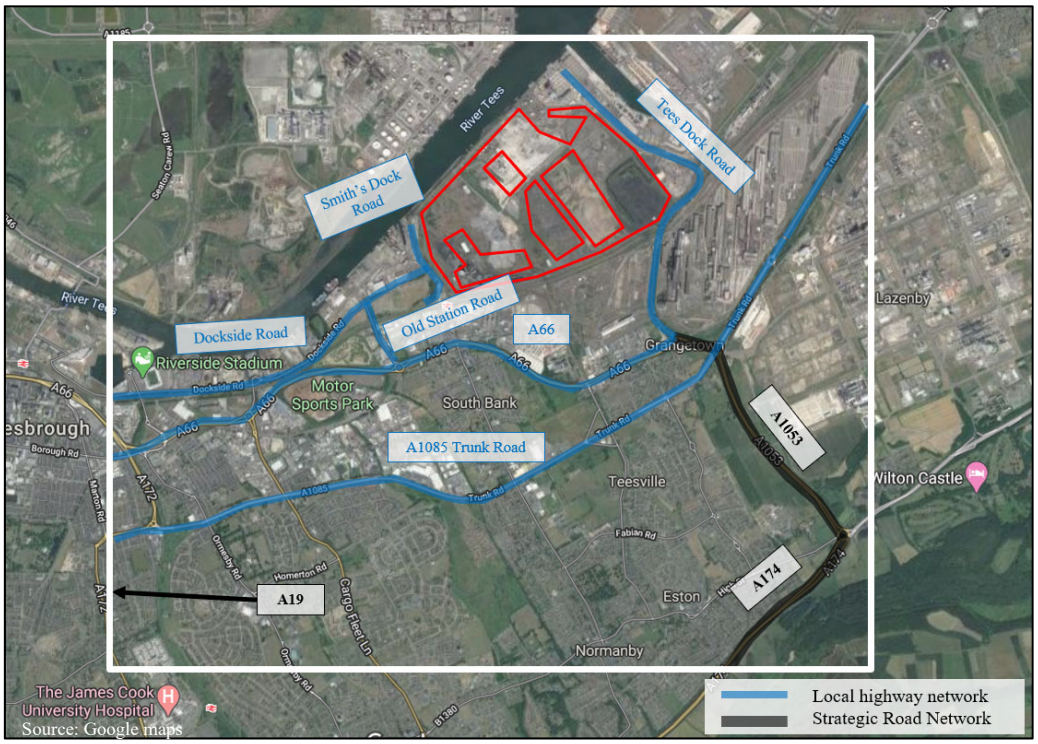
Railway Services

South Bank railway station is located approximately 900m to the south of the site (11min walking distance). The station is serviced by Northern, which provides hourly services between Bishop Auckland (via Darlington) and Saltburn.

3.3 Highway Network

An overview of the local and Strategic Road Network (SRN) in the vicinity of the site is shown in **Figure 4**.

Figure 4: Local and Strategic Road Network



3.3.1 Local Highway Network

The local highway network consists of the following key roads:

- A66, a dual four-lane carriageway in the vicinity of the site, runs in an east-west direction to the south of the site, and connects to the A19 to the west and to the A1053 and Trunk Road to the east. The A66 is a key east-west corridor that links Middlesbrough to Redcar;
- Dockside Road, a two-lane single carriageway, runs in an east-west direction to the west of the site. Dockside Road will provide access to the site via the new roundabout that has been constructed at its junction with Smith's Dock Road;
- Smith's Dock Road is a local access road (two-lane single carriageway) that currently provides access to businesses located to the west of the site;
- Old Station Road, a two-lane single carriageway, runs in a north-south direction and connects to Dockside Road to the north and to the A66 and Middlesbrough Road to the south; and
- Tees Dock Road is a two-lane single carriageway along most of its length, that runs to the south-east of the site. Tees Dock Road provides a secondary access to/from the eastern boundary of the proposed development and connects to the A66 and the A1053 at a three-arm roundabout.

3.3.2 Strategic Road Network

The SRN near the site consists of the following roads:

- A1053, a four-lane dual carriageway, runs in a north-south direction and connects to the A66, Tees Dock Road, and Trunk Road, which is the key corridor into Redcar town centre in the north. To the south, the A1053 connects to the A174 and B1380 High Street at the Greystones roundabout; and
- A174, a four-lane dual carriageway to the south of the site, is a key east-west corridor between Middlesbrough and Redcar, that connects to the A19 to the west and to the A1053 to the east.

3.4 Road Safety

Collision data covering the study area has been sourced, for the period 2015 to 2019 inclusive, from the Crashmap website. An overview of the collisions in the study area is provided in **Figure 5** and **Table 3**. The detailed records are attached in Appendix C.

Figure 5: Study Area Collision Map

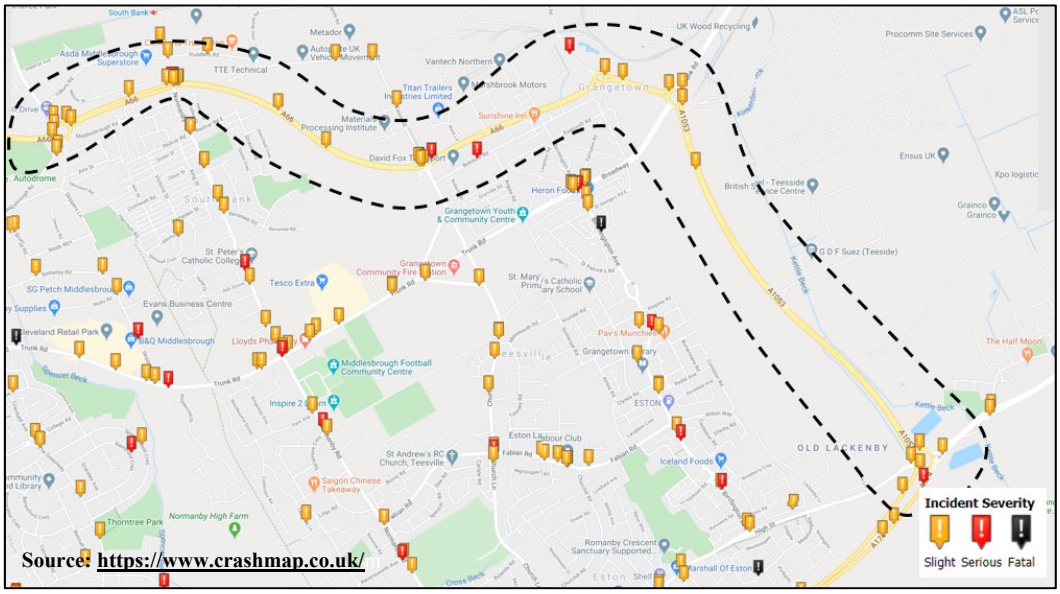


Table 3: Study Area Collision Data 2015 - 2019

Severity	2015	2016	2017	2018	2019	Total
Fatal	0	0	0	0	0	0
Serious	3	0	1	1	1	6
Slight	10	8	6	4	2	30
Total	13	8	7	5	3	36

3.4.1 A66 / Middlesbrough Road / Old Station Road

At the A66 / Middlesbrough Road / Old Station Road roundabout, the data indicates that seven collisions resulting in slight injuries were recorded between 2015 and 2019, two of which were located on the links, away from the approaches

to the junction. Four of the collisions took place in 2018, and one collision took place in each year between 2015 and 2017.

At the A66 / Old Station Road / Middlesbrough Road roundabout all the collisions are categorised as slight and there are no common causation factors, with collisions distributed around the junction and appearing to be minor shunt type collisions. No collisions involving vulnerable road users were noted at the junction between 2015 and 2019.

3.4.2 A66 / Normanby Road

Nine collisions were recorded at the A66 / Normanby Road junction in the 2015-2019 period. Two of the collisions resulted in serious injuries, with the remaining seven collisions resulting in slight injuries. Three of the collisions took place in 2015, three took place in 2016, and one took place in each year between 2017 and 2019.

There is an apparent trend that the collisions at the A66 / Normanby Road crossroads appear to be related to vehicles making a turning manoeuvre. One of the collisions that took place at the junction between 2015 and 2019 also involved a vulnerable road user (cyclist), resulting in serious injury to the cyclist.

3.4.3 A66 / Eston Road / Church Lane

Five collisions took place between 2015 and 2019 at the A66 / Eston Road / Church Lane junction, two of which resulted in serious injuries (both took place in 2015) and three in slight injuries. Four out of the total five collisions happened in 2015 and one in 2017.

At the A66 / Eston Road / Church Lane junction there are two collisions classified as serious, involving pedal cyclists, but there appears to be no common causation factor to the collisions.

3.4.4 A66 / A1053 / Tees Dock Road

Two collisions with slight injuries were recorded at the A66 / A1053 / Tees Dock Road roundabout in the study period; one in 2015 and one in 2018. A collision resulting in serious injuries took place in 2017 on Tees Dock Road, further north of the junction.

3.4.5 A1053 / A1085 Trunk Road / A1053 Greystone Road

Three collisions with slight injuries were recorded in the study period at the A1053 / A1085 Trunk Road / A1053 Greystone Road roundabout, two of which happened in 2019 and one in 2016.

3.4.6 A1053 Greystone Road / B1380 High Street / A174

Six collisions were noted at the A1053 Greystones roundabout between 2015 and 2019, one of which was serious (took place in 2015). Three of the total collisions took place in 2015 and three in 2016.

3.4.7 Road Safety Summary

Based on the review of the collision data, three local junctions have been identified where geographic clusters of collisions have occurred in the assessment period:

- A66 / Old Station Road / Middlesbrough Road roundabout;
- A66 / Normanby Road signalised crossroads; and
- A66 / Eston Road / Church Lane signalised junction.

No common causation factors have been identified except at the A66/Normanby Road junction where vehicles turning right was recorded as the vehicle manoeuvre in five of the nine collision records.

4 Development Proposals

4.1 Development Description

It is expected that the proposed outline planning application will be for the development of up to 418,000sqm of general industry (use class B2) and storage or distribution facilities (use class B8), with ancillary office accommodation, HGV and car parking, and associated works.

First occupancy of the development will be in 2023, with the site fully occupied by 2028. When fully operational, the site is expected to accommodate approximately 3,870 employees.

4.2 Vehicular Site Access

Two vehicular accesses into the site will be provided to disperse trips across the network. The main access into the site will be via the new roundabout junction which has been constructed at the junction of Smith's Dock Road and Dockside Road. The roundabout has been constructed to serve the STDC Regeneration Masterplan and facilitate access into the SIZ. There is also a secondary access provided on the eastern boundary of the site which connects to Tees Dock Road.

4.3 Pedestrian and Cycling Facilities

A walking and cycling network will be provided across the site and will connect to existing facilities on the site accesses and surrounding area. The internal walking and cycling network will be developed as part of the transport strategy for the wider STDC site and agreed through the reserved matters application for the proposed development. Associated facilities such as cycle parking, showers and lockers etc will also be provided within the proposed development, the details of which will be agreed through the reserved matters application.

The transport strategy for the South Tees Regeneration Masterplan is currently being developed. Some of the key outcomes included in the strategy are the following:

- High quality public transport, walking and cycling routes and connections are prioritised over other transport modes;
- Cycling and walking connections to local residential centres are safer, more attractive, widely used and support local town centre regeneration;
- Transport options enable improved individual health and wellbeing and access to jobs; and
- Transport options will support the transition to zero carbon and contribute to a high-quality environment that will attract future occupiers.

The strategy for the wider site will propose a series of measures to be implemented across the STDC site in order to achieve these outcomes, which is expected to include, amongst other things, limiting car parking provision,

introducing mobility hubs, providing high quality cycling parking and improving public transport provision. Future occupiers of the proposed development will be expected to sign up to the transport strategy to meet sustainability targets (including RCBC's ambition to be carbon neutral by 2030) and will benefit from the measures introduced to enhance the accessibility of the site. These benefits, which will be embedded into the site in the future, will help to minimise the impact of development traffic and have a beneficial impact on pedestrian and cyclist amenity.

4.4 Public Transport Facilities

The proposed development will benefit from improvements to the existing public transport facilities in the wider area and new provisions within the STDC site, as part of the transport strategy for the wider site.

Some of the relevant key outcomes of the STDC transport strategy currently being developed include prioritising public transport (along with active travel) over other modes, providing a range of accessible, fast, frequent and reliable transport options for the site, and ensuring connections with local and inter-regional transport networks are seamless.

The strategy for the wider site will propose a list of potential measures to be implemented across the wider South Tees site to achieve these outcomes, such as the provision of mobility hubs within the South Tees site, an internal bus service to connect between the hubs and the provision of real time information at bus stops.

4.5 Car Parking

As an outline planning application, the internal site layout has not yet been developed and therefore the level of car parking provision is expected to be agreed as part of the reserved matters application.

A transport strategy for the South Tees Regeneration Masterplan is currently in development and it is envisaged that the strategy will limit car parking within the site as far as reasonably possible, to meet sustainability targets (including RCBC's ambition to be carbon neutral by 2030). Therefore, this TA does not include a car parking assessment but assumes that car mode share is in line with baseline conditions, to assess a worst-case scenario with regards to the potential highway impact. However, it is expected that investment will be made in alternative transport provision to support the wider South Tees strategy and limit private car trips to / from the site.

Among others, the STDC site transport strategy aims to prioritise public transport and active travel over other modes, ensure that the site does not feel dominated by cars and other vehicles, and the transport options provided will support the transition to zero carbon and contribute to a high-quality environment that will attract future occupiers. To achieve these outcomes, the strategy will propose a series of measures to limit car use to the site, such as providing centralised car

parks, providing priority parking for car sharers, providing EV charging infrastructure, and enforcing car parking restrictions, amongst others.

4.6 Cycle Parking

The development will provide cycle parking spaces in excess of the current Tees Valley standards (*Tees Valley Design Guide and Specification – Residential and Industrial Estates Development)* in accordance with the transport strategy that is being developed for the wider South Tees site. The development will also provide supporting facilities for walking and cycling, such as showers and changing rooms, lockers etc, as mentioned in Section 4.3.

Details about the cycle parking spaces and associated facilities for the proposed development will be agreed through the reserved matters application.

5 Trip Generation

5.1 Person Trips

The development proposals are for B2/B8 industrial use, with approximately 10% of the floor area for ancillary office use. It has been forecast that when fully operational (2028), the development could accommodate approximately 3,870 employees.

To determine how many trips the employees would generate on a daily basis, we have derived trip rates from the TRICS database. TRICS is a recognised database widely used by transport professionals, which predicts trip rates of developments based on survey information of comparable sites.

It is difficult to find comparable sites given the scale of the proposed development, but four industrial estate type sites were identified in the TRICS database that were of similar scale and predominately B2/B8 use (with 10% office use), and with recent surveys (2017 and 2018). The trip rates per employee are shown in **Table 4** with further details contained in the TA Scoping Report (see Appendix B).

Table 4: Industrial Estate Trip Rates

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	0.322	0.089	0.411	0.078	0.314	0.392	2.134	2.121	4.255
LGVs	0.029	0.022	0.051	0.01	0.016	0.026	0.294	0.287	0.581
HGVs	0.19	0.16	0.035	0.014	0.01	0.024	0.218	0.208	0.426

The trip rate for service and delivery vehicle trips (light goods vehicles and heavy goods vehicles) has been shown to disaggregate the overall person trip rate and determine how many trips are likely to be made by commuters, versus service vehicle trips. The trips for each mode, based on 3,870 employees, are shown in **Table 5**.

Table 5: Total Trips

	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	1,246	344	1,591	302	1,215	1,517	8,259	8,208	16,467
LGVs	112	85	197	39	62	101	1,138	1,111	2,248
HGVs	74	62	135	54	39	93	844	805	1,649
Person Trips (excluding LGVs/HGVs)	1,060	197	1,258	209	1,115	1,324	6,277	6,293	12,570

The data in **Table 5** shows that LGVs account for approximately 14% of all trips, with HGVs accounting for 10% of daily trips based on the surveys from other industrial estates. Excluding servicing trips, the site is forecast to generate 12,570 two-way commuter trips on a daily basis (and approximately 1,500 two-way trips in each peak hour).

The south-eastern corner of the site was previously used as landfill and for waste management facilities. However, as the development site is currently vacant, it is proposed that the trip generation does not take into account previous or permitted uses and therefore the overall trip generation will not be discounted; all trips will be added to the network as new trips.

Similarly, there is potential for the quayside to be developed providing the opportunity for freight movement by sea. This would reduce freight movements in and out of the site via the highway network. However, for the purpose of the assessment, it has been assumed that all freight traffic travels by road.

5.2 Trips by Mode of Transport

Having established a method for calculating the number of trips generated by the proposed development, the person trips (excluding servicing) have been distributed onto transport modes using data from the 2011 UK Census Journey to Work dataset. This data records how people working in this area (Census zone E02002517) travelled to work in 2011 and the results are shown in **Table 6**.

Table 6: 2011 Census Method of Journey to Work (Destination Zone - E02002517)

Mode	2011 UK Census - Percentage
Car Driver	82%
Car Passenger	8%
Bus	3%
Bicycle	3%
Walking	3%
Motorcycle	1%

It can be seen that 82% of trips to the South Tees area for the purpose of work were made by car in 2011. It is expected that the transport strategy for the site will seek to reduce this mode share significantly, but as a worst-case scenario for the transport impact assessment it will be assumed that 82% of employees will drive to the proposed development site. Applying this mode share to the person trip generation (excluding servicing), results in the commuter vehicular trip generation outlined in

Table 7. It is assumed that visitor and business trips have also been captured in the employee car trip generation.

Table 7: Total Vehicular Trip Generation

	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Employee Car Trips	870	162	1,031	171	914	1,085	5,147	5,160	10,307
LGVs	112	85	197	39	62	101	1,138	1,111	2,248
HGVs	74	62	135	54	39	93	844	805	1,649
Total Vehicular Trips	1,055	309	1,364	264	1,015	1,279	7,129	7,076	14,204

5.3 Vehicular Trip Distribution and Assignment

It is proposed that the development site be served by two accesses, one on the eastern boundary and accessible via Tees Dock Road, and the other via the new roundabout on Smith's Dock Road. The latter will be promoted as the main access into the site with Tees Dock Road as a secondary access.

Whilst the Smith's Dock Road access on the western boundary of the development site will be signposted as the main access, the distribution of trips in the transport models indicates that a large proportion of trips will come from the Redcar area to the east, as shown in **Table 8**.

Table 8: Transport Models Trip Distribution

Origin	NRTM	TVM	Average	Route	Nearest Access
Redcar	42%	47%	44%	Trunk Road or A174	East
Middlesbrough	21%	21%	21%	A66, Cargo Fleet Lane or A174	Either
Stockton	24%	10%	17%	A66	West
Hartlepool	5%	5%	5%	A19/A66	West
Darlington	2%	5%	4%	A66	West
External North	2%	5%	4%	A19/A66	West
External South	4%	6%	5%	A19/A174	Either

Based on the average distribution from the two models, it is assumed that approximately 40% of trips may use the secondary eastern access via Tees Dock Road. The eastern access may also be the nearest access to the development for some trips from Middlesbrough and the south that approach via the A174. However, as the address given for the main access will be Smith's Dock Road, it is reasonable to assume that the majority of trips from other areas will be directed towards the western access at Smith's Dock Road. Accordingly, it will be assumed that 60% of vehicular trips to / from the development use the new

roundabout via Smith's Dock Road and up to 40% use the eastern access via Tees Dock Road.

Traffic has been distributed on the remainder of the network using the turning proportions in the baseline traffic flow diagrams, which have been developed based on the methodology presented in Section 6.2.2. The traffic distribution, and resultant morning and evening peak hour vehicular development trips, are shown in Appendix D.

6 Development Impact Assessment

6.1 Sustainable Transport Network Impact Assessment

The trip generation methodology estimates trips by non-car modes but it is based on a worst-case scenario for the purpose of the highway impact assessment (assuming that 82% of people working on the site travel by car, as they did at the time of the 2011 UK Census). In the longer-term, it is expected that the transport strategy for the South Tees Regeneration Masterplan will bring forward accessibility enhancements to encourage a greater proportion of people to travel to and from the site sustainably. In the longer term, it is therefore expected that the activity generated by the proposed development will have a positive impact on the viability of sustainable transport networks in the vicinity of the site.

The proposed development will provide a series of physical measures to encourage active travel to /from the site, including an internal network of walking and cycling routes and associated facilities, such as cycle parking, showers and changing facilities. The development will also benefit from walking and cycling measures that will be provided across the wider STDC site. The proposed active travel and sustainable transport measures will aim to create a site that is not dominated by vehicles, but a site where trips by sustainable and active travel modes are enabled and encouraged.

6.2 Highway Impact Assessment

6.2.1 Assessment Scope

Based on the location of the proposed development and the current conditions at the local and SRN junctions, the impact of the development on the following junctions has been assessed:

1. Dockside Road / Smiths Dock Road / SIZ site access roundabout;
2. B1513 Dockside Road / Old Station Road roundabout;
3. A66 / Middlesbrough Road / B1513 Old Station Road roundabout;
4. A66 / A1053 / Tees Dock Road roundabout; and
5. A1053 Tees Dock Road / A1085 Trunk Road / A1053 Greystone Road signalised roundabout.

The locations of the junctions to be assessed is shown in **Figure 6**.

Figure 6: Locations of Junctions to be Assessed

6.2.2 Methodology and Assessment Scenarios

Due to current circumstances with the Covid 19 pandemic and lockdown measures, it is not possible for traffic surveys to be undertaken to inform the baseline condition assessment. To establish the baseline traffic flows, the following data sources have been utilised:

- Traffic data from HE North Regional Transport Model (NRTM);
- Traffic data from the Tees Valley Combined Authority (TVCA) Tees Valley Cube Model (TVM);
- Department for Transport traffic counts available online;
- WebTRIS (HE) online data;
- Traffic surveys collected on behalf of Capita in 2019 to construct a VISSIM model of the area for RCBC – permission to obtain a copy of these surveys was granted by RCBC, Capita and NETDC Ltd; and
- Survey data publicly available online from other local developments, including the planning application for the new roundabout at Smith's Dock Road / Dockside Road (application number R/2017/0788/FF) and the Cargo Fleet Lane junction improvements[1].

Peak hour data from the two traffic models (NRTM and TVM) was input into two separate traffic flow diagrams for the study area. On both diagrams, any observed

[1] Fore Consulting (2018) *Cargo Fleet Lane Junction Feasibility Study: Aimsun Modelling Report,* accessed 03/06/2020 https://www.middlesbrough.gov.uk/sites/default/files/A66-Cargo-Fleet-Aimsun-modelling-report-Apr18.pdf

data was added above the links to enable a comparison to be made and determine which data source provided the most comparable base. The NRTM was found to be a comparable match against the baseline flows, and therefore the NRTM flows were predominantly used to inform the baseline, except for where observed data was available. All data has been adjusted to 2020 and 2028 using NRTM growth.

The traffic flow diagrams are attached in Appendix D and the base flows are categorised to indicate which data source was used at each junction.

Based on the above, two assessment scenarios have been developed as follows:

- 2028 Base; and
- 2028 Base + Proposed Development.

Further details regarding how the base flows have been calculated is provided in the response to HE in Appendix B.

Given the inability to gather site specific baseline data, it should be noted that preparing the baseline traffic flow forecasts has relied on information provided by others and whilst all data was checked, Arup and STDC do not accept responsibility for the accuracy of such information. Arup emphasise that any forward-looking projections, forecasts, or estimates have been based upon interpretations or assessments of available information at the time of production.

6.2.3 Cumulative Impact Assessment

RCBC provided a list of committed developments for inclusion in the assessment. The development most likely to generate a cumulative impact on the local network is the York Potash Project (ref no R/2014/0627/FFM). However, the latest traffic diagrams for the development were not available on the planning portal. The data has been requested from RCBC but has not been obtained prior to submission of this TA.

The future base scenario (2028) has been developed using the growth included in the NRTM (adjusted for 2028). Many of the major committed developments in the area have been included in the NRTM growth. Therefore, no additional committed development traffic has been added to the '2028 Base + Proposed Development' scenario.

6.2.4 Junction Capacity Assessments

This section presents the junction modelling outputs for each assessed junction. The following non-signalised junctions have been developed using the ARCADY module of the Junctions 9 junction modelling software:

- Dockside Road / Smith's Dock Road / SIZ site access roundabout;
- B1513 Dockside Road / Old Station Road roundabout;
- A66 / Middlesbrough Road / B1513 Old Station Road roundabout; and
- A66 / A1053 / Tees Dock Road roundabout.

The A1053 Tees Dock Road /A1085 Trunk Road / A1053 Greystone Road signalised roundabout has been developed using the LinSig 3.2.39.0 signalised junction modelling software.

This section summarises the modelling outputs for each junction. The detailed modelling results for each junction are included in Appendix E.

Dockside Road / Smith's Dock Road / SIZ site access

Table 9 and **Table 10** below show the junction modelling results for the site access roundabout at Dockside Road / Smiths Dock Road.

Table 9: Dockside Road / Smith's Dock Road / SIZ site access junction – '2028 Base' scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Site Access	0.00	0	0.0	0.00	0	0.0
Smith's Dock Road NB	0.10	0	2.8	0.03	0	2.6
Dockside Road	0.08	0	2.7	0.09	0	2.8
Smith's Dock Road SB	0.04	0	2.6	0.01	0	2.6

Table 10: Dockside Road / Smith's Dock Road / SIZ site access junction – '2028 Base + Development' scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Site Access	0.18	0	3.1	0.49	1	5.0
Smith's Dock Road NB	0.11	0	3.2	0.04	0	3.7
Dockside Road	0.60	2	6.3	0.23	0	3.3
Smith's Dock Road SB	0.06	0	3.9	0.02	0	2.8

Based on the model outputs, the junction is forecast to operate within capacity for both the '2028 Base' and the '2028 Base + Development' scenario. The highest RFC (0.60) is noted for the Dockside Road arm of the roundabout for the '2028 Base + Development' AM peak hour scenario, which is well below its theoretical capacity (RFC=0.6<1).

B1513 Dockside Road / Old Station Road

Table 11 and **Table 12** below show the junction modelling results for the Dockside Road / Old Station Road roundabout.

Table 11: B1513 Dockside Road / Old Station Road junction – '2028 Base' scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Dockside Road WB	0.17	0	3.8	0.05	0	3.0
Old Station Road NB	0.22	0	3.6	0.28	0	3.7
Dockside Road EB	0.26	0	3.1	0.10	0	2.5
Teesport access road	0.05	0	3.0	0.04	0	2.7

Table 12: B1513 Dockside Road / Old Station Road junction – '2028 Base + Development' scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Dockside Road WB	0.38	1	5.1	0.59	1	6.9
Old Station Road NB	0.61	2	7.6	0.39	1	4.6
Dockside Road EB	0.55	1	6.2	0.16	0	2.8
Teesport access road	0.08	0	4.8	0.04	0	3.0

Based on the ARCADY model outputs, the junction is forecast to operate within capacity for both the '2028 Base' and the '2028 Base + Development' scenario. The highest RFC (0.61) is on the Old Station Road NB arm for the '2028 Base + Development' AM peak scenario, which is well below its theoretical capacity (RFC=0.61<1).

A66 / Middlesbrough Road / B1513 Old Station Road

Table 13 and **Table 14** below show the ARCADY model results for the A66 / Middlesbrough Road / B1513 Old Station Road roundabout.

Table 13: A66 / Middlesbrough Road / B1513 Old Station Road junction – '2028 Base' scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Middlesbrough Road WB	0.72	2	75.5	0.18	0	6.1
Middlesbrough Road NB	0.47	1	17.0	0.38	1	7.6
A66 EB	0.60	2	3.9	0.71	3	5.0
Old Station Road	0.28	0	5.9	0.64	2	18.6
A66 WB	0.91	10	15.4	0.61	2	3.7

Table 14: A66 / Middlesbrough Road / B1513 Old Station Road junction – '2028 Base + Development' scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Middlesbrough Road WB	3.32	46	2732.4	0.27	0	9.7
Middlesbrough Road NB	0.87	5	68.0	0.55	1	13.5
A66 EB	0.75	3	6.4	0.75	3	5.9
Old Station Road	0.39	1	6.8	1.60	174	732.6
A66 WB	0.98	23	34.7	0.72	3	5.3

The ARCADY model results indicate that the A66 westbound arm of the junction is forecast to approach its theoretical capacity in the '2028 Base' AM peak scenario (0.85<RFC=0.91<1).

In the '2028 Base + Development' AM peak scenario, the Middlesbrough Road westbound arm is forecast to be significantly above its theoretical capacity (RFC=3.32>1), and the Middlesbrough Road northbound and A66 westbound arms are forecast to approach their theoretical capacity (0.85<RFC=0.87<1 and 0.85<RFC=0.98<1 respectively).

In the PM peak, the Old Station Road arm is forecast to operate above its theoretical capacity (RFC=1.60>1).

A66 / A1053 / Tees Dock Road

Table 15 and **Table 16** below show the ARCADY model results for the A66 / A1053 / Tees Dock Road roundabout.

Table 15: A66 / A1053 / Tees Dock Road junction – '2028 Base' scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Tees Dock Road WB	0.92	11	21.3	0.43	1	2.8
A66 E	0.57	1	3.7	0.91	9	16.5
Tees Dock Road SB	0.62	2	5.8	0.87	6	27.1

Table 16: A66 / A1053 / Tees Dock Road junction – '2028 Base + Development' scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Tees Dock Road WB	0.97	19	36.9	0.49	1	3.2
A66 E	0.58	1	3.9	1.01	43	64.6
Tees Dock Road SB	0.72	3	7.9	1.44	217	689.4

The modelling results show that all three arms of the roundabout are forecast to approach their theoretical capacity in the '2028 Base' scenario (0.85<RFC<1), i.e. Tees Dock Road westbound in the AM peak, and A66 eastbound approach and Tees Dock Road southbound in the PM peak.

In the '2028 Base + Development' scenario, the Tees Dock Road westbound arm is forecast to continue to approach its theoretical capacity in the AM peak, (0.85<RFC=0.97<1), whilst the A66 eastbound approach and Tees Dock Road southbound arms are forecast to be above their theoretical capacity in the PM peak (RFC=1.01>1 and RFC=1.44>1 respectively).

A1053 Tees Dock Road / A1085 Trunk Road / A1053 Greystone Road

Table 17 and **Table 18** below show the LinSig model results for the A1053 Tees Dock Road / A1085 Trunk Road / A1053 Greystone Road signalised roundabout.

Table 17: A1053 Tees Dock Road / A1085 Trunk Road / A1053 Greystone Road junction – '2028 Base' scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Delay (PCUHr)	DoS (%)	Mean Max Queue (PCU)	Delay (PCUHr)
JUNCTION PRC (%)	24.30%			16.90%		
Cycle time	60 Seconds			60 Seconds		
A1085 Trunk Road NB, Ahead/Left	29.2%	0.7	0.3	27.2%	0.9	0.3
A1085 Trunk Road NB, Ahead	32.6%	1	0.4	23.5%	0.7	0.2
A1053 EB, Left	30.4%	3.1	0.9	56.8%	7.2	1.7
A1053 EB, Ahead	47.2%	5.6	1.6	77.0%	13.3	3.5
A1085 Trunk Road SB, Left/Ahead	23.8%	1.9	0.7	35.3%	2.2	1.2
A1085 Trunk Road SB, Ahead	70.1%	9.9	3.3	69.8%	7.1	3.2
Wilton site access, Left/Ahead	7.8%	0.2	0.1	10.4%	0.3	0.1
Wilton site access, Ahead	27.2%	0.8	0.3	47.7%	1.5	0.8
A1053 Greystone Road NB, Ahead/Left	71.4%	9.7	3.4	29.5%	2.7	1
A1053 Greystone Road NB, Ahead	72.4%	10.1	3.6	33.1%	3.1	1.1

Table 18: A1053 Tees Dock Road / A1085 Trunk Road / A1053 Greystone Road junction – '2028 Base + Development' scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Delay (PCUHr)	DoS (%)	Mean Max Queue (PCU)	Delay (PCUHr)
JUNCTION PRC (%)	7.10%			1.20%		
Cycle time	60 Seconds			60 Seconds		
A1085 Trunk Road NB, Ahead/Left	25.7%	0.5	0.3	31.6%	1.3	0.4
A1085 Trunk Road NB, Ahead	58.2%	2.1	1.1	24.8%	0.6	0.2
A1053 EB, Left	31.5%	3.2	0.9	65.2%	9.1	2.2
A1053 EB, Ahead	48.8%	5.8	1.6	88.9%	20.1	6.3
A1085 Trunk Road SB, Left/Ahead	22.4%	1.8	0.6	35.8%	2.3	1.2
A1085 Trunk Road SB, Ahead	81.9%	13.7	4.9	78.9%	8.8	4.3
Wilton site access, Left/Ahead	11.2%	0.3	0.1	13.6%	0.3	0.2
Wilton site access, Ahead	47.1%	1.5	0.8	70.5%	2.4	1.6
A1053 Greystone Road NB, Ahead/Left	84.0%	13.6	5.3	32.7%	3.1	1.1
A1053 Greystone Road NB, Ahead	84.1%	14.1	5.5	35.8%	3.4	1.3

The modelling outputs identify that the junction is forecast to operate within its theoretical capacity for both the '2028 Base' and the '2028 Base + Development' scenarios (PRC>0).

6.2.5 Junction Assessment Summary

The junction capacity assessments have identified that the following roundabouts will operate within capacity for both the '2028 Base' and the '2028 Base + Development' scenario:

- Dockside Road / Smith's Dock Road / SIZ site access roundabout;
- B1513 Dockside Road / Old Station Road roundabout; and
- A1053 Tees Dock Road / A1085 Trunk Road / A1053 Greystone Road signalised roundabout.

The A66 / Middlesbrough Road / B1513 Old Station Road roundabout is forecast to be approaching its theoretical capacity in the '2028 Base' AM peak scenario (A66 westbound arm). In the '2028 Base + Development' scenario, the Middlesbrough Road westbound and Old Station Road arms of the roundabout are forecast to be above their theoretical capacity (in the AM peak and PM peak respectively), whilst Middlesbrough Road northbound and A66 westbound are forecast to approach theoretical capacity in the AM peak.

The assessment forecasts that the A66 / A1053 / Tees Dock Road roundabout will approach its theoretical capacity in the '2028 Base' scenario. For the '2028 Base + Development' scenario, the Tees Dock Road arm of the junction will continue to approach its theoretical capacity, whilst the A66 eastbound approach and Tees Dock Road southbound arms will operate above their theoretical capacity.

It should be noted that the assessment has been undertaken based on a worst-case scenario, concentrating traffic in the south-west of the site and assuming that the majority of employees (82%) will drive to the site based on existing travel trends. The STDC transport strategy will implement measures to substantially reduce the 82% commuter car mode share percentage and reduce the volume of traffic generated by the proposed development. As the transport strategy is still in development, it has not been possible to quantify the reduction in car mode share that the measures would deliver, and re-model the junctions. In mitigation, it is expected that the requirement to provide a car parking management plan in the interim will be conditioned.

The assessment also assumes future development traffic will follow existing distributions. However, the impacts are expected to be minimised if vehicles re-route in the future, due to off-site highway improvements. For example, rather than access the site via Old Station Road, traffic has an alternative route to access the site via Dockside Road, where it can access the A66 at the Cargo Fleet Lane junction. The Cargo Fleet Lane junction is currently being improved to provide additional capacity and consequently it may be more attractive to use Dockside Road and the improved Cargo Fleet Lane junction to access the site from the A66.

A previous Arup study (Joint Transport Needs Assessment, 2019) raised capacity issues at the A66 / Tees Dock Road roundabout, and the future baseline

assessment indicates that the junction is approaching capacity without the addition of development traffic. Existing issues at the junction, that may be exacerbated by the development, will need addressing as part of the wider STDC strategy. In the interim, it is expected that traffic will be permitted to travel through the site on the internal road network and use the Steel House roundabout access located at the eastern extent of the site. This will reduce traffic through the Tees Dock Road junction and minimise the impact at the A66 / Tees Dock Road junction.

6.2.6 Road Safety Assessment

The baseline review of collision data identified three local junctions where clusters of collisions occurred, and which have therefore been reviewed in further detail.

A66 / Middlesbrough Road / Old Station Road

At the A66 / Old Station Road / Middlesbrough Road roundabout all the collisions recorded between 2015 – 2019 were categorised as slight and there were no common causation factors identified. Collisions were distributed around the junction and were generally minor shunt type collisions. No collisions involving vulnerable road users were noted at the junction between 2015 and 2019. The proposed development will add additional traffic through this junction but given that there is no evidence of a prevailing road safety issue at any arms of the junction, the effect of the increased traffic flow on collisions and safety is expected to be negligible.

A66 / Normanby Road

The baseline review identified an apparent trend that the collisions at the crossroads appeared to be related to vehicles making a turning manoeuvre. The majority of traffic generated by the proposed development is expected to travel straight-ahead at this junction. It will not therefore increase turning manoeuvres at the junction, but it will increase the volume of oncoming traffic so it could have a minor impact on collisions and safety.

A66 / Eston Road / Church Lane

The baseline review identified two collisions at this junction that were classified as serious and involved pedal cyclists, but there appeared to be no common causation factor to the collisions. As there is no evidence of a prevailing road safety issue at the junction, the effect of the forecast increase in traffic flow generated by the development in this location is expected to be negligible.

6.3 Mitigation

The junction modelling has identified that two of the assessed junctions in the vicinity of the site will be significantly impacted by the proposed development. It is however reasonable to suggest that implementing the wider transport strategy

for the South Tees site will mitigate, to some extent, the impact on the highway network.

The South Tees site transport strategy, currently in development, will set out the vision for the wider site to become an exemplar, world class industrial park that is renowned as a destination for manufacturing excellence. To achieve the vision, the transport strategy has agreed eight outcomes with the Transport Steering Group that the STDC site should aim to deliver. The outcomes are:

- A range of high-quality transport options, which are all inclusive, accessible, fast, frequent, convenient, affordable, reliable, safe and resilient;
- High quality public transport, walking and cycling routes and connections are prioritised over other transport modes;
- The site should not be dominated by cars and other vehicles or severed from local areas by transport infrastructure;
- Transport connections with local, inter-regional, national and international transport networks for people and goods are seamless and will attract developers / investors to the site;
- Cycling and walking connections to local residential centres are safer, more attractive, widely used and support local town centre regeneration;
- Transport options enable improved individual health and wellbeing and access to jobs;
- Transport options will support the transition to zero carbon and contribute to a high-quality environment that will attract future occupiers; and
- Transport infrastructure can adapt to market demand, new transport technology and market disruptors, attracting developers / investors to the site.

The strategy will develop a delivery plan of interventions to meet the outcomes, which is expected to include, amongst other things, measures such as limiting car parking provision, introducing mobility hubs, providing high quality cycle parking and improving public transport provision.

7 Travel Plan Framework

A transport strategy is currently being developed for the wider South Tees site, which will include a series of outcomes and measures as agreed with the South Tees Transport Steering Group.

It is proposed that a Travel Plan will be developed for this site based on the transport strategy for the South Tees Regeneration Masterplan. Future occupiers of each development within the South Tees site will be expected to sign up to the Travel Plan.

However, as this site will be developed in advance of the transport strategy being adopted, a Travel Plan framework has been developed in this section. The framework identifies a list of measures for the proposed development that could be applied in advance of the wider strategy coming forward, but also outlines how the site will be incorporated into the wider masterplan in due course.

Details about the Travel Plan management and monitoring processes will be identified as part of the emerging transport strategy.

7.1 Travel Plan Measures

7.1.1 Facilitating Walking and Cycling

This section provides a list of physical and promotional measures to enable and encourage walking and cycling to / from the proposed development.

- Providing secure, well located cycle parking spaces on the site in exceedance of local cycle parking requirements. The occupiers will also be encouraged to provide supporting facilities for walking and cycling, such as shower and changing facilities, safe storage / lockers for bicycle gear / shoes / umbrellas etc. The potential for providing pool bikes / cycle hire facilities / cycle hubs across the site will also be explored as part of the transport strategy for the wider South Tees site;
- Briefing staff on walking / cycling opportunities to travel to / from the site and providing information on provisions within the site as well as in the wider area in employee starter packs. Personalised help and support will also be provided to individuals requiring further help with travel;
- Providing information on walking and cycling routes in the vicinity as well as within the site, and on the health benefits of walking and cycling, on noticeboards in staff common areas, as well as on the occupier's website;
- Encouraging those who walk to join a "Walking Buddy" scheme so employees can walk together rather than alone;
- Developing partnerships with local cycle shops to organise Bike Doctor events for the occupier, for employees to bring bicycles in for servicing and minor repairs;

- Enabling efficient cycle purchase by participating in the Cycle to Work scheme;
- Promoting National Travel Awareness Days including Walk to Work Week, World Environment Day, European Mobility Week etc; and
- Working with RCBC and TVCA to promote their travel awareness initiatives and brands such as 'Let's Go Tees Valley', alongside initiatives run by other stakeholders such as Sustrans.

7.1.2 Facilitating Public Transport Use

This framework proposes a list of measures to help promote the use of sustainable transport for trips to / from the site including:

- Briefing staff on sustainable transport provisions to / from the site and providing information in employee starter packs. Personalised help and support will also be provided to individuals requiring further help with travel. Information on the internal public transport provisions within the wider South Tees site will also be provided, when the transport strategy for the wider site is adopted;
- Displaying up to date public transport information, including timetables, maps, fare information and available ticket deals for buses and train services within staff common areas, as well as on the occupier's website; and
- Exploring the opportunities for corporate public transport ticketing, by liaising with transport operators.

7.1.3 Reducing Car Dependency

In addition to the measures to encourage travel by sustainable modes, it is important that a series of measures to reduce dependency on the private car is also implemented at the proposed development:

- Providing a reduced number of car parking spaces for the proposed development, in agreement with the South Tees site transport strategy, which is currently being developed. The details on car parking provision for the proposed development will be agreed through a reserved matters application;
- Developing and enforcing a car parking management strategy/plan, which is expected to be conditioned, to allow adequate parking for those who need it, whilst encouraging the use of sustainable transport;
- Promoting opportunities for car sharing to employees (e.g. publicising car sharing websites such as liftshare.com) and the benefits of car sharing on building noticeboards and the occupier's website. It should also be ensured that employees are provided with a guaranteed lift home in the event of an emergency;
- Providing dedicated car parking spaces for car sharers;
- Liaising with neighbouring businesses to promote car sharing; and

- Providing information on noticeboards and on the official occupier's website on car club opportunities (or similar) provided at the wider STDC site, as and when these come forward.

7.1.4 Managing Delivery and Servicing Trips

- Consolidating servicing, where possible, will be encouraged across the wider South Tees site. More information on managing servicing and delivery trips to the site will be provided within the transport strategy.

7.1.5 Implementation Timescales

The measures outlined in this section will be implemented as follows:

- **Physical measures**: implemented during construction at the same time as the proposed development, in time for opening;
- **Promotional measures**: implemented prior to occupation during the marketing of the development and staff interviews/induction, and on a continuous basis with specific initiatives on at least an annual frequency; and
- **Other site-wide measures**: This section has referred to some potential measures that will be developed to promote active and sustainable transport and manage vehicular trips, as part of the wider site transport strategy. These measures, among others, will be implemented when the South Tees site transport strategy gets adopted.

7.2 Travel Plan Management and Monitoring

A site-wide Travel Plan Coordinator(s) will be appointed to develop a marketing strategy for the site-wide Travel Plan, ensure and oversee its implementation, as well as monitor and review its effectiveness. More details on the role of the Coordinator(s) will be included within the transport strategy and the site-wide Travel Plan. The TP Coordinator(s) will also be responsible for the implementation of the initial Travel Plan measures that have been developed for the proposed development.

Regular monitoring of the site-wide Travel Plan will be undertaken to review its targets and the effectiveness of its measures, and it will be updated accordingly. More details on the monitoring process and timelines will be included within the transport strategy and the site-wide Travel Plan.

8 Summary and Conclusions

Arup has been commissioned by the South Tees Development Corporation to develop a Transport Assessment in support of a planning application for the development of industrial (B2/B8) land-use at the South Industrial Zone of the South Tees Development Corporation site in Redcar.

The key findings of the Transport Assessment are summarised below:

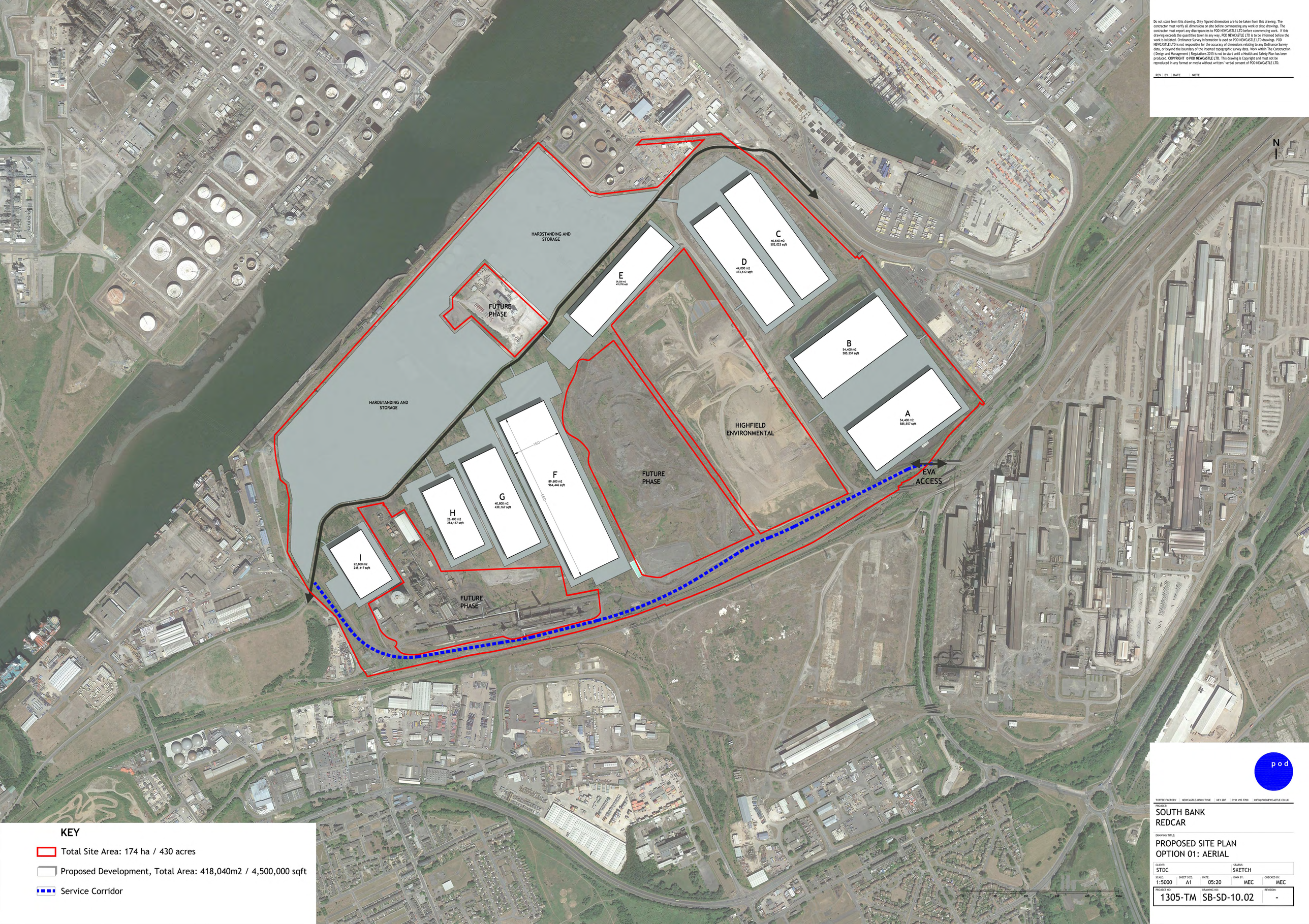
- Current walking and cycling provisions in the vicinity of the site are limited. The proposed development will provide an internal network of walking and cycling routes, along with cycle parking spaces and associated facilities. The development will also benefit from additional measures to encourage active travel to/from the site, as part of the transport strategy for the wider South Tees area, which is currently in development;
- There are no bus services in the immediate vicinity of the site, with the closest bus stops located in the residential areas to the south. South Bank railway station is located near the site; however, the station is serviced by a limited number of services. The proposed development will benefit from improvements to the existing public transport facilities in the wider area and new provisions within the wider South Tees site, as part of the transport strategy for the STDC site. It is expected that the activity generated by the proposed development will have a positive impact on the viability of future sustainable transport networks in the vicinity of the site;
- The A66 / Middlesbrough Road / B1513 Old Station Road roundabout and A66 / A1053 / Tees Dock Road roundabout are forecast to approach their theoretical capacity in the '2028 Base' scenario. This is exacerbated by the addition of the proposed development traffic, with some arms of both junctions forecast to operate above capacity. However, the highway impact assessment is expected to represent a worst-case assessment by concentrating traffic in the south-west of the site, assuming that the majority of employees will drive to the site based on existing travel trends, and that future development traffic will follow existing distributions;
- It is reasonable to suggest that implementing the transport strategy for the South Tees Regeneration Masterplan will mitigate, to some extent, the impact of the development on the highway network. The transport strategy will implement measures to promote sustainable transport and active travel patterns to/from the site, and substantially reduce the commuter car mode share. This should therefore reduce the volume of traffic generated by the proposed development;
- As the transport strategy is currently being developed, it is expected that the requirement to provide a Travel Plan Framework, including a car parking management plan in the interim will be conditioned, as mitigation for the impact of the proposed development on the surrounding transport network. Additionally, the development impacts are expected to be minimised if vehicles re-route in the future due to off-site highway improvements (e.g. as a result of improvements to the Cargo Fleet Lane junction);

- A previous Arup study raised capacity issues at the A66 / A1053 / Tees Dock Road roundabout and the future baseline assessment indicates that the junction is approaching capacity. Existing issues at the junction, that may be exacerbated by the development, will need addressing as part of the wider STDC strategy. In the interim, it is expected that traffic will be permitted to travel through the site on the internal road network and use the Steel House roundabout access located at the eastern extent of the site, therefore minimising the impact at the A66/Tees Dock Road junction; and
- It is expected that a site-wide Travel Plan will be developed for the South Tees site based on the emerging transport strategy. However, as the South Industrial Zone site will be developed in advance of the transport strategy being adopted, this Transport Assessment identifies a list of initial measures for the proposed development that could be applied in advance of the wider strategy coming forward, also outlining how the development will be incorporated into the wider masterplan in due course.

The proposed development is in compliance with local, regional and national policy as it contributes towards the regeneration of the South Tees site. The development is one of the first phases of the masterplan which will be incorporated into the transport strategy for the South Tees Regeneration Masterplan. The strategy will seek to mitigate the impact of the development on the local highway network, whilst having a positive impact on the local sustainable and active travel networks.

Appendix A

Indicative Site Plan



Do not scale from this drawing. Only figured dimensions are to be taken from this drawing. The contractor must verify all dimensions on site before commencing any work or shop drawings. The contractor must report any discrepancies to POD NEWCASTLE LTD before commencing work. If this drawing exceeds the quantities taken in any way, POD NEWCASTLE LTD is to be informed before the work is initiated. Ordinance Survey information is used on POD NEWCASTLE LTD drawings. POD NEWCASTLE LTD is not responsible for the accuracy of dimensions relating to any Ordinance Survey data, or beyond the boundary of the inserted topographic survey data. Work within The Construction (Design and Management) Regulations 2015 is not to start until a Health and Safety Plan has been produced.

REV	BY	DATE	NOTE

KEY

- Total Site Area: 174 ha / 430 acres
- Proposed Development, Total Area: 418,040m2 / 4,500,000 sqft
- Service Corridor

pod

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PROJECT:
SOUTH BANK
REDCAR

DRAWING TITLE:
PROPOSED SITE PLAN
OPTION 01: AERIAL

CLIENT:			STATUS:	
STDC			SKETCH	
SCALE:	SHEET SIZE:	DATE:	DWN BY:	CHECKED BY:
1:5000	A1	05:20	MEC	MEC
PROJECT NO:	DRAWING NO:			REVISION:
1305-TM	SB-SD-10.02			-

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Appendix B

TA Scoping Report and Consultee Responses

South Tees Development Corporation

South Industrial Zone

Transport Assessment - Scoping Report

001

Issue | 19 June 2020

Job number 276320

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TRICS

1 Introduction

1.1 Purpose of Scoping Report

Arup has been commissioned by the South Tees Development Corporation (STDC) to develop a Transport Assessment (TA) and Framework Travel Plan in support of a planning application for the development of industrial (B2/B8) land-use at the South Industrial Zone (SIZ) of the South Tees Development Corporation (STDC) site.

Arup will also undertake the traffic and transportation assessment to be included within the Environmental Statement.

The application site is located within the STDC area and is known as the South Industrial Zone and extends to an area of approximately 174 hectares. The site's history includes iron and steel industries, and the storage of material and freight rail infrastructure uses.

The site is located on the south bank of the River Tees, approximately 7km to the west of Redcar town centre and 4.5km to the east of Middlesbrough town centre. The site location is shown in **Figure 1** and an indicative site plan is attached in **Appendix A**.

Figure 1: Site ocation

The purpose of this scoping report is to agree the methodology and main parameters of the assessment with Redcar and Cleveland Borough Council (RCBC), the local planning and highway authority, and Highways England (HE). A copy will also be sent to the neighbouring highway authority, Middlesbrough Council (MC). The key aspects of the methodology which we are seeking to agree are:

- The principles of the baseline traffic data to be used for junction capacity modelling;
- The trip generation methodology and resulting vehicular trips;
- The junction assessments that need to be undertaken; and
- The approach to travel planning.

Decision points throughout the document are provided in a text box

1.2 Proposed Development

It is expected that the proposed outline planning application will be for the development of up to 418,000sqm of general industry (use class B2) and storage or distribution facilities (use class B8), with ancillary office accommodation, HGV and car parking, and associated works.

First occupancy of the development will be in 2023, with the site fully occupied by 2028. When fully operational, the site is expected to accommodate approximately 3,870 employees.

2 Planning Policy Review

The TA will address the relevant transport related policy documents as follows:

- National Planning Policy Framework (NPPF) 2019;
- Tees Valley Combined Authority Strategic Transport Plan 2020 - 2030;
- Redcar and Cleveland Local Plan 2018;
- Redcar and Cleveland Local Transport Plan 2011-2021;
- South Tees Regeneration Masterplan 2019; and
- South Tees Area Supplementary Planning Document (SPD) 2018.

It is proposed that the development considers relevant transport policies from the policy and guidance documents listed above. RCBC to advise if any other documents should be considered.

3 Baseline Conditions

The scope of the TA will include a full audit of available transport modes following the methodology outlined in this section.

3.1 Site Description and Location

This section will provide a high-level description of the characteristics of the site and the surrounding area.

3.2 Sustainable Transport Networks

A desktop audit of existing facilities and routes will be provided in this section of the TA. Information such as bus and rail routes, destinations and example journey times will be provided. For scheduled services, information such as frequencies and service times will be included.

3.3 Highway Network

This section of the TA will provide an overview of the main local roads and Strategic Road Network connecting the site to the wider area.

Due to current circumstances with the Covid 19 pandemic and lockdown measures, it is not possible for traffic surveys to be undertaken to inform the baseline condition assessment. To establish the baseline traffic flows, the following data sources have been utilised:

- Traffic data from HE North Regional Transport Model (NRTM);
- Traffic data from the Tees Valley Combined Authority (TVCA) Tees Valley Cube Model (TVM);
- Department for Transport traffic counts available online;
- WebTRIS (HE) online data;
- Traffic surveys collected on behalf of Capita in 2019 to construct a VISSIM model of the area for RCBC – permission to obtain a copy of these surveys was granted by RCBC, Capita and NETDC Ltd; and
- Survey data publicly available online from other local developments, including the planning application for the new roundabout at Smith's Dock Road / Dockside Road (application number R/2017/0788/FF) and the Cargo Fleet Lane junction improvements[1].

Peak hour data from the two traffic models (NRTM and TVM) was input into two separate traffic flow diagrams for the study area. On both diagrams, any observed data was added above the links to enable a comparison to be made and determine

[1] Fore Consulting (2018) *Cargo Fleet Lane Junction Feasibility Study: Aimsun Modelling Report,* accessed 03/06/2020 https://www.middlesbrough.gov.uk/sites/default/files/A66-Cargo-Fleet-Aimsun-modelling-report-Apr18.pdf

which data source provided the most comparable base. The NRTM was found to be a comparable match against the baseline flows, and therefore the NRTM flows were predominantly used to inform the baseline, except for where observed data was available. All data has been adjusted to 2020 and 2028 using NRTM growth.

The traffic flow diagrams are attached in **Appendix B** and the base flows are categorised to indicate which data source was used at each junction.

3.4 Accident Analysis

To inform road safety considerations associated with the development proposals, a high-level review of five years' worth of accident data on the roads within the vicinity of the site will be undertaken.

Should any common factors pertaining to road traffic accidents be identified, suitable mitigation features may be considered as part of the development proposal.

This section seeks agreement that:

- The scope of the transport networks audit is acceptable;
- The methodology for establishing baseline traffic flows is acceptable; and
- The scope of the accident appraisal is adequate.

4 Development Proposals

This section will provide an overview of the proposed development, including details about site accesses and proposed transport provisions for the site.

4.1 Vehicular Access

The TA will provide details about the site accesses and emergency access arrangements. It is anticipated that the development site will have two connections to the highway network, one at the western end of the site which will utilise the new roundabout at Smith's Dock Road and another at the eastern extent of the site which will connect to Tees Dock Road.

4.2 Walking and Cycling Facilities

The TA will provide information about the proposed walking and cycling facilities for the development and how these connect to the external network.

4.3 Public Transport Facilities

Details of existing public transport connections will be provided in the TA.

4.4 Car and Cycle Parking

As an outline planning application, the internal site layout has not yet been developed and therefore the level of car parking provision is unknown.

A transport strategy for the wider South Tees site is currently in development and it is envisaged that the strategy will limit car parking within the site to meet sustainability targets (including RCBC's ambition to be carbon neutral by 2030). It is subsequently anticipated that the internal layout, when developed, will support the strategy and limit car parking as far as reasonably possible. The TA will not therefore undertake a car parking assessment but assume (as outlined further in **Section 5**) that car mode share is in line with baseline conditions, to assess a worst case with regards to the potential highway impact. However, it is expected that investment will be made in alternative transport provision to support the wider South Tees strategy and limit private car trips to / from the site.

Similarly, high quality cycle parking is expected to be provided, in excess of the usual standards, in support of a more sustainable travel policy for the site.

This section seeks agreement on the transport proposals for the proposed development.

5 Trip Generation

5.1 Person Trips

The development proposals are for B2/B8 industrial use, with approximately 10% of the floor area for ancillary office use. It has been forecast that when fully operational (2028), the development could accommodate approximately 3,870 employees.

To determine how many trips the employees would generate on a daily basis, we have derived trip rates from the TRICS database. TRICS is a recognised database widely used by transport professionals which predicts trip rates of developments based on survey information of comparable sites.

It is difficult to find comparable sites given the scale of the proposed development, but four industrial estate type sites were identified in the TRICs database that were of similar scale and predominately B2/B8 use (with 10% office use), and with recent surveys (2017 and 2018). The trip rates per employee are shown in **Table 1** with further details contained in **Appendix C**.

Table 1 Industrial Estate Trip Rates

	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	0.322	0.089	0.411	0.078	0.314	0.392	2.134	2.121	4.255
LGVs	0.029	0.022	0.051	0.01	0.016	0.026	0.294	0.287	0.581
HGVs	0.19	0.16	0.035	0.014	0.01	0.024	0.218	0.208	0.426

The trip rate for service and delivery vehicle trips (light goods vehicles and heavy goods vehicles) has been shown to disaggregate the overall person trip rate and determine how many trips are likely to made by commuters, versus service vehicle trips. The trips for each mode, based on 3,870 employees, are shown in **Table 2**.

Table 2 Total Trips

	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	1,246	344	1,591	302	1,215	1,517	8,259	8,208	16,467
LGVs	112	85	197	39	62	101	1,138	1,111	2,248
HGVs	74	62	135	54	39	93	844	805	1,649
Person Trips (excluding LGVs/HGVs)	1,060	197	1,258	209	1,115	1,324	6,277	6,293	12,570

The data in **Table 2** shows that LGVs account for approximately 14% of all trips, with HGVs accounting for 10% of daily trips based on the surveys from other industrial estates. Excluding servicing trips, the site is forecast to generate 12,570 two-way commuter trips on a daily basis (and approximately 1,500 two-way trips in each peak period).

The south-eastern corner of the site was previously used as landfill and for waste management facilities. However, as the development site is currently vacant, it is proposed that the trip generation does not take into account previous or permitted uses and therefore the overall trip generation will not be discounted; all trips will be added to the network as new trips.

5.2 Trips by Mode of Transport

Having established a method for calculating the number of trips, the person trips (excluding servicing) have been distributed onto transport modes using data from the 2011 UK Census Journey to Work dataset. This data records how people working in this area (Census zone E02002517) travelled to work in 2011 and the results are shown in **Table 3**.

Table 3 2011 Census Method of Journey to Work (Destination Zone - E02002517)

Mode	2011 UK Census - Percentage
Car Driver	82%
Car Passenger	8%
Bus	3%
Bicycle	3%
Walking	3%
Motorcycle	1%

It can be seen that 82% of trips to the South Tees area for the purpose of work were made by car in 2011. It is expected that the transport strategy for the site will seek to reduce this mode share significantly but as a worst-case scenario for the transport impact assessment, it will be assumed that 82% of employees will drive to the proposed development site. Applying this mode share to the person trip generation (excluding servicing) results in the commuter vehicular trip generation outlined in **Table 4**.

Table 4 Total Vehicular Trip Generation

	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Employee Car Trips	870	162	1,031	171	914	1,085	5,147	5,160	10,307
LGVs	112	85	197	39	62	101	1,138	1,111	2,248
HGVs	74	62	135	54	39	93	844	805	1,649
Total Vehicular Trips	1,055	309	1,364	264	1,015	1,279	7,129	7,076	14,204

5.3 Vehicular Trip Distribution

It is proposed that the development site be served by two accesses, one on the eastern boundary and accessible via Tees Dock Road, and the other via the new roundabout on Smith's Dock Road. The latter will be promoted as the main access into the site with Tees Dock Road as a secondary access.

Whilst the Smith's Dock Road access on the western boundary of the development site will be signposted as the main access, the distribution of trips in the transport models indicates that a large proportion of trips will come from the Redcar area to the east, as shown in **Table 5**.

Table 5 Transport Models Trip Distribution

Origin	NRTM	TVM	Average	Route	Nearest Access
Redcar	42%	47%	44%	Trunk Road or A174	East
Middlesbrough	21%	21%	21%	A66, Cargo Fleet Lane or A174	Either
Stockton	24%	10%	17%	A66	West
Hartlepool	5%	5%	5%	A19/A66	West
Darlington	2%	5%	4%	A66	West
External North	2%	5%	4%	A19/A66	West
External South	4%	6%	5%	A19/A174	Either

Based on the average distribution from the two models, it is assumed that approximately 40% of trips may use the secondary eastern access via Tees Dock Road. The eastern access may also be the nearest access to the development for some trips from Middlesbrough and the south that approach via the A174. However, as the address given for the main access will be Smith's Dock Road, it is reasonable to assume that the majority of trips from other areas will be directed towards the western access at Smith's Dock Road. Accordingly, it will be assumed that 60% of vehicular trips to / from the development use the new roundabout via Smith's Dock Road and up to 40% use the eastern access via Tees Dock Road.

Traffic has been distributed on the remainder of the network using the turning proportions in the baseline traffic flow diagrams. The traffic distribution, and resultant morning and evening peak hour development trips, are shown in **Appendix B**.

5.4 Cumulative Assessment and Future Growth

There are local developments that will add traffic to the network within the study area, particularly the York Potash development which includes a Materials Handling Facility (MHF) at Wilton (reference R/2014/0626/FFM) and a conveyor route to Bran Sands storage facility. However, it has not been possible to trace the traffic flow diagrams that are provided in the 2014 assessment. To account for future growth, it is therefore proposed to extract a growth factor from the NRTM to factor traffic up to 2028 when the site is expected to be operational.

This scoping report seeks agreement on:

- The person employee trip rates derived from TRICs;
- Applying 2011 Census mode share proportions, to calculate a worst-case highway impact assessment;
- The proposed trip distribution; and
- The approach to use NRTM forecasts to growth traffic to 2028, to establish a future baseline scenario.

6 Development Impact Assessment

6.1 Scope of Highway Impact Assessment

Development traffic has been assigned onto the network as outlined in **Section 5** and shown in **Appendix B. Table 6** shows the change in traffic through the junctions within the study area.

Table 6 Total Vehicular Trip Generation

Junction	AM Peak Development Trips	2028 AM Peak	% Change
Dockside Road/Smith's Dock Road (site access)	818	285	287%
Dockside Road/Old Station Road	820	879	93%
A66/Old Station Road/Middlesbrough Road	515	4,013	13%
A66/ Normanby Road	106	3,647	3%
A66/ Eston Road/Church Lane	108	3,752	3%
A66/A1053 Tees Dock Road	552	3,810	14%
A1053 Tees Dock Road/A1085 Trunk Road	445	3,518	13%
A174/A1053 Greystones Road/B1380 High Street	242	4,801	5%

Based on the scale of impact, it is proposed that the TA will assess the capacity of the following junctions where an impact greater than 10% is forecast:

1. Dockside Road / Smith's Dock Road site access roundabout;
2. Dockside Road/Old Station Road roundabout;
3. A66 / Middlesbrough Road / Old Station Road roundabout;
4. A66 / A1053 / Tees Dock Road roundabout; and
5. A1053 / A1085 Trunk Road / local access road / A1053 Greystone Road.

These junction locations are shown in **Figure 2**.

Figure 2: Junctions to be Assessed as part of the TA

Non-signalised roundabouts 1 – 4 will be assessed using the ARCADY module of the Junctions 9 software. Junction 5 will be assessed using LinSig.

6.2 Environmental Impact Assessment

A traffic and transportation assessment will be included in the Environmental Statement (ES). The Environmental Impact Assessment (EIA) will be carried out in accordance with the EIA Regulations and guidance contained in relevant publications including:

- Environmental Impact Assessment: A Guide to Procedures (Department of the Environment, Transport and the Regions (DETR), 2000); and
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management & Assessment (IEMA), 2004).

In accordance with the IEMA Guidelines, it is proposed that the following conditions on the transport network within the study area be assessed during the operational phase (2028 with development):

- Severance (change in traffic flows);
- Driver and bus user delay (derived from the junction assessments);
- Pedestrian and cyclist amenity (change in traffic flows on local routes used by pedestrians and cyclists); and

- Accidents and safety (following a review of existing conditions, a judgement will be made as to whether the proposed development will result in any changes to highway safety).

Construction details are not yet finalised and will be subject to a Construction Management Plan. It is therefore proposed that the effects during construction be limited to qualitative assessments based on the likely routes that will be used by construction vehicles.

6.3 Assessment Scenarios

The year of opening of the proposed development is expected to be 2028. It is proposed that the assessment scenarios will be:

- 2020 Base;
- 2028 Future Base; and
- 2028 Future Base + Proposed Development.

This section of the scoping report seeks agreement on:

- The scope of the junction impact assessments for the TA;
- The scope of the EIA assessment; and
- The assessment years / scenarios.

7 Travel Plan

7.1 Overview

The proposed development is located within the South Tees Development Corporation site and subsequently it will be encompassed into the STDC Transport Strategy and benefit from the measures that will be delivered to serve the wider site. The Transport Strategy is still under development but is expected to include ambitious targets to reduce car use and recommend measures that significantly improve the accessibility of the site by public transport, walking and cycling.

However, as this site will be developed in advance of the strategy being adopted, a Travel Plan Framework for the site will be outlined in the TA detailing measures that could be applied in advance of the wider strategy coming forward, but also outlining how the site will be incorporated into the wider masterplan in due course.

7.2 Summary

RCBC to confirm that this application can be incorporated into the wider STDC Transport Strategy and that a Travel Plan Framework, which outlines the potential measures that occupiers could introduce prior to more wide-ranging measures coming forward (e.g. mobility hubs), will be sufficient to support the planning application.

8 Conclusions and Next Steps

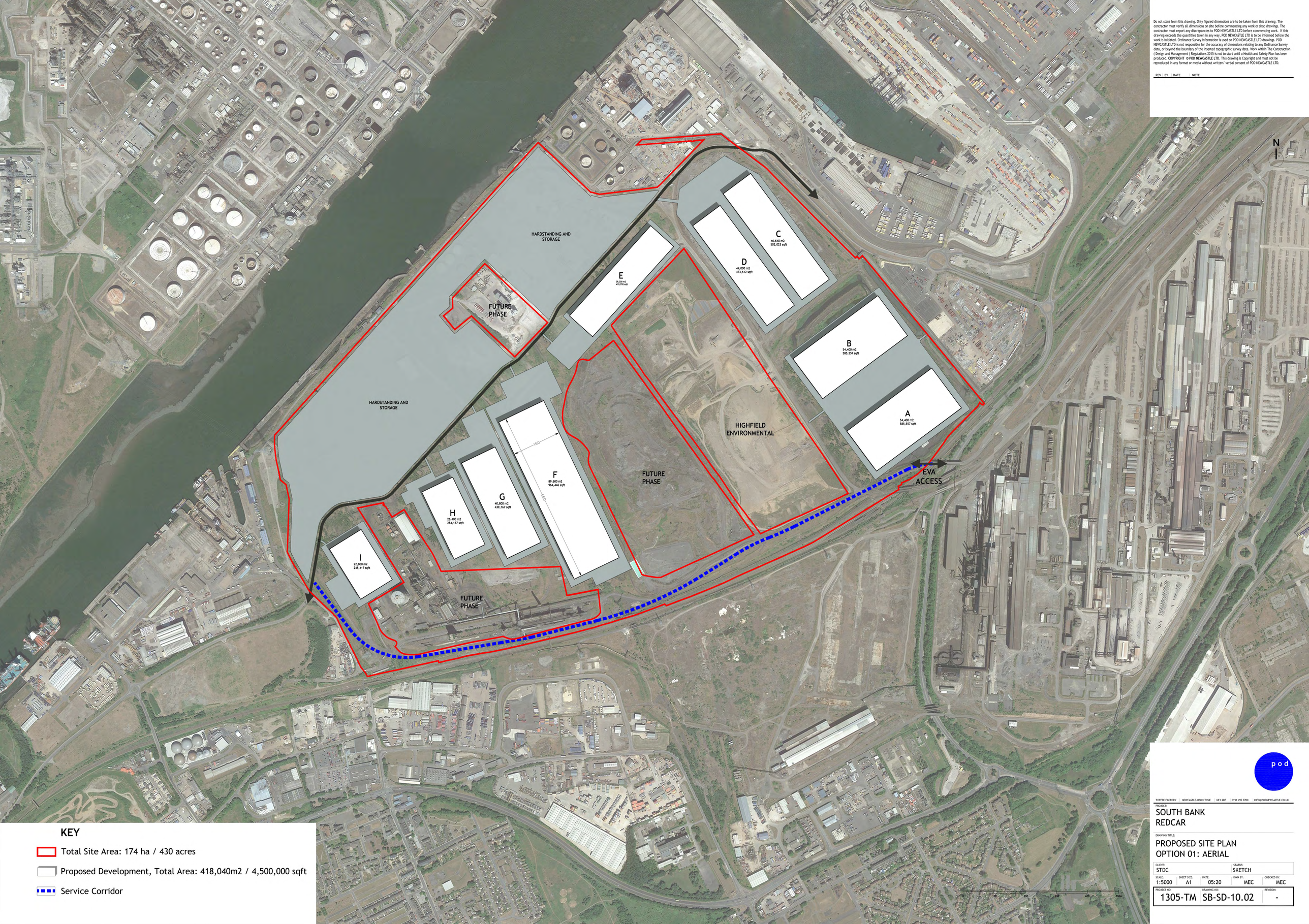
This scoping report has considered the potential impact of providing B2/B8 industrial use on the South Industrial Zone of the South Tees site.

This Scoping Report outlines what is proposed to be covered by the Transport Assessment and Environmental Statement that will be submitted as part of the planning application for the propose development.

Arup would be grateful if RCBC and HE could respond in writing to confirm that the methodology proposed in this report is acceptable. Should there be any significant issues with regards to the scope, an online meeting is requested at the earliest convenience.

Appendix A

Indicative Site Plan



Do not scale from this drawing. Only figured dimensions are to be taken from this drawing. The contractor must verify all dimensions on site before commencing any work or shop drawings. The contractor must report any discrepancies to POD NEWCASTLE LTD before commencing work. If this drawing exceeds the quantities taken in any way, POD NEWCASTLE LTD is to be informed before the work is initiated. Ordinance Survey information is used on POD NEWCASTLE LTD drawings. POD NEWCASTLE LTD is not responsible for the accuracy of dimensions relating to any Ordinance Survey data, or beyond the boundary of the inserted topographic survey data. Work within The Construction (Design and Management) Regulations 2015 is not to start until a Health and Safety Plan has been produced.

REV	BY	DATE	NOTE

KEY

- Total Site Area: 174 ha / 430 acres
- Proposed Development, Total Area: 418,040m2 / 4,500,000 sqft
- Service Corridor

pod

TOFFEE FACTORY | NEWCASTLE-UPON-TYNE | NE1 2DF | 0191 495 7700 | INFO@PODNEWCASTLE.CO.UK

PROJECT:
SOUTH BANK
REDCAR

DRAWING TITLE:
PROPOSED SITE PLAN
OPTION 01: AERIAL

CLIENT:			STATUS:	
STDC			SKETCH	
SCALE:	SHEET SIZE:	DATE:	DWN BY:	CHECKED BY:
1:5000	A1	05:20	MEC	MEC
PROJECT NO:	DRAWING NO:			REVISION:
1305-TM	SB-SD-10.02			-

0 100 200 300 400 500m

Appendix B

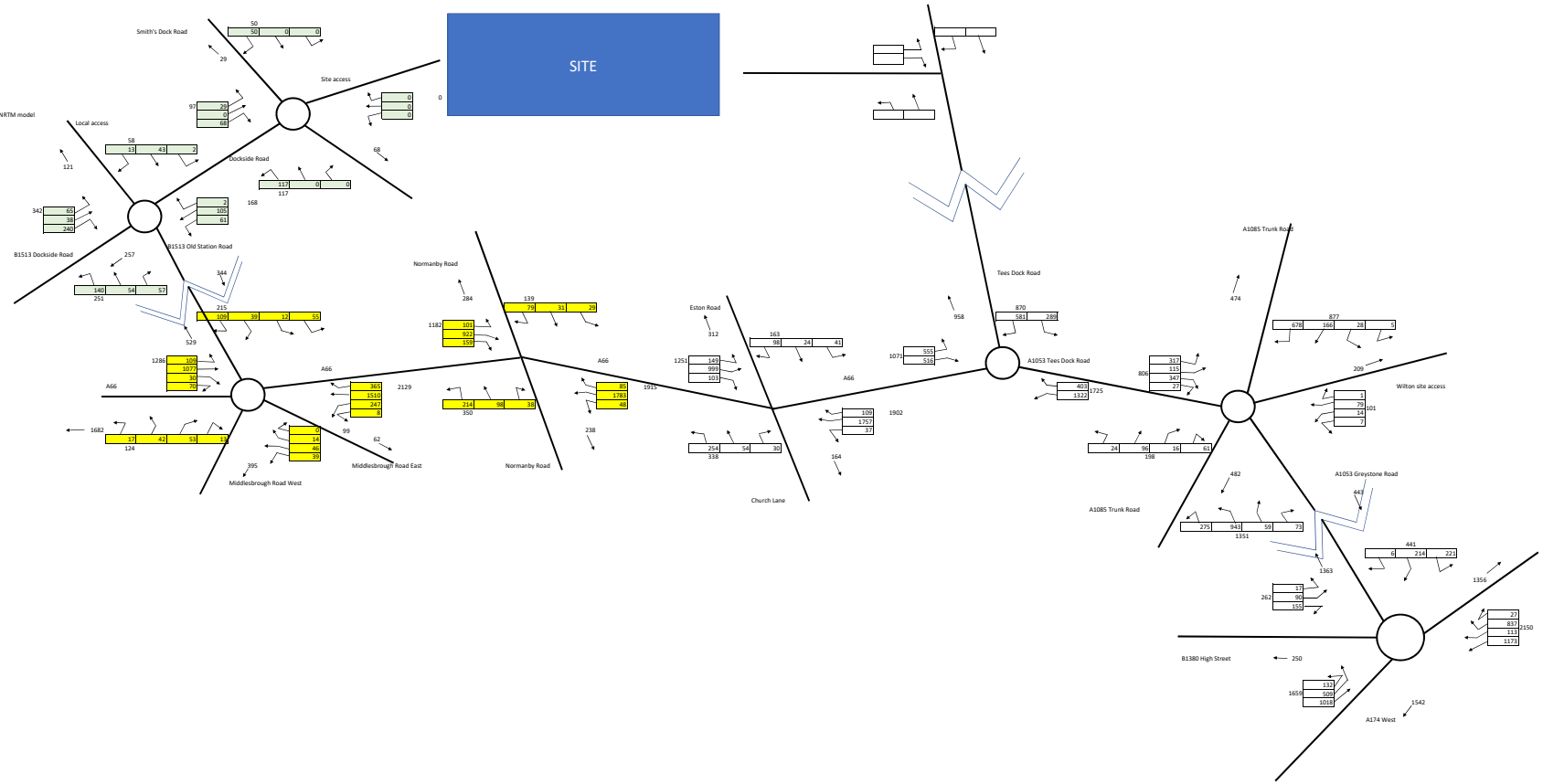
Traffic Flow Diagrams

Base 2020 AM Peak Hour

Key

- 2021 NRTM data adjusted for 2020
- 2016 survey data (from TA for the site access), adjusted using calculated growth between 2015 NRTM model data and 2019 survey data on Old Station Rd
- 2019 Middlesbrough Rd junction and Normanby Rd junction traffic surveys

**Base traffic assigned onto site access junction based on site access TA assignment*
***All traffic flows in pcu*

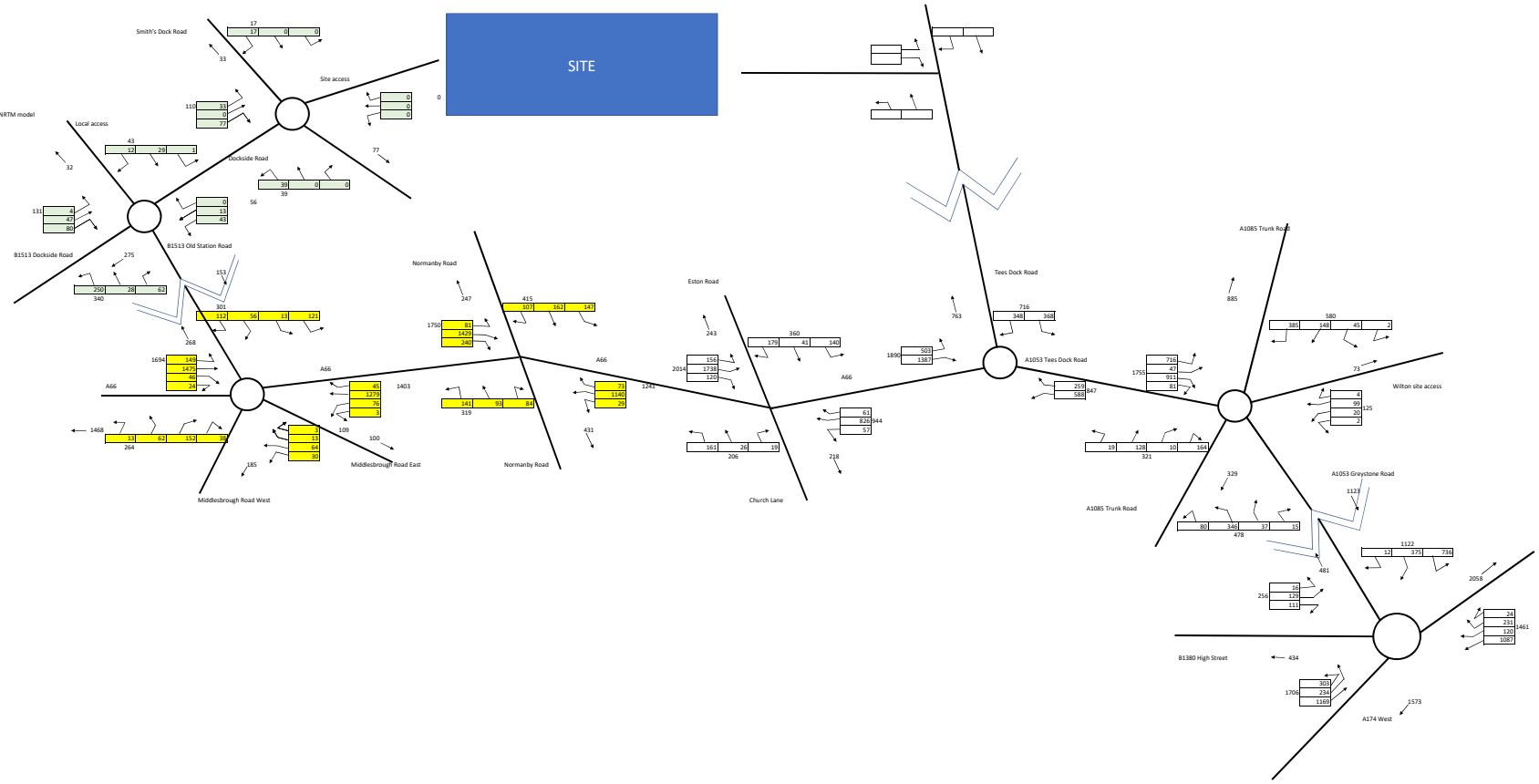


Base 2020 PM Peak Hour

Key

- 2021 NRTM data adjusted for 2020
- 2016 survey data (from TA for the site access), adjusted using calculated growth between 2015 NRTM model data and 2019 survey data on Old Station Rd
- 2019 Middlesbrough Rd junction and Normanby Rd junction traffic surveys

**Base traffic assigned onto site access junction based on site access TA assignment*
***All traffic flows in pcu*



Base 2028 AM Peak Hour

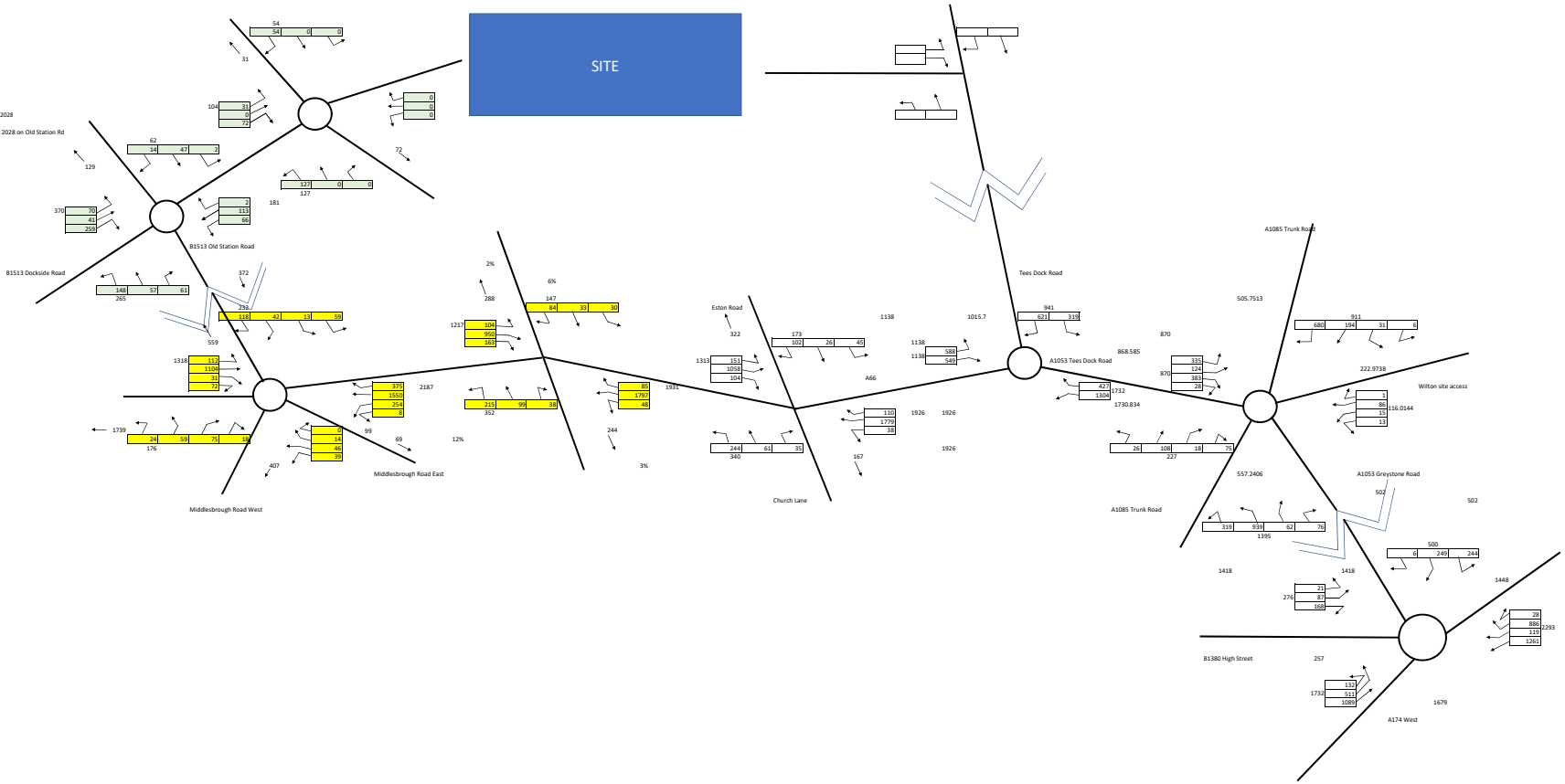
Key

2031 NRTM forecasts adjusted for 2028

2020 data (see 2020 diagram), growthed using NRTM model growth between 2020 and 2028

2020 data (see 2020 diagram), growthed using NRTM model growth between 2020 and 2028 on Old Station Rd

***All traffic flows in pcu*



Base 2028 PM Peak Hour

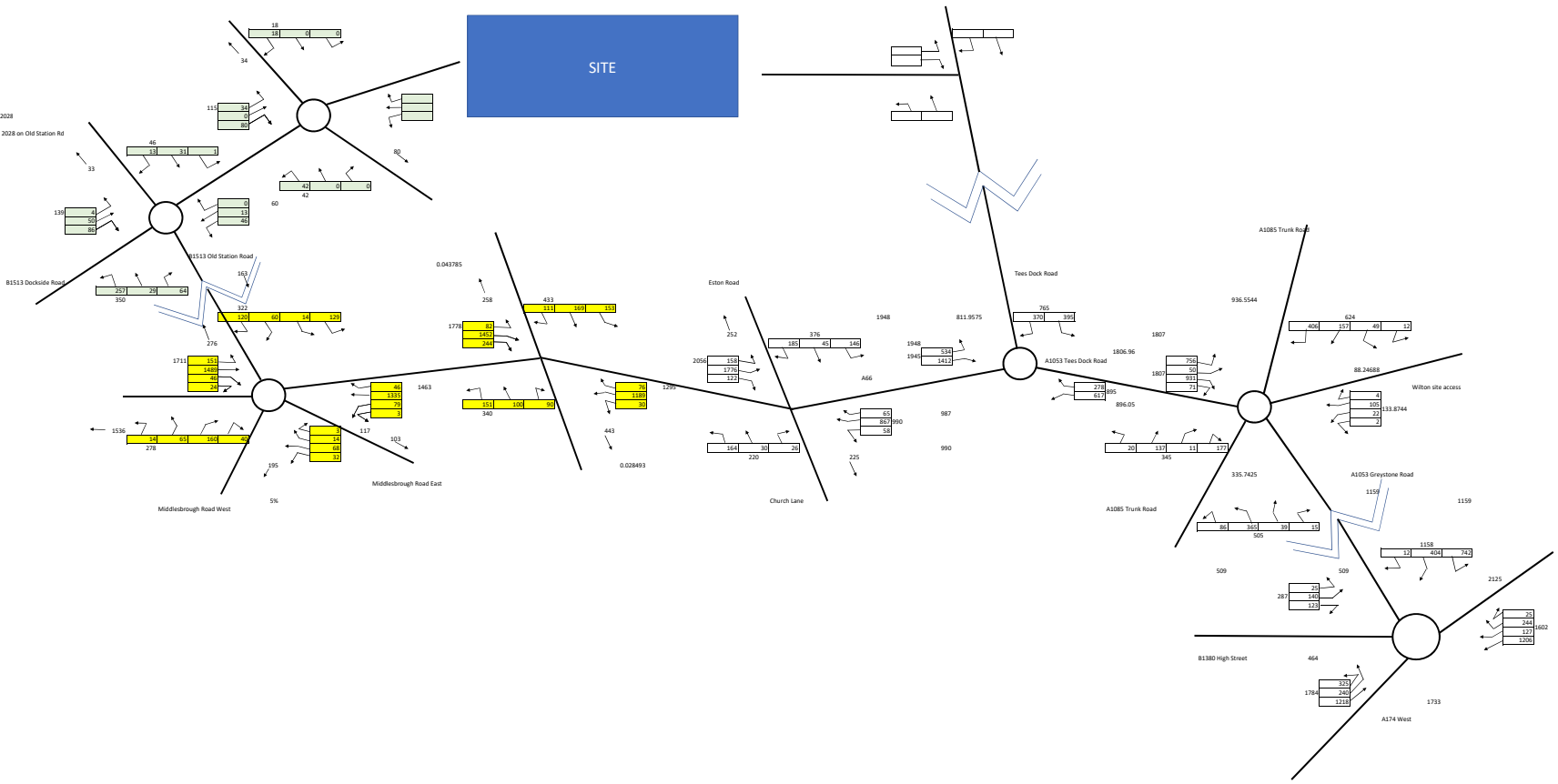
Key

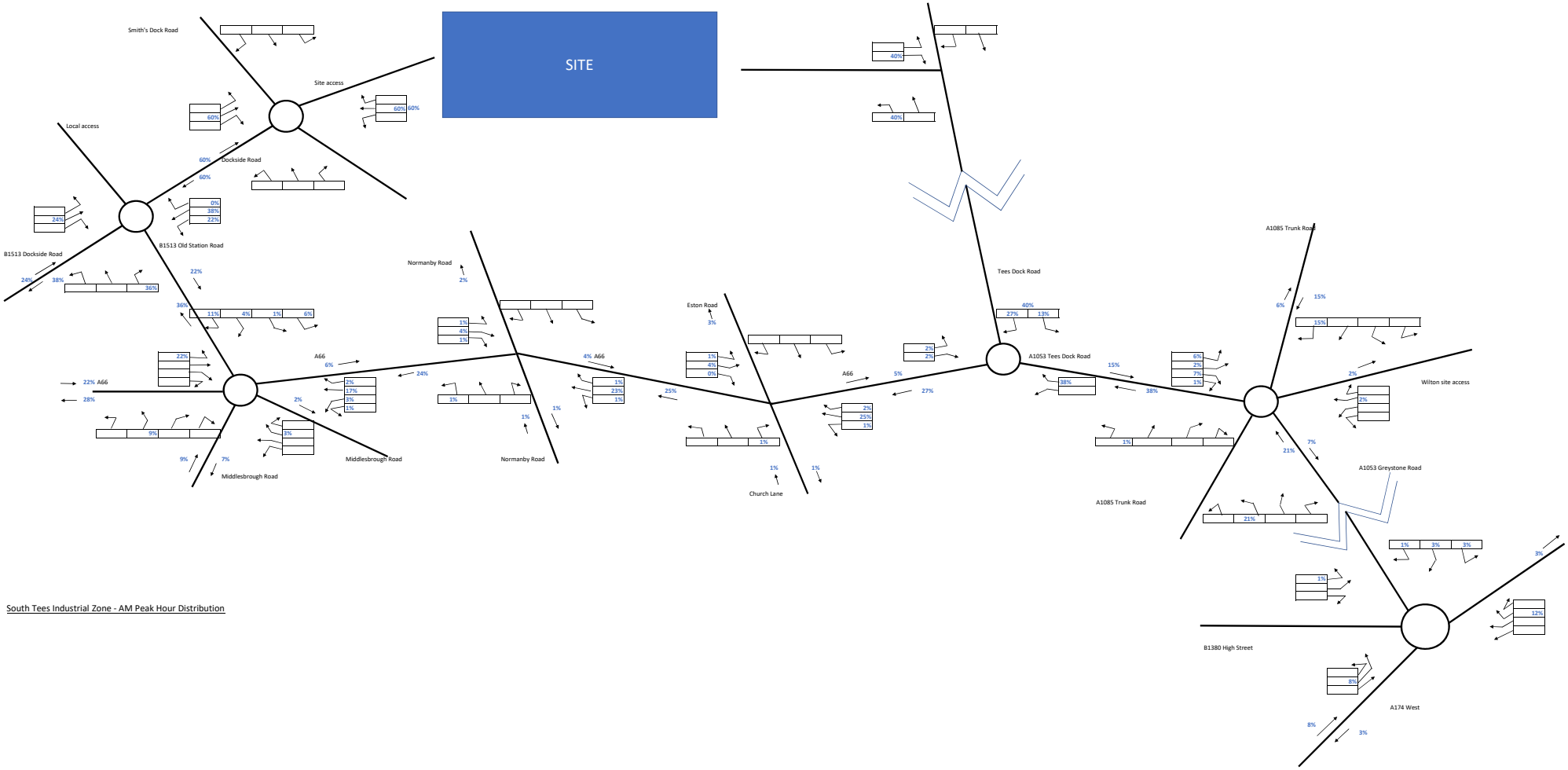
RTM forecasts adjusted for 2028

2020 data (see 2020 diagram), growthed using NRTM model growth between 2020 and 2028

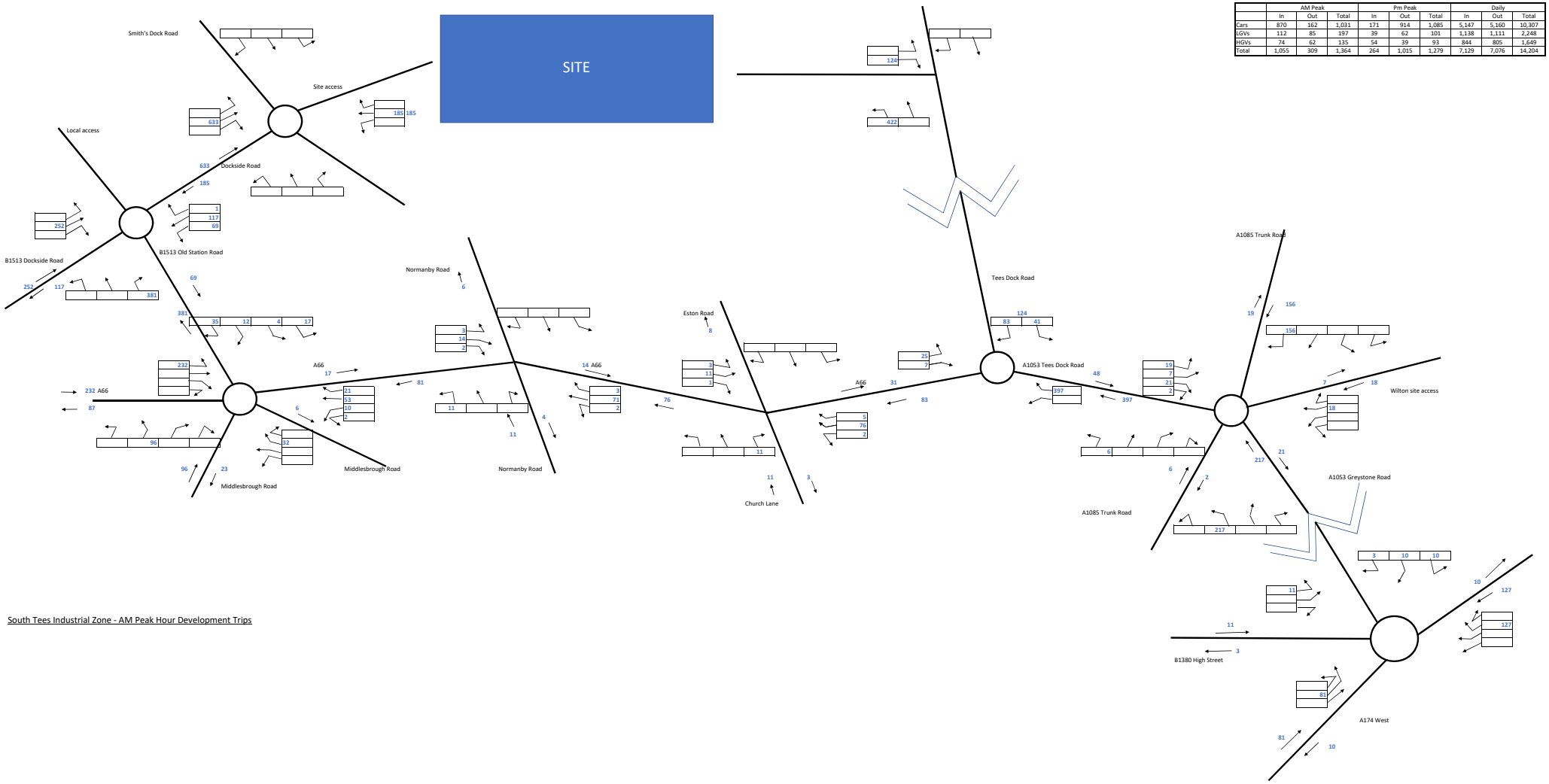
2020 data (see 2020 diagram), growthed using NRTM model growth between 2020 and 2028 on Old Station Rd

***All traffic flows in pcu*



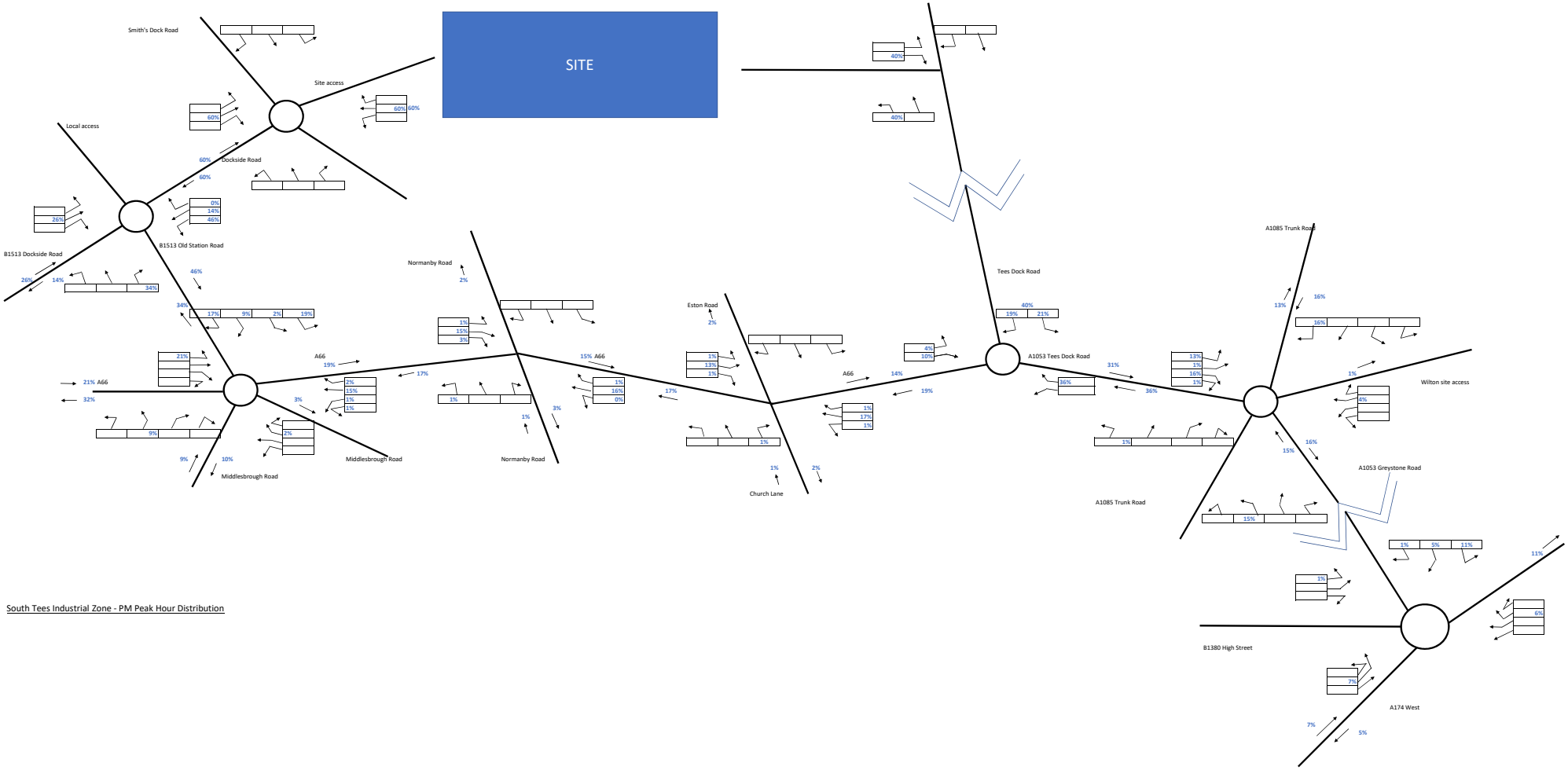


South Tees Industrial Zone - AM Peak Hour Distribution

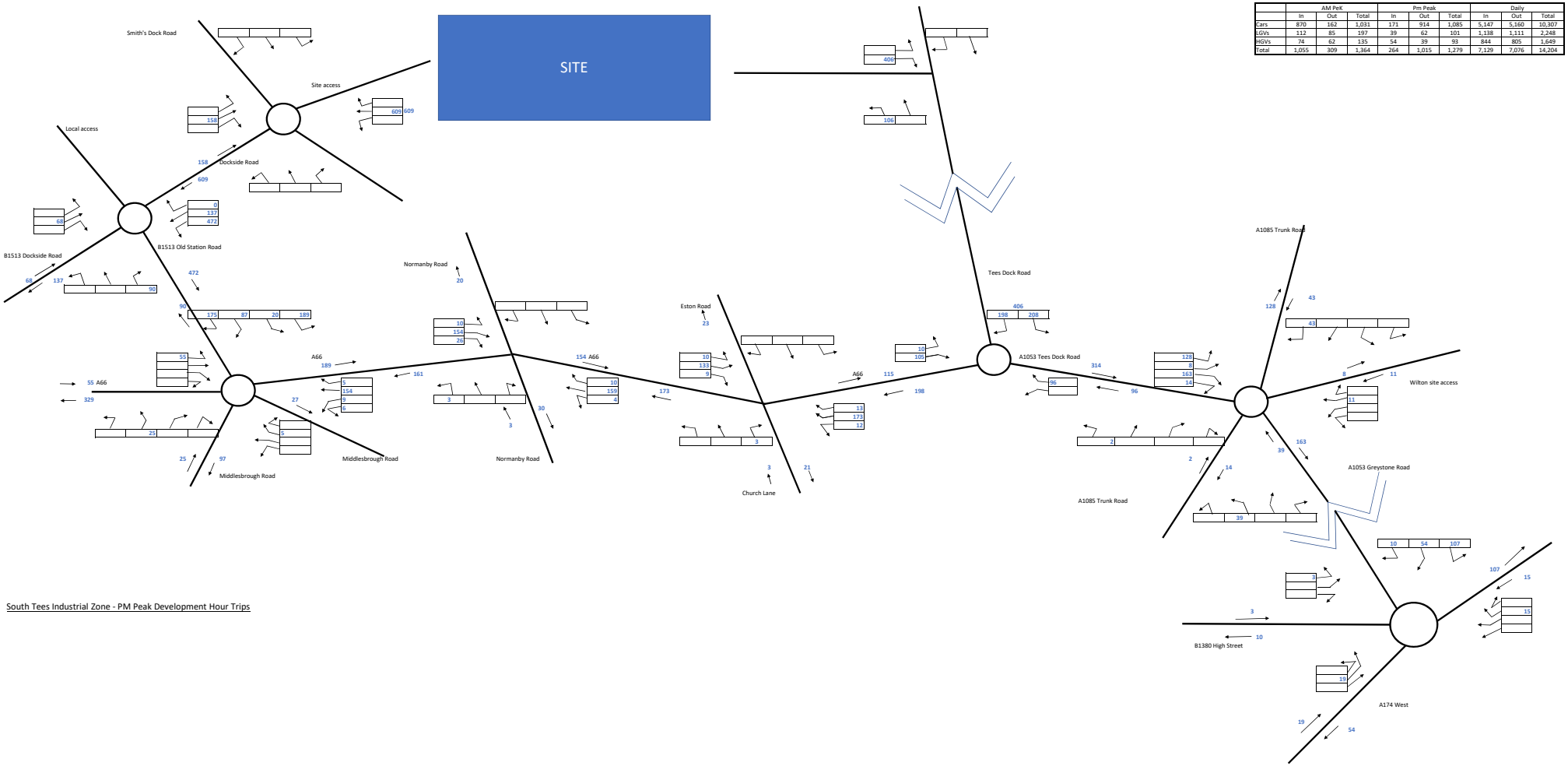


	AM Peak			Pm Peak			Daily		
	In	Out	Total	In	Out	Total	In	Out	Total
Cars	870	162	1,031	171	914	1,085	5,147	5,160	10,307
LGVs	112	85	197	39	62	101	1,138	1,111	2,248
HGVs	74	62	135	54	39	93	844	805	1,649
Total	1,055	309	1,364	264	1,015	1,279	7,129	7,076	14,204

South Tees Industrial Zone - AM Peak Hour Development Trips



South Tees Industrial Zone - PM Peak Hour Distribution



	AM PeK			Pm Peak			Daily		
	In	Out	Total	In	Out	Total	In	Out	Total
Cars	870	162	1,031	171	914	1,085	5,147	5,160	10,307
LGVs	112	85	197	39	62	101	1,138	1,111	2,248
HGVs	74	62	135	54	39	93	844	805	1,649
Total	1,055	309	1,364	264	1,015	1,279	7,129	7,076	14,204

South Tees Industrial Zone - PM Peak Development Hour Trips

Appendix C

TRICS

Filtering Summary

Land Use	02/D	EMPLOYMENT/INDUSTRIAL ESTATE
Selected Trip Rate Calculation Parameter Range	477-1665 EMPLOY	
Actual Trip Rate Calculation Parameter Range	477-1665 EMPLOY	
Date Range	Minimum: 01/01/12	Maximum: 27/06/18
Parking Spaces Range	All Surveys Included	
Days of the week selected	Tuesday Wednesday	2 2
Main Location Types selected	Edge of Town	4
Population <1 Mile ranges selected	5,001 to 10,000 10,001 to 15,000	3 1
Population <5 Mile ranges selected	25,001 to 50,000 75,001 to 100,000	2 2
Car Ownership <5 Mile ranges selected	1.1 to 1.5	4
PTAL Rating	No PTAL Present	4

Calculation Reference: AUDIT-701007-200617-0625

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 02 - EMPLOYMENT
Category : D - INDUSTRIAL ESTATE
MULTI-MODAL VEHICLES

Selected regions and areas:

06	WEST MIDLANDS		
	WK	WARWICKSHIRE	2 days
	WO	WORCESTERSHIRE	1 days
11	SCOTLAND		
	AG	ANGUS	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: No of Employees
Actual Range: 477 to 1665 (units:)
Range Selected by User: 477 to 1665 (units:)

Parking Spaces Range: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/12 to 27/06/18

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Tuesday	2 days
Wednesday	2 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	4 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town	4

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Industrial Zone	2
Out of Town	1
No Sub Category	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

Not Known	2 days
B1	1 days
B8	1 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Secondary Filtering selection (Cont.):

Population within 1 mile:

5,001 to 10,000	3 days
10,001 to 15,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

25,001 to 50,000	2 days
75,001 to 100,000	2 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

1.1 to 1.5	4 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	4 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	4 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

Site(1):	AG-02-D-02	Site area:	30.07 hect
Development Name:	INDUSTRIAL ESTATE	Gross floor area:	78500 sqm
Location:	ARBROATH	Parking spaces:	1270
Postcode:	DD11 2NJ	No of Employees:	875
Main Location Type:	Edge of Town	Survey Date:	25/04/17
Sub-Location Type:	No Sub Category	Survey Day:	Tuesday
PTAL:	n/a		

Site(2):	WK-02-D-01	Site area:	35.43 hect
Development Name:	INDUSTRIAL ESTATE	Gross floor area:	150564 sqm
Location:	RUGBY	Parking spaces:	1473
Postcode:	CV23 0WA	No of Employees:	477
Main Location Type:	Edge of Town	Survey Date:	27/06/18
Sub-Location Type:	Industrial Zone	Survey Day:	Wednesday
PTAL:	n/a		

Site(3):	WK-02-D-02	Site area:	25.00 hect
Development Name:	INDUSTRIAL ESTATE	Gross floor area:	974258 sqm
Location:	RUGBY	Parking spaces:	1873
Postcode:	CV23 0WE	No of Employees:	1665
Main Location Type:	Edge of Town	Survey Date:	27/06/18
Sub-Location Type:	Industrial Zone	Survey Day:	Wednesday
PTAL:	n/a		

Site(4):	WO-02-D-03	Site area:	27.00 hect
Development Name:	INDUSTRIAL ESTATE	Gross floor area:	84575 sqm
Location:	EVESHAM	Parking spaces:	1744
Postcode:	WR11 1GR	No of Employees:	1499
Main Location Type:	Edge of Town	Survey Date:	26/06/18
Sub-Location Type:	Out of Town	Survey Day:	Tuesday
PTAL:	n/a		

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL VEHICLES
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.200	4	1129	0.065	4	1129	0.265
08:00 - 09:00	4	1129	0.210	4	1129	0.074	4	1129	0.284
09:00 - 10:00	4	1129	0.154	4	1129	0.081	4	1129	0.235
10:00 - 11:00	4	1129	0.118	4	1129	0.089	4	1129	0.207
11:00 - 12:00	4	1129	0.113	4	1129	0.094	4	1129	0.207
12:00 - 13:00	4	1129	0.121	4	1129	0.140	4	1129	0.261
13:00 - 14:00	4	1129	0.174	4	1129	0.132	4	1129	0.306
14:00 - 15:00	4	1129	0.100	4	1129	0.157	4	1129	0.257
15:00 - 16:00	4	1129	0.092	4	1129	0.165	4	1129	0.257
16:00 - 17:00	4	1129	0.072	4	1129	0.180	4	1129	0.252
17:00 - 18:00	4	1129	0.053	4	1129	0.204	4	1129	0.257
18:00 - 19:00	4	1129	0.059	4	1129	0.091	4	1129	0.150
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.466			1.472			2.938

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	477 - 1665 (units:)
Survey date date range:	01/01/12 - 27/06/18
Number of weekdays (Monday-Friday):	4
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL TAXIS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
08:00 - 09:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
09:00 - 10:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
10:00 - 11:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
11:00 - 12:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
12:00 - 13:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
13:00 - 14:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
14:00 - 15:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
15:00 - 16:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
16:00 - 17:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
17:00 - 18:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
18:00 - 19:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.001			0.001			0.002

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL OGVS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.016	4	1129	0.011	4	1129	0.027
08:00 - 09:00	4	1129	0.019	4	1129	0.016	4	1129	0.035
09:00 - 10:00	4	1129	0.026	4	1129	0.017	4	1129	0.043
10:00 - 11:00	4	1129	0.020	4	1129	0.021	4	1129	0.041
11:00 - 12:00	4	1129	0.017	4	1129	0.020	4	1129	0.037
12:00 - 13:00	4	1129	0.025	4	1129	0.021	4	1129	0.046
13:00 - 14:00	4	1129	0.018	4	1129	0.021	4	1129	0.039
14:00 - 15:00	4	1129	0.019	4	1129	0.019	4	1129	0.038
15:00 - 16:00	4	1129	0.021	4	1129	0.021	4	1129	0.042
16:00 - 17:00	4	1129	0.013	4	1129	0.019	4	1129	0.032
17:00 - 18:00	4	1129	0.014	4	1129	0.010	4	1129	0.024
18:00 - 19:00	4	1129	0.010	4	1129	0.012	4	1129	0.022
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.218			0.208			0.426

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL PSVS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.000	4	1129	0.004	4	1129	0.004
08:00 - 09:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
09:00 - 10:00	4	1129	0.002	4	1129	0.000	4	1129	0.002
10:00 - 11:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
11:00 - 12:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
12:00 - 13:00	4	1129	0.002	4	1129	0.001	4	1129	0.003
13:00 - 14:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
14:00 - 15:00	4	1129	0.000	4	1129	0.002	4	1129	0.002
15:00 - 16:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
16:00 - 17:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
17:00 - 18:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
18:00 - 19:00	4	1129	0.003	4	1129	0.000	4	1129	0.003
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.013			0.012			0.025

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL CYCLISTS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.005	4	1129	0.002	4	1129	0.007
08:00 - 09:00	4	1129	0.006	4	1129	0.000	4	1129	0.006
09:00 - 10:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
10:00 - 11:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
11:00 - 12:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
12:00 - 13:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
13:00 - 14:00	4	1129	0.003	4	1129	0.002	4	1129	0.005
14:00 - 15:00	4	1129	0.003	4	1129	0.004	4	1129	0.007
15:00 - 16:00	4	1129	0.001	4	1129	0.007	4	1129	0.008
16:00 - 17:00	4	1129	0.001	4	1129	0.003	4	1129	0.004
17:00 - 18:00	4	1129	0.001	4	1129	0.006	4	1129	0.007
18:00 - 19:00	4	1129	0.004	4	1129	0.001	4	1129	0.005
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.026			0.028			0.054

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL VEHICLE OCCUPANTS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.281	4	1129	0.068	4	1129	0.349
08:00 - 09:00	4	1129	0.302	4	1129	0.085	4	1129	0.387
09:00 - 10:00	4	1129	0.219	4	1129	0.095	4	1129	0.314
10:00 - 11:00	4	1129	0.163	4	1129	0.109	4	1129	0.272
11:00 - 12:00	4	1129	0.142	4	1129	0.124	4	1129	0.266
12:00 - 13:00	4	1129	0.154	4	1129	0.177	4	1129	0.331
13:00 - 14:00	4	1129	0.223	4	1129	0.170	4	1129	0.393
14:00 - 15:00	4	1129	0.135	4	1129	0.233	4	1129	0.368
15:00 - 16:00	4	1129	0.119	4	1129	0.240	4	1129	0.359
16:00 - 17:00	4	1129	0.097	4	1129	0.247	4	1129	0.344
17:00 - 18:00	4	1129	0.074	4	1129	0.297	4	1129	0.371
18:00 - 19:00	4	1129	0.086	4	1129	0.143	4	1129	0.229
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.995			1.988			3.983

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL PEDESTRIANS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.005	4	1129	0.003	4	1129	0.008
08:00 - 09:00	4	1129	0.004	4	1129	0.001	4	1129	0.005
09:00 - 10:00	4	1129	0.002	4	1129	0.000	4	1129	0.002
10:00 - 11:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
11:00 - 12:00	4	1129	0.001	4	1129	0.002	4	1129	0.003
12:00 - 13:00	4	1129	0.004	4	1129	0.004	4	1129	0.008
13:00 - 14:00	4	1129	0.008	4	1129	0.004	4	1129	0.012
14:00 - 15:00	4	1129	0.003	4	1129	0.004	4	1129	0.007
15:00 - 16:00	4	1129	0.002	4	1129	0.004	4	1129	0.006
16:00 - 17:00	4	1129	0.001	4	1129	0.003	4	1129	0.004
17:00 - 18:00	4	1129	0.001	4	1129	0.004	4	1129	0.005
18:00 - 19:00	4	1129	0.002	4	1129	0.002	4	1129	0.004
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.034			0.032			0.066

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL BUS/TRAM PASSENGERS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.017	4	1129	0.003	4	1129	0.020
08:00 - 09:00	4	1129	0.009	4	1129	0.000	4	1129	0.009
09:00 - 10:00	4	1129	0.005	4	1129	0.001	4	1129	0.006
10:00 - 11:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
11:00 - 12:00	4	1129	0.002	4	1129	0.002	4	1129	0.004
12:00 - 13:00	4	1129	0.003	4	1129	0.005	4	1129	0.008
13:00 - 14:00	4	1129	0.016	4	1129	0.004	4	1129	0.020
14:00 - 15:00	4	1129	0.004	4	1129	0.016	4	1129	0.020
15:00 - 16:00	4	1129	0.002	4	1129	0.016	4	1129	0.018
16:00 - 17:00	4	1129	0.002	4	1129	0.004	4	1129	0.006
17:00 - 18:00	4	1129	0.001	4	1129	0.006	4	1129	0.007
18:00 - 19:00	4	1129	0.001	4	1129	0.002	4	1129	0.003
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.063			0.060			0.123

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL TOTAL RAIL PASSENGERS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
08:00 - 09:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
09:00 - 10:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
10:00 - 11:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
11:00 - 12:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
12:00 - 13:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
13:00 - 14:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
14:00 - 15:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
15:00 - 16:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
16:00 - 17:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
17:00 - 18:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
18:00 - 19:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.001			0.002			0.003

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL COACH PASSENGERS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.000	4	1129	0.004	4	1129	0.004
08:00 - 09:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
09:00 - 10:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
10:00 - 11:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
11:00 - 12:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
12:00 - 13:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
13:00 - 14:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
14:00 - 15:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
15:00 - 16:00	4	1129	0.001	4	1129	0.001	4	1129	0.002
16:00 - 17:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
17:00 - 18:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
18:00 - 19:00	4	1129	0.004	4	1129	0.000	4	1129	0.004
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.011			0.010			0.021

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL PUBLIC TRANSPORT USERS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.018	4	1129	0.007	4	1129	0.025
08:00 - 09:00	4	1129	0.010	4	1129	0.002	4	1129	0.012
09:00 - 10:00	4	1129	0.006	4	1129	0.001	4	1129	0.007
10:00 - 11:00	4	1129	0.002	4	1129	0.002	4	1129	0.004
11:00 - 12:00	4	1129	0.003	4	1129	0.003	4	1129	0.006
12:00 - 13:00	4	1129	0.004	4	1129	0.006	4	1129	0.010
13:00 - 14:00	4	1129	0.017	4	1129	0.004	4	1129	0.021
14:00 - 15:00	4	1129	0.004	4	1129	0.018	4	1129	0.022
15:00 - 16:00	4	1129	0.003	4	1129	0.018	4	1129	0.021
16:00 - 17:00	4	1129	0.003	4	1129	0.005	4	1129	0.008
17:00 - 18:00	4	1129	0.002	4	1129	0.007	4	1129	0.009
18:00 - 19:00	4	1129	0.005	4	1129	0.003	4	1129	0.008
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.077			0.076			0.153

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL TOTAL PEOPLE
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.310	4	1129	0.080	4	1129	0.390
08:00 - 09:00	4	1129	0.322	4	1129	0.089	4	1129	0.411
09:00 - 10:00	4	1129	0.228	4	1129	0.097	4	1129	0.325
10:00 - 11:00	4	1129	0.165	4	1129	0.112	4	1129	0.277
11:00 - 12:00	4	1129	0.147	4	1129	0.129	4	1129	0.276
12:00 - 13:00	4	1129	0.163	4	1129	0.187	4	1129	0.350
13:00 - 14:00	4	1129	0.252	4	1129	0.180	4	1129	0.432
14:00 - 15:00	4	1129	0.145	4	1129	0.258	4	1129	0.403
15:00 - 16:00	4	1129	0.125	4	1129	0.268	4	1129	0.393
16:00 - 17:00	4	1129	0.102	4	1129	0.258	4	1129	0.360
17:00 - 18:00	4	1129	0.078	4	1129	0.314	4	1129	0.392
18:00 - 19:00	4	1129	0.097	4	1129	0.149	4	1129	0.246
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.134			2.121			4.255

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL CARS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.157	4	1129	0.036	4	1129	0.193
08:00 - 09:00	4	1129	0.159	4	1129	0.035	4	1129	0.194
09:00 - 10:00	4	1129	0.094	4	1129	0.033	4	1129	0.127
10:00 - 11:00	4	1129	0.063	4	1129	0.039	4	1129	0.102
11:00 - 12:00	4	1129	0.068	4	1129	0.049	4	1129	0.117
12:00 - 13:00	4	1129	0.066	4	1129	0.089	4	1129	0.155
13:00 - 14:00	4	1129	0.118	4	1129	0.081	4	1129	0.199
14:00 - 15:00	4	1129	0.054	4	1129	0.106	4	1129	0.160
15:00 - 16:00	4	1129	0.045	4	1129	0.107	4	1129	0.152
16:00 - 17:00	4	1129	0.037	4	1129	0.134	4	1129	0.171
17:00 - 18:00	4	1129	0.028	4	1129	0.175	4	1129	0.203
18:00 - 19:00	4	1129	0.042	4	1129	0.072	4	1129	0.114
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.931			0.956			1.887

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

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TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL LGVS
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.025	4	1129	0.013	4	1129	0.038
08:00 - 09:00	4	1129	0.029	4	1129	0.022	4	1129	0.051
09:00 - 10:00	4	1129	0.031	4	1129	0.030	4	1129	0.061
10:00 - 11:00	4	1129	0.034	4	1129	0.028	4	1129	0.062
11:00 - 12:00	4	1129	0.027	4	1129	0.025	4	1129	0.052
12:00 - 13:00	4	1129	0.028	4	1129	0.028	4	1129	0.056
13:00 - 14:00	4	1129	0.036	4	1129	0.029	4	1129	0.065
14:00 - 15:00	4	1129	0.026	4	1129	0.029	4	1129	0.055
15:00 - 16:00	4	1129	0.025	4	1129	0.035	4	1129	0.060
16:00 - 17:00	4	1129	0.020	4	1129	0.026	4	1129	0.046
17:00 - 18:00	4	1129	0.010	4	1129	0.016	4	1129	0.026
18:00 - 19:00	4	1129	0.003	4	1129	0.006	4	1129	0.009
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.294			0.287			0.581

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL MOTOR CYCLES
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
08:00 - 09:00	4	1129	0.002	4	1129	0.000	4	1129	0.002
09:00 - 10:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
10:00 - 11:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
11:00 - 12:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
12:00 - 13:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
13:00 - 14:00	4	1129	0.001	4	1129	0.000	4	1129	0.001
14:00 - 15:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
15:00 - 16:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
16:00 - 17:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
17:00 - 18:00	4	1129	0.000	4	1129	0.002	4	1129	0.002
18:00 - 19:00	4	1129	0.000	4	1129	0.001	4	1129	0.001
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.005			0.006			0.011

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

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TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE
MULTI-MODAL Servicing Vehicles
Calculation factor: 1 EMPLOY
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate	No. Days	Ave. EMPLOY	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	1129	0.010	4	1129	0.006	4	1129	0.016
08:00 - 09:00	4	1129	0.009	4	1129	0.011	4	1129	0.020
09:00 - 10:00	4	1129	0.011	4	1129	0.013	4	1129	0.024
10:00 - 11:00	4	1129	0.012	4	1129	0.014	4	1129	0.026
11:00 - 12:00	4	1129	0.010	4	1129	0.011	4	1129	0.021
12:00 - 13:00	4	1129	0.012	4	1129	0.012	4	1129	0.024
13:00 - 14:00	4	1129	0.016	4	1129	0.010	4	1129	0.026
14:00 - 15:00	4	1129	0.012	4	1129	0.012	4	1129	0.024
15:00 - 16:00	4	1129	0.012	4	1129	0.013	4	1129	0.025
16:00 - 17:00	4	1129	0.008	4	1129	0.009	4	1129	0.017
17:00 - 18:00	4	1129	0.004	4	1129	0.004	4	1129	0.008
18:00 - 19:00	4	1129	0.000	4	1129	0.000	4	1129	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.116			0.115			0.231

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

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South Industrial Zone – Response to "Transport Assessment – Scoping Report"

PREPARED FOR:	Chris Bell / Sunny Ali (Highways England)
PREPARED BY:	Angela Lopez Garces (CH2M)
DATE:	25th June 2020
PROJECT NUMBER:	679066.AA.20.03.16
SITE/ DOCUMENT REF:	DevTV0048/TM001
REVIEWED / APPROVED BY:	Gavin Nicholson (CH2M)

Background

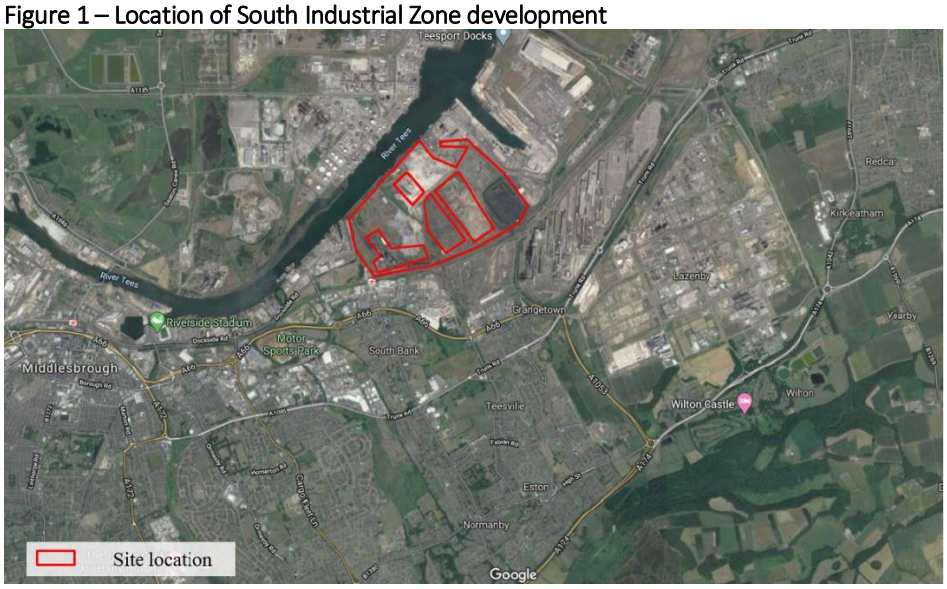
CH2M has been commissioned by Highways England to provide a review of the document titled "South Industrial Zone, Transport Assessment – Scoping Report" prepared by Arup on behalf of the South Tees Development Corporation and dated 19 June 2020 [the Scoping Report].

The site is located on the south bank of the River Tees, approximately 7km to the west of Redcar tow centre and 4.5km to the east of Middlesbrough town centre. The site location is shown in Figure 1, extracted from the Scoping Report.

According to the Scoping Report, it is expected that the proposed outline planning application will be for the development of up to 418,000sqm of general industry (use class B2) and storage or distribution facilities (use class B8), with ancillary office accommodation, HGV and car parking, and associated works.

First occupancy of the development will be in 2023, with the site fully occupied by 2028. When fully operational, the site is expected to accommodate approximately 3,870 employees.

Figure 1 – Location of South Industrial Zone development



(Extract from the Scoping Report)

The South Tees Regeneration Master Plan[1] states that *"consideration will be given to the impact on the local highway network of the planned major increases in development traffic that will ensue as the proposals for the regeneration programme begin to be realised, so that junction capacities are not adversely impacted and the current favourable position the South Tees area benefits from is not compromised. The requirements for Transport Appraisals to assess transport impacts, particularly highways, will be given due attention as the development proposals begin to be fleshed-out".*

With this in mind, we recommend that a view of the full site impacts is provided, either in the Scoping Report itself or alongside it, so that a view can be gained.

The Scoping Report proposes the methodology and main parameters for the South Industrial Zone Transport Assessment and seeks agreement from various partners, including Highways England, of the following:

- The principles of the baseline traffic data to be used for junction capacity modelling;
- The trip generation methodology and resulting vehicular trips;
- The junction assessments that need to be undertaken; and
- The approach to travel planning.

The consultation with Highways England at this stage of the process should be welcomed as early engagement enables the assessment to be aligned to Highways England's requirements.

This Technical Memorandum [TM] mirrors the structure of the Scoping Report and specifically aims to provides a response to all the decision points identified by Arup.

Baseline conditions

Scope of the transport networks audit

The Scoping Report presents baseline conditions for the road network in close proximity of the South Industrial Zone, including Dockside Road, the A66 nearby local element) and the A1053.

Given the size of the development, which is expected to accommodate 3,870 employees, it is considered that the geographical scope of the transport networks audit is insufficient for such a scale of development (something which we turn to in detail in later sections of this TM).

Methodology for establishing baseline traffic flows

Due to the impossibility of collecting new data that represents typical traffic conditions during the Covid 19 pandemic, the methodology for establishing baseline traffic flows is based on existing data sources. Flows extracted from the North Regional Transport Model [NRTM] were combined with observed data to inform the baseline flows. Growth figures extracted from the model were also used to adjust all data to 2020 and 2028 assessment years.

We consider that the NRTM is a strategic regional tool which may not be accurate enough to inform individual turning counts for the purpose of a development assessment. We would therefore recommend that a fully defined approach of reflecting typical traffic conditions is established including sourcing all available traffic data (traffic count companies and Highways England) once the study area is confirmed. Similarly, it is not clear how growth figures were obtained from the model and applied to the individual movements and we would welcome further information in this regard to consider this method as opposed to a typical approach of using TEMPRo, for example.

[1] https://www.southteesdc.com/wp-content/uploads/2020/01/South-Tees-Master-Plan-Nov-19.2.pdf

Further explanation of the methodology applied to derive baseline flows is therefore required.

Scope of the accident appraisal

The Scoping Report proposes that a high-level review of five year' worth of accident data within the vicinity of the site is to be undertaken.

This approach is accepted but the review will also need to cover any extended SRN geography.

Trip generation

Trip rates

The Scoping Report presents the level of trips that the site is likely to generate based on a TRICS assessment. We have undertaken a review of this information and make the following comments (on the basis that the planning application will be specific in relation to the scale and mix of development proposed).

There are various parameters that influence the trip generating characteristics of industrial employment sites, the specific details of which are not currently defined for the proposed site. Therefore, confirmation of the trip making suggested is founded on a broad examination of the data adopted, confirmation of its acceptability and sensitivity to variance by virtue of consideration of:

- The referenced sites' similarity, primarily in terms of scale:

  It is accepted that there is limited TRICS data relating to Industrial Sites of the scale proposed but it should also be recognised that two of the sites referenced (AG-02-D-02 and WO-02-D-03) are noticeably smaller than the proposed development. The influence of these sites is discussed below.

- Availability of other data:

  Excluded from the list of sites referenced is one of a more similar scale (FS-02-D-01); it is assumed that this site has been excluded due to no multi-modal data being available for it. However, it has been included within CH2M's comparison calculations, which consider vehicle trip generation only.

- Potential muting of trip making identified by virtue of shift-change times for the referenced sites being outside of the assessment periods:

  The trip numbers have been identified from the individual site's surveys (discussed below) and examined to identify, firstly, if there are any peaks in the traffic generations apparent (resulting from shift-changes) that result in a muting of the trips suggested for the weekday morning and evening peaks considered. Whilst there were 'out of peak' peaks apparent the primary periods of traffic generation for the highest generating sites have been confirmed to comply with the morning and evening assessment periods.

- Identification of individual site's trip making, founded on both the proposed Gross Floor Area and number of employees suggested:

  Whilst the WO-02-D-03 reference site generates trips at a higher rate than that suggested, as noted, this site is noticeably smaller than the proposed site. In considering the larger sites only, these generate trips at a lower rate than that suggested and the other smaller site (AG-02-D-02) generates an equivalent number of trips to those proposed. These checks are founded on the proposed GFA but have similarly been validated through identification of the trip numbers founded on the number of employees suggested.

- Comparison to independently identified rates:

Independent trip rates have been identified for the two largest of the referenced sites plus the additional site identified by CH2M. The trip generating characteristics of these independent calculations suggest lower trip numbers. These calculations are considered sufficient to provide Highways England with the comfort that the trip making characteristics proposed are fit for purpose.

- Confirmation of the employee numbers suggested.

  Founded on the site details for all referenced sites the ratio of employee numbers to GFA have been identified and applied to the proposed GFA. As per the examination of the trip making, only the AG-02-D-02 and WO-02-D-03 reference sites results in employee numbers greater than that suggested but, as noted, these sites are noticeably smaller than the proposed site. Both individually and when combined into averages, the other ratios result in lower employee numbers. Similarly, therefore, these calculations are considered sufficient to provide Highways England with the comfort that the employee numbers suggested as the basis of the trip making is fit for purpose.

On this basis, the trip generation outcomes as proposed in the Scoping Report can be considered to be acceptable.

Trips by mode of transport

Journey to Work data has been used to infer the proportion of highway trips based on Census zone E02002517. Given that most of the land within the Census zone chosen is currently vacant, it would be beneficial to sense check the figures obtained. We recommend doing this by extracting values also for Census zone, adjacent to the south west, to confirm the proportions obtained are realistic.

Vehicular trip distribution

The Scoping Report proposes that vehicular trip distribution is to be based on the distribution of trips in the NRTM and the Tees Valley Model. It is not clear if there are any zones in those models that represent the area where the development is to be located. In addition, with the site being vacant at the moment, the number of trips being generated and attracted from the relevant zones could be small, and non-representative of the future year distribution of the South Industrial Zone.

Looking at the urban density, it appears unlikely that over 40% of the South Industrial Zone would have an origin or a destination to the east side of the development, as the most densely populated area is located west of the development, including the wider Tees Valley (most prominently Middlesbrough and Stockton-on-Tees). We also note that discussions as part of the wider transport strategy for the STDC site, that it is anticipated that the site would have a more regional “draw” than a typical B2/B8 development and we would therefore seek to understand if this would have any further influence on trip patterns.

Distributing traffic using existing observed or modelled turning proportions is not acceptable given that the patterns at these locations extracted by those means relate to a range of trip purposes and cannot be wholly related to being typical of this specific type of development.

With a view to the main site entrance, the geography of the SRN that would need to be covered is not likely to only include the A1053 and A174 to the south, but also the network to the west given that west facing trips would likely travel via the local road network element of the A66 through Middlesbrough to reach the A19 and A66.

We recommend that census data of a surrounding (already developed) area be analysed from which a distribution pattern could be established. Cognisance to the fact that this site could be a regional attractor and have a larger catchment area than a typical B2/B8 site should also be provided.

Cumulative Assessment and Future Growth

The Scoping Report mentions there are *local developments that will add traffic to the network within the study area, particularly the York Potash development which includes a Materials Handling Facility (MHF) at Wilton (reference R/2014/0626/FFM) and a conveyor route to Bran Sands storage facility.*

With respect to the developments to be included in the growth assessment, it is advised that contact should be made with the Local Planning Authorities (not only Redcar & Cleveland but other authorities such as Middlesbrough, given the likely area of influence) to understand what committed developments need specific consideration in the assessment and then this built into an assessment of traffic growth.

The Scoping Report proposes that growth figures from the NRTM could be applied. Is not clear as to how the growth figures will be derived from the NRTM. However, the NRTM is a strategic model which will have little specific detail about this area. Because of this, the use of TEMPro is recommended instead of extracting growth figures from the NRTM.

The Scoping Report does not give any details as to how the committed development trips will be distributed. We recommend that a methodology for committed development trips distribution also needs to be outlined and embedded into the process of creating future year demands.

Development Impact Assessment

Scope of Highways Impact Assessment

The Scoping Report includes only 8 junctions in the long list of potentially affected locations. Those for which the estimated flow impact is greater than 10% are proposed for further assessment, resulting in a final list that includes five junctions in the immediate vicinity of the South Industrial Zone. Only one of these 5 junctions is located in the SRN (A1053 / A1085 Trunk Road / local access road / A1053 Greystone Road). The extent of the SRN proposed to be assessed appears to be small, given the size of the development.

Percentage impacts are no longer used as the indicator of when operational assessments are required and therefore the view of only considering junctions with an impact greater than 10% is not accepted. Highways England consider that the starting point to identifying the need for assessment is based on an impact exceeding 30 two way trips at a junction. Information should be afforded to enable the SRN study area to be confirmed.

Should assessment of other SRN junctions (beyond that identified within the Scoping Note) be deemed necessary as a result of the comments made within this TM (and any resultant impact assessment undertaken by Arup), early consultation with Highways England should take place with regards to the scope of operational assessment and the potential ability for models or data to be provided by Highways England to support these assessments.

Environmental Impact Assessment

Given the scale of the site, consideration may need to be given to the impacts during construction. Given the scale of development, there is the potential that there could be significant construction impacts. While it is identified that a qualitative assessment is proposed as part of a Construction Traffic Management Plan [CTMP], it may be necessary for the CTMP to be conditioned until a clear view on construction impacts (construction trip impacts and potential abnormal loads) is known.

Assessment Scenarios

The Scoping report proposes that the scenarios to be considered in the Transport Assessment include 2020 and 2028. We suggest that the following need to be considered:

- Full opening year which, according to the Scoping Report, is 2028; and

- 10 years post application or the end of the Local Plan (if later than 10 years post application).

Conclusion

The following table lists all the items that were highlighted in the Scoping Report as decision points and Highways England's response.

Scoping Report Section	Decision point (as defined in Scoping Report)	Highways England response	Suggested Action
2. Planning Policy Review	Documents proposed for planning review	Acceptable	No action
3. Baseline Conditions	Scope of transport networks	Not acceptable	Consideration should be given to the impacts on the wider SRN
	Methodology for establishing baseline traffic flows	Not acceptable	Further information is required to consider the method proposed as opposed to using NRTM and Tees Valley model
	Scope of the accident appraisal	Not acceptable	Needs to cover any extended SRN geography
4. Development Proposals	Transport Proposals	Acceptable	No action
5. Trip Generation	Person employee trip rates	Acceptable	No action
	Mode share proportions	Not acceptable	Additional Census zone should be used in the analysis
	Proposed trip distribution	Not acceptable	Census data of a surrounding (already developed) area from which a distribution pattern could be established should be analysed
	Approach to growth forecast	Not acceptable	The use of TEMPro is recommended instead of extracting growth figures from the NRTM
6. Development Impact Assessment	Scope of junction assessment	Not acceptable	The starting point for identifying the need of assessment at the SRN is based on an impact exceeding 30 two way trips at a junction
	Scope of the EIA	Not acceptable	It may be necessary for the CTMP to be conditioned until a clear view on construction impacts is known.
	Assessment years/scenarios	Not acceptable	Full opening year and 10 years post application (or the end of the Local Plan if later than 10 years post application) need to be considered.

ARUP

Subject	South Industrial Zone Transport Assessment Scoping Report - Response to HE		
Date	3 July 2020	**Job No/Ref**	276320/001

Introduction

This document provides additional information on the Transport Assessment scope prepared in support of a planning application for the development of industrial (B2/B8) land use within the South Industrial Zone (SIZ) of the STDC site. It is in response to a Technical Memorandum dated 30 June 2020 from Highways England (HE) on the transport aspects of the proposed development.

Decision Points

The following table is extracted from the HE Technical Memorandum and provides a response to the actions suggested.

Subject South Industrial Zone Transport Assessment Scoping Report - Response to HE

Date 3 July 2020 **Job No/Ref** 276320/001

Scoping Report Section	Decision Point	HE Response and Suggested Action	Arup Response
2. Planning Policy Review	3a. Documents proposed for planning review	Acceptable - no action required	N/A
3. Baseline Conditions	3a. Scope of transport networks	Not acceptable - consideration should be given to the impacts on the wider SRN	The proposed scope of the assessment, as set out in the Arup Scoping Report, includes any junction where the impact on total traffic through the junction exceeds 10%. Five junction assessments, including the A1053/A1085 Trunk Road roundabout, are included in the scope of the assessment. HE advise that 30 two-way trips should be used as the benchmark for junction assessments which would bring an additional SRN junction, the A1053 Greystone Road / A174 / B1380 High Street junction (Greystones Roundabout) into scope. The AM peak hour impact at the junction, in terms of traffic flows, is 5%. Previous DfT guidance (withdrawn in 2014) indicates that 30 two-way trips provides a useful point of reference to commence discussions. The scale of this impact is relative to the existing level of traffic the junction can accommodate. Selecting junctions with a greater than 10% impact was considered to be a reasonable approach as it selects junctions where the impact is likely to be perceptible, above the daily variations in traffic flow.

Scoping Report Section	Decision Point	HE Response and Suggested Action	Arup Response
			We understand that junction improvements are planned for Greystones roundabout. If a model of the junction exists, Arup can provide '2028 Base + Proposed Development' AM and PM peak hour scenarios for testing to ascertain the scale of impact, of this particular development, at Greystones roundabout.
	3b. Methodology for establishing baseline traffic flows	Not acceptable - further information is required to consider the method proposed as opposed to using NRTM and Tees Valley model	The methodology for establishing baseline traffic flows, in the absence of surveys, has followed a detailed review process. In the first instance, separate traffic flow diagrams were developed for the AM and PM peak hour, using data from each of the two transport models available (2015 NRTM data and 2014 TVM data). These diagrams are attached in Appendix A. The two diagrams were compared against the most relevant traffic survey information that was available for each location (i.e. publicly available 2015, 2016 and 2017 DfT traffic data, 2015 WebTRIS data, and 2016 traffic survey data from the *Cargo Fleet Lane Junction Feasibility Study: Aimsun Modelling Report).* Based on a comparison between modelled data and survey data, and taking into account the potential impact of the SSI steel-works closure on post-2015 surveyed traffic flows, it was considered that the turning flows extracted from the NRTM represented a more realistic estimation of 2015 traffic conditions for the study area. However, where survey data could be sourced, it was reviewed against NRTM flows. Hybrid AM and PM peak hour traffic flow diagrams were developed (and are attached to this report) that included NRTM turning movements at each junction of the study area, surveyed link flows (for comparison purposes), and junction turning counts. The following observed data was obtained:

Scoping Report Section	Decision Point	HE Response and Suggested Action	Arup Response
			• 2016 junction turning counts data at the Dockside Road / B1513 Old Station Road and Dockside Road / site access roundabouts, extracted from the *Redcar and Cleveland Borough Council Proposed Smith's Dock Road / Dockside Road roundabout Transport Assessment*. • Traffic survey data collected on behalf of Capita in 2019 at the A66 / B1513 Old Station Road / Middlesbrough Road and A66 / Normanby Road junctions. <u>2020 Base scenario</u> The 2019 observed survey data (A66 / Old Station Road, A66 / Normanby Road junctions) was assumed to be a reasonable representation of current (2020) baseline flows. The 2016 survey data (Dockside Road junctions) was adjusted based on the difference between the 2019 survey data and 2015 NRTM flows on Old Station Road. For the remaining junctions, the 2021 NRTM forecasts were extracted from the model, adjusted for 2020. <u>2028 Base scenario</u> For junctions where the 2020 Base scenario was developed based on survey data, the 2028 Base scenario was calculated by applying the NRTM 2020-2028 growth, calculated as a % change to the 2020 Base traffic flow diagram. For the remaining junctions, the 2031 NRTM forecasts were extracted from the model, adjusted for 2028. The traffic flow diagrams that were developed to inform the baseline conditions (2015 NRTM, 2014 TVM, 2015 Hybrid, 2020 Base and 2028 Base) are provided in Appendix A of this note.

Scoping Report Section	Decision Point	HE Response and Suggested Action	Arup Response
	3c. Scope of the accident appraisal	Not acceptable - needs to cover any extended SRN geography	The accident analysis has been extended to include the A1053 Greystone Road / A174 / B1380 High Street Strategic Road Network (SRN) roundabout.
4. Development Proposals	4a. Transport Proposals	Acceptable - no action required	N/A
5. Trip Generation	5a. Person employee trip rates	Acceptable - no action required	N/A
	5b. Mode share proportions	Not acceptable –additional Census zone should be used in the analysis	Data from the 2011 UK Census shows that across the Tees Valley, 62% of people travelled to work by car at the time of the Census. Across the borough of Redcar and Cleveland, the proportion was slightly higher at 64% compared with Middlesbrough where the proportion of residents travelling to work by car was 57%. The Census data suggests that 82% of people that travelled to the site in 2011 did so by car; the data indicates that this is above the average for the Tees Valley area. This could be attributed to a number of factors, including the shift patterns of the previous land-use (including the SSI steel-works, which closed in 2015) but also the poor accessibility of the site by non-car modes. The assessment has therefore applied the 82% car mode share as a very worst-case assessment if no mitigation is applied and the accessibility of the site remains as existing.

Scoping Report Section	Decision Point	HE Response and Suggested Action	Arup Response
	5c. Proposed trip distribution	Not acceptable - Census data of a surrounding (already developed) area from which a distribution pattern could be established should be analysed	Development trip assignment has been informed by the existing trip distributions in both the TVM (48% to/from Redcar) and NRTM (42% Redcar). This data, and 2011 Census Journey to Work data, indicates that a large proportion of trips are local trips travelling to/from Redcar to the east. It is acknowledged that the change in use on the site could alter the trip distribution and this has been taking into consideration when making the western access the main access into this development site. Accordingly, 60% of trips have been assigned to this access. This could be higher but retaining a value of 40% on the eastern side was considered to be a reasonable assumption if current travel trends continue and those travelling from areas such as south Stockton and Middlesbrough use the A174. Assignments throughout the remainder of the network have been informed by the distribution patterns of base traffic derived from the NRTM (and based on the 2020 base traffic flow diagrams, described in the Arup response to Decision Point 3b). This is considered to be a more up to date approach than reviewing 2011 Census data, which may now be outdated, to inform distributions.
	5d. Approach to growth forecast	Not acceptable - the use of TEMPro is recommended instead of extracting growth figures from the NRTM	TEMPro is based on the National Trip End Model (NTEM). The NTEM is a national model, based on planning data at local authority level. The NTEM contains no information of planned developments in each zone. Growth at each zone is based upon the local authority level projections and "historic trends". Consideration for specific developments can be made using the "Alternative Planning Assumptions" functionality within the TEMPro software. This results in updated NTEM forecasts, presented at zone level. By comparison, the NRTM is a regional transport model. It is underpinned by the NTEM as well as a full variable demand model accounting for changing economic conditions

Scoping Report Section	Decision Point	HE Response and Suggested Action	Arup Response
			and competing transport modes. Growth in the NRTM is controlled to NTEM at district level (as per TAG guidance). However individual developments are explicitly accounted for using the uncertainty log process outlined in TAG. This means that local trip end growth is calculated in a much more detailed way than in NTEM. The trip end growth is applied to the demand matrix and the traffic growth (on the network) is appropriately calculated using the full variable demand and assignment models. The result of this is that forecasts are provided by link rather than by zone (as in the NTEM). At the South Tees site, there are very significant changes to the demand which cannot be reflected using NTEM and TEMPro. This includes the closing of the steel-works. So local are these significant changes that to apply the effect of these changes universally would be incorrect. The closing of the steel-works does not result in a consistent reduction to other traffic generators in the zone. As such the application of zone-based growth factors is incorrect. The correct approach to estimating growth is the use of a formal traffic model such as the NRTM and apply growth at a link level.
6. Development Impact Assessment	6a. Scope of junction assessment	Not acceptable –the starting point for identifying the need of assessment at the SRN is based on an impact exceeding 30 two way trips at a junction	See Arup response to action 3a - selecting junctions with a greater than 10% impact was considered to be a reasonable approach as it takes into account the existing nature of the junction to identify junctions where the impact is likely to be perceptible above the daily variations in traffic flow We understand that junction improvements are planned for the Greystones roundabout. If a model of the junction exists, Arup can provide '2028 Base + Proposed Development' AM and PM peak hour scenarios for testing to ascertain the scale of impact of this particular part of the STDC masterplan.

Scoping Report Section	Decision Point	HE Response and Suggested Action	Arup Response
	6b. Scope of the EIA	Not acceptable - it may be necessary for the CTMP to be conditioned until a clear view on construction impacts is known.	Agree – we expect a CTMP to be conditioned.
	6c. Assessment years/scenarios	Not acceptable – full opening year and 10 years post application (or the end of the Local Plan if later than 10 years post application) need to be considered.	Given the scale of the development, it has been forecast that construction will take approximately eight years. The opening year assessment year is therefore 2028 (scenario '2028 Base + Proposed Development'). The HE response refers to an additional future assessment scenario, i.e. the 'end of the Local Plan' (2032) scenario, which is later than the 'ten years post application' (2030) scenario. The transport strategy for the wider STDC site will be looking at a longer-term horizon in terms of future year assessments. The impact of the wider STDC site up to a final year scenario, expected to be circa 2040, will be assessed by undertaking strategic modelling of the surrounding highway network.

Appendix A – Traffic Flow Diagrams

2015 AM Peak Hour-NRTM

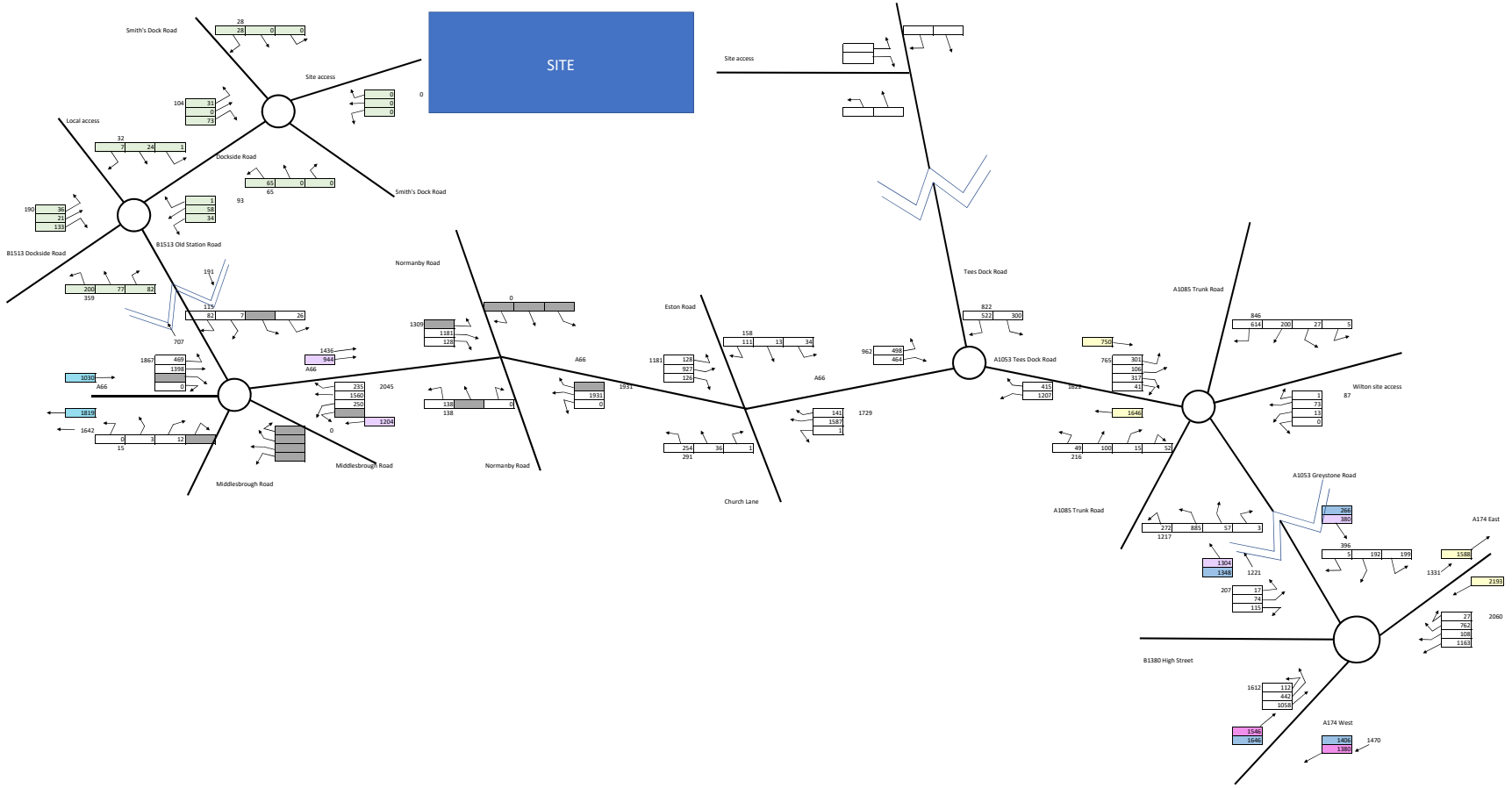
(see below for exceptions)

Key

- 2016 survey data (from site access junction TA)
- 2015 data (from NRTM)
- Data not included in NRTM
- 2017 DfT surveyed link flows
- 2015 DfT surveyed link flows
- 2016 survey data (from Cargo Fleet Lane Aimsun report)
- 2015 WebTRIS data (vehicles)
- 2016 DfT surveyed link flows

**2016 survey data assigned onto site access junction based on site access TA assignment*

***All traffic flows in pcu, with the exception of WebTRIS data*



2015 PM Peak Hour-NRTM

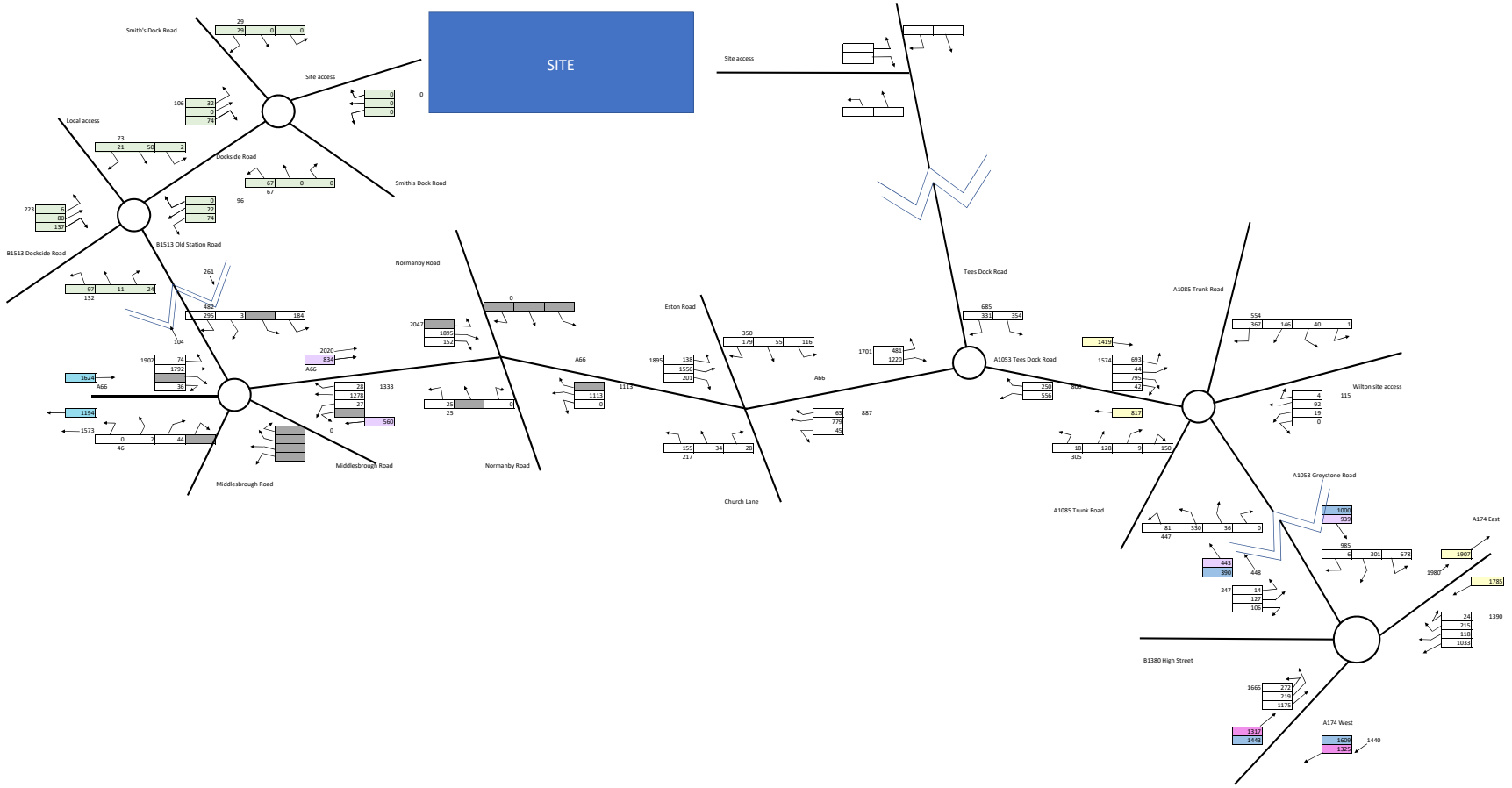
(see below for exceptions)

Key

- 2016 survey data (from site access junction TA)
- 2015 data (from NRTM)
- Data not included in NRTM
- 2017 DfT surveyed link flows
- 2015 DfT surveyed link flows
- 2016 survey data (from Cargo Fleet Lane Aimsun report)
- 2015 WebTRIS data (vehicles)
- 2016 DfT surveyed link flows

**2016 survey data assigned onto site access junction based on site access TA assignment*

***All traffic flows in pcu, with the exception of WebTRIS data*



2014 AM Peak Hour-TVM

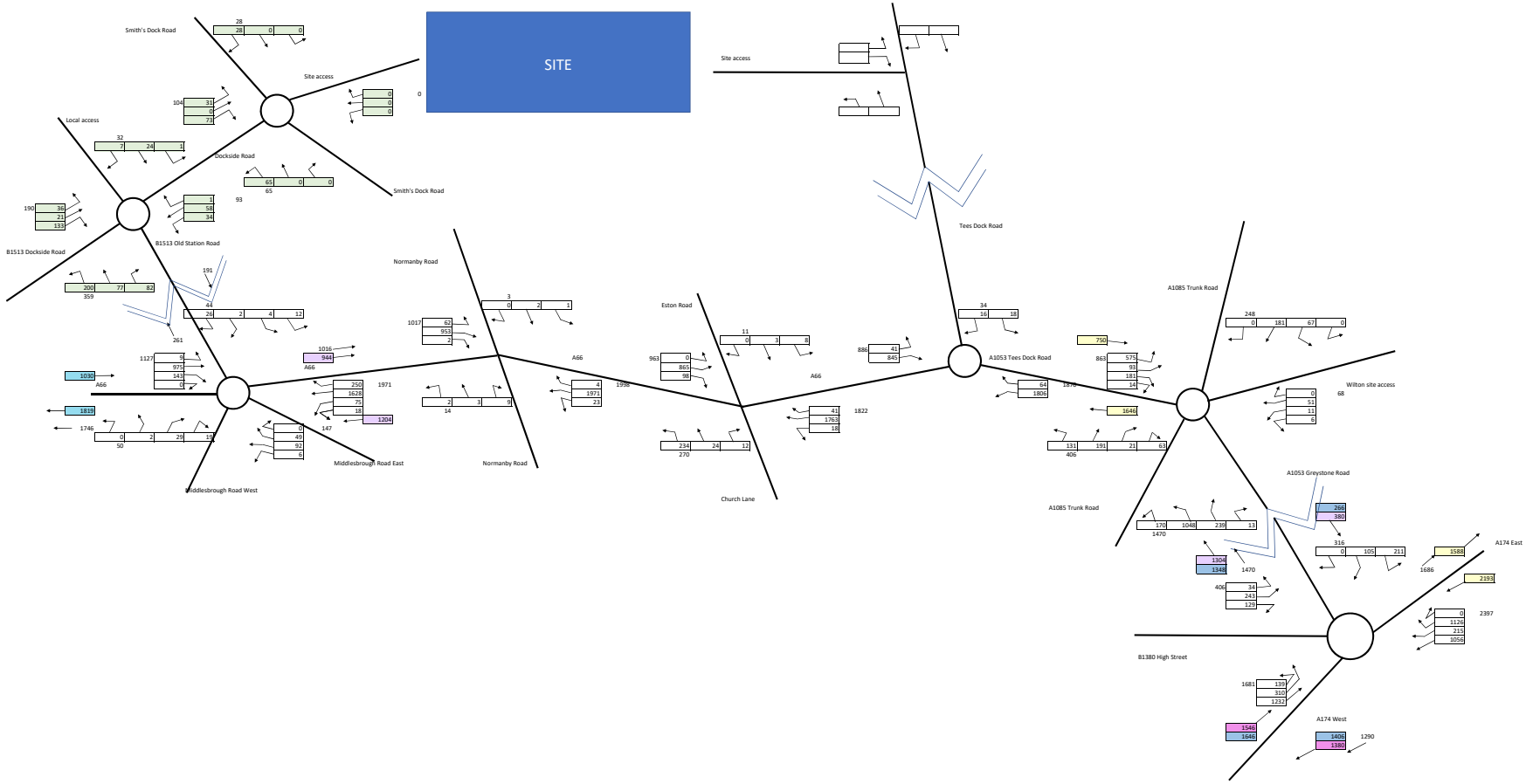
(see below for exceptions)

Key

	2016 survey data (from site access junction TA)
	2014 data (from TVM)
	2017 DFT surveyed link flows
	2015 DFT surveyed link flows
	2016 survey data (from Cargo Fleet Lane Aimsun report)
	2015 WebTRIS data (vehicles)
	2016 DFT surveyed link flows

**2016 survey data assigned onto site access junction based on site access TA assignment*

***All traffic flows in pcu, with the exception of WebTRIS data*



2014 PM Peak Hour-TVM

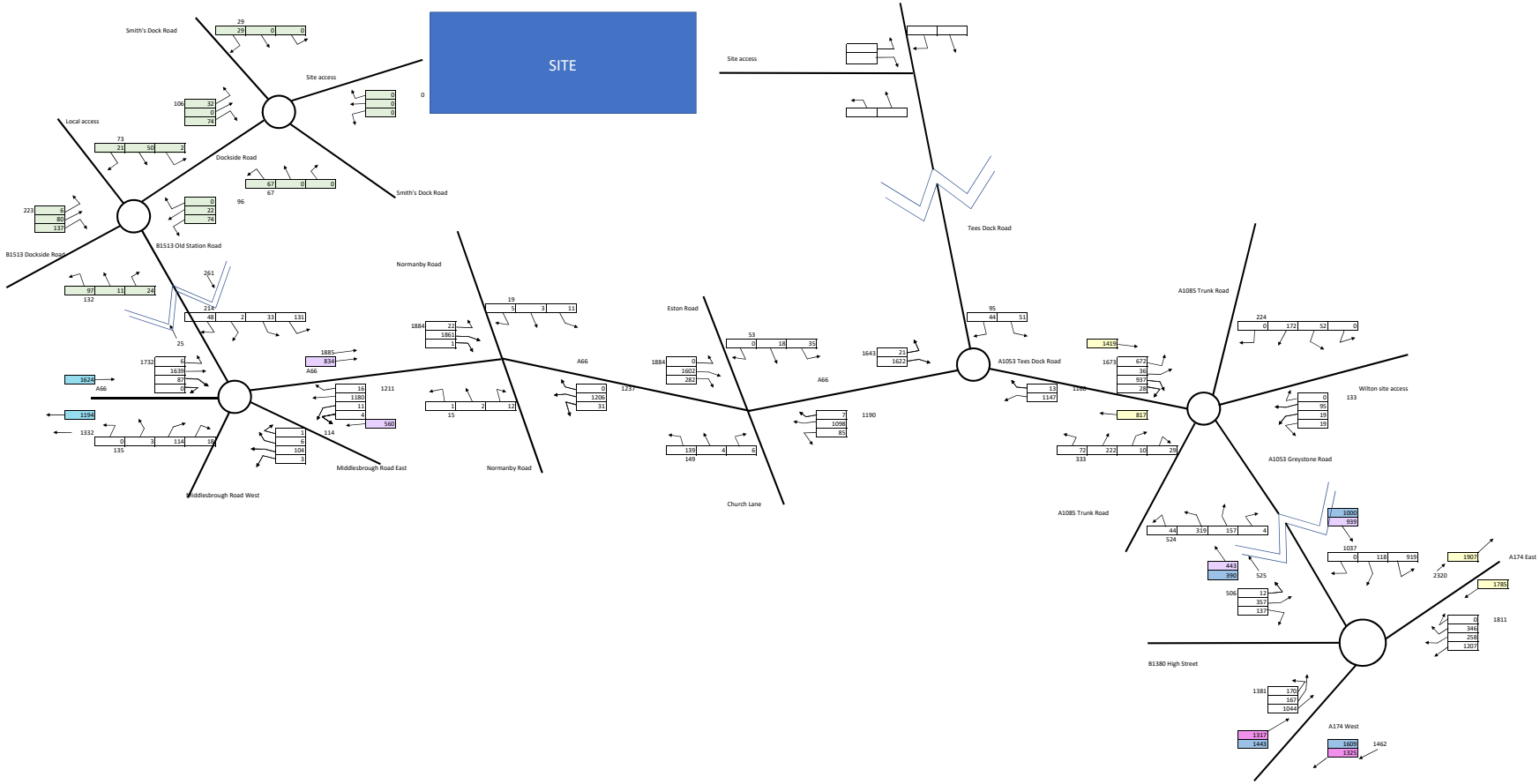
(see below for exceptions)

Key

	2016 survey data (from site access junction TA)
	2014 data (from TVM)
	2017 DfT surveyed link flows
	2015 DfT surveyed link flows
	2016 survey data (from Cargo Fleet Lane Aimsun report)
	2015 WebTRIS data (vehicles)
	2016 DfT surveyed link flows

**2016 survey data assigned onto site access junction based on site access TA assignment*

***All traffic flows in pcu, with the exception of WebTRIS data*



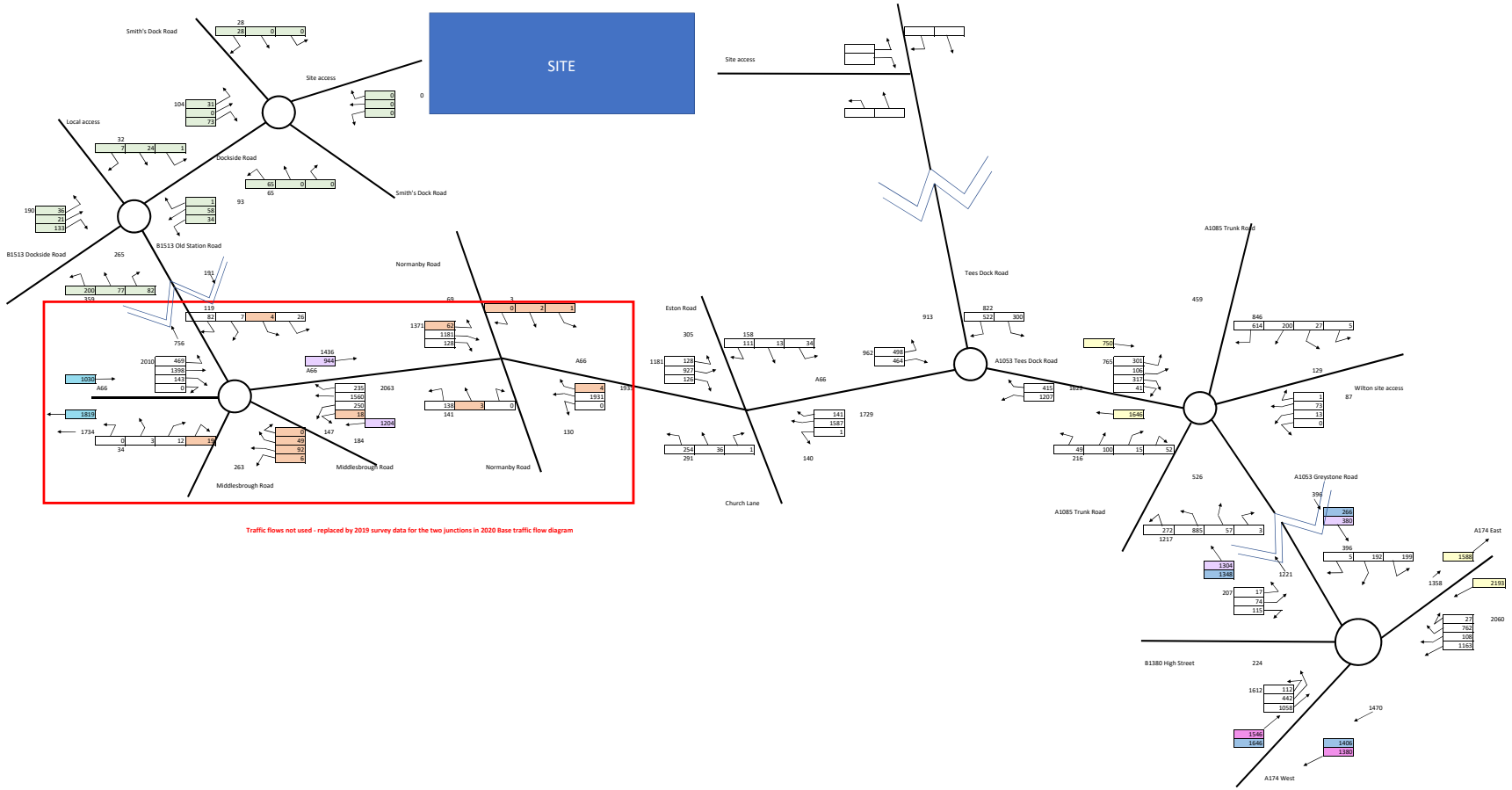
2015 AM Peak Hour-Hybrid Diagram

Key

- 2016 survey data (from site access junction TA)
- 2015 data from N8TM
- 2014 data from TVM
- 2017 DfT surveyed link flows
- 2015 DfT surveyed link flows
- 2016 survey data (from Cargo Fleet Lane Aimsun report)
- 2015 WebTRIS data (vehicles)
- 2016 DfT surveyed link flows

**2016 survey data assigned onto site access junction based on site access TA assignment*

***All traffic flows in pcu, with the exception of WebTRIS data*



Traffic flows not used - replaced by 2019 survey data for the two junctions in 2020 Base traffic flow diagram

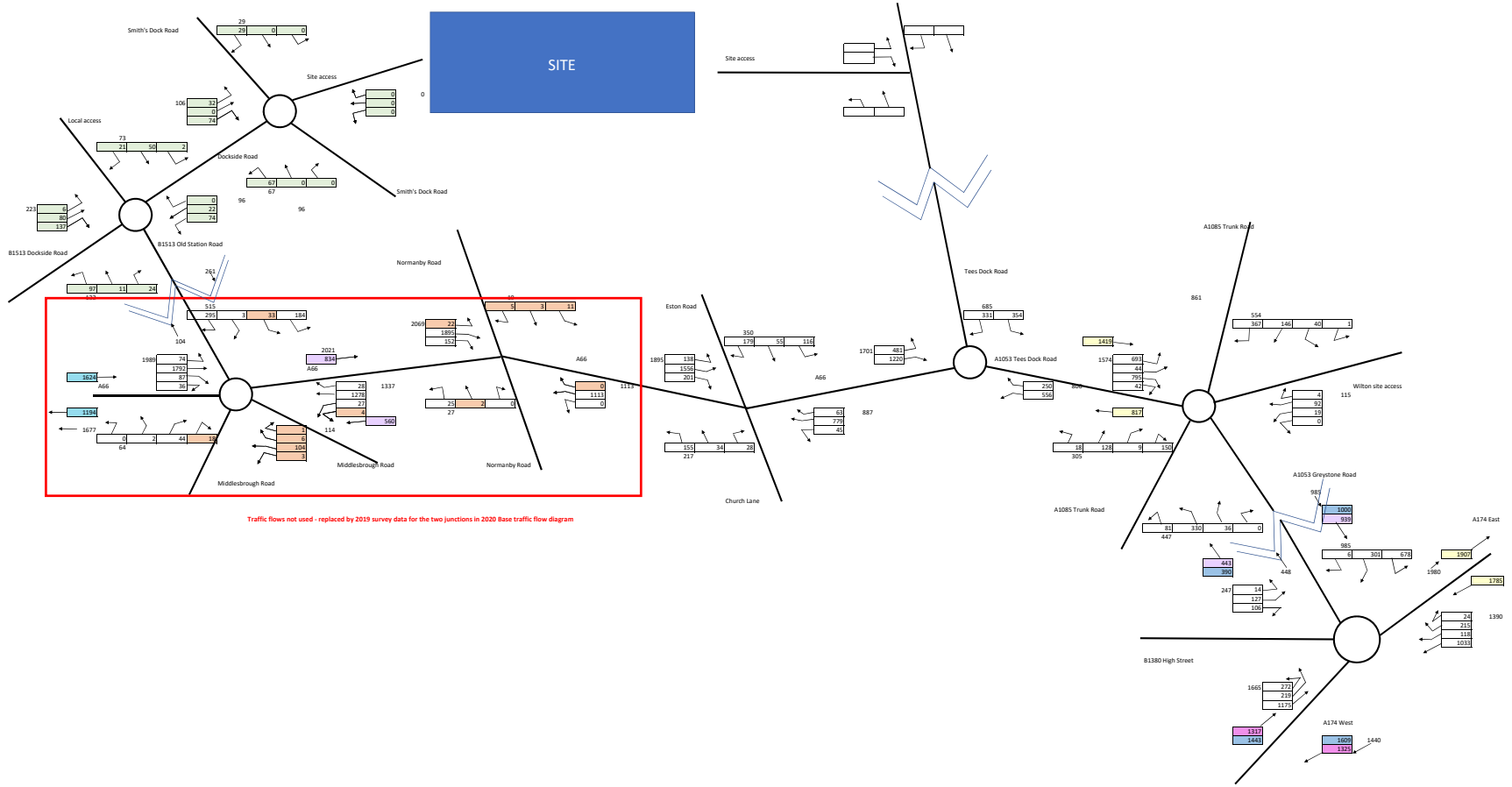
2015 PM Peak Hour-Hybrid Diagram

Key

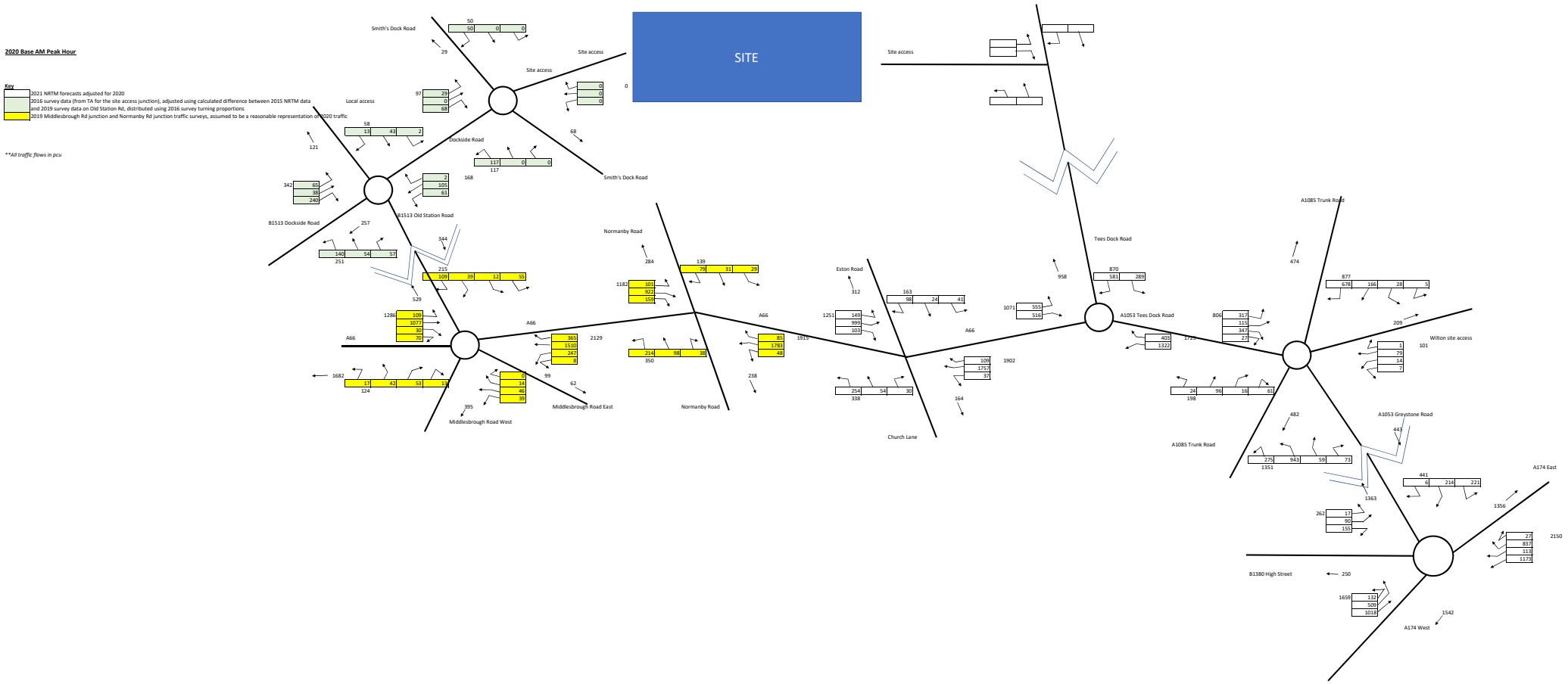
- 2016 survey data (from site access junction TA)
- 2015 data from N8TM
- 2014 data from TVM
- 2017 DfT surveyed link flows
- 2015 DfT surveyed link flows
- 2016 survey data (from Cargo Fleet Lane Aimsun report)
- 2015 WebTRIS data (vehicles)
- 2016 DfT surveyed link flows

**2016 survey data assigned onto site access junction based on site access TA assignment*

***All traffic flows in pcu, with the exception of WebTRIS data*



Traffic flows not used - replaced by 2019 survey data for the two junctions in 2020 Base traffic flow diagram

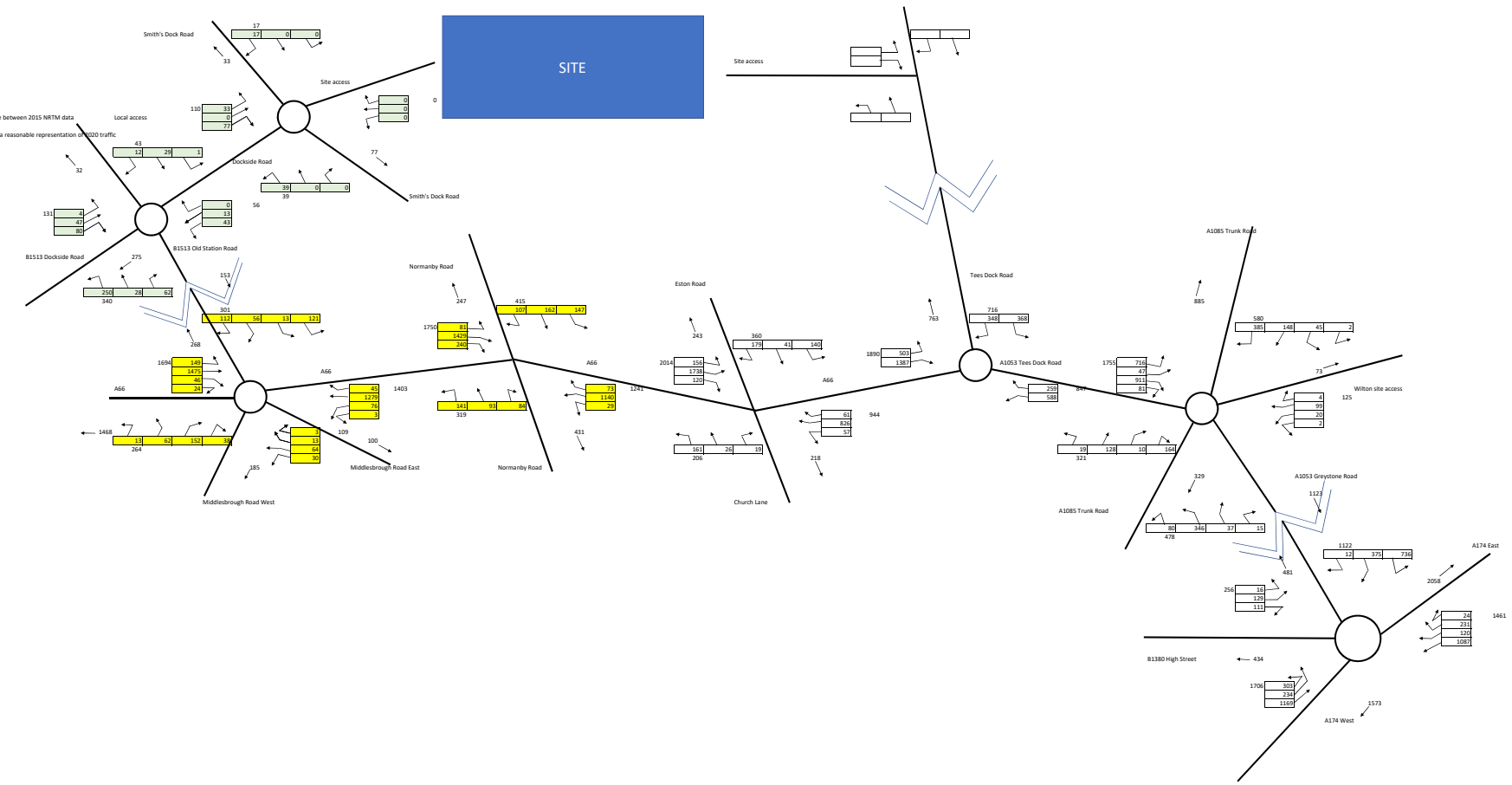

2020 Base AM Peak Hour
Key
2021 NRTM forecasts adjusted for 2020
2016 survey data (from TA for the site access junction), adjusted using calculated difference between 2015 NRTM data and 2019 survey data on Old Station Rd, distributed using 2016 survey turning proportions
2019 Middlesbrough Rd junction and Normanby Rd junction traffic surveys, assumed to be a reasonable representation of 2020 traffic
**All traffic flows in pcu
SITE
Site access
Site access
Site access
Smith's Dock Road
Smith's Dock Road
Local access
Dockside Road
B1513 Dockside Road
B1513 Old Station Road
Normanby Road
Normanby Road
Middlesbrough Road East
Middlesbrough Road West
A66
A66
A66
Eston Road
Church Lane
Tees Dock Road
A1053 Tees Dock Road
A1085 Trunk Road
A1053 Greystone Road
A1085 Trunk Road
Wilton site access
A174 East
A174 West
B1380 High Street

2020 Base PM Peak Hour

Key

2021 NRTM forecasts adjusted for 2020
2016 survey data (from TA for the site access junction), adjusted using calculated difference between 2015 NRTM data and 2019 survey data on Old Station Rd, distributed using 2016 survey turning proportions
2019 Middlesbrough Rd junction and Normanby Rd junction traffic surveys, assumed to be a reasonable representation of 2020 traffic

***All traffic flows in pcu*

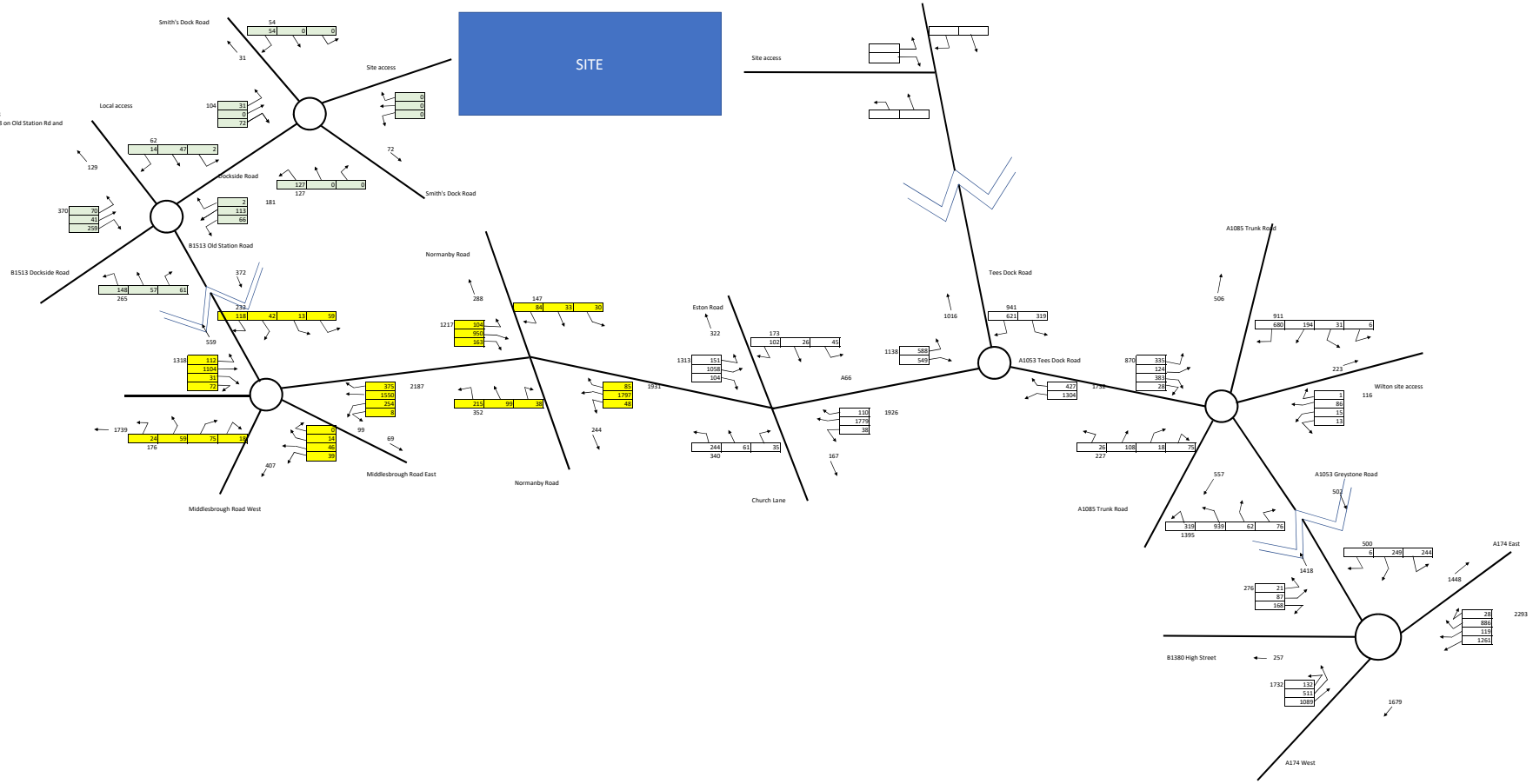


2028 Base AM Peak Hour

Key

2031 NRTM forecasts adjusted for 2028
2020 data (see 2020 diagram), growthed using NRTM growth between 2020 and 2028
2020 data (see 2020 diagram), growthed using NRTM growth between 2020 and 2028 on Old Station Rd and 2016 traffic survey turning proportions

***All traffic flows in pcu*

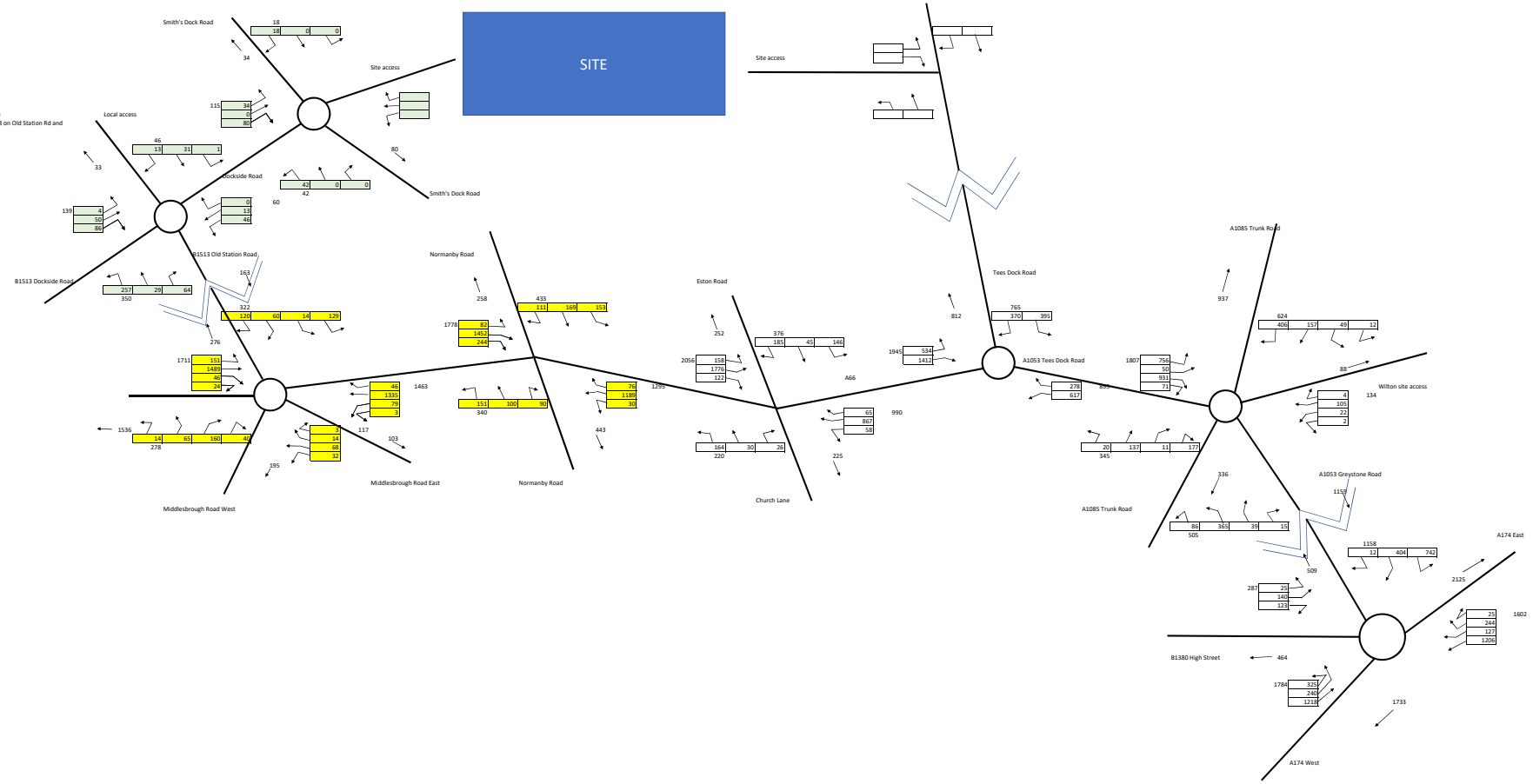


2028 Base PM Peak Hour

Key

- 2031 NRTM forecasts adjusted for 2028
- 2020 data (see 2020 diagram), growthed using NRTM growth between 2020 and 2028
- 2020 data (see 2020 diagram), growthed using NRTM growth between 2020 and 2028 on Old Station Rd and 2016 traffic survey turning proportions

***All traffic flows in pcu*



From:
Sent: 02 July 2020 12:08
To:
Cc:
Subject: [External] RE: TA Scoping Report for STDC South Industrial Zone
Attachments: JN1551-Rep-0001.0 Technical Note - Trip Generation and Distribution ALL.pdf; 679066.AA.18.03 TM001 TA Trip Making Review.pdf

Nicola,

Simon and I have discussed the draft Scoping Report that you circulated on Friday 19th June. Apologies for the delay in getting back to you.

The approach that we would recommend is based broadly upon that adopted for the TeesAMP development at Riverside Park, which was granted planning consent in August 2018 (Application ref. 18/0308/FUL). The key points are as follows:

Trip Generation

This should be based on the trip rate per employee, not the gross floor area as proposed in the draft Scoping Report. The attached Technical Note – prepared by SAJ Consultants on behalf of Linthorpe Developments, the developer of the TeesAMP site – sets out the methodology agreed with the Council. It is noted that the trip rates proposed for the South Industrial Zone would appear to be somewhat lower than those agreed for the TeesAMP development.

Also attached is a Technical Memorandum prepared by CH2M for Highways England, which broadly concurs with the methodology adopted for the TeesAMP development. As a precedent has, therefore, been set, it is reasonable to assume that Highways England will agree to the adoption of a similar methodology for the South Industrial Zone. This should make negotiations with Highways England more straightforward.

Assessment Years

There is no mention of the expected build out rate in the draft Scoping Strategy. This will need to be agreed with the Council in order to determine the likely impact of the development on the surrounding transport network in each of the future year scenarios and to ensure that appropriate mitigation measures are introduced at the appropriate time.

Modelling

As you will be aware, Fore Consulting Limited, working on behalf of the Council, has developed an Aimsun highway model covering the whole Local Authority area. This model (the Middlesbrough Transport Model) comprises microsimulation models of each of the key highway corridors in the Borough together with a wider-area macroscopic model, thereby allowing both the strategic and local impacts of new developments to be properly assessed through a combination of macroscopic and microscopic modelling.

Given the above, the Middlesbrough Transport Model should be used to assess the impact of the South Industrial Zone on the highway network in Middlesbrough, with the future year scenarios aligning with the five-year 'time slices' used in the Middlesbrough Model. This will ensure that committed developments elsewhere in the Borough are taken fully into account in the assessment process. This approach is consistent with that adopted for other proposed developments, with the developer and its agents liaising directly with Fore Consulting Limited and Fore acting on behalf of the Council and representing its interests.

Travel Plan

The assessment must be by all modes in order to identify the mitigation/improvement measures required to suppress the demand for journeys to and from the site by car and to promote the use of more sustainable alternatives.

General Comments

Given the proposed scale of the South Industrial Zone, and the potential impact of the traffic generated by the development on the operation of the Borough's highway network in future years, the overall parameters of the assessment and the methodology to be used will need to be agreed jointly between Middlesbrough Council, Redcar & Cleveland Borough Council and the South Tees Development Corporation.

Any improvements required in order to mitigate the impact of the South Industrial Zone on the operation of the Borough's highway network should be consistent with the Council's own infrastructure improvement plans.

Middlesbrough Council will need to have a direct say in any conditions and potential S106 contributions associated with the application (e.g. works, funding, trigger, clawback).

I hope that these comments are helpful. Should you wish to discuss any of the points raised in more detail, please do not hesitate to contact Simon (in the first instance) or myself.

ARUP

Subject	South Industrial Zone Transport Assessment Scoping Report - Response to MC		
Date	3 July 2020	**Job No/Ref**	276320/001

Introduction

This document provides additional information on the Transport Assessment scope prepared in support of a planning application for the development of industrial (B2/B8) land use within the South Industrial Zone (SIZ) of the STDC site. It is in response to comments dated 2 July 2020 from Middlesbrough Council (MC) on the transport aspects of the proposed development.

Trip Generation

MC Question *- This should be based on the trip rate per employee, not the gross floor area as proposed in the draft Scoping Report. The attached Technical Note – prepared by SAJ Consultants on behalf of Linthorpe Developments, the developer of the TeesAMP site – sets out the methodology agreed with the Council. It is noted that the trip rates proposed for the South Industrial Zone would appear to be somewhat lower than those agreed for the TeesAMP development.*

Arup Clarification – The trip rates extracted for the SIZ are per employee, rather than floor area. We did review the TeesAMP trip rates to validate that those we had extracted from TRICS for the SIZ were of a similar range. However, the TeesAMP site is much smaller (23,266sqm) than the SIZ development (418,000sqm) and therefore the TRICS search for the SIZ focussed specifically on larger industrial uses which were more comparable to the type of use proposed on the SIZ.

Assessment Years

MC Question *- There is no mention of the expected build out rate in the draft Scoping Strategy. This will need to be agreed with the Council in order to determine the likely impact of the development on the surrounding transport network in each of the future year scenarios and to ensure that appropriate mitigation measures are introduced at the appropriate time.*

Arup Clarification – The full opening year assessment scenario ('2028 Base + Proposed Development') has been developed and the outputs will be presented in the TA.

The transport strategy for the wider STDC site will be looking at a longer-term horizon in terms of future year assessments. The impact of the wider STDC site up to a final year scenario, expected to be circa 2040, will be assessed by undertaking strategic modelling of the surrounding highway network.

Modelling

MC Question *– As you will be aware, Fore Consulting Limited, working on behalf of the Council, has developed an Aimsun highway model covering the whole Local Authority area. This model (the Middlesbrough Transport Model) comprises microsimulation models of each of the key highway corridors in the Borough together with a wider-area macroscopic model, thereby allowing both the*

strategic and local impacts of new developments to be properly assessed through a combination of macroscopic and microscopic modelling.

Given the above, the Middlesbrough Transport Model should be used to assess the impact of the South Industrial Zone on the highway network in Middlesbrough, with the future year scenarios aligning with the five-year 'time slices' used in the Middlesbrough Model. This will ensure that committed developments elsewhere in the Borough are taken fully into account in the assessment process. This approach is consistent with that adopted for other proposed developments, with the developer and its agents liaising directly with Fore Consulting Limited and Fore acting on behalf of the Council and representing its interests.

Arup Clarification – Noted. Arup can provide the forecast development traffic for testing. Given the timescales, it is expected that the results from the Middlesbrough Transport Model will be provided in a TA Addendum.

Travel Plan

MC Question *– The assessment must be by all modes in order to identify the mitigation / improvement measures required to suppress the demand for journeys to and from the site by car and to promote the use of more sustainable alternatives.*

Arup Clarification – Agreed – a Travel Plan Framework will be provided with this submission. The trip generation methodology estimates trips by non-car modes but it is based on a worst-case scenario for the purpose of highway impact assessment (assuming that 82% of people working on the site travel by car, as they did at the time of the 2011 UK Census).

In addition to the Travel Plan Framework, a Transport Strategy for the wider STDC site (within which the proposed development is located) is currently in development. The strategy will develop a delivery plan of interventions to meet a set of agreed outcomes which is expected to include, amongst other things, limiting car parking provision, introducing mobility hubs, providing high quality cycling parking and improving public transport provision. Future occupiers of the proposed development will be expected to sign up to the strategy to meet sustainability targets (including RCBC's ambition to be carbon neutral by 2030) and will benefit from the measures introduced to enhance the accessibility of the site. These benefits, which will be embedded into the site in the future, will help to minimise the impact of development traffic and have a beneficial impact on pedestrian and cyclist amenity.

General Comments

MC Question *- Given the proposed scale of the South Industrial Zone, and the potential impact of the traffic generated by the development on the operation of the Borough's highway network in future years, the overall parameters of the assessment and the methodology to be used will need to be agreed jointly between Middlesbrough Council, Redcar & Cleveland Borough Council and the South Tees Development Corporation.*

Any improvements required in order to mitigate the impact of the South Industrial Zone on the operation of the Borough's highway network should be consistent with the Council's own infrastructure improvement plans.

Middlesbrough Council will need to have a direct say in any conditions and potential S106 contributions associated with the application (e.g. works, funding, trigger, clawback).

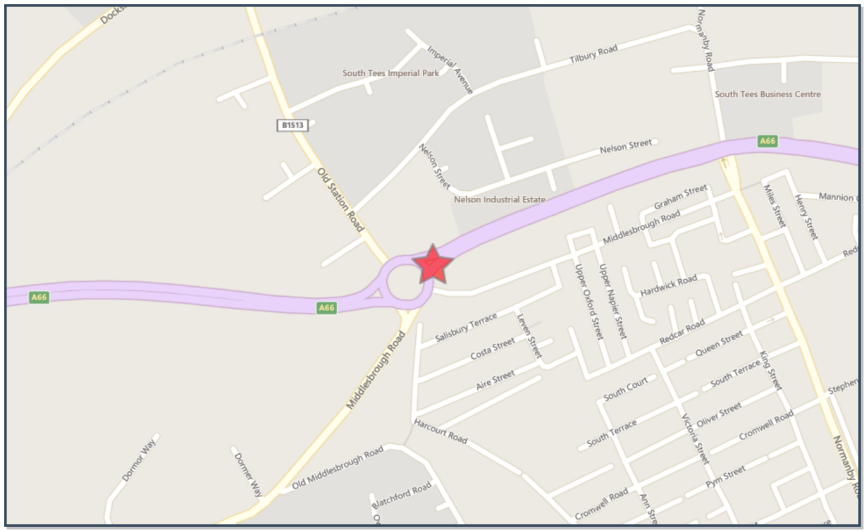
Arup Clarification – Comments noted. The Scoping Note has been circulated to all stakeholders and the Transport Steering Group for the STDC site will continue to meet to coordinate the delivery of infrastructure, as and when required, to support the South Tees Regeneration Masterplan.

Appendix C

Collision Data

crashmap.co.uk

Crash Date:	Wednesday, November 28, 2018	**Time of Crash:**	2:00:00 PM	**Crash Reference:**	**2018170L21388**
Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	452942 520755
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Roundabout				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Give way or uncontrolled				



For more information about the data please visit: *www.crashmap.co.uk/home/Faq*
To subscribe to unlimited reports using CrashMap Pro visit *www.crashmap.co.uk/Home/Premium_Services*

powered by agilysis

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
2	Car (excluding private hire)	9	Female	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Front	Other	None	None
1	Car (excluding private hire)	11	Female	21 - 25	Vehicle is waiting to proceed normally but is held up	Back	Other	None	None

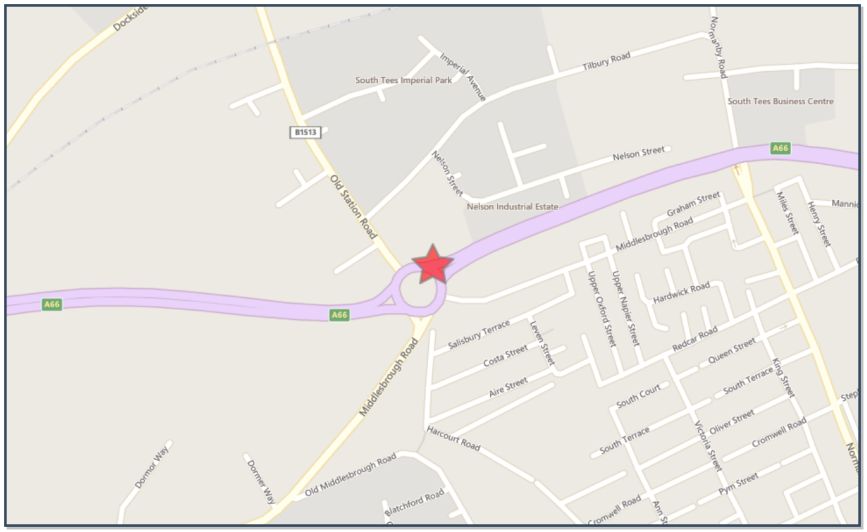
Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Female	21 - 25	Unknown or other	Unknown or other

crashmap.co.uk

Crash Date:	Wednesday, June 27, 2018	**Time of Crash:**	5:40:00 PM	**Crash Reference:**	**2018170L20588**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	452921 520768
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Roundabout				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Roundabout				
Junction Control:	Give way or uncontrolled				



For more information about the data please visit: *www.crashmap.co.uk/home/Faq*
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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
2	Car (excluding private hire)	9	Female	21 - 25	Vehicle is in the act of turning right	Offside	Commuting to/from work	None	None
1	Motorcycle over 500cc	9	Male	46 - 55	Vehicle proceeding normally along the carriageway, not on a bend	Front	Commuting to/from work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	46 - 55	Unknown or other	Unknown or other

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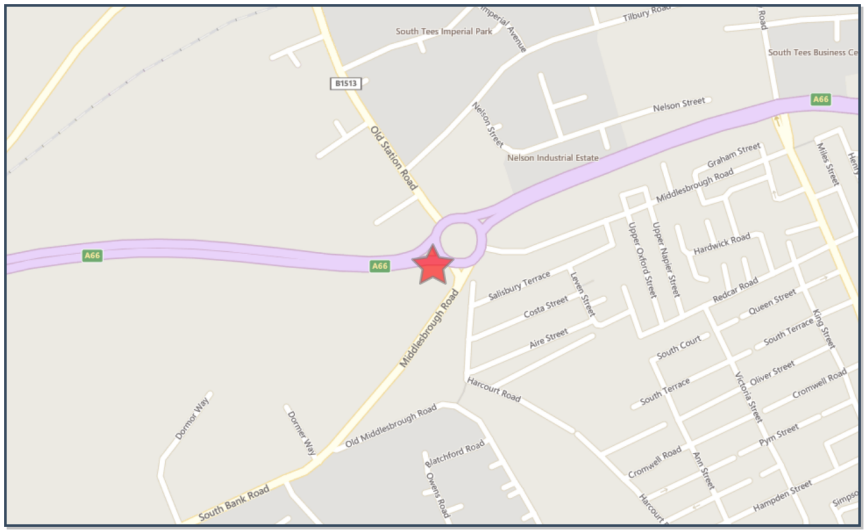
Crash Date:	Tuesday, January 23, 2018	**Time of Crash:**	8:10:00 PM	**Crash Reference:**	**2018170L20078**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	1
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	452857 520697
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Darkness: street lights present and lit				
Carriageway Hazards:	None				
Junction Detail:	Roundabout				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Give way or uncontrolled				



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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	Car (excluding private hire)	13	Male	21 - 25	Vehicle proceeding normally along the carriageway, not on a bend	Nearside	Commuting to/from work	Kerb	Central crash barrier

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	21 - 25	Unknown or other	Unknown or other

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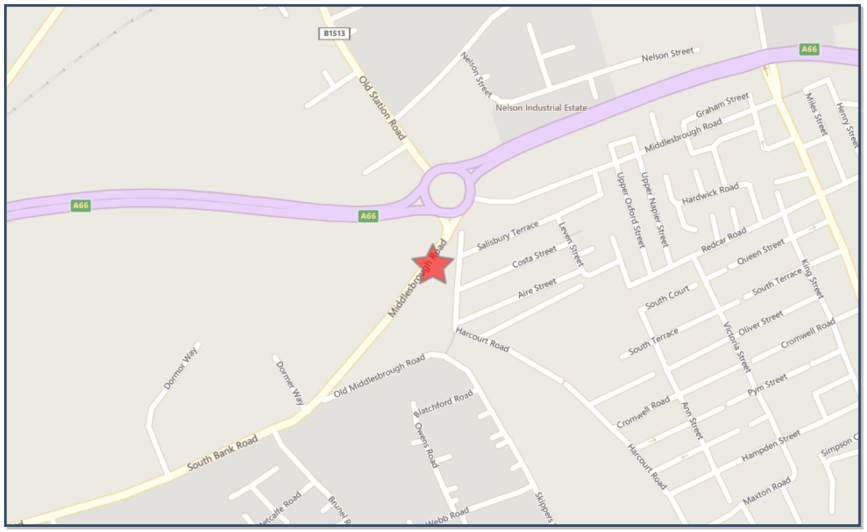
Crash Date:	Tuesday, January 02, 2018	**Time of Crash:**	8:20:00 AM	**Crash Reference:**	**2018170L20028**

Highest Injury Severity:	Slight	**Road Number:**	U0	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	1
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	452878 520619
Weather Description:	Fine without high winds				
Road Surface Description:	Frost or Ice				
Speed Limit:	30				
Light Conditions:	Daylight: regardless of presence of streetlights				
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				



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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	Car (excluding private hire)	7	Female	46 - 55	Vehicle proceeding normally along the carriageway, not on a bend	Front	Other	None	Wall or fence

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Female	46 - 55	Unknown or other	Unknown or other

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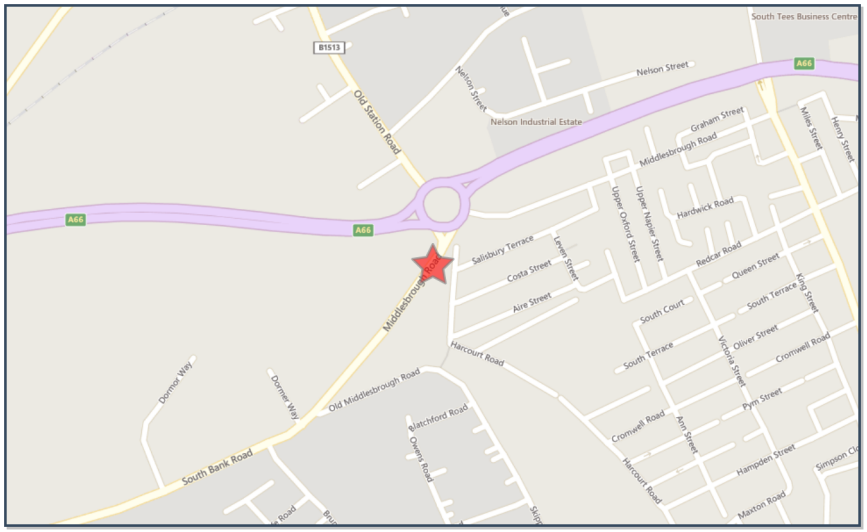
Crash Date:	Friday, July 28, 2017	**Time of Crash:**	5:16:00 PM	**Crash Reference:**	**2017170L20927**

Highest Injury Severity:	Slight	**Road Number:**	U0	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	452884 520637
Weather Description:	Raining without high winds				
Road Surface Description:	Wet or Damp				
Speed Limit:	30				
Light Conditions:	Daylight: regardless of presence of streetlights				
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				



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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
2	Minibus (8 - 16 passenger seats)	-1	Male	Unknown	Vehicle proceeding normally along the carriageway, not on a bend	Front	Journey as part of work	None	None
1	Car (excluding private hire)	4	Male	26 - 35	Vehicle is waiting to proceed normally but is held up	Back	Commuting to/from work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	26 - 35	Unknown or other	Unknown or other

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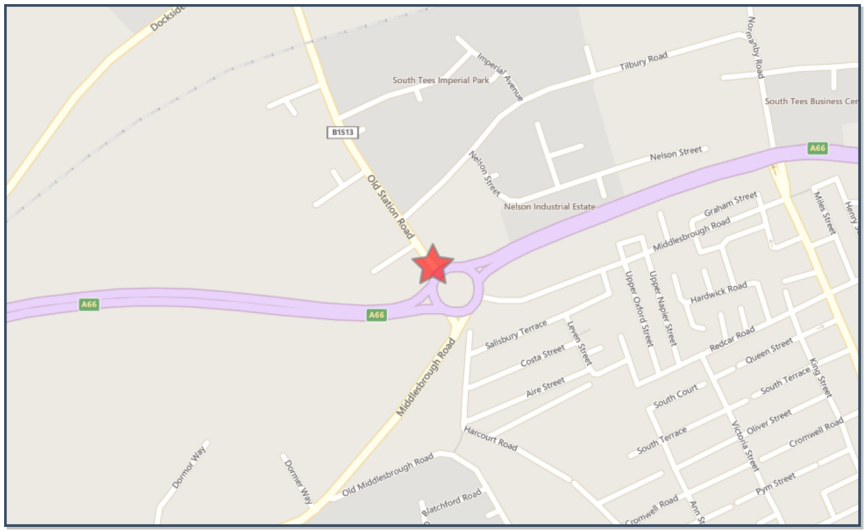
Crash Date:	Tuesday, July 05, 2016	**Time of Crash:**	5:20:00 PM	**Crash Reference:**	**2016170L20886**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	3
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	452861 520773
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	30				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Roundabout				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Give way or uncontrolled				



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
2	Car (excluding private hire)	9	Male	Unknown	Vehicle proceeding normally along the carriageway, not on a bend	Front	Other	None	None
1	Car (excluding private hire)	14	Female	46 - 55	Vehicle is waiting to proceed normally but is held up	Back	Other	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Female	46 - 55	Unknown or other	Unknown or other
1	2	Slight	Vehicle or pillion passenger	Male	16 - 20	Unknown or other	Unknown or other
1	3	Slight	Vehicle or pillion passenger	Male	26 - 35	Unknown or other	Unknown or other

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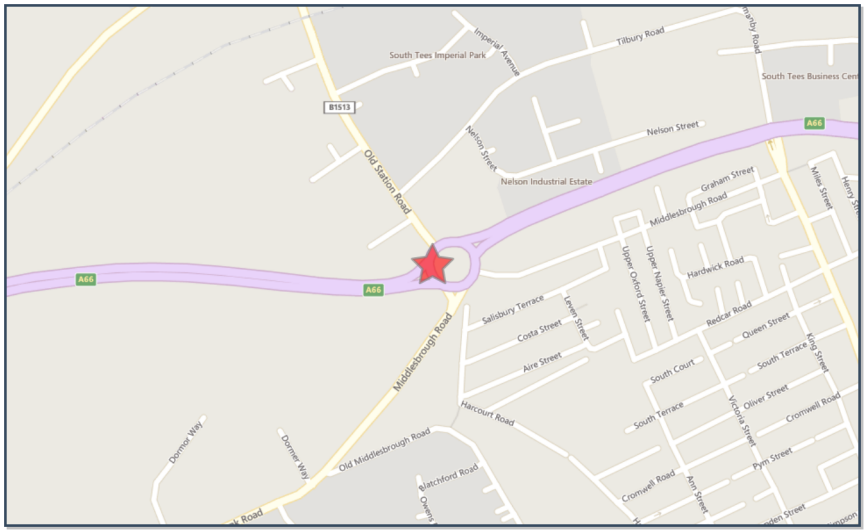
Crash Date:	Monday, September 14, 2015	**Time of Crash:**	12:27:00 AM	**Crash Reference:**	**2015170L21425**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	4
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	1
Local Authority:	Redcar and Cleveland			**OS Grid Reference:**	452866 520732
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Darkness: street lights present and lit				
Carriageway Hazards:	None				
Junction Detail:	Roundabout				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Roundabout				
Junction Control:	Give way or uncontrolled				



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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	Car (excluding private hire)	9	Male	21 - 25	Vehicle proceeding normally along the carriageway, not on a bend	Front	Other	Central island of roundabout	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	21 - 25	Unknown or other	Unknown or other
1	2	Slight	Vehicle or pillion passenger	Female	16 - 20	Unknown or other	Unknown or other
1	3	Slight	Vehicle or pillion passenger	Male	21 - 25	Unknown or other	Unknown or other
1	4	Slight	Vehicle or pillion passenger	Male	16 - 20	Unknown or other	Unknown or other

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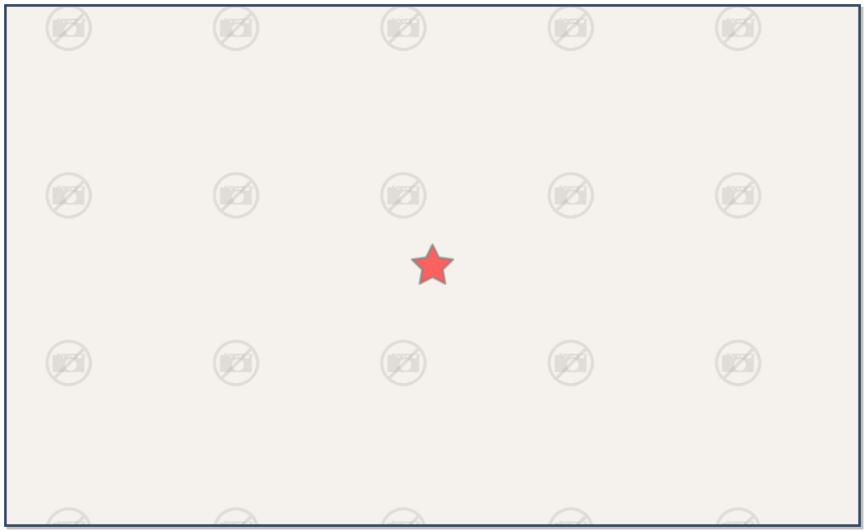
Crash Date:	Wednesday, March 13, 2019	**Time of Crash:**	9:07:00 PM	**Crash Reference:**	**2019170L20229**

Highest Injury Severity:	Serious	**Road Number:**	A66	**Number of Casualties:**	2
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	453400 520955
Weather Description:	Fine with high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Darkness: street lights present and lit				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Auto traffic signal				



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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
2	Car (excluding private hire)	-1	Female	16-24	Vehicle is in the act of turning right	Unknown	Other	None	None
1	Car (excluding private hire)	-1	Male	45-54	Vehicle proceeding normally along the carriageway, not on a bend	Unknown	Commuting to/from work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	45-54	Unknown or other	Unknown or other
2	2	Serious	Vehicle or pillion passenger	Male	16-24	Unknown or other	Unknown or other

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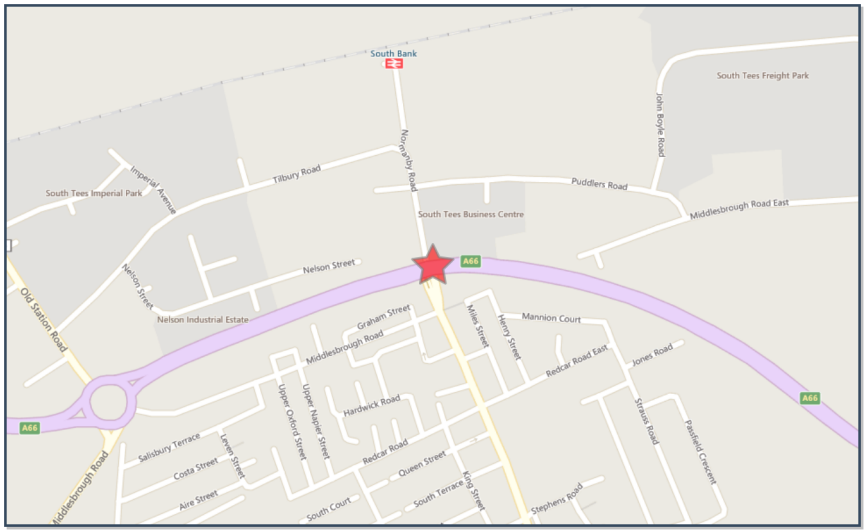
Crash Date:	Wednesday, June 06, 2018	**Time of Crash:**	5:14:00 PM	**Crash Reference:**	**2018170L20458**

Highest Injury Severity:	Serious	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	453409 520954
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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	Car (excluding private hire)	10	Male	16 - 20	Vehicle is in the act of turning right	Front	Other	None	None
2	Pedal cycle	-1	Male	46 - 55	Vehicle proceeding normally along the carriageway, not on a bend	Front	Commuting to/from work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
2	1	Serious	Driver or rider	Male	46 - 55	Unknown or other	Unknown or other

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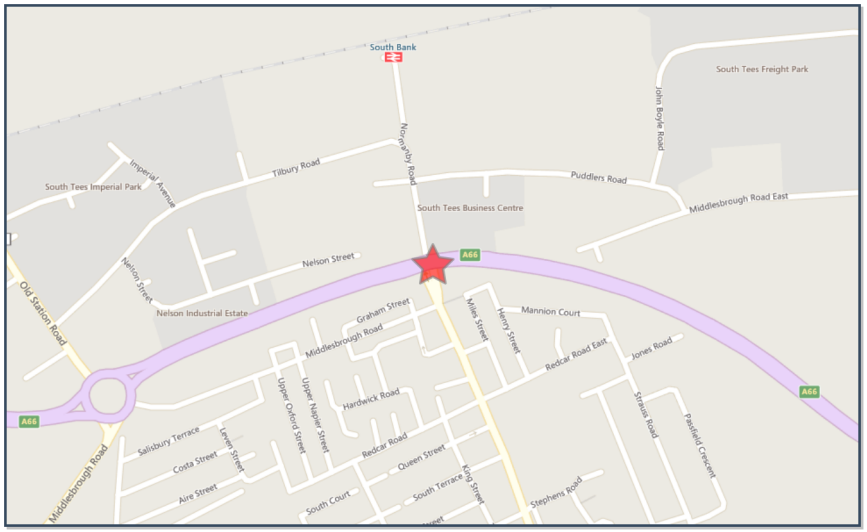
Crash Date:	Friday, March 03, 2017	**Time of Crash:**	5:12:00 PM	**Crash Reference:**	**2017170L20347**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	2
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	453410 520943
Weather Description:	Raining without high winds				
Road Surface Description:	Wet or Damp				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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
2	Car (excluding private hire)	9	Male	36 - 45	Vehicle proceeding normally along the carriageway, not on a bend	Front	Other	None	None
1	Car (excluding private hire)	12	Female	26 - 35	Vehicle is in the act of turning right	Front	Other	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
2	1	Slight	Driver or rider	Male	36 - 45	Unknown or other	Unknown or other
2	2	Slight	Vehicle or pillion passenger	Male	21 - 25	Unknown or other	Unknown or other

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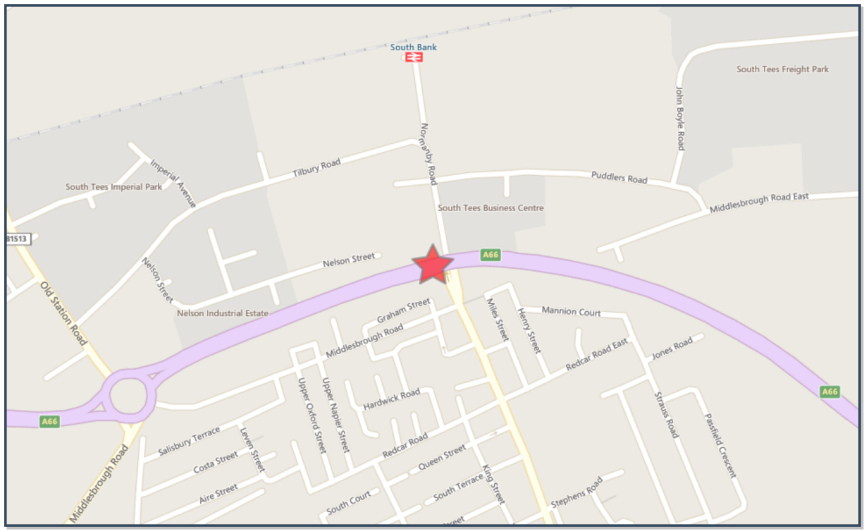
Crash Date:	Friday, May 13, 2016	**Time of Crash:**	12:20:00 PM	**Crash Reference:**	**2016170L20586**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	453377 520948
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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
2	Car (excluding private hire)	3	Female	21 - 25	Vehicle is slowing down or stopping	Back	Commuting to/from work	None	None
1	Goods vehicle 7.5 tonnes mgw and over	5	Male	56 - 65	Vehicle proceeding normally along the carriageway, not on a bend	Front	Journey as part of work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
2	1	Slight	Driver or rider	Female	21 - 25	Unknown or other	Unknown or other

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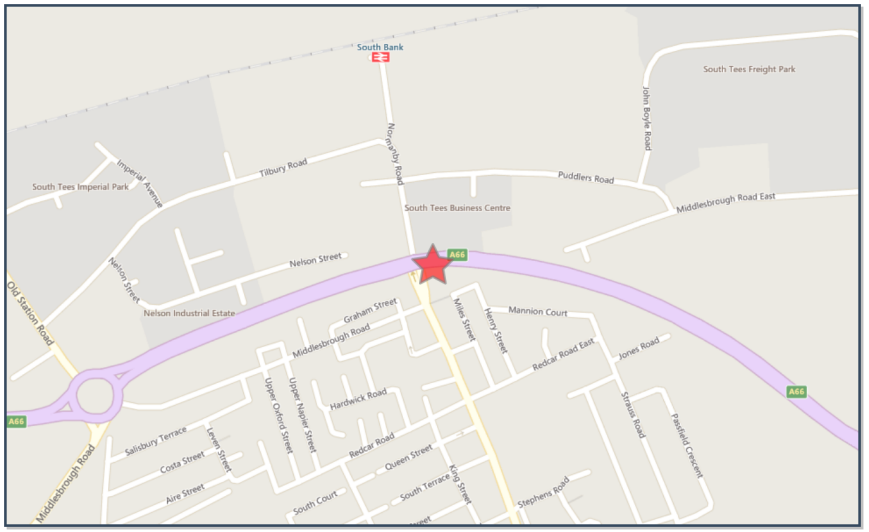
Crash Date:	Wednesday, May 11, 2016	**Time of Crash:**	6:38:00 PM	**Crash Reference:**	**2016170L20576**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	3
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	453429 520948
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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	Car (excluding private hire)	7	Male	46 - 55	Vehicle is moving off	Back	Other	None	None
2	Car (excluding private hire)	-1	Male	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Front	Other	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	46 - 55	Unknown or other	Unknown or other
1	2	Slight	Vehicle or pillion passenger	Female	6 - 10	Unknown or other	Unknown or other
1	3	Slight	Vehicle or pillion passenger	Female	6 - 10	Unknown or other	Unknown or other

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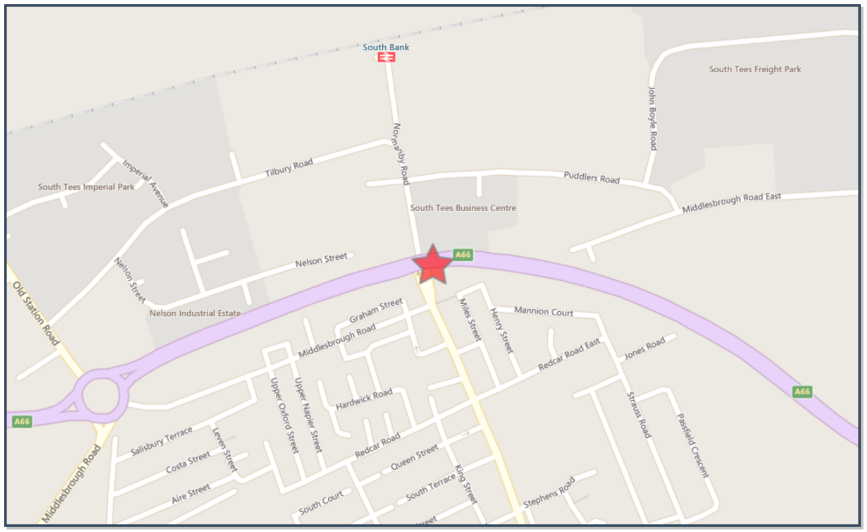
Crash Date:	Saturday, April 09, 2016	**Time of Crash:**	10:50:00 AM	**Crash Reference:**	**2016170L20496**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	453420 520948
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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
2	Car (excluding private hire)	-1	Male	Unknown	Vehicle proceeding normally along the carriageway, not on a bend	Front	Other	None	None
1	Van or goods vehicle 3.5 tonnes mgw and under	4	Male	21 - 25	Vehicle is waiting to proceed normally but is held up	Back	Journey as part of work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	21 - 25	Unknown or other	Unknown or other

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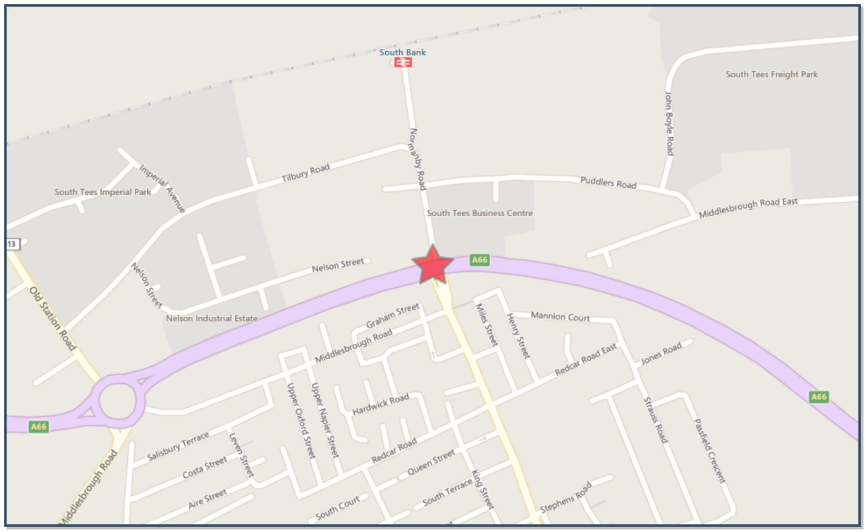
Crash Date:	Monday, October 12, 2015	**Time of Crash:**	7:00:00 AM	**Crash Reference:**	**2015170L21585**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	6
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	3
Local Authority:	Redcar and Cleveland			**OS Grid Reference:**	453394 520954
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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	Car (excluding private hire)	13	Male	46 - 55	Vehicle is in the act of turning right	Front	Other	None	None
2	Car (excluding private hire)	8	Male	36 - 45	Vehicle proceeding normally along the carriageway, not on a bend	Front	Commuting to/from work	None	None
3	Minibus (8 - 16 passenger seats)	-1	Male	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Front	Commuting to/from work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Vehicle or pillion passenger	Female	46 - 55	Unknown or other	Unknown or other
3	2	Slight	Vehicle or pillion passenger	Male	36 - 45	Unknown or other	Unknown or other
3	3	Slight	Vehicle or pillion passenger	Male	26 - 35	Unknown or other	Unknown or other
3	4	Slight	Vehicle or pillion passenger	Male	26 - 35	Unknown or other	Unknown or other
3	5	Slight	Vehicle or pillion passenger	Male	16 - 20	Unknown or other	Unknown or other
3	6	Slight	Vehicle or pillion passenger	Male	36 - 45	Unknown or other	Unknown or other

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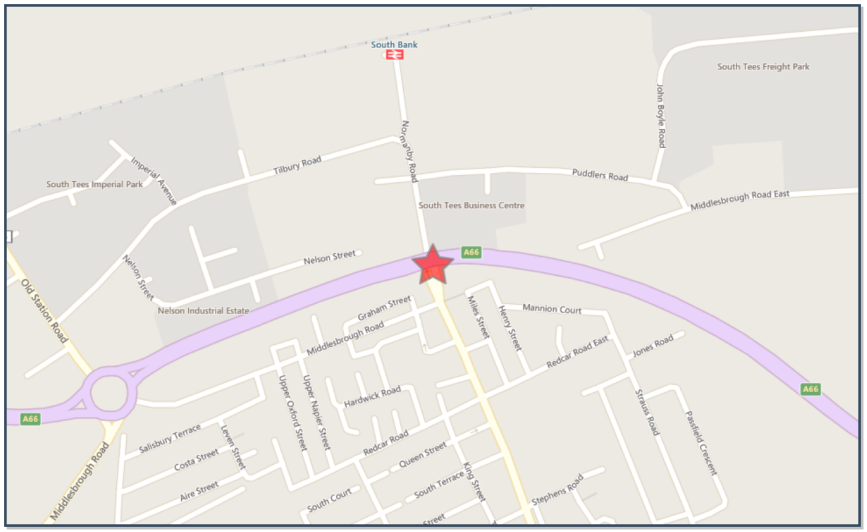
Crash Date:	Tuesday, March 24, 2015	**Time of Crash:**	7:58:00 PM	**Crash Reference:**	**2015170L20445**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	4
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar and Cleveland			**OS Grid Reference:**	453407 520942
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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
2	Car (excluding private hire)	2	Female	21 - 25	Vehicle is in the act of turning right	Front	Other	None	None
1	Car (excluding private hire)	2	Female	16 - 20	Vehicle proceeding normally along the carriageway, not on a bend	Front	Other	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Female	16 - 20	Unknown or other	Unknown or other
1	3	Slight	Vehicle or pillion passenger	Male	21 - 25	Unknown or other	Unknown or other
2	2	Slight	Driver or rider	Female	21 - 25	Unknown or other	Unknown or other
2	4	Slight	Vehicle or pillion passenger	Female	16 - 20	Unknown or other	Unknown or other

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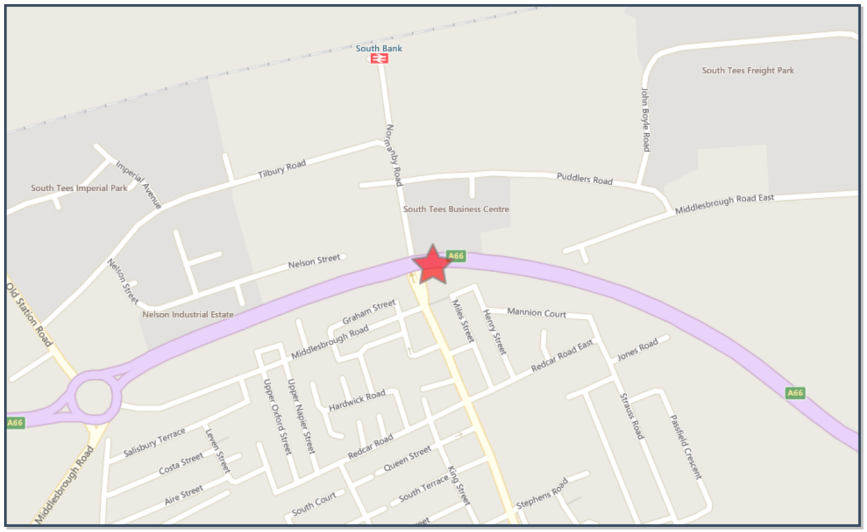
Crash Date:	Tuesday, February 17, 2015	**Time of Crash:**	6:55:00 PM	**Crash Reference:**	**2015170L20255**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar and Cleveland			**OS Grid Reference:**	453431 520948
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	Pedestrian phase at traffic signal junction				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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
2	Car (excluding private hire)	7	Female	26 - 35	Vehicle is moving off	Front	Other	None	None
1	Car (excluding private hire)	2	Female	21 - 25	Vehicle is moving off	Back	Other	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Female	21 - 25	Unknown or other	Unknown or other

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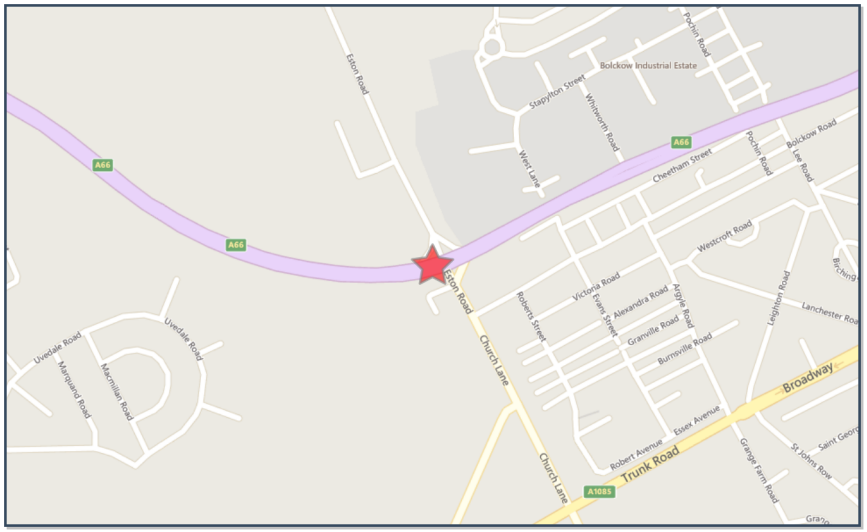
Crash Date:	Wednesday, April 15, 2015	**Time of Crash:**	7:00:00 AM	**Crash Reference:**	**2015170L20555**

Highest Injury Severity:	Serious	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar and Cleveland			**OS Grid Reference:**	454531 520602
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	Pedestrian phase at traffic signal junction				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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	Pedal cycle	-1	Male	56 - 65	Vehicle proceeding normally along the carriageway, not on a bend	Front	Commuting to/from work	None	None
2	Car (excluding private hire)	6	Male	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Front	Commuting to/from work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Serious	Driver or rider	Male	56 - 65	Unknown or other	Unknown or other

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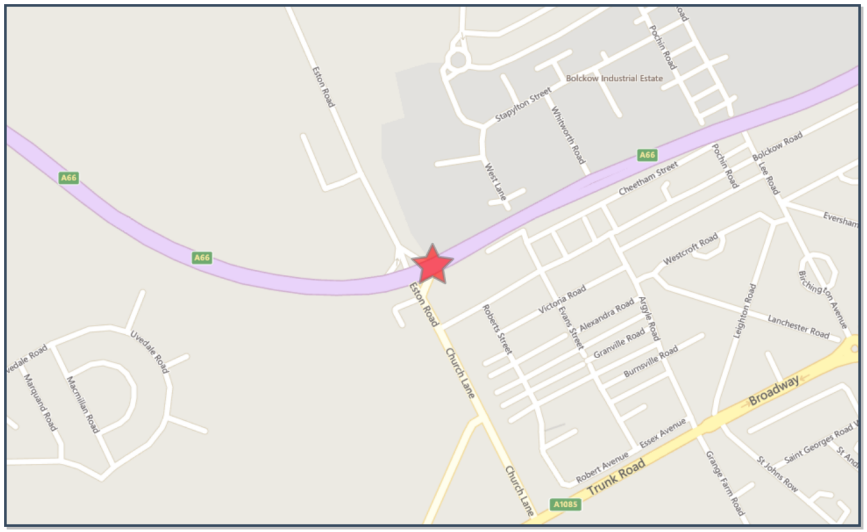
Crash Date:	Thursday, July 23, 2015	**Time of Crash:**	3:45:00 PM	**Crash Reference:**	**2015170L21055**

Highest Injury Severity:	Serious	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar and Cleveland			**OS Grid Reference:**	454585 520623
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Slip road				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Give way or uncontrolled				



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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
2	Motorcycle over 500cc	8	Male	66 - 75	Vehicle proceeding normally along the carriageway, not on a bend	Nearside	Commuting to/from work	None	Central crash barrier
1	Car (excluding private hire)	11	Male	16 - 20	Vehicle is in the act of turning left	Offside	Commuting to/from work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
2	1	Serious	Driver or rider	Male	66 - 75	Unknown or other	Unknown or other

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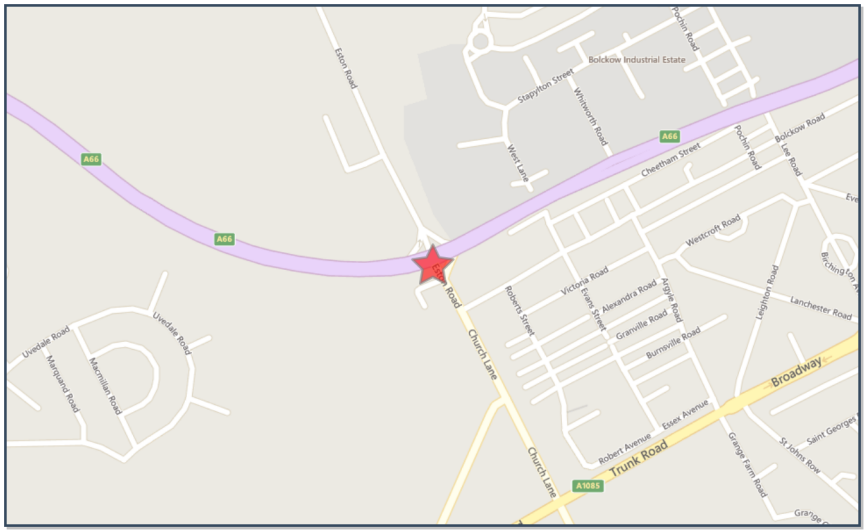
Crash Date:	Tuesday, September 15, 2015	**Time of Crash:**	9:03:00 AM	**Crash Reference:**	**2015170L21415**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar and Cleveland			**OS Grid Reference:**	454550 520593
Weather Description:	Raining without high winds				
Road Surface Description:	Wet or Damp				
Speed Limit:	50				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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	Car (excluding private hire)	11	Male	46 - 55	Vehicle is performing a U turn	Nearside	Commuting to/from work	None	None
2	Goods vehicle 7.5 tonnes mgw and over	2	Male	46 - 55	Vehicle proceeding normally along the carriageway, not on a bend	Front	Journey as part of work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	46 - 55	Unknown or other	Unknown or other

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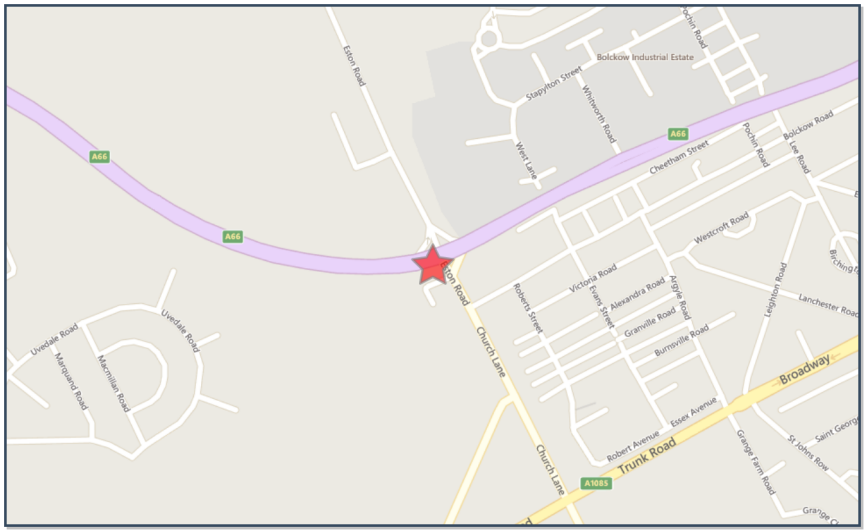
Crash Date:	Thursday, December 17, 2015	**Time of Crash:**	4:07:00 PM	**Crash Reference:**	**2015170L22045**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar and Cleveland			**OS Grid Reference:**	454537 520589
Weather Description:	Fine without high winds				
Road Surface Description:	Wet or Damp				
Speed Limit:	50				
Light Conditions:	Darkness: street lights present and lit				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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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
2	Pedal cycle	-1	Male	16 - 20	Vehicle proceeding normally along the carriageway, not on a bend	Did not impact	Other	None	None
1	Car (excluding private hire)	4	Male	16 - 20	Vehicle proceeding normally along the carriageway, on a left hand bend	Front	Journey as part of work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
2	1	Slight	Driver or rider	Male	16 - 20	Unknown or other	Unknown or other

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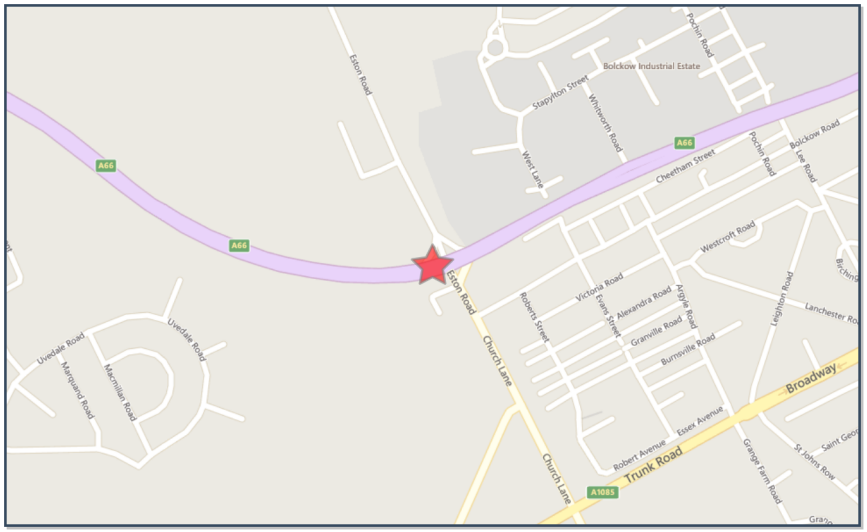
Crash Date:	Monday, January 16, 2017	**Time of Crash:**	4:38:00 PM	**Crash Reference:**	**2017170L20047**

Highest Injury Severity:	Slight	**Road Number:**	A66	**Number of Casualties:**	1
Highway Authority:	Redcar and Cleveland			**Number of Vehicles:**	2
Local Authority:	Redcar & Cleveland Borough			**OS Grid Reference:**	454526 520600
Weather Description:	Raining without high winds				
Road Surface Description:	Wet or Damp				
Speed Limit:	50				
Light Conditions:	Darkness: street lights present and lit				
Carriageway Hazards:	None				
Junction Detail:	Crossroads				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Dual carriageway				
Junction Control:	Auto traffic signal				



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Vehicles involved

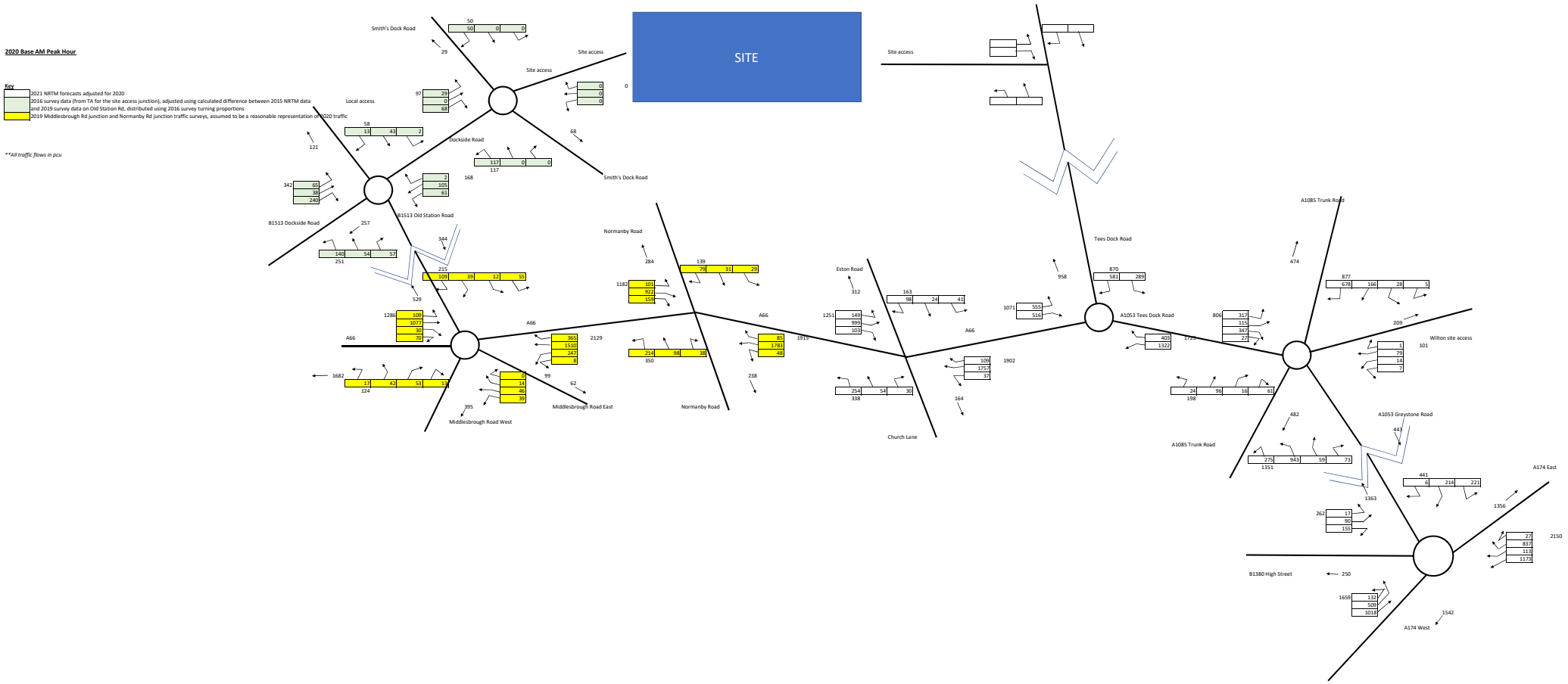
Vehicle Ref	Vehicle Type	Vehicle Age	Driver Gender	Driver Age Band	Vehicle Maneouvre	First Point of Impact	Journey Purpose	Hit Object - On Carriageway	Hit Object - Off Carriageway
2	Car (excluding private hire)	1	Female	36 - 45	Vehicle is waiting to proceed normally but is held up	Back	Commuting to/from work	None	None
1	Car (excluding private hire)	16	Female	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Front	Commuting to/from work	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
2	1	Slight	Driver or rider	Female	36 - 45	Unknown or other	Unknown or other

Appendix D

Traffic Flow Diagrams

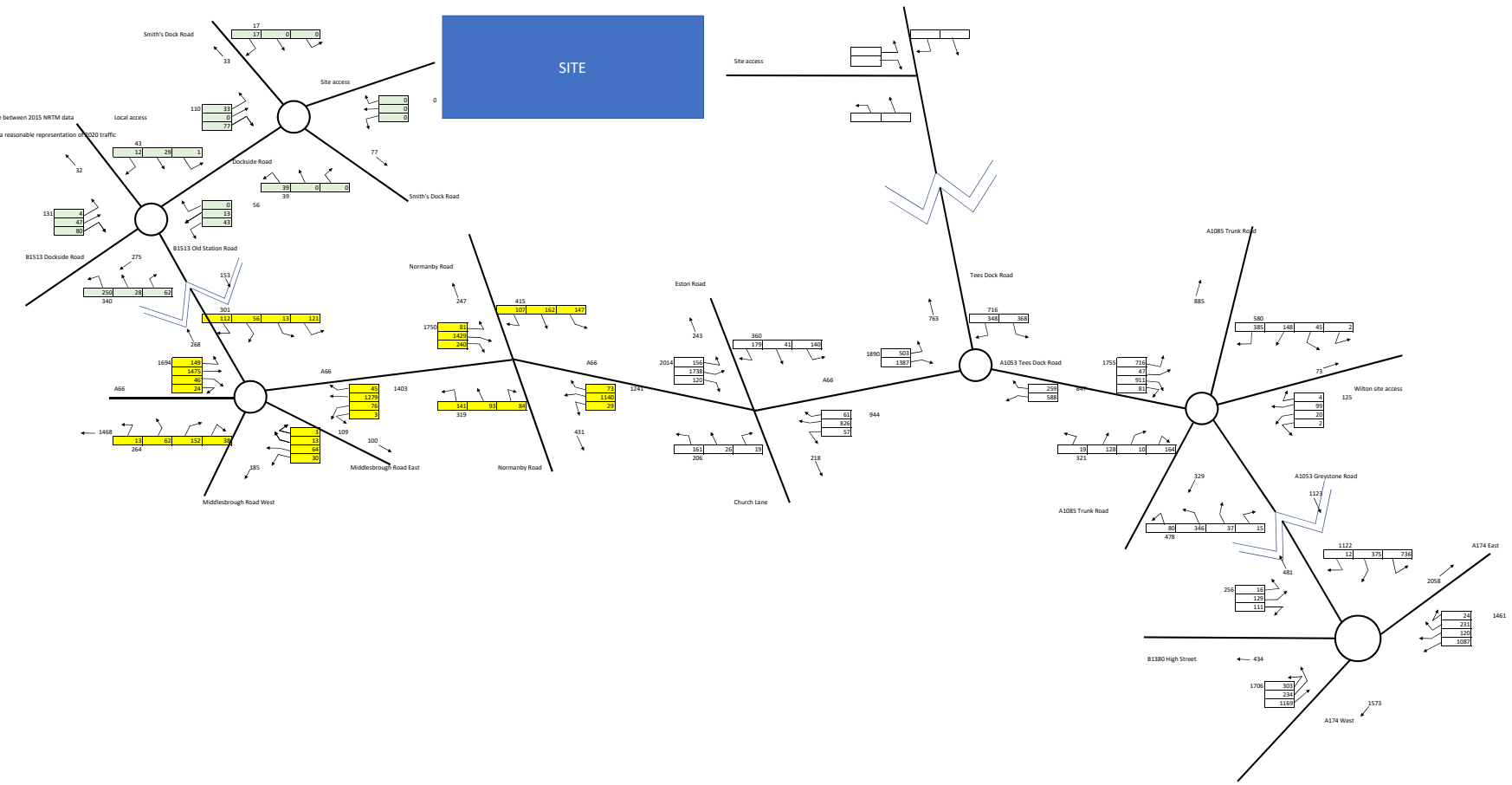

2020 Base AM Peak Hour
Key
2021 NRTM forecasts adjusted for 2020
2016 survey data (from TA for the site access junction), adjusted using calculated difference between 2015 NRTM data and 2019 survey data on Old Station Rd, distributed using 2016 survey turning proportions
2019 Middlesbrough Rd junction and Normanby Rd junction traffic surveys, assumed to be a reasonable representation of 2020 traffic
**All traffic flows in pcu
SITE
Site access
Site access
Site access
Smith's Dock Road
Smith's Dock Road
Local access
Dockside Road
B1513 Dockside Road
B1513 Old Station Road
Normanby Road
Normanby Road
Middlesbrough Road East
Middlesbrough Road West
A66
A66
A66
Eston Road
Church Lane
Tees Dock Road
A1053 Tees Dock Road
A1085 Trunk Road
A1053 Greystone Road
A1085 Trunk Road
Wilton site access
A174 East
A174 West
B1380 High Street

2020 Base PM Peak Hour

Key

2021 NRTM forecasts adjusted for 2020
2016 survey data (from TA for the site access junction), adjusted using calculated difference between 2015 NRTM data and 2019 survey data on Old Station Rd, distributed using 2016 survey turning proportions
2019 Middlesbrough Rd junction and Normanby Rd junction traffic surveys, assumed to be a reasonable representation of 2020 traffic

***All traffic flows in pcu*

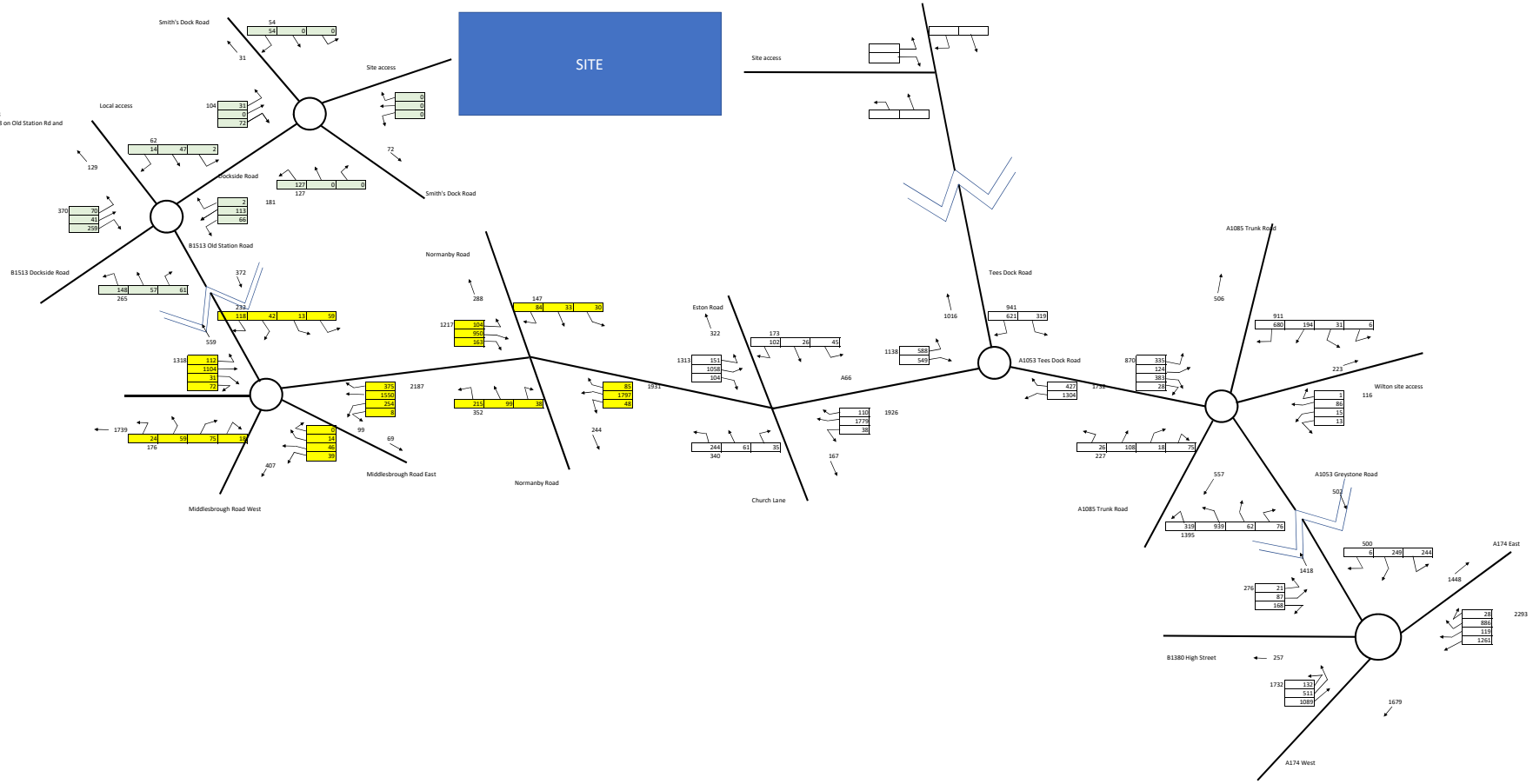


2028 Base AM Peak Hour

Key

2031 NRTM forecasts adjusted for 2028
2020 data (see 2020 diagram), growthed using NRTM growth between 2020 and 2028
2020 data (see 2020 diagram), growthed using NRTM growth between 2020 and 2028 on Old Station Rd and 2016 traffic survey turning proportions

***All traffic flows in pcu*

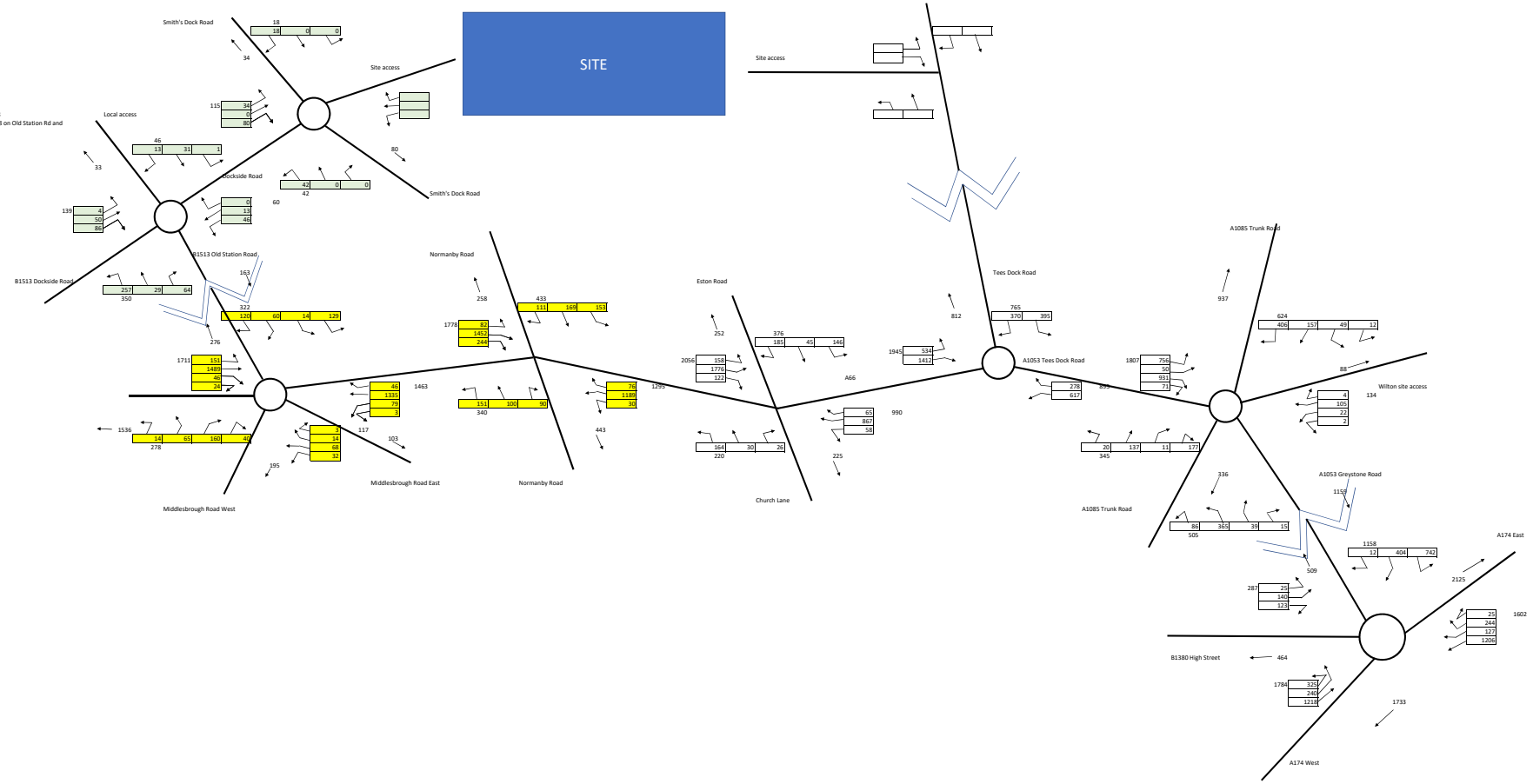


2028 Base PM Peak Hour

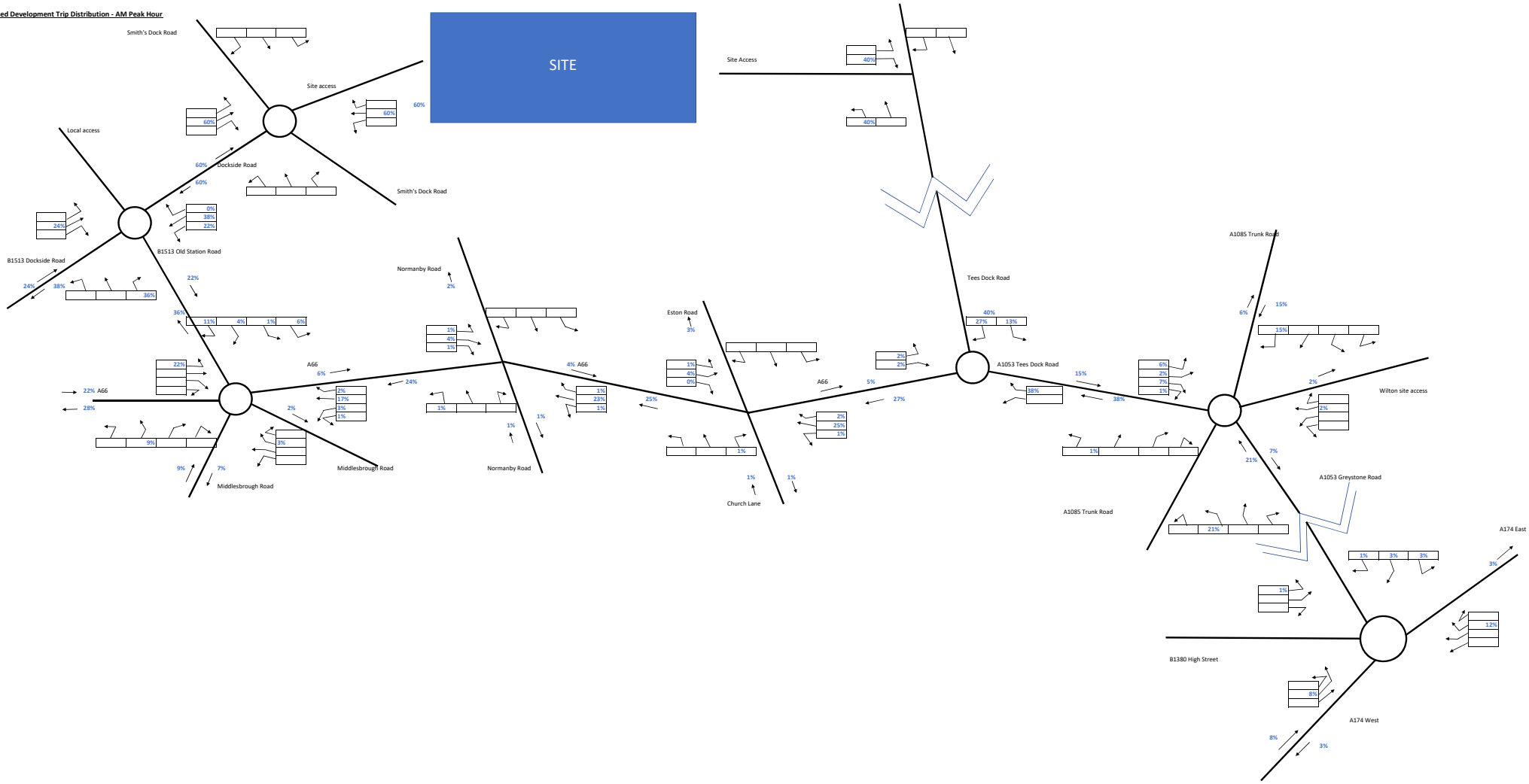
Key

- 2031 NRTM forecasts adjusted for 2028
- 2020 data (see 2020 diagram), growthed using NRTM growth between 2020 and 2028
- 2020 data (see 2020 diagram), growthed using NRTM growth between 2020 and 2028 on Old Station Rd and 2016 traffic survey turning proportions

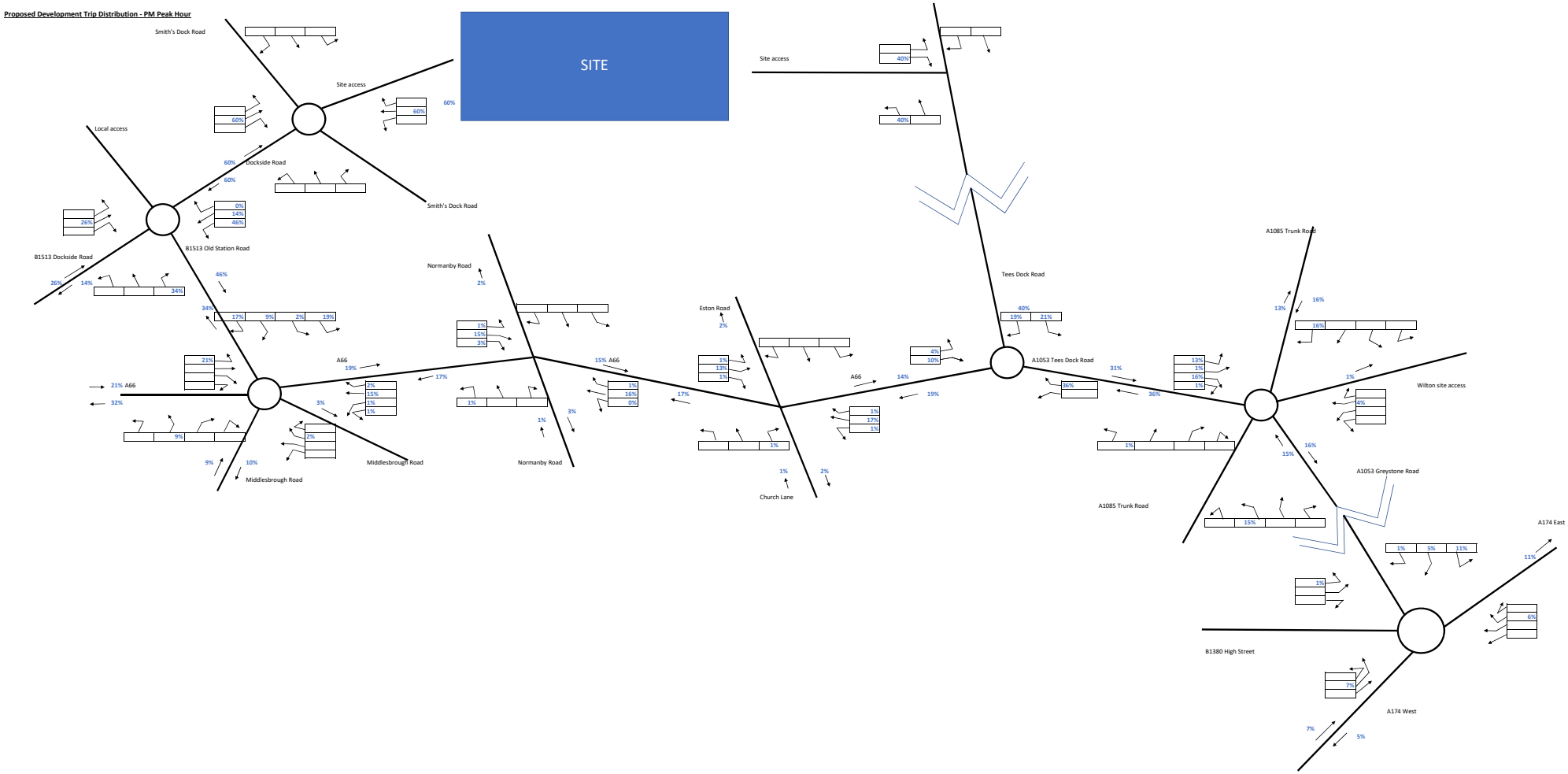
***All traffic flows in pcu*



Proposed Development Trip Distribution - AM Peak Hour



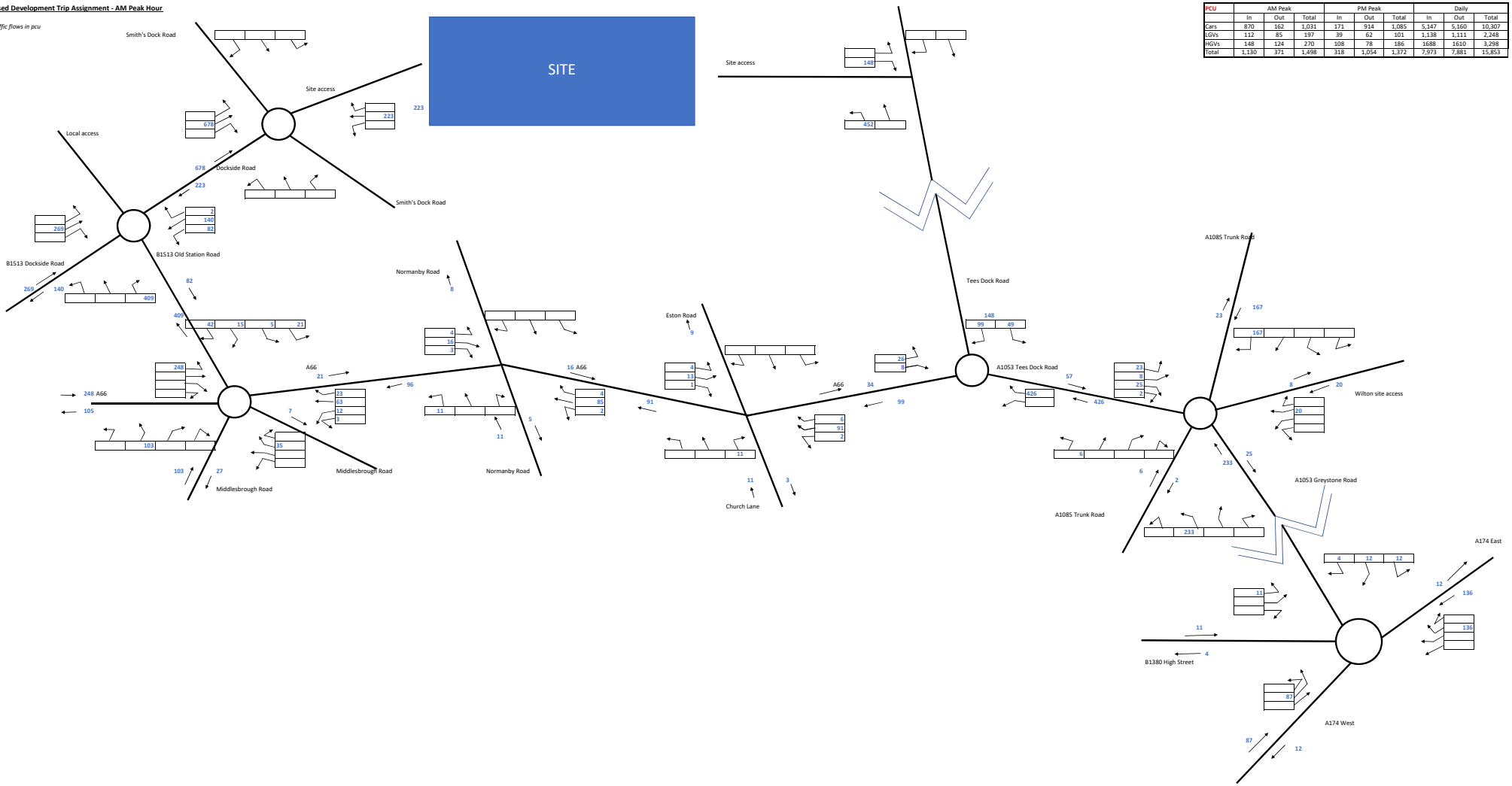
Proposed Development Trip Distribution - PM Peak Hour



Proposed Development Trip Assignment - AM Peak Hour

***All traffic flows in pcu*

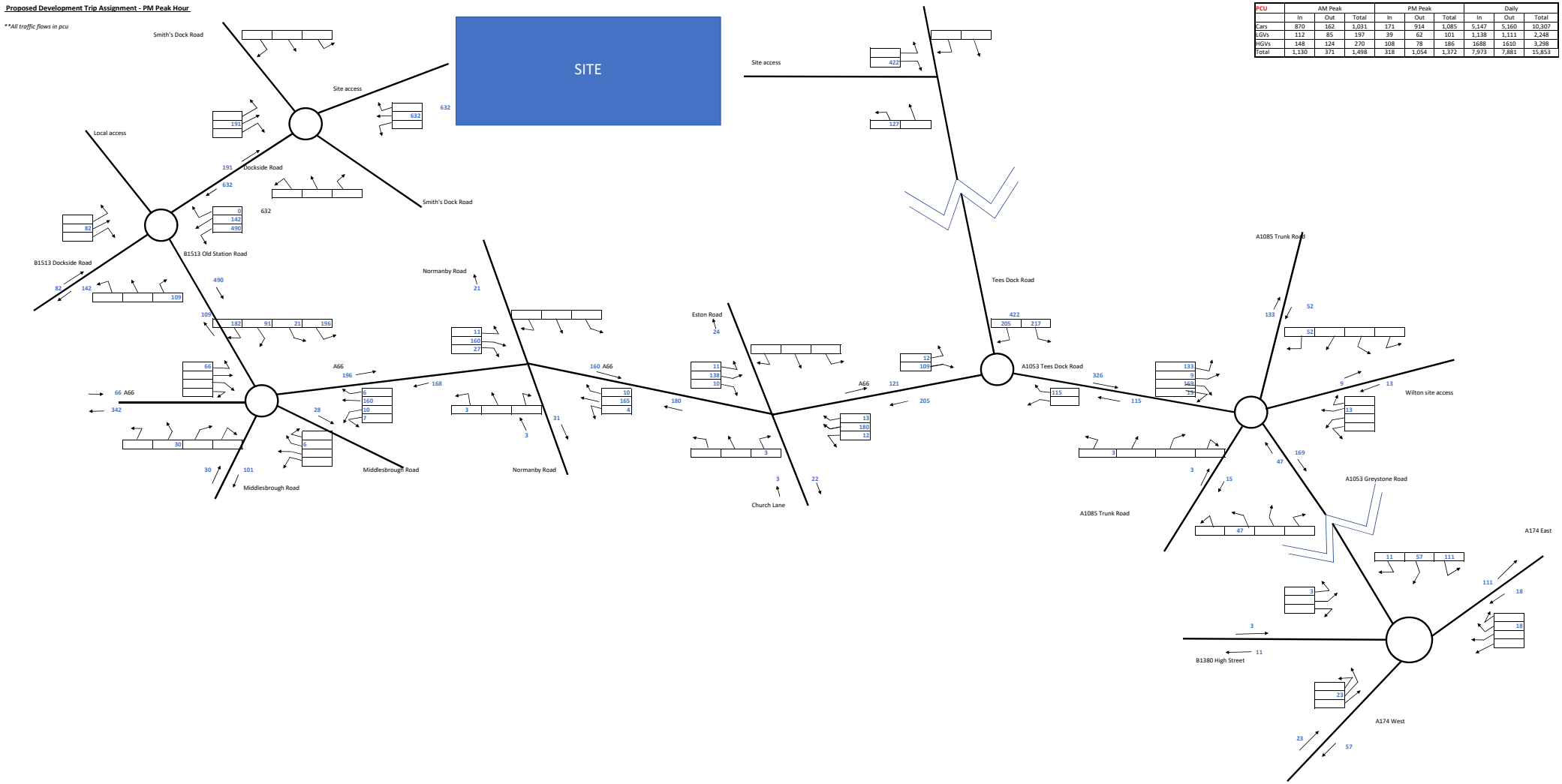
PCU	AM Peak			PM Peak			Daily		
	In	Out	Total	In	Out	Total	In	Out	Total
Cars	870	162	1,031	171	914	1,085	5,147	5,160	10,307
LGVs	112	85	197	39	62	101	1,138	1,111	2,248
HGVs	148	124	270	108	78	186	1688	1610	3,298
Total	1,130	371	1,498	318	1,054	1,372	7,973	7,881	15,853



Proposed Development Trip Assignment - PM Peak Hour

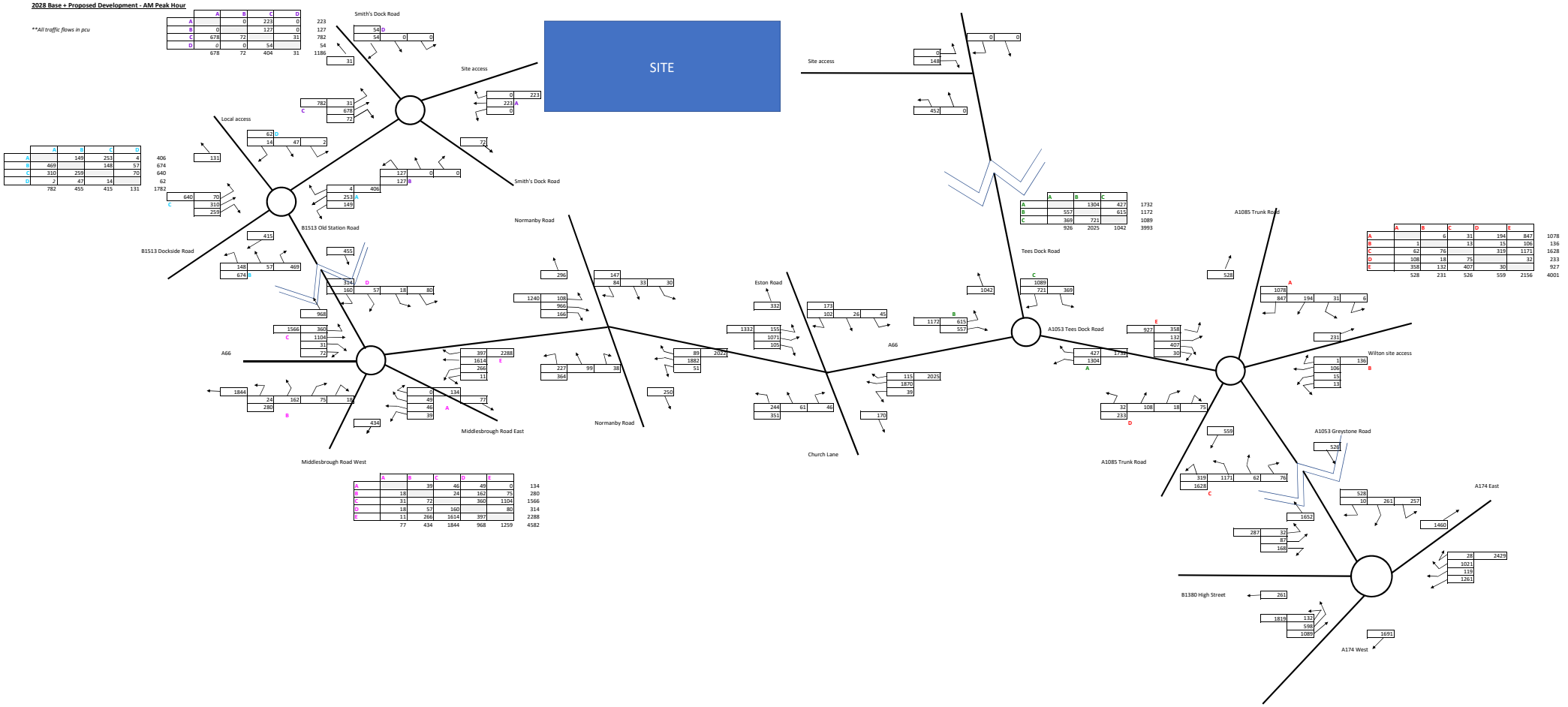
***All traffic flows in pcu*

PCU	AM Peak			PM Peak			Daily		
	In	Out	Total	In	Out	Total	In	Out	Total
Cars	870	162	1,031	171	914	1,085	5,147	5,160	10,307
LGVs	112	85	197	39	62	101	1,138	1,111	2,248
HGVs	148	124	270	108	78	186	1688	1610	3,298
Total	1,130	371	1,498	318	1,054	1,372	7,973	7,881	15,853



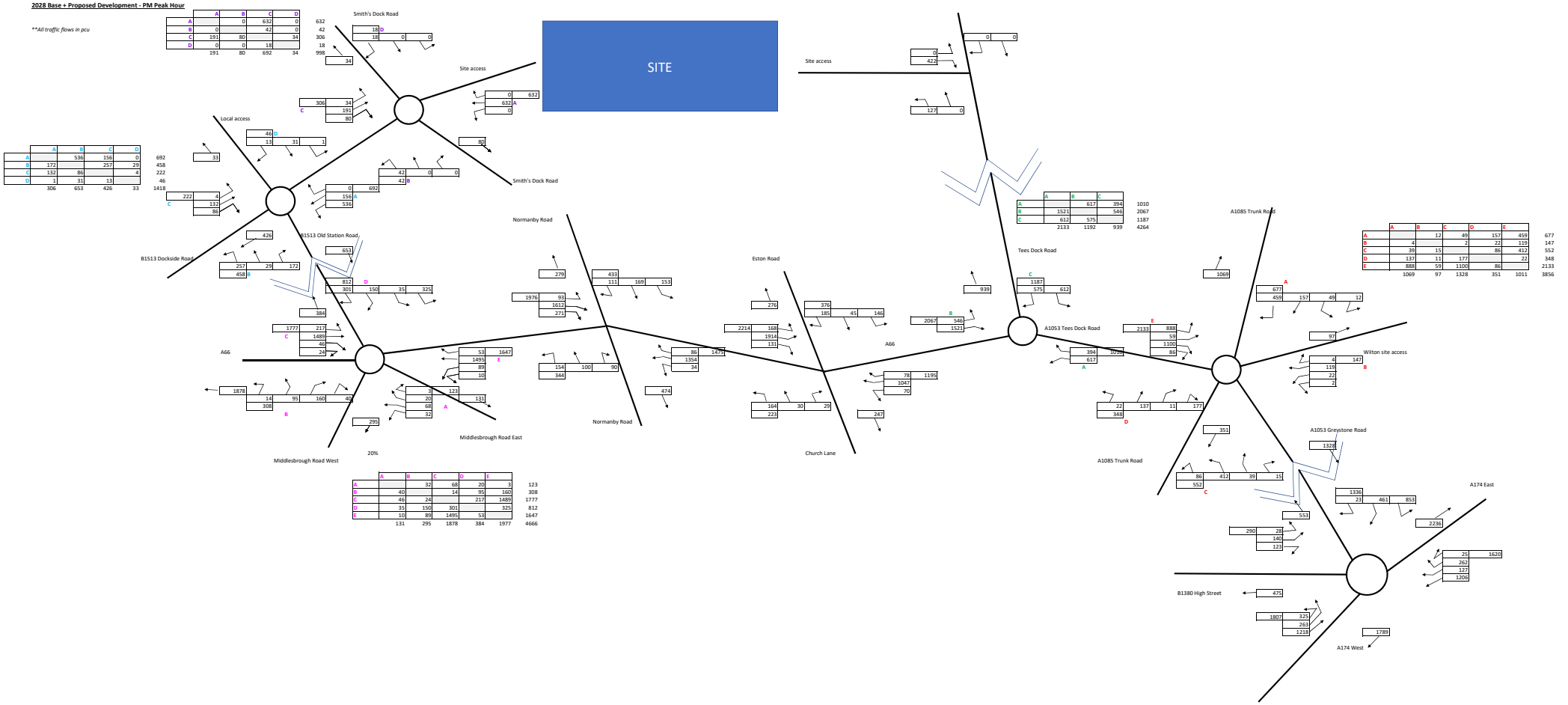
2028 Base + Proposed Development - AM Peak Hour

***All traffic flows in pcu*



2028 Base + Proposed Development - PM Peak Hour

***All traffic flows in pcu*



Appendix E

Junction Model Outputs

Junctions 9

ARCADY 9 - Roundabout Module

Filename: Site Access_Smiths Dock Road Roundabout.j9
Path: \\global\europe\Newcastle\Jobs\270000\276320\04 DELIVERABLES\4-04 Calcs\Transport\Junction models\Arcady
Report generation date: 19/06/2020 15:01:15

Summary of junction performance

	AM peak				PM peak			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
2028 Base								
Arm 1	0.0	0.00	0.00	A	0.0	0.00	0.00	A
Arm 2	0.1	2.80	0.10	A	0.0	2.56	0.03	A
Arm 3	0.1	2.73	0.08	A	0.1	2.75	0.09	A
Arm 4	0.0	2.62	0.04	A	0.0	2.56	0.01	A
2028 Base+Dev								
Arm 1	0.2	3.14	0.18	A	1.0	5.03	0.49	A
Arm 2	0.1	3.16	0.11	A	0.0	3.65	0.04	A
Arm 3	1.5	6.27	0.60	A	0.3	3.28	0.23	A
Arm 4	0.1	3.93	0.06	A	0.0	2.82	0.02	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	10/06/2020
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	GLOBAL\laura.otoole
Description	

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

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2028 Base	AM peak	ONE HOUR	07:45	09:15	15
D2	2028 Base	PM peak	ONE HOUR	16:45	18:15	15
D3	2028 Base+Dev	AM peak	ONE HOUR	07:45	09:15	15
D4	2028 Base+Dev	PM peak	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2028 Base, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	2.74	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Site Access	
2	Smiths Dock Road	
3	Dockside Road	
4	Smiths Dock Road	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	4.00	5.20	10.0	26.0	36.0	33.0	
2	3.85	5.30	10.0	26.0	36.0	34.0	
3	3.65	5.20	10.0	34.0	36.0	33.0	

4	4.00	5.00	12.5	32.0	36.0	30.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.605	1476
2	0.601	1463
3	0.599	1434
4	0.611	1480

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

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2028 Base	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	0	100.000
2		✓	127	100.000
3		✓	103	100.000
4		✓	54	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	**2**	**3**	**4**
From	**1**	0	0	0	0
	2	0	0	127	0
	3	0	72	0	31
	4	0	0	54	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	**2**	**3**	**4**
From	**1**	0	5	0	0
	2	5	0	0	5
	3	0	0	0	0
	4	0	5	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.00	0.00	0.0	A
2	0.10	2.80	0.1	A
3	0.08	2.73	0.1	A
4	0.04	2.62	0.0	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	95	1419	0.000	0	0.0	0.000	A
2	96	41	1438	0.066	95	0.1	2.680	A
3	78	0	1434	0.054	77	0.1	2.654	A
4	41	54	1447	0.028	41	0.0	2.559	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	113	1408	0.000	0	0.0	0.000	A
2	114	49	1434	0.080	114	0.1	2.727	A
3	93	0	1434	0.065	93	0.1	2.683	A
4	49	65	1440	0.034	49	0.0	2.586	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	139	1392	0.000	0	0.0	0.000	A
2	140	59	1427	0.098	140	0.1	2.795	A
3	113	0	1434	0.079	113	0.1	2.726	A
4	59	79	1431	0.042	59	0.0	2.623	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	139	1392	0.000	0	0.0	0.000	A
2	140	59	1427	0.098	140	0.1	2.796	A
3	113	0	1434	0.079	113	0.1	2.726	A
4	59	79	1431	0.042	59	0.0	2.623	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	113	1407	0.000	0	0.0	0.000	A
2	114	49	1434	0.080	114	0.1	2.730	A
3	93	0	1434	0.065	93	0.1	2.686	A
4	49	65	1440	0.034	49	0.0	2.586	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	95	1419	0.000	0	0.0	0.000	A
2	96	41	1438	0.066	96	0.1	2.682	A
3	78	0	1434	0.054	78	0.1	2.656	A
4	41	54	1447	0.028	41	0.0	2.561	A

2028 Base, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	2.69	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2028 Base	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	0	100.000
2		✓	42	100.000
3		✓	114	100.000
4		✓	18	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	0	0	0
	2	0	0	42	0
	3	0	80	0	34
	4	0	0	18	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	5	0	0
	2	5	0	0	5
	3	0	0	0	0
	4	0	5	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.00	0.00	0.0	A
2	0.03	2.56	0.0	A
3	0.09	2.75	0.1	A
4	0.01	2.56	0.0	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	74	1432	0.000	0	0.0	0.000	A
2	32	14	1455	0.022	32	0.0	2.529	A
3	86	0	1434	0.060	86	0.1	2.670	A
4	14	60	1443	0.009	14	0.0	2.517	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	88	1423	0.000	0	0.0	0.000	A
2	38	16	1453	0.026	38	0.0	2.543	A
3	102	0	1434	0.071	102	0.1	2.703	A
4	16	72	1436	0.011	16	0.0	2.535	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	108	1411	0.000	0	0.0	0.000	A
2	46	20	1451	0.032	46	0.0	2.562	A
3	126	0	1434	0.088	125	0.1	2.751	A
4	20	88	1426	0.014	20	0.0	2.559	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	108	1411	0.000	0	0.0	0.000	A
2	46	20	1451	0.032	46	0.0	2.562	A

3	126	0	1434	0.088	126	0.1	2.751	A
4	20	88	1426	0.014	20	0.0	2.559	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	88	1423	0.000	0	0.0	0.000	A
2	38	16	1453	0.026	38	0.0	2.543	A
3	102	0	1434	0.071	103	0.1	2.706	A
4	16	72	1436	0.011	16	0.0	2.537	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	0	74	1431	0.000	0	0.0	0.000	A
2	32	14	1455	0.022	32	0.0	2.531	A
3	86	0	1434	0.060	86	0.1	2.672	A
4	14	60	1443	0.009	14	0.0	2.517	A

2028 Base+Dev, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	5.24	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2028 Base+Dev	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	223	100.000
2		✓	127	100.000
3		✓	781	100.000
4		✓	54	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	0	223	0
	2	0	0	127	0
	3	678	72	0	31
	4	0	0	54	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	5	0	0
	2	5	0	0	5
	3	0	0	0	0
	4	0	5	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.18	3.14	0.2	A
2	0.11	3.16	0.1	A
3	0.60	6.27	1.5	A
4	0.06	3.93	0.1	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	168	94	1419	0.118	167	0.1	2.874	A
2	96	208	1338	0.071	95	0.1	2.897	A
3	588	0	1434	0.410	585	0.7	4.229	A
4	41	562	1136	0.036	41	0.0	3.284	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	200	113	1408	0.142	200	0.2	2.981	A
2	114	249	1313	0.087	114	0.1	3.001	A
3	702	0	1434	0.490	701	0.9	4.906	A
4	49	673	1069	0.045	49	0.0	3.528	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	246	138	1392	0.176	245	0.2	3.138	A
2	140	305	1280	0.109	140	0.1	3.157	A
3	860	0	1434	0.600	858	1.5	6.229	A
4	59	824	977	0.061	59	0.1	3.925	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	246	139	1392	0.176	246	0.2	3.139	A
2	140	305	1279	0.109	140	0.1	3.158	A
3	860	0	1434	0.600	860	1.5	6.273	A
4	59	826	975	0.061	59	0.1	3.930	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	200	114	1407	0.142	201	0.2	2.985	A
2	114	249	1313	0.087	114	0.1	3.002	A
3	702	0	1434	0.490	704	1.0	4.948	A
4	49	676	1067	0.046	49	0.0	3.535	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	168	95	1419	0.118	168	0.1	2.878	A
2	96	209	1337	0.071	96	0.1	2.901	A
3	588	0	1434	0.410	589	0.7	4.267	A
4	41	566	1134	0.036	41	0.0	3.291	A

2028 Base+Dev, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	4.40	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2028 Base+Dev	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	632	100.000
2		✓	42	100.000
3		✓	305	100.000
4		✓	18	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	0	632	0
	2	0	0	42	0
	3	191	80	0	34
	4	0	0	18	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	5	0	0
	2	5	0	0	5
	3	0	0	0	0
	4	0	5	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.49	5.03	1.0	A
2	0.04	3.65	0.0	A
3	0.23	3.28	0.3	A
4	0.02	2.82	0.0	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service

1	476	74	1432	0.332	474	0.5	3.751	A
2	32	487	1170	0.027	32	0.0	3.162	A
3	230	0	1434	0.160	229	0.2	2.986	A
4	14	203	1356	0.010	14	0.0	2.681	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	568	88	1423	0.399	567	0.7	4.203	A
2	38	584	1112	0.034	38	0.0	3.350	A
3	274	0	1434	0.191	274	0.2	3.104	A
4	16	243	1331	0.012	16	0.0	2.737	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	696	108	1411	0.493	695	1.0	5.019	A
2	46	714	1033	0.045	46	0.0	3.646	A
3	336	0	1434	0.234	336	0.3	3.278	A
4	20	298	1298	0.015	20	0.0	2.816	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	696	108	1411	0.493	696	1.0	5.035	A
2	46	716	1033	0.045	46	0.0	3.648	A
3	336	0	1434	0.234	336	0.3	3.278	A
4	20	298	1298	0.015	20	0.0	2.816	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	568	88	1423	0.399	569	0.7	4.224	A
2	38	586	1111	0.034	38	0.0	3.354	A
3	274	0	1434	0.191	274	0.2	3.105	A
4	16	244	1331	0.012	16	0.0	2.737	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	476	74	1431	0.332	476	0.5	3.774	A
2	32	490	1168	0.027	32	0.0	3.166	A
3	230	0	1434	0.160	230	0.2	2.992	A
4	14	204	1355	0.010	14	0.0	2.685	A

Junctions 9

ARCADY 9 - Roundabout Module

Filename: Old Station Road_Dockside Road Roundabout.j9
Path: \\global\europe\Newcastle\Jobs\270000\276320\04 DELIVERABLES\4-04 Calcs\Transport\Junction models\Arcady
Report generation date: 24/06/2020 18:45:38

Summary of junction performance

	AM peak				PM peak			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
2028 Base								
Arm 1	0.2	3.76	0.17	A	0.1	2.96	0.05	A
Arm 2	0.3	3.56	0.22	A	0.4	3.66	0.28	A
Arm 3	0.3	3.07	0.26	A	0.1	2.50	0.10	A
Arm 4	0.1	2.98	0.05	A	0.0	2.69	0.04	A
2028 Base+Dev								
Arm 1	0.6	5.06	0.38	A	1.4	6.91	0.59	A
Arm 2	1.6	7.60	0.61	A	0.6	4.64	0.39	A
Arm 3	1.2	6.21	0.55	A	0.2	2.83	0.16	A
Arm 4	0.1	4.80	0.08	A	0.0	2.98	0.04	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	10/06/2020
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	GLOBAL\laura.otoole
Description	

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

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2028 Base	AM peak	ONE HOUR	07:45	09:15	15
D2	2028 Base	PM peak	ONE HOUR	16:45	18:15	15
D3	2028 Base+Dev	AM peak	ONE HOUR	07:45	09:15	15
D4	2028 Base+Dev	PM peak	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2028 Base, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	3.35	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Dockside Road WB	
2	Old Station Road NB	
3	Dockside Road EB	
4	Teesport	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	3.40	5.60	11.6	18.0	18.0	44.0	
2	3.75	5.30	25.5	10.0	18.0	43.0	
3	3.50	6.50	22.0	21.0	18.0	35.0	

4	3.70	5.90	16.0	28.0	18.0	45.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.579	1367
2	0.571	1386
3	0.654	1668
4	0.617	1524

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

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2028 Base	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	181	100.000
2		✓	266	100.000
3		✓	370	100.000
4		✓	63	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	**2**	**3**	**4**
From	**1**	0	66	113	2
	2	61	0	148	57
	3	41	259	0	70
	4	2	47	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	**2**	**3**	**4**
From	**1**	0	0	1	0
	2	0	0	0	0
	3	1	0	0	0
	4	0	0	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.17	3.76	0.2	A
2	0.22	3.56	0.3	A
3	0.26	3.07	0.3	A
4	0.05	2.98	0.1	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	136	240	1228	0.111	136	0.1	3.315	A
2	200	97	1330	0.151	200	0.2	3.182	A
3	279	90	1609	0.173	278	0.2	2.706	A
4	47	271	1357	0.035	47	0.0	2.749	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	163	287	1200	0.136	163	0.2	3.489	A
2	239	116	1320	0.181	239	0.2	3.331	A
3	333	108	1597	0.208	332	0.3	2.848	A
4	57	324	1324	0.043	57	0.0	2.840	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	199	352	1163	0.171	199	0.2	3.757	A
2	293	142	1305	0.224	293	0.3	3.557	A
3	407	132	1582	0.258	407	0.3	3.068	A
4	69	397	1279	0.054	69	0.1	2.976	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	199	352	1163	0.171	199	0.2	3.758	A
2	293	142	1305	0.224	293	0.3	3.557	A
3	407	132	1582	0.258	407	0.3	3.068	A
4	69	397	1279	0.054	69	0.1	2.976	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	163	288	1200	0.136	163	0.2	3.492	A
2	239	116	1319	0.181	239	0.2	3.335	A
3	333	108	1597	0.208	333	0.3	2.852	A
4	57	325	1323	0.043	57	0.0	2.843	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	136	241	1227	0.111	136	0.1	3.320	A
2	200	97	1330	0.151	200	0.2	3.188	A
3	279	90	1609	0.173	279	0.2	2.711	A
4	47	272	1356	0.035	47	0.0	2.752	A

2028 Base, PM peak

Data Errors and Warnings
No errors or warnings

Junction Network

Junctions
Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	3.24	A

Junction Network Options
Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details
ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2028 Base	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)
Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	59	100.000
2		✓	350	100.000
3		✓	140	100.000
4		✓	45	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	46	13	0
	2	64	0	257	29
	3	50	86	0	4
	4	1	31	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	0	1	0
	2	0	0	0	0
	3	1	0	0	0
	4	0	0	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.05	2.96	0.1	A
2	0.28	3.66	0.4	A
3	0.10	2.50	0.1	A
4	0.04	2.69	0.0	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	44	98	1310	0.034	44	0.0	2.849	A
2	263	20	1375	0.192	263	0.2	3.234	A
3	105	70	1622	0.065	105	0.1	2.381	A
4	34	150	1431	0.024	34	0.0	2.576	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	53	117	1299	0.041	53	0.0	2.894	A
2	315	23	1372	0.229	314	0.3	3.402	A
3	126	84	1613	0.078	126	0.1	2.428	A
4	40	180	1413	0.029	40	0.0	2.622	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	65	143	1284	0.051	65	0.1	2.958	A
2	385	29	1369	0.281	385	0.4	3.657	A
3	154	102	1601	0.096	154	0.1	2.496	A
4	50	220	1388	0.036	50	0.0	2.689	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	65	143	1284	0.051	65	0.1	2.958	A
2	385	29	1369	0.281	385	0.4	3.657	A

3	154	102	1601	0.096	154	0.1	2.496	A
4	50	220	1388	0.036	50	0.0	2.689	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	53	117	1299	0.041	53	0.0	2.896	A
2	315	23	1372	0.229	315	0.3	3.405	A
3	126	84	1613	0.078	126	0.1	2.430	A
4	40	180	1413	0.029	40	0.0	2.623	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	44	98	1310	0.034	44	0.0	2.849	A
2	263	20	1374	0.192	264	0.2	3.243	A
3	105	70	1622	0.065	105	0.1	2.381	A
4	34	151	1431	0.024	34	0.0	2.578	A

2028 Base+Dev, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	6.42	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2028 Base+Dev	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	406	100.000
2		✓	674	100.000
3		✓	639	100.000
4		✓	63	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	149	253	4
	2	469	0	148	57
	3	310	259	0	70
	4	2	47	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	0	1	0
	2	0	0	0	0
	3	1	0	0	0
	4	0	0	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.38	5.06	0.6	A
2	0.61	7.60	1.6	A
3	0.55	6.21	1.2	A
4	0.08	4.80	0.1	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	306	240	1228	0.249	304	0.3	3.916	A
2	507	203	1270	0.400	505	0.7	4.690	A
3	481	397	1408	0.342	479	0.5	3.883	A
4	47	778	1044	0.045	47	0.0	3.611	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	365	287	1201	0.304	365	0.4	4.331	A
2	606	243	1247	0.486	605	0.9	5.599	A
3	574	476	1357	0.423	574	0.7	4.613	A
4	57	932	949	0.060	57	0.1	4.033	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	447	351	1163	0.384	446	0.6	5.046	A
2	742	298	1216	0.610	740	1.5	7.526	A
3	704	582	1288	0.546	702	1.2	6.154	A
4	69	1140	821	0.085	69	0.1	4.789	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	447	352	1163	0.384	447	0.6	5.059	A
2	742	298	1215	0.611	742	1.6	7.602	A
3	704	583	1286	0.547	704	1.2	6.205	A
4	69	1143	819	0.085	69	0.1	4.802	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	365	289	1200	0.304	366	0.4	4.347	A
2	606	244	1246	0.486	608	1.0	5.664	A
3	574	478	1355	0.424	576	0.7	4.654	A
4	57	936	946	0.060	57	0.1	4.047	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	306	241	1227	0.249	306	0.3	3.935	A
2	507	204	1269	0.400	509	0.7	4.742	A
3	481	400	1406	0.342	482	0.5	3.917	A
4	47	783	1041	0.046	47	0.0	3.623	A

2028 Base+Dev, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	5.41	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2028 Base+Dev	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	692	100.000
2		✓	458	100.000
3		✓	222	100.000
4		✓	45	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	536	156	0
	2	172	0	257	29
	3	132	86	0	4
	4	1	31	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	0	1	0
	2	0	0	0	0
	3	1	0	0	0
	4	0	0	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.59	6.91	1.4	A
2	0.39	4.64	0.6	A
3	0.16	2.83	0.2	A
4	0.04	2.98	0.0	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service

1	521	98	1310	0.398	518	0.7	4.541	A
2	345	127	1313	0.263	343	0.4	3.707	A
3	167	151	1569	0.107	167	0.1	2.582	A
4	34	293	1343	0.025	34	0.0	2.748	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	622	117	1299	0.479	621	0.9	5.312	A
2	412	152	1299	0.317	411	0.5	4.053	A
3	200	181	1550	0.129	199	0.1	2.681	A
4	40	350	1308	0.031	40	0.0	2.840	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	762	143	1284	0.593	760	1.4	6.854	A
2	504	186	1280	0.394	504	0.6	4.634	A
3	244	221	1523	0.160	244	0.2	2.830	A
4	50	429	1259	0.039	50	0.0	2.975	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	762	143	1284	0.593	762	1.4	6.909	A
2	504	186	1279	0.394	504	0.6	4.643	A
3	244	221	1523	0.160	244	0.2	2.831	A
4	50	429	1259	0.039	50	0.0	2.976	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	622	117	1299	0.479	624	0.9	5.362	A
2	412	152	1299	0.317	412	0.5	4.066	A
3	200	181	1550	0.129	200	0.1	2.682	A
4	40	351	1307	0.031	40	0.0	2.841	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	521	98	1310	0.398	522	0.7	4.583	A
2	345	127	1313	0.263	345	0.4	3.721	A
3	167	152	1569	0.107	167	0.1	2.585	A
4	34	294	1342	0.025	34	0.0	2.752	A

Junctions 9

ARCADY 9 - Roundabout Module

Filename: A66_Middlesbrough Road Roundabout.j9
Path: F:\270000\276320\04 DELIVERABLES\4-04 Calcs\Transport\Junction models
Report generation date: 19/06/2020 15:05:39

Summary of junction performance

	AM peak				PM peak			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
	2028 Base							
Arm 1	2.1	75.47	0.72	F	0.2	6.09	0.18	A
Arm 2	0.9	16.99	0.47	C	0.6	7.64	0.38	A
Arm 3	1.5	3.86	0.60	A	2.6	5.02	0.71	A
Arm 4	0.4	5.87	0.28	A	1.8	18.56	0.64	C
Arm 5	9.8	15.37	0.91	C	1.6	3.68	0.61	A
	2028 Base+Dev							
Arm 1	45.5	2732.41	3.32	F	0.4	9.68	0.27	A
Arm 2	5.4	67.99	0.87	F	1.3	13.50	0.55	B
Arm 3	3.0	6.38	0.75	A	3.2	5.91	0.75	A
Arm 4	0.7	6.83	0.39	A	174.2	732.64	1.60	F
Arm 5	23.2	34.73	0.98	D	2.6	5.27	0.72	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	10/06/2020
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	GLOBAL\laura.otoole
Description	

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

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2028 Base	AM peak	ONE HOUR	07:45	09:15	15
D2	2028 Base	PM peak	ONE HOUR	16:45	18:15	15
D3	2028 Base+Dev	AM peak	ONE HOUR	07:45	09:15	15
D4	2028 Base+Dev	PM peak	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2028 Base, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	12.59	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Middlesbrough Road WB	
2	Middlesbrough Road NB	
3	A66 EB	
4	Old Station Road	
5	A66 WB	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	3.34	9.00	21.5	42.0	44.5	28.0	
2	4.00	9.20	17.8	28.0	44.5	40.0	

3	8.00	10.50	14.7	51.0	44.5	35.0	
4	3.70	9.00	12.5	36.0	44.5	28.0	
5	7.50	11.00	17.8	35.0	44.5	36.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.699	2006
2	0.679	1984
3	0.878	2951
4	0.668	1854
5	0.869	2924

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

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2028 Base	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	99	100.000
2		✓	176	100.000
3		✓	1319	100.000
4		✓	232	100.000
5		✓	2187	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	**2**	**3**	**4**	**5**
From	**1**	0	39	46	14	0
	2	18	0	24	59	75
	3	31	72	0	112	1104
	4	13	42	118	0	59
	5	8	254	1550	375	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	1	1	1	1
	2	1	0	5	5	5
	3	5	5	0	2	5
	4	1	5	5	0	5
	5	5	1	5	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.72	75.47	2.1	F
2	0.47	16.99	0.9	C
3	0.60	3.86	1.5	A
4	0.28	5.87	0.4	A
5	0.91	15.37	9.8	C

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	75	1808	742	0.100	74	0.1	5.440	A
2	133	1577	914	0.145	132	0.2	4.812	A
3	993	406	2595	0.383	990	0.6	2.346	A
4	175	976	1202	0.145	174	0.2	3.667	A
5	1646	221	2732	0.603	1640	1.6	3.409	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	89	2162	494	0.180	89	0.2	8.949	A
2	158	1886	704	0.225	158	0.3	6.888	A
3	1186	485	2525	0.470	1185	0.9	2.810	A
4	209	1167	1074	0.194	208	0.3	4.355	A
5	1966	264	2694	0.730	1961	2.8	5.073	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	109	2629	169	0.647	104	1.6	52.420	F
2	194	2289	430	0.451	192	0.8	15.669	C
3	1452	589	2434	0.597	1450	1.5	3.823	A
4	255	1428	900	0.284	255	0.4	5.838	A
5	2408	323	2643	0.911	2383	9.1	13.240	B

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	109	2652	152	0.716	107	2.1	75.474	F
2	194	2312	415	0.467	194	0.9	16.993	C
3	1452	595	2428	0.598	1452	1.5	3.862	A
4	255	1431	898	0.284	255	0.4	5.869	A
5	2408	324	2643	0.911	2405	9.8	15.366	C

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	89	2196	471	0.189	96	0.2	9.886	A
2	158	1920	681	0.232	161	0.3	7.267	A
3	1186	494	2517	0.471	1188	0.9	2.842	A
4	209	1172	1071	0.195	209	0.3	4.379	A
5	1966	265	2693	0.730	1994	2.9	5.556	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	75	1820	734	0.102	75	0.1	5.527	A
2	133	1588	906	0.146	133	0.2	4.875	A
3	993	409	2592	0.383	994	0.7	2.361	A
4	175	980	1199	0.146	175	0.2	3.684	A
5	1646	222	2731	0.603	1652	1.6	3.486	A

2028 Base, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	5.86	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2028 Base	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	117	100.000
2		✓	279	100.000
3		✓	1710	100.000
4		✓	323	100.000
5		✓	1463	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	32	68	14	3
	2	40	0	14	65	160
	3	46	24	0	151	1489
	4	14	60	120	0	129
	5	3	79	1335	46	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	1	1	1	1
	2	1	0	5	5	5
	3	5	5	0	2	5
	4	1	5	5	0	5
	5	5	1	5	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.18	6.09	0.2	A
2	0.38	7.64	0.6	A
3	0.71	5.02	2.6	A
4	0.64	18.56	1.8	C
5	0.61	3.68	1.6	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	88	1249	1133	0.078	88	0.1	3.479	A

2	210	1191	1176	0.179	209	0.2	3.884	A
3	1287	246	2735	0.471	1284	0.9	2.592	A
4	243	1322	971	0.251	242	0.3	5.168	A
5	1101	228	2726	0.404	1099	0.7	2.312	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	105	1494	962	0.109	105	0.1	4.245	A
2	251	1424	1017	0.247	250	0.3	4.897	A
3	1537	294	2692	0.571	1535	1.4	3.253	A
4	290	1582	797	0.364	289	0.6	7.418	A
5	1315	273	2687	0.489	1314	1.0	2.742	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	129	1827	729	0.177	128	0.2	6.050	A
2	307	1742	802	0.383	306	0.6	7.565	A
3	1883	360	2635	0.715	1878	2.6	4.951	A
4	356	1935	561	0.633	351	1.7	17.580	C
5	1611	332	2636	0.611	1608	1.6	3.659	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	129	1832	726	0.178	129	0.2	6.092	A
2	307	1746	799	0.385	307	0.6	7.644	A
3	1883	361	2634	0.715	1883	2.6	5.019	A
4	356	1940	558	0.637	355	1.8	18.564	C
5	1611	335	2633	0.612	1611	1.6	3.685	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	105	1501	957	0.110	106	0.1	4.272	A
2	251	1430	1013	0.248	252	0.3	4.946	A
3	1537	296	2691	0.571	1542	1.4	3.295	A
4	290	1589	792	0.366	295	0.6	7.659	A
5	1315	276	2684	0.490	1318	1.0	2.763	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	88	1255	1129	0.078	88	0.1	3.495	A
2	210	1196	1173	0.179	211	0.2	3.908	A
3	1287	247	2733	0.471	1289	0.9	2.615	A
4	243	1329	966	0.252	244	0.4	5.231	A
5	1101	230	2724	0.404	1103	0.7	2.325	A

2028 Base+Dev, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	104.02	F

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2028 Base+Dev	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	134	100.000
2		✓	279	100.000
3		✓	1567	100.000
4		✓	315	100.000
5		✓	2288	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	39	46	49	0
	2	18	0	24	162	75
	3	31	72	0	360	1104
	4	18	57	160	0	80
	5	11	266	1614	397	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	1	1	1	1
	2	1	0	5	5	5
	3	5	5	0	2	5
	4	1	5	5	0	5
	5	5	1	5	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	3.32	2732.41	45.5	F
2	0.87	67.99	5.4	F
3	0.75	6.38	3.0	A
4	0.39	6.83	0.7	A
5	0.98	34.73	23.2	D

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	101	1924	661	0.153	100	0.2	6.471	A
2	210	1699	831	0.253	209	0.4	6.044	A
3	1180	525	2490	0.474	1176	0.9	2.849	A
4	237	975	1202	0.197	236	0.3	3.898	A
5	1723	267	2692	0.640	1715	1.8	3.806	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	120	2300	399	0.302	119	0.4	12.981	B
2	251	2030	606	0.414	249	0.7	10.530	B
3	1409	627	2400	0.587	1407	1.5	3.772	A
4	283	1167	1075	0.263	283	0.4	4.758	A
5	2057	319	2646	0.777	2050	3.5	6.210	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	148	2765	73	2.008	71	19.7	652.478	F
2	307	2387	363	0.845	293	4.2	47.057	E
3	1725	721	2318	0.744	1719	3.0	6.211	A
4	347	1422	904	0.384	346	0.6	6.740	A
5	2519	390	2585	0.975	2459	18.5	23.102	C

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	148	2806	44	3.319	44	45.5	2732.406	F
2	307	2405	351	0.874	302	5.4	67.993	F
3	1725	726	2313	0.746	1725	3.0	6.382	A
4	347	1430	899	0.386	347	0.7	6.829	A
5	2519	392	2583	0.975	2500	23.2	34.731	D

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	120	2385	339	0.356	300	0.6	225.477	F
2	251	2233	468	0.536	267	1.3	20.177	C
3	1409	724	2315	0.609	1414	1.6	4.194	A
4	283	1178	1067	0.265	284	0.4	4.825	A
5	2057	322	2644	0.778	2135	3.8	8.463	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	101	1940	650	0.155	103	0.2	6.663	A
2	210	1714	820	0.256	214	0.4	6.248	A
3	1180	533	2483	0.475	1182	1.0	2.895	A
4	237	982	1198	0.198	238	0.3	3.928	A
5	1723	269	2690	0.640	1730	1.9	3.929	A

2028 Base+Dev, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	132.60	F

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2028 Base+Dev	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	123	100.000
2		✓	309	100.000
3		✓	1776	100.000
4		✓	811	100.000
5		✓	1647	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	32	68	20	3
	2	40	0	14	95	160
	3	46	24	0	217	1489
	4	35	150	301	0	325
	5	10	89	1495	53	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	1	1	1	1
	2	1	0	5	5	5
	3	5	5	0	2	5
	4	1	5	5	0	5
	5	5	1	5	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.27	9.68	0.4	A
2	0.55	13.50	1.3	B
3	0.75	5.91	3.2	A
4	1.60	732.64	174.2	F
5	0.72	5.27	2.6	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	93	1582	900	0.103	92	0.1	4.498	A
2	233	1454	997	0.233	231	0.3	4.903	A
3	1337	278	2707	0.494	1333	1.0	2.734	A
4	611	1322	971	0.629	604	1.7	10.100	B
5	1240	444	2538	0.489	1236	1.0	2.887	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	111	1884	689	0.160	110	0.2	6.275	A

2	278	1733	808	0.344	277	0.5	7.075	A
3	1597	333	2659	0.601	1594	1.6	3.531	A
4	729	1582	798	0.914	706	7.5	34.904	D
5	1481	522	2470	0.599	1478	1.5	3.791	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	135	2137	513	0.264	135	0.4	9.605	A
2	340	2008	621	0.548	337	1.2	13.152	B
3	1955	406	2595	0.754	1949	3.1	5.780	A
4	893	1933	563	1.586	561	90.5	328.891	F
5	1813	457	2527	0.718	1809	2.6	5.219	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	135	2139	511	0.265	135	0.4	9.685	A
2	340	2012	619	0.550	340	1.3	13.496	B
3	1955	408	2592	0.754	1955	3.2	5.910	A
4	893	1940	558	1.600	558	174.2	732.641	F
5	1813	456	2528	0.717	1813	2.6	5.271	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	111	1934	654	0.169	111	0.2	6.706	A
2	278	1769	783	0.355	280	0.6	7.521	A
3	1597	336	2655	0.601	1603	1.6	3.601	A
4	729	1591	791	0.922	786	159.9	707.072	F
5	1481	571	2428	0.610	1485	1.7	4.010	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	93	1786	757	0.122	93	0.1	5.474	A
2	233	1592	903	0.258	233	0.4	5.621	A
3	1337	280	2705	0.494	1339	1.0	2.762	A
4	611	1329	966	0.632	960	72.6	438.089	F
5	1240	658	2352	0.527	1242	1.2	3.402	A

Junctions 9

ARCADY 9 - Roundabout Module

Filename: A66_Tees Dock Road Roundabout.j9
Path: \\global\europe\Newcastle\Jobs\270000\276320\04 DELIVERABLES\4-04 Calcs\Transport\Junction models\Arcady
Report generation date: 19/06/2020 15:26:45

Summary of junction performance

	AM peak				PM peak			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
2028 Base								
Arm 1	10.6	21.31	0.92	C	0.8	2.79	0.43	A
Arm 2	1.3	3.74	0.57	A	9.3	16.51	0.91	C
Arm 3	1.6	5.77	0.62	A	6.0	27.10	0.87	D
2028 Base+Dev								
Arm 1	18.5	36.89	0.97	E	1.0	3.20	0.49	A
Arm 2	1.4	3.89	0.58	A	42.7	64.55	1.01	F
Arm 3	2.6	7.90	0.72	A	217.0	689.42	1.44	F

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	10/06/2020
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	GLOBAL\laura.otoole
Description	

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

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2028 Base	AM peak	ONE HOUR	07:45	09:15	15
D2	2028 Base	PM peak	ONE HOUR	16:45	18:15	15
D3	2028 Base+Dev	AM peak	ONE HOUR	07:45	09:15	15
D4	2028 Base+Dev	PM peak	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2028 Base, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3	12.23	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Tees Dock Road WB	
2	A66 EB	
3	Tees Dock Road SB	

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
1	7.30	9.80	12.4	38.5	30.0	40.0	
2	7.10	8.80	19.3	30.0	30.0	28.0	
3	4.70	7.84	30.0	33.0	30.0	38.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.847	2642
2	0.852	2612
3	0.741	2119

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

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2028 Base	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	1731	100.000
2		✓	1137	100.000
3		✓	940	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1	2	3
From	1	0	1304	427
	2	549	0	588
	3	319	621	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1	2	3
From	1	0	0	3
	2	0	0	0
	3	2	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.92	21.31	10.6	C
2	0.57	3.74	1.3	A

3	0.62	5.77	1.6	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1303	466	2248	0.580	1298	1.4	3.795	A
2	856	320	2340	0.366	854	0.6	2.420	A
3	708	412	1813	0.390	705	0.6	3.307	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1556	557	2170	0.717	1552	2.5	5.820	A
2	1022	383	2286	0.447	1021	0.8	2.844	A
3	845	493	1753	0.482	844	0.9	4.033	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1906	682	2065	0.923	1878	9.6	17.270	C
2	1252	463	2218	0.564	1250	1.3	3.710	A
3	1035	604	1671	0.619	1032	1.6	5.718	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1906	684	2063	0.924	1902	10.6	21.307	C
2	1252	469	2213	0.566	1252	1.3	3.745	A
3	1035	604	1671	0.619	1035	1.6	5.774	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1556	560	2168	0.718	1588	2.6	6.587	A
2	1022	392	2279	0.449	1024	0.8	2.872	A
3	845	494	1752	0.482	848	1.0	4.071	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1303	468	2246	0.580	1308	1.4	3.887	A
2	856	323	2338	0.366	857	0.6	2.434	A
3	708	414	1812	0.391	709	0.7	3.331	A

2028 Base, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3	15.35	C

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2028 Base	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	895	100.000
2		✓	1946	100.000
3		✓	765	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1	2	3
From	1	0	617	278
	2	1412	0	534
	3	395	370	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1	2	3
From	1	0	0	6
	2	0	0	0
	3	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS

1	0.43	2.79	0.8	A
2	0.91	16.51	9.3	C
3	0.87	27.10	6.0	D

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	674	277	2408	0.280	672	0.4	2.109	A
2	1465	209	2435	0.602	1459	1.5	3.668	A
3	576	1059	1334	0.432	573	0.8	4.756	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	805	331	2362	0.341	804	0.5	2.353	A
2	1749	250	2400	0.729	1745	2.6	5.459	A
3	688	1266	1181	0.583	685	1.4	7.304	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	985	400	2304	0.428	984	0.8	2.777	A
2	2143	306	2352	0.911	2118	8.7	14.156	B
3	842	1537	980	0.860	827	5.3	21.901	C

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	985	406	2298	0.429	985	0.8	2.790	A
2	2143	306	2352	0.911	2140	9.3	16.508	C
3	842	1553	968	0.870	839	6.0	27.104	D

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	805	341	2353	0.342	806	0.5	2.368	A
2	1749	250	2399	0.729	1776	2.8	6.006	A
3	688	1288	1164	0.591	706	1.5	8.232	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	674	280	2405	0.280	674	0.4	2.117	A
2	1465	209	2434	0.602	1470	1.5	3.751	A
3	576	1067	1328	0.434	579	0.8	4.868	A

2028 Base+Dev, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3	19.29	C

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2028 Base+Dev	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	1731	100.000
2		✓	1172	100.000
3		✓	1090	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1	2	3
From	1	0	1304	427
	2	557	0	615
	3	369	721	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1	2	3
From	1	0	0	3
	2	0	0	0
	3	2	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS

1	0.97	36.89	18.5	E
2	0.58	3.89	1.4	A
3	0.72	7.90	2.6	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1303	541	2184	0.597	1297	1.5	4.061	A
2	882	320	2340	0.377	880	0.6	2.461	A
3	821	418	1809	0.454	817	0.8	3.691	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1556	647	2094	0.743	1551	2.8	6.606	A
2	1054	383	2287	0.461	1053	0.8	2.914	A
3	980	500	1748	0.561	978	1.3	4.759	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1906	790	1973	0.966	1858	14.9	24.941	C
2	1290	458	2222	0.581	1288	1.4	3.846	A
3	1200	612	1665	0.721	1195	2.6	7.730	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1906	794	1970	0.967	1891	18.5	36.891	E
2	1290	467	2215	0.583	1290	1.4	3.893	A
3	1200	613	1664	0.721	1200	2.6	7.901	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1556	652	2090	0.744	1618	3.0	8.674	A
2	1054	399	2272	0.464	1056	0.9	2.963	A
3	980	502	1747	0.561	985	1.3	4.852	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1303	544	2181	0.597	1309	1.5	4.187	A
2	882	323	2337	0.378	883	0.6	2.479	A
3	821	420	1808	0.454	822	0.9	3.736	A

2028 Base+Dev, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3	223.92	F

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2028 Base+Dev	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	1011	100.000
2		✓	2067	100.000
3		✓	1187	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1	2	3
From	1	0	617	394
	2	1521	0	546
	3	612	575	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1	2	3
From	1	0	0	6
	2	0	0	0
	3	1	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS

1	0.49	3.20	1.0	A
2	1.01	64.55	42.7	F
3	1.44	689.42	217.0	F

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	761	428	2279	0.334	759	0.5	2.418	A
2	1556	296	2360	0.659	1549	1.9	4.393	A
3	894	1139	1274	0.701	884	2.3	9.123	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	909	499	2220	0.409	908	0.7	2.805	A
2	1858	354	2311	0.804	1850	3.9	7.676	A
3	1067	1361	1110	0.961	1029	11.7	35.200	E

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1113	450	2261	0.492	1112	1.0	3.200	A
2	2276	433	2243	1.014	2179	28.2	35.046	E
3	1307	1603	931	1.404	929	106.2	239.972	F

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1113	440	2269	0.491	1113	1.0	3.183	A
2	2276	434	2243	1.015	2218	42.7	64.555	F
3	1307	1632	909	1.437	909	205.6	595.395	F

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	909	495	2223	0.409	910	0.7	2.805	A
2	1858	355	2310	0.804	2012	4.4	18.311	C
3	1067	1480	1022	1.044	1021	217.0	689.419	F

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	761	610	2126	0.358	762	0.6	2.699	A
2	1556	297	2360	0.659	1566	2.0	4.589	A
3	894	1152	1265	0.706	1259	125.6	491.005	F

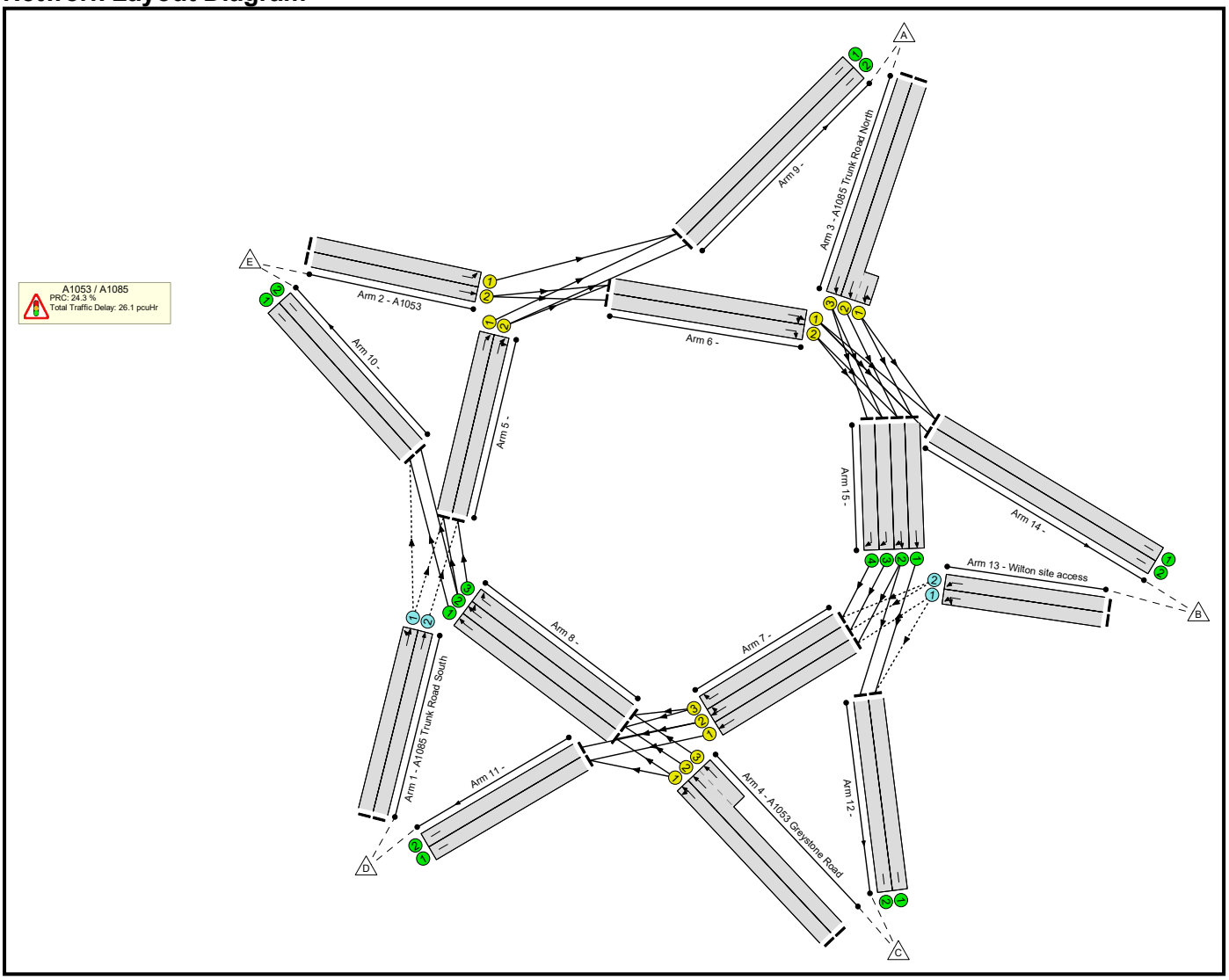
Basic Results Summary

User and Project Details

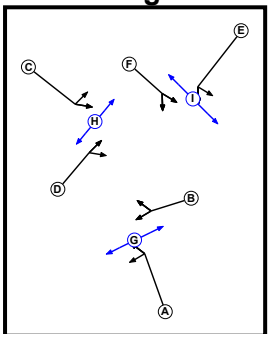
Project:	**STDC South Industrial Zone**
Title:	**A1085 / A1053 Roundabout**
Company:	Ove Arup & Partners Ltd.

General Model Data

Network Layout Diagram



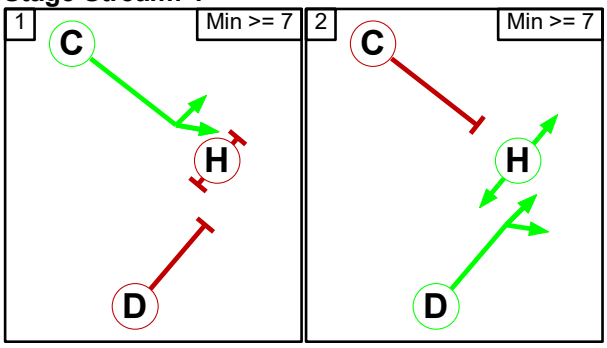
Phase Diagram



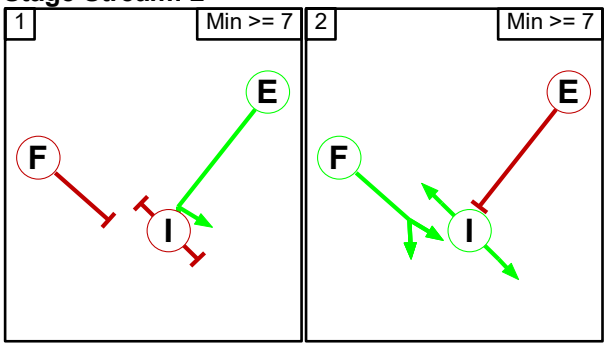
Basic Results Summary

Stage Diagram

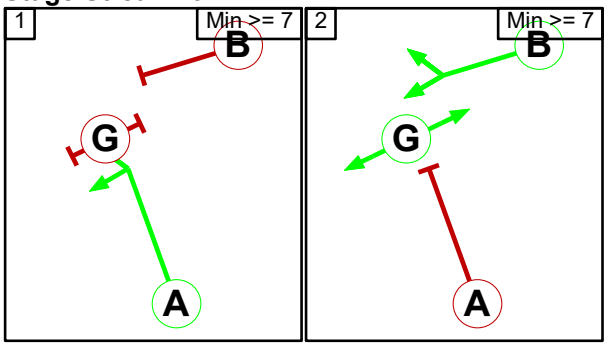
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3

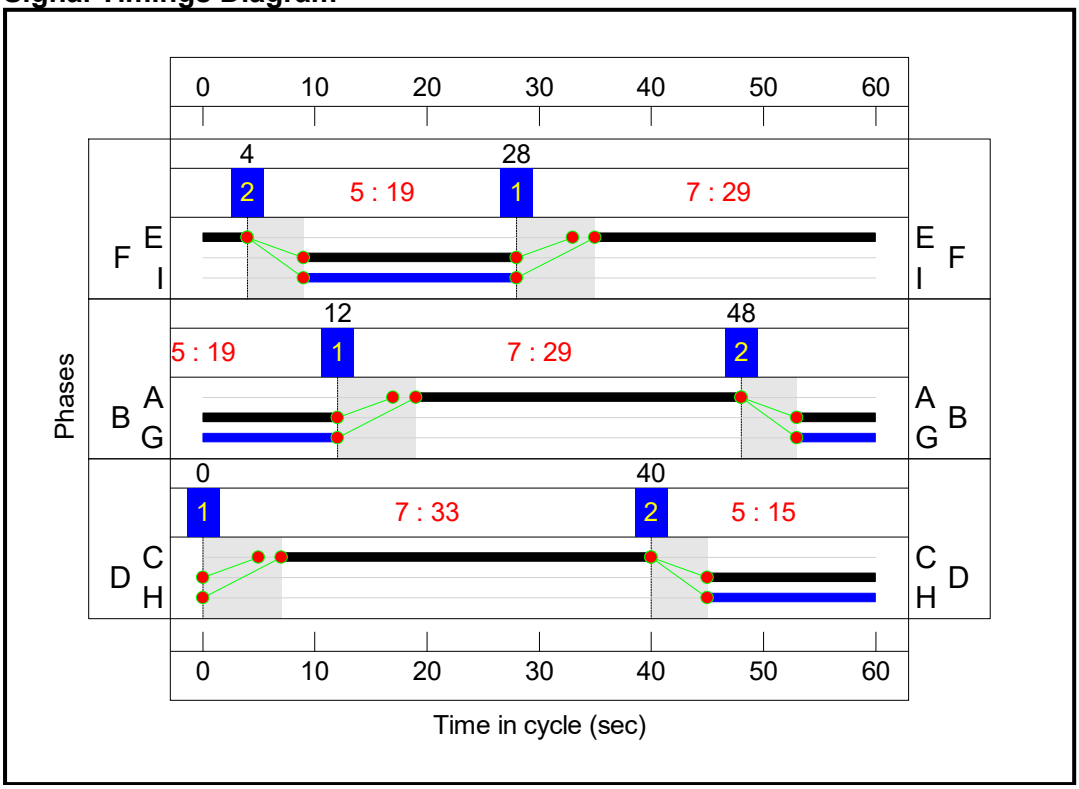


Phase Intergreens Matrix

Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I
A	-	5	-	-	-	-	5	-	-
B	5	-	-	-	-	-	-	-	-
C	-	-	-	5	-	-	-	5	-
D	-	-	5	-	-	-	-	-	-
E	-	-	-	-	-	5	-	-	5
F	-	-	-	-	5	-	-	-	-
G	7	-	-	-	-	-	-	-	-
H	-	-	7	-	-	-	-	-	-
I	-	-	-	-	7	-	-	-	-

Basic Results Summary
Scenario 1: 2028 AM Base

Signal Timings Diagram



Traffic Flows, Actual

Actual Flow :

		Destination					
		A	B	C	D	E	Tot.
Origin	A	0	6	31	194	680	911
	B	1	0	13	15	86	115
	C	62	76	0	319	939	1396
	D	108	18	75	0	26	227
	E	335	124	383	28	0	870
	Tot.	506	224	502	556	1731	3519

Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**72.4%**	**-**	**-**	**342**	**0**	**0**	**26.1**	**-**
A1053 / A1085	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**72.4%**	**-**	**-**	**342**	**0**	**0**	**26.1**	**-**
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	65	1968	29.2%	0.7	222	65	0	0	0.3	19.0
1/2	A1085 Trunk Road South Ahead	O	-		-	-	162	2015	32.6%	1.0	497	162	0	0	0.4	8.6
2/1	A1053 Left	U	C		33	-	335	1947	30.4%	3.1	1103	-	-	-	0.9	9.2
2/2	A1053 Ahead	U	C		33	-	535	2000	47.2%	5.6	1133	-	-	-	1.6	10.7
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		29	-	231	1955:1600	23.8 : 23.8%	1.9	814+155	-	-	-	0.7	10.7
3/3	A1085 Trunk Road North Ahead	U	E		29	-	680	1940	70.1%	9.9	970	-	-	-	3.3	17.7
4/1	A1053 Greystone Road Ahead Left	U	A		29	-	662	1854	71.4%	9.7	927	-	-	-	3.4	18.4
4/2+4/3	A1053 Greystone Road Ahead	U	A		29	-	734	1940:1950	72.4 : 72.4%	10.1	909+105	-	-	-	3.6	17.6
5/1	Ahead	U	D		15	-	102	1800	21.3%	1.3	480	-	-	-	0.4	14.1
5/2	Right Ahead	U	D		15	-	238	1800	49.6%	3.3	480	-	-	-	1.4	21.4
6/1	Ahead Right	U	F		19	-	355	1800	59.2%	5.4	600	-	-	-	2.1	21.0
6/2	Right	U	F		19	-	349	1800	58.2%	2.5	600	-	-	-	1.7	17.4
7/1	Ahead	U	B		19	-	237	1800	39.5%	3.4	600	-	-	-	1.0	14.8
7/2	Right Ahead	U	B		19	-	422	1800	70.3%	6.7	600	-	-	-	2.0	16.9
7/3	Right	U	B		19	-	345	1700	60.9%	5.2	567	-	-	-	1.3	13.8
8/1	Ahead	U	-		-	-	765	1800	42.5%	0.4	1800	-	-	-	0.4	1.7

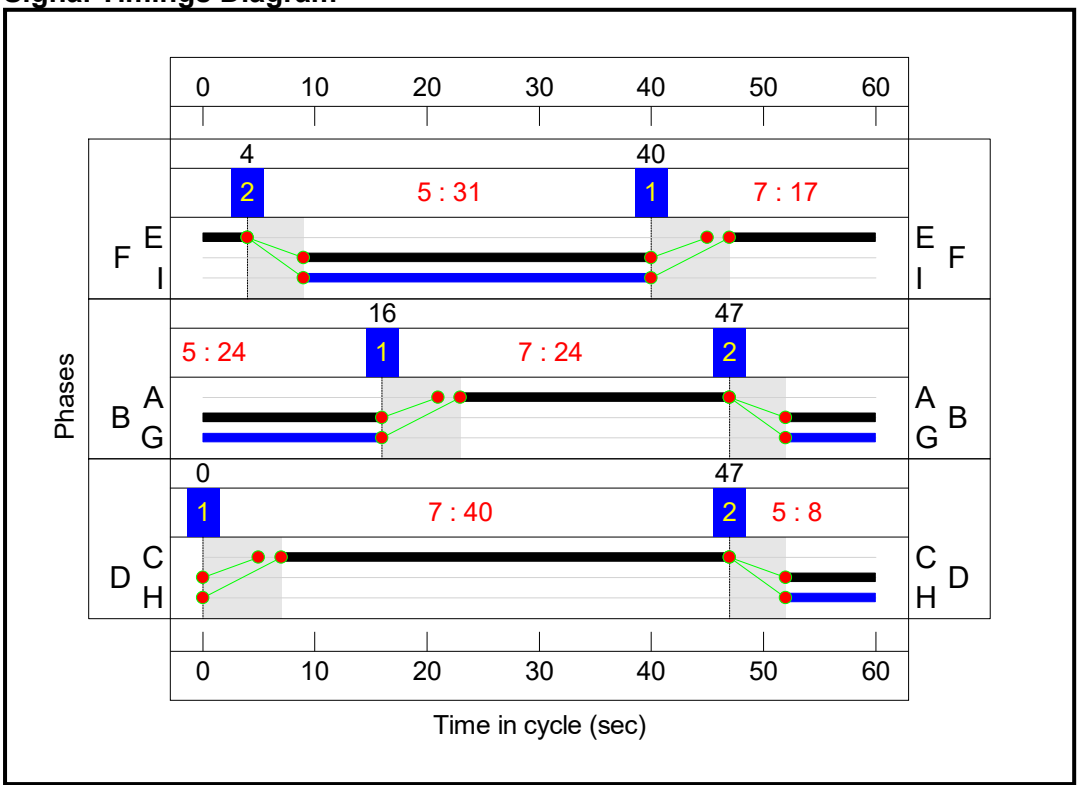
Basic Results Summary

8/2	Right Ahead	U	-		-	-	1003	1800	55.7%	6.7	1800	-	-	-	0.7	2.3
8/3	Right	U	-		-	-	76	1800	4.2%	0.0	1800	-	-	-	0.0	1.0
13/1	Wilton site access Ahead Left	O	-		-	-	28	1931	7.8%	0.2	359	28	0	0	0.1	10.5
13/2	Wilton site access Ahead	O	-		-	-	87	2015	27.2%	0.8	319	87	0	0	0.3	14.0
15/1	Ahead	U	-		-	-	168	1600	10.5%	0.1	1600	-	-	-	0.1	1.3
15/2	Right Ahead	U	-		-	-	543	1600	33.9%	0.3	1600	-	-	-	0.3	1.7
15/3	Right	U	-		-	-	359	1600	22.4%	0.1	1600	-	-	-	0.1	1.5
15/4	Right	U	-		-	-	321	1600	20.1%	0.1	1600	-	-	-	0.1	1.4

C1	Stream: 1 PRC for Signalled Lanes (%):	81.5	Total Delay for Signalled Lanes (pcuHr):	4.26	Cycle Time (s): 60
C1	Stream: 2 PRC for Signalled Lanes (%):	28.4	Total Delay for Signalled Lanes (pcuHr):	7.78	Cycle Time (s): 60
C1	Stream: 3 PRC for Signalled Lanes (%):	24.3	Total Delay for Signalled Lanes (pcuHr):	11.25	Cycle Time (s): 60
	PRC Over All Lanes (%):	24.3	Total Delay Over All Lanes(pcuHr):	26.07	

Basic Results Summary
Scenario 2: 2028 PM Base

Signal Timings Diagram



Traffic Flows, Actual

Actual Flow :

		Destination					
		A	B	C	D	E	Tot.
Origin	A	0	12	49	157	406	624
	B	4	0	2	22	105	133
	C	39	15	0	86	365	505
	D	137	11	177	0	20	345
	E	756	50	931	71	0	1808
	Tot.	936	88	1159	336	896	3415

Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**77.0%**	**-**	**-**	**478**	**0**	**0**	**24.9**	**-**
A1053 / A1085	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**77.0%**	**-**	**-**	**478**	**0**	**0**	**24.9**	**-**
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	157	2000	27.2%	0.9	577	157	0	0	0.3	6.5
1/2	A1085 Trunk Road South Ahead	O	-		-	-	188	2015	23.5%	0.7	799	188	0	0	0.2	3.7
2/1	A1053 Left	U	C		40	-	756	1947	56.8%	7.2	1330	-	-	-	1.7	8.0
2/2	A1053 Ahead	U	C		40	-	1052	2000	77.0%	13.3	1367	-	-	-	3.5	12.0
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		17	-	218	1955:1600	35.3 : 35.3%	2.2	447+170	-	-	-	1.2	20.3
3/3	A1085 Trunk Road North Ahead	U	E		17	-	406	1940	69.8%	7.1	582	-	-	-	3.2	28.7
4/1	A1053 Greystone Road Ahead Left	U	A		24	-	229	1860	29.5%	2.7	775	-	-	-	1.0	14.9
4/2+4/3	A1053 Greystone Road Ahead	U	A		24	-	276	1940:1950	33.1 : 33.1%	3.1	789+45	-	-	-	1.1	15.0
5/1	Ahead	U	D		8	-	180	1800	66.7%	3.8	270	-	-	-	2.0	40.4
5/2	Right Ahead	U	D		8	-	203	1800	75.2%	4.7	270	-	-	-	2.8	48.9
6/1	Ahead Right	U	F		31	-	625	1800	65.1%	8.0	960	-	-	-	2.4	13.8
6/2	Right	U	F		31	-	630	1800	65.6%	3.7	960	-	-	-	1.9	10.8
7/1	Ahead	U	B		24	-	225	1800	30.0%	1.2	750	-	-	-	0.5	7.9
7/2	Right Ahead	U	B		24	-	390	1800	52.0%	1.4	750	-	-	-	0.8	7.0
7/3	Right	U	B		24	-	150	1700	21.2%	0.3	708	-	-	-	0.2	4.2
8/1	Ahead	U	-		-	-	508	1800	28.2%	0.2	1800	-	-	-	0.2	1.4

Basic Results Summary

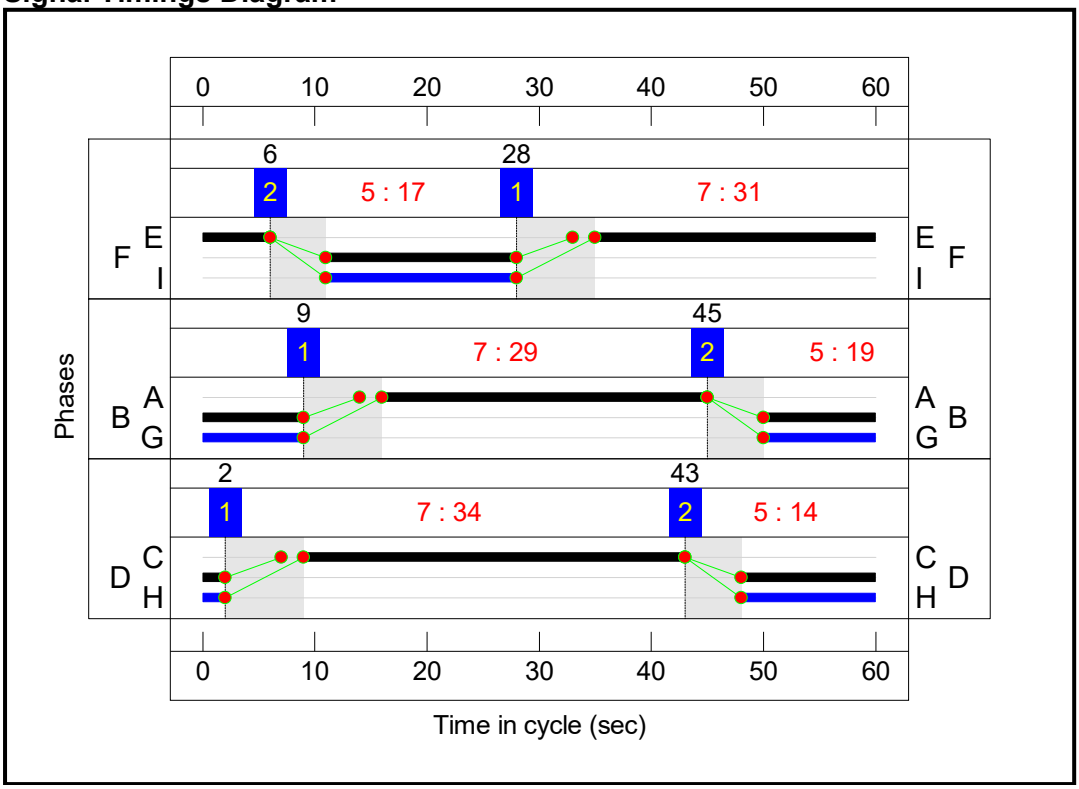
8/2	Right Ahead	U	-		-	-	411	1800	22.8%	0.1	1800	-	-	-	0.1	1.3
8/3	Right	U	-		-	-	15	1800	0.8%	0.0	1800	-	-	-	0.0	1.0
13/1	Wilton site access Ahead Left	O	-		-	-	24	1999	10.4%	0.3	232	24	0	0	0.1	17.9
13/2	Wilton site access Ahead	O	-		-	-	109	2015	47.7%	1.5	228	109	0	0	0.8	25.8
15/1	Ahead	U	-		-	-	597	1600	37.3%	0.3	1600	-	-	-	0.3	1.8
15/2	Right Ahead	U	-		-	-	763	1600	47.7%	0.5	1600	-	-	-	0.5	2.1
15/3	Right	U	-		-	-	320	1600	20.0%	0.1	1600	-	-	-	0.1	1.4
15/4	Right	U	-		-	-	111	1600	6.9%	0.0	1600	-	-	-	0.0	1.2

C1	Stream: 1 PRC for Signalled Lanes (%):	16.9	Total Delay for Signalled Lanes (pcuHr):	9.97	Cycle Time (s): 60
C1	Stream: 2 PRC for Signalled Lanes (%):	29.0	Total Delay for Signalled Lanes (pcuHr):	8.76	Cycle Time (s): 60
C1	Stream: 3 PRC for Signalled Lanes (%):	73.1	Total Delay for Signalled Lanes (pcuHr):	3.53	Cycle Time (s): 60
	PRC Over All Lanes (%):	16.9	Total Delay Over All Lanes(pcuHr):	24.90	

Basic Results Summary

Scenario 3: 2028 AM Base+Dev

Signal Timings Diagram



Traffic Flows, Actual

Actual Flow :

		Destination					
		A	B	C	D	E	Tot.
Origin	A	0	6	31	194	847	1078
	B	1	0	13	15	106	135
	C	62	76	0	319	1171	1628
	D	108	18	75	0	32	233
	E	358	132	407	30	0	927
	Tot.	529	232	526	558	2156	4001

Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	-	-	-		-	-	-	-	**84.1%**	-	-	**368**	**0**	**0**	**38.6**	-
A1053 / A1085	-	-	-		-	-	-	-	**84.1%**	-	-	**368**	**0**	**0**	**38.6**	-
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	40	1923	25.7%	0.5	156	40	0	0	0.3	26.9
1/2	A1085 Trunk Road South Ahead	O	-		-	-	193	2015	58.2%	2.1	331	193	0	0	1.1	20.6
2/1	A1053 Left	U	C		34	-	358	1947	31.5%	3.2	1136	-	-	-	0.9	8.7
2/2	A1053 Ahead	U	C		34	-	569	2000	48.8%	5.8	1167	-	-	-	1.6	10.3
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		31	-	231	1955:1600	22.4 : 22.4%	1.8	867+165	-	-	-	0.6	9.4
3/3	A1085 Trunk Road North Ahead	U	E		31	-	847	1940	81.9%	13.7	1035	-	-	-	4.9	21.0
4/1	A1053 Greystone Road Ahead Left	U	A		29	-	780	1858	84.0%	13.6	929	-	-	-	5.3	24.6
4/2+4/3	A1053 Greystone Road Ahead	U	A		29	-	848	1940:1950	84.1 : 84.1%	14.1	918+90	-	-	-	5.5	23.3
5/1	Ahead	U	D		14	-	71	1800	15.8%	1.0	450	-	-	-	0.3	15.3
5/2	Right Ahead	U	D		14	-	269	1800	59.8%	3.9	450	-	-	-	1.8	24.3
6/1	Ahead Right	U	F		17	-	372	1800	68.9%	6.2	540	-	-	-	2.6	25.0
6/2	Right	U	F		17	-	366	1800	67.8%	3.6	540	-	-	-	2.3	22.6
7/1	Ahead	U	B		19	-	239	1800	39.8%	3.5	600	-	-	-	1.1	16.4
7/2	Right Ahead	U	B		19	-	503	1800	83.8%	9.6	600	-	-	-	3.9	27.9
7/3	Right	U	B		19	-	451	1700	79.6%	8.0	567	-	-	-	3.1	25.0
8/1	Ahead	U	-		-	-	964	1800	53.6%	2.6	1800	-	-	-	0.6	2.2

Basic Results Summary

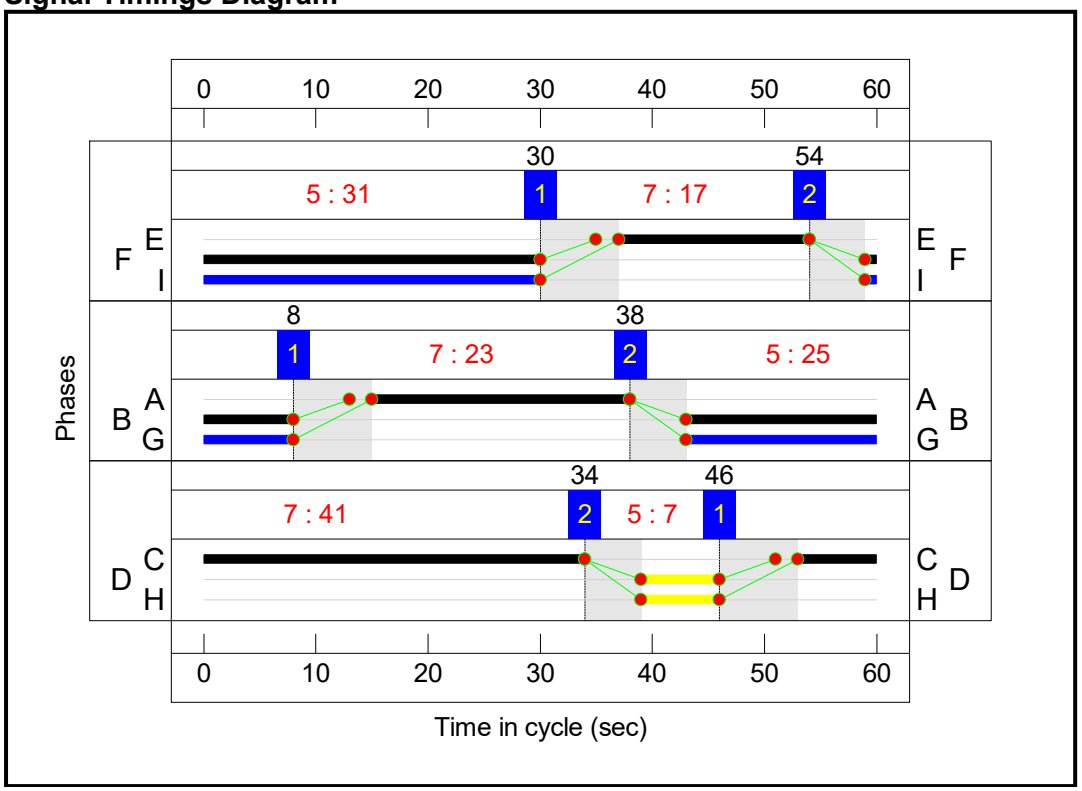
8/2	Right Ahead	U	-		-	-	1223	1800	67.9%	9.6	1800	-	-	-	1.1	3.2
8/3	Right	U	-		-	-	76	1800	4.2%	0.0	1800	-	-	-	0.0	1.0
13/1	Wilton site access Ahead Left	O	-		-	-	28	1931	11.2%	0.3	250	28	0	0	0.1	16.1
13/2	Wilton site access Ahead	O	-		-	-	107	2015	47.1%	1.5	227	107	0	0	0.8	25.7
15/1	Ahead	U	-		-	-	177	1600	11.1%	0.1	1600	-	-	-	0.1	1.3
15/2	Right Ahead	U	-		-	-	560	1600	35.0%	0.3	1600	-	-	-	0.3	1.7
15/3	Right	U	-		-	-	446	1600	27.9%	0.2	1600	-	-	-	0.2	1.6
15/4	Right	U	-		-	-	401	1600	25.1%	0.2	1600	-	-	-	0.2	1.5

C1	Stream: 1 PRC for Signalled Lanes (%):	50.6	Total Delay for Signalled Lanes (pcuHr):	4.61	Cycle Time (s): 60
C1	Stream: 2 PRC for Signalled Lanes (%):	9.9	Total Delay for Signalled Lanes (pcuHr):	10.42	Cycle Time (s): 60
C1	Stream: 3 PRC for Signalled Lanes (%):	7.1	Total Delay for Signalled Lanes (pcuHr):	18.94	Cycle Time (s): 60
	PRC Over All Lanes (%):	7.1	Total Delay Over All Lanes(pcuHr):	38.65	

Basic Results Summary

Scenario 4: 2028 PM Base+Dev

Signal Timings Diagram



Traffic Flows, Actual

Actual Flow :

		Destination					
		A	B	C	D	E	Tot.
Origin	A	0	12	49	157	459	677
	B	4	0	2	22	119	147
	C	39	15	0	86	412	552
	D	137	11	177	0	22	347
	E	888	59	1100	86	0	2133
	Tot.	1068	97	1328	351	1012	3856

Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	-	-	-		-	-	-	-	**88.9%**	-	-	**494**	**0**	**0**	**33.8**	-
A1053 / A1085	-	-	-		-	-	-	-	**88.9%**	-	-	**494**	**0**	**0**	**33.8**	-
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	159	1998	31.4%	1.2	506	159	0	0	0.4	9.0
1/2	A1085 Trunk Road South Ahead	O	-		-	-	188	2015	24.8%	0.6	758	188	0	0	0.2	3.6
2/1	A1053 Left	U	C		41	-	888	1947	65.2%	9.1	1363	-	-	-	2.2	8.7
2/2	A1053 Ahead	U	C		41	-	1245	2000	88.9%	20.1	1400	-	-	-	6.3	18.2
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		17	-	218	1955:1600	35.8 : 35.8%	2.3	461+148	-	-	-	1.2	20.5
3/3	A1085 Trunk Road North Ahead	U	E		17	-	459	1940	78.9%	8.8	582	-	-	-	4.3	33.5
4/1	A1053 Greystone Road Ahead Left	U	A		23	-	254	1862	34.1%	3.2	745	-	-	-	1.1	16.2
4/2+4/3	A1053 Greystone Road Ahead	U	A		23	-	298	1940:1950	37.2 : 37.2%	3.6	761+40	-	-	-	1.3	16.1
5/1	Ahead	U	D		7	-	180	1800	75.0%	4.3	240	-	-	-	2.4	48.3
5/2	Right Ahead	U	D		7	-	203	1800	84.6%	5.7	240	-	-	-	3.8	67.2
6/1	Ahead Right	U	F		31	-	723	1800	75.3%	10.2	960	-	-	-	3.4	16.8
6/2	Right	U	F		31	-	725	1800	75.5%	7.1	960	-	-	-	2.6	12.7
7/1	Ahead	U	B		25	-	234	1800	30.0%	1.3	780	-	-	-	0.5	8.1
7/2	Right Ahead	U	B		25	-	386	1800	49.5%	1.5	780	-	-	-	0.7	6.6
7/3	Right	U	B		25	-	227	1700	30.8%	0.3	737	-	-	-	0.2	3.9
8/1	Ahead	U	-		-	-	523	1800	29.1%	0.2	1800	-	-	-	0.2	1.4

Basic Results Summary

8/2	Right Ahead	U	-		-	-	510	1800	28.3%	0.7	1800	-	-	-	0.2	1.4
8/3	Right	U	-		-	-	15	1800	0.8%	0.0	1800	-	-	-	0.0	1.0
13/1	Wilton site access Ahead Left	O	-		-	-	24	1999	13.3%	0.3	181	24	0	0	0.1	22.2
13/2	Wilton site access Ahead	O	-		-	-	123	2015	69.1%	2.3	178	123	0	0	1.5	43.9
15/1	Ahead	U	-		-	-	679	1600	42.4%	0.4	1600	-	-	-	0.4	2.0
15/2	Right Ahead	U	-		-	-	859	1600	53.7%	3.7	1600	-	-	-	0.6	2.4
15/3	Right	U	-		-	-	302	1600	18.9%	0.1	1600	-	-	-	0.1	1.4
15/4	Right	U	-		-	-	188	1600	11.8%	0.1	1600	-	-	-	0.1	1.3

C1	Stream: 1 PRC for Signalled Lanes (%):	1.2	Total Delay for Signalled Lanes (pcuHr):	14.67	Cycle Time (s): 60
C1	Stream: 2 PRC for Signalled Lanes (%):	14.1	Total Delay for Signalled Lanes (pcuHr):	11.44	Cycle Time (s): 60
C1	Stream: 3 PRC for Signalled Lanes (%):	81.9	Total Delay for Signalled Lanes (pcuHr):	3.96	Cycle Time (s): 60
	PRC Over All Lanes (%):	1.2	Total Delay Over All Lanes(pcuHr):	33.84	