



Dust and Air Quality Innovation and Expertise

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17 January 2023

Air Quality Mitigation Plan to Discharge Condition 10 for River Academy Reading – Planning Reference 212061

Prepared by Gordon Allison

Introduction

This condition for an Air Quality Mitigation Plan has been requested to be discharged by Reading Borough Council prior to starting the above ground works necessary for the proposed development.

The condition is as follows:

No development shall take place above foundation level until a detailed air quality mitigation plan has been submitted to and approved in writing by the Local Planning Authority. The Air Quality Mitigation Plan is to quantify the impact on emissions as set out in the approved air quality report, Reference ZBKRARA AQA, dated 17/05/2022 in order to demonstrate that any detrimental impact from the development will be mitigated and that the development will not cause an increase in air pollutants to the satisfaction of the Council.

Thereafter, the development shall not be carried out other than in accordance with the approved mitigation scheme, which shall be implemented in accordance with the timescales agreed with the Local Planning Authority.

Reading Borough Council's air quality officer was consulted in the preparation of the air quality assessment and this air quality mitigation plan. The consultation response was that to date, few quality mitigation plans had been required as a planning condition, and therefore no detailed advice could be given as to the council's expectations.

Development Description

The development is: 'a new three-storey 8 form entry school for years 11 -16, including a Special Educational Needs and Disabilities unit and 300 place 6th form (total school capacity of 1500 pupils) including the creation of a new access from Richfield Avenue, new parking area, cycle parking landscaped areas, external play areas, Multi Use Games Area and sporting pitches.

Summary and Quantification of Air Quality Impacts

The River Academy is a new school to serve the increase in population in school age children in the north of Reading. The school is designed to have a catchment of 3 miles on first opening, declining to 1.5 miles as pupil admission by proximity progressively takes over, meaning that pupils will be encouraged and enabled to walk or cycle to school. According to the way in which the transport assessment has been carried out, there will however be an increase in vehicle trips to the school, with a consequent increase in vehicle exhaust emissions, including of NO_x which gives rise to NO₂. Some of these increases will occur on roads in the Reading Air Quality Management Area, where the local authority is taking action to improve air quality.

The air quality impacts have been assessed and accepted to be insignificant. The detailed air quality assessment is appended. The largest predicted increase in nitrogen dioxide at a residential receptor is predicted to be 0.13 µg/m³. This quantum of change is below that which could be measured with any confidence by methods set out in Local Air Quality Management: Technical Guidance 2022. The greatest increase in nitrogen dioxide where air quality is already significantly impacted (over 30 µg/m³) is predicted to be 0.07 µg/m³, on Prospect Street in Caversham, resulting from an additional 90 trips per day. Air quality is predicted to be meeting the National Air Quality Objective on Prospect Street, by some margin, with the scheme in place.

The transport assessment and air quality assessment assume full trip generation on the year of opening, whereas in fact the school will expand gradually, year group by year group.

The transport assessment and air quality assessment do not assess the trips removed from the network, which are trips which would have otherwise taken place if the school was not built. These trips would have taken place in part on other roads in the Reading Air Quality Management Area.

For the purpose of the Transport Assessment any Travel Plan benefits through a reduction in vehicular trip generation were not taken into account.

The proposed catchment area for the school was defined for the Transport Assessment, and it was anticipated to be no more than 3 miles upon first opening. As the school fills to capacity, increased demand for admission would result in places being allocated to pupils who live the closest. This would therefore result in a tightening of the area from which pupils are drawn over time. In order to establish a baseline modal split for the purposes of assessment, the 2011 census travel to secondary school mode share data for schools across Reading has been used to estimate the mode share of pupils attending River Academy. This is considered a highly robust approach given the accessibility and catchment of the proposed site, which should see a greater uptake of walking and cycling (and corresponding reduction in car trips) than would be reflected in an average of all schools across Reading.

For the reasons set out above, the results of the air quality assessment are considered to be more conservative than will be the out-turn in reality. Mitigation measures are described below, appropriate to the likely level of air quality impact.

The air quality mitigation measures are set out below. The measures are a series of hard and soft measures which are designed to avoid or mitigate emissions which would otherwise have an impact on local air quality.

1. Travel Plan – Soft Measure

The proposed development will implement a travel plan with the aim of reducing vehicle journeys to and from the school. This should have the effect of reducing the air quality impacts. The plan will promote a series of measures to lessen the dependency on single occupancy vehicle trips and encourages walking, bicycle and bus travel.

2. Active Travel Mitigation Works - Path widening works under the Section 106/Section 278 agreements between the Department for Education and Reading Borough Council – Hard Measure

The agreement is for the following works:

The Owner will widen the existing footway/cycleway to 3 metres on the northern side of Richfield Avenue between the pedestrian entrance to the application site and the junction of Richfield Avenue and Thames Side Promenade to include the provision of stage 2, 3 and 4 safety audits in accordance with GG119DMRB or any subsequent revision amendment or re-enactment thereof published by the UK

The Owner will widen the existing footway to 3 metres to create a shared footway/cycleway on the south side of Richfield Avenue from the signalised crossing adjacent to the petrol station to the junction of Richfield Avenue / Cardiff Road to include the provision of stage 2, 3 and 4 safety audits in accordance with GG119DMRB or any subsequent revision amendment or reenactment thereof published by the UK

The purpose of this project is to improve the quality of walking and cycling access to the school. The new Tiger crossing (combined pedestrian and cycle crossing) offers priority crossing to non-car users, therefore promoting the up-take of non-car modes. This is expected to enable a greater proportion of the school students to use cycling and walking than would have been predicted with the assumptions available at the time that the transport assessment was carried out. Hence the traffic generation and transport emissions used in the air quality assessment are likely to be a conservative prediction of the future air quality situation.

This project is expected to cost several hundred thousand pounds. It is not as yet being managed by Bowmer & Kirkland; Bowmer & Kirkland are anticipated to be the designers of the scheme. The scheme is shown in drawing 600353-HEX-00-00-DR-TP-0500.



Figure 1: Sketch mark-up of improved active transport links to the River Academy



Figure 2: Illustration of a Tiger Crossing – parallel foot and cycleway

3. Operational Mitigation for Transport Emissions – Hard Measure

The proposed development will include eight car parking spaces with active EV charging provision, with passive provision provided for a further eight spaces. A large covered and secure bicycle parking facility will be provided to school users. This has 120 covered and secure spaces, with space available for up to 120 more, should the demand arise.

4. Landscape Planting for Air Quality Mitigation – Hard Measure

Landscape planting is recognised as a means by which certain plants can be more effective than others in removing air pollutants, by virtue of offering a greater leaf surface area, over a longer period of time.

Plants help remove pollutants from the air by trapping the particles on their leaves, which are then washed off by rain or discarded as the plant drops its leaves. This can help to inform a planting palette that is varied in species, form and height, from ground covers and perennials to mid level shrubs and tall trees, that will provide a complex matrix to help trap particles that may stray into the

development. A significant number of new trees have been proposed across the site providing a varied canopy above ground.

Leaves with a large surface area such as on ornamental grasses and ferns are particularly effective at trapping and filtering airborne particles so these will be considered for inclusion, as well as plants with hairy/furry leaves such as Perovskia and Lavandula. Evergreen species provide filtration in the winter as well as year round interest.

Research has shown that plants that are located very close to the source of traffic-generated pollution are particularly effective, so densely planted trees and shrubs should be considered for locations close to the most-trafficked areas.

5. On-site Emissions Mitigation – Hard Measure

The proposed development will make efficient use of gas boilers to provide hot water and space heating with a LTHW system, thereby reducing emissions of NO_x to air.

The building is designed to allow future improvement to the carbon emissions by including connection points to the centralised heating plant for introduction of Low and Zero Carbon (LZC) technology and the designed heating flow temperatures have been reduced to work at operating temperatures to suit LZC technology such as heat pumps.

The Energy Statement (FS0949-CPW-ZZ-XX-RP-N-0027) is appended.

Conclusions

The proposed development has been assessed and has been agreed to have an insignificant impact on local air quality. The assessment has been undertaken with a set of conservative assumptions, meaning that the air quality impact predicted will likely be lower in reality, since the school will have phased opening, and a travel plan and other mitigation measures will be in place. The set of mitigation measures to reduce the impact on local air quality has been set out above, and are considered appropriate to the impact of the scheme.

Appendix 1: Air Quality Assessment Report

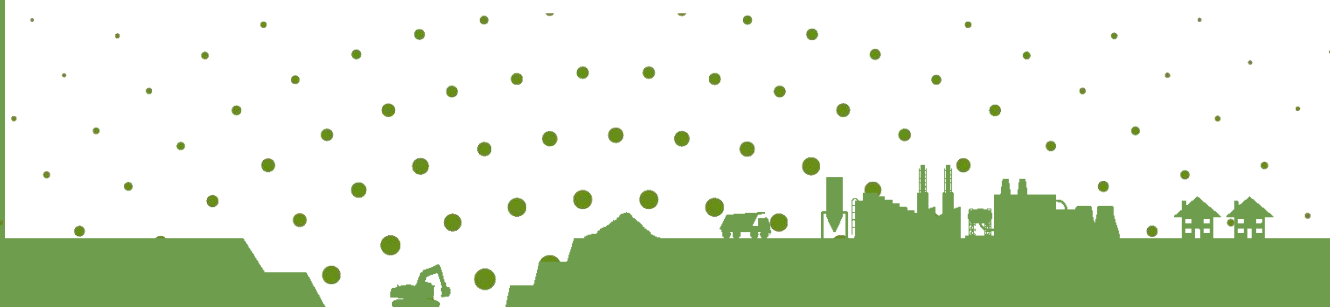


Air Quality Assessment

River Academy, Reading

May, 2022

Bowmer and Kirkland Ltd

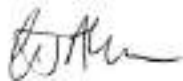


Document Control Sheet

Project Information

Title	River Academy, Reading
Job Code	ZBKRARA
Report Ref	ZBKRARA_AQA
Report Type	Air Quality Assessment
Client	Bowmer and Kirkland Ltd
Client Contact	Andy Taylor
Revision	A
Status	Final
Date of Issue	17/05/2022

Revision History

Revision	Date	Author	Reviewer	Approver	Status
A	17/05/2022	Paul Eaton	Gordon Allison	Gordon Allison	Final
					

Distribution

Organisation	Contact	Date of Issue	Copies
Bowmer and Kirkland Ltd	Andy Taylor	17/05/2022	1

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Glossary of Terms

Term	Definition
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMP	Dust Management Plan
EPUK	Environmental Protection UK
EU	European Union
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LNR	Local Nature Reserve
NAQS	National Air Quality Strategy
NO	Nitric oxide
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NRMM	Non-road Mobile Machinery
PM	Particulate Matter
Ramsar Sites	Designated Wetland
RBC	Reading Borough Council
SAC	Special Areas of Conservation
SPA	Special Protection Areas
SPG	Supplementary Planning Guidance
SSSI	Sites of Special Scientific Interest
WHO	World Health Organisation

1 Introduction

DustScanAQ have been appointed by Bowmer and Kirkland Ltd to prepare an air quality assessment in support of an application (ref: 212061) for a new school at Richfield Driving Range, Richfield Avenue, Reading, Berkshire RG1 8EQ.

The proposed River Academy project comprises: *“The demolition of existing driving range structures and the development of a new three-storey 8 form entry school for years 11 -16, including a SEND unit and 300 place 6th form (total school capacity of 1500 pupils) including the creation of a new access from Richfield Avenue, new parking area, cycle parking landscaped areas, external play areas, Multi Use Games Area (MUGA) and sporting pitches.”*

The planning application is determined by Reading Borough Council (RBC). DustScanAQ liaised with the EHO at RBC in detail over the scope of the assessment. Agreement on scope was received from the EHO by email on 28/04/2022.

The potential air quality impacts arising as a result of the proposed development are assessed using the latest planning guidance from Environmental Protection UK (EPUK), the Institute of Air Quality Management (IAQM)¹ and the Department for Environment, Food and Rural Affairs (Defra)².

1.1 Objectives

This report provides an assessment on the following key issues associated with the construction and operational phases of the proposed development:

- Nuisance, loss of amenity and health impacts associated with the construction phase of the proposed development on sensitive receptors;
- Characterisation of the baseline conditions at the site using monitored pollutant data from RBC and background concentrations from Defra background maps;
- Assessment of the suitability of air quality at the site for the proposed school;
- Assessment of the impact of the proposed development on existing sensitive receptors from transport emissions; and
- If required, make recommendations for mitigation measures.

1.2 Proposed Development Location

The proposed development is located within the jurisdiction of Reading Borough Council, school at Richfield Driving Range, Richfield Avenue, Reading, Berkshire RG1 8EQ. The location of the proposed development is shown below in Figure 1.1.

¹ IAQM (2017): ‘Land Use Planning and Development Control: Planning for Air Quality v1.2’.

² Defra (2016): ‘Local Air Quality Management – Technical Guidance (TG16)’.

The site is bounded to the north by Rivermead Park, to the east by Rivermead Park and the Rivermead Leisure Complex, to the south by Richfield Avenue, and to the west by Cow Lane and open fields.



Figure 1.1: Proposed development location

1.3 Key Pollutants

The key pollutant associated with the construction phase of the project will be 'disamenity' or 'nuisance' dust. Nitrogen dioxide (NO₂) and particulate matter (PM_{2.5} and PM₁₀) may also be associated with emissions from non-road mobile machinery (NRMM) and construction related traffic.

The key pollutants associated with the operational phase of the proposed development will be road traffic emissions including NO₂ and particulate matter (PM_{2.5} and PM₁₀). These pollutants are therefore considered as part of this assessment.

Further details of the key pollutants are presented below.

1.3.1 Nitrogen Dioxide (NO₂)

NO₂ and nitric oxide (NO) are collectively referred to as oxides of nitrogen (NO_x). During fuel combustion, atmospheric nitrogen combines with oxygen to form NO, which is not considered harmful. Through a chemical reaction with ozone (O₃), NO further combines with oxygen to create NO₂ which is harmful to human health and vegetation. The foremost sources of NO₂ in the UK are combustion activities, mainly road transport and power generation.

1.3.2 Particulate Matter

Particulate matter as a term refers to a mixture of solid particles and liquid droplets suspended in the air. These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some particles, such as dust, dirt, soot or smoke, are large or dark enough to be seen with the naked eye. Others can be so small that they can only be detected using an electron microscope. Fine dust, essentially particles up to 10 microns (µm), is commonly referred to as PM₁₀.

PM₁₀ is known to arise from a number of sources such as construction sites, road traffic movement, industrial and agricultural activities. Very fine particles (PM_{0.1} – PM_{2.5}) are known to be associated with pollutants such as NO_x and sulphur dioxide (SO₂) emitted from power plants, industrial installations and road transport sources.

PM_{2.5} is generally associated with combustion and traffic sources and is more likely to be associated with the operational phase of the proposed development.

1.3.3 Disamenity Dust

'Dust' is generally regarded as particulate matter up to 75 µm in diameter and in an environmental context can be considered in two size categories; coarser dust (particles greater than 10 µm) and fine particulate matter (PM₁₀ and PM_{2.5}) as described above.

Coarser dust (particles greater than 10 µm) is generally regarded as 'disamenity dust' and can be associated with annoyance, although there are no official standards for dust

annoyance³. Disamenity dust is more readily described than defined as it relates to the visual impact of short-lived dust clouds and the long-term soiling of surfaces.

Although it is a widespread environmental phenomenon, dust is also generated through many anthropogenic activities including materials handling, construction, demolition and vehicle use. Dust is generally produced by mechanical action on materials and is carried by moving air when there is sufficient energy in the airstream. More energy is required for dust to become airborne than for it to remain suspended.

³ Note that the expression 'nuisance dust' refers here to 'generally visible particulate matter' rather than specifically and in a legal sense to statutory nuisance, as defined in Section 79 of the Environmental Protection Act 1990.

2 Legislation, Policy and Non-Statutory Guidance

This section summarises all legislation, policy, statutory and non-statutory guidelines relevant to the proposed development. Furthermore, the latest regional and local planning policy guidance specifically applicable to the proposed development has been reviewed.

The UK left the EU on the 31st January 2020 and a new trade deal, the EU-UK Trade and Cooperation Agreement, was signed on 30th December 2020. Following exit day on the 31st January 2020, the current framework of air quality legislation was converted into domestic law through the European Union (Withdrawal) Act 2018⁴.

2.1 International (European Union)

Whilst the UK has left the EU, it is relevant to understand the source of the current UK legislation. The European Union (EU) sets legally binding limit values for outdoor air pollutants to be met by EU countries by a given date. These limit values are based on the World Health Organisation (WHO) guidelines on outdoor air pollutants. These are legally binding and set out to protect human health and the environment by avoiding, preventing or reducing harmful air pollution effects.

Directive 2008/50/EC⁵ on ambient air quality and cleaner air for Europe entered into force in June 2008. This merged the existing 'Daughter' Directives^{6,7,8,9} (apart from the fourth Daughter Directive), maintaining existing air quality objectives set out by 'Daughter' Directives for:

- Sulphur dioxide (SO₂);
- Nitrogen dioxide (NO₂);
- Oxides of nitrogen (NO_x);
- Particulate matter (PM_{2.5} and PM₁₀);
- Lead (Pb);
- Benzene(C₆H₆);
- Carbon monoxide (CO); and
- Ozone (O₃).

Directive 2008/50/EC also includes related objectives, exposure concentration obligations and exposure reduction targets for PM_{2.5} (fine particles). The 'Daughter' Directives were

⁴ European Union. (2018): <http://www.legislation.gov.uk/ukpga/2018/16/contents/enacted>

⁵ European Union. (2008), 'Ambient air quality assessment management', Framework Directive 2008/50/EC.

⁶ European Union. (1999), 'Ambient air quality assessment management', Framework Directive 1999/30/EC.

⁷ European Union. (2000), 'Ambient air quality assessment management', Framework Directive 2000/3/EC.

⁸ European Union. (2002), 'Ambient air quality assessment management', Framework Directive 2002/3/EC.

⁹ European Union. (2004), 'Ambient air quality assessment management', Framework Directive 2004/107/EC.

based upon requirements set out in the first EU Ambient Air Quality Framework Directive 96/92/EEC¹⁰.

2.2 National (England)

The 2008 EU ambient air quality directive 2008/50/EC was transposed into English law through the introduction of the Air Quality (Standards) Regulations in 2010¹¹ which also incorporated the fourth EU Daughter Directive (2004/107/EC) that set target values for certain toxic heavy metals and polycyclic aromatic hydrocarbons, (PAH).

The UK government has a responsibility to meet its own limit values, which mirror the EU limit values. Part IV of the 1995 Environment Act¹² sets guidelines for protecting air quality in the UK and forms the basis of local air quality management. The Environment Act requires local authorities in the UK to review air quality in their area periodically and designate Air Quality Management Areas (AQMA) where the objectives are not being achieved or are not likely to be achieved within the relevant period. Where an AQMA is designated, local authorities are also required to produce an 'Air Quality Action Plan' (AQAP) detailing the pollution reduction measures that need to be adopted to achieve the relevant air quality objectives within an AQMA.

As part of the Environment Act, the UK Government was required to publish a National Air Quality Strategy (NAQS) to establish the system of 'local air quality management' (LAQM) for the designation of AQMA. This led to the introduction of the first Air Quality Strategy in 1997¹³ which has since progressed through several revisions until it was replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007¹⁴. Each revision introduced strategies and regulations that considered measures for different pollutants by tightening existing objectives and also by introducing new ones to establish a common framework to protect human health and the environment by achieving ambient air quality improvements.

2.2.1 National Planning Policy Framework

The principal national planning policy guidance in respect of the proposed development is the National Planning Policy Framework (NPPF)¹⁵. The most recent update of the NPPF was published in July 2021 by the Department for Communities and Local Government (DCLG).

The NPPF 2021 contains five sections which are relevant to air quality.

¹⁰ European Union. (1996), 'Ambient air quality assessment management', Framework Directive 96/62/EC.

¹¹ Statutory Instrument. (2010), 'The Air Quality Standards Regulations', No. 1001. Queen's Printer of Acts of Parliament.

¹² Parliament of the United Kingdom. (1990), 'Environmental Protection Act', Chapter 43. Queen's Printer of Acts of Parliament.

¹³ Department for Environment Food and Rural Affairs. (1997), 'The United Kingdom National Air Quality Strategy', Cm 3587, Department for Environment Food and Rural Affairs.

¹⁴ Department for Environment Food and Rural Affairs. (2007), 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland', Cm 7169, Department for Environment Food and Rural Affairs.

¹⁵ National Planning Policy Framework. Accessible at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

Section 105 states that:

“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making.”

Section 174 (e) states that:

“preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.....”

Section 185 includes

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.: “

Section 186 states that:

“Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.”

Section 188 states that:

The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular

development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

2.2.2 National Planning Practice Guidance

The DCLG published a number of supporting web based resources of Planning Practice Guidance (PPG)¹⁶ to supplement the NPPF. With respect to air quality the PPG¹⁷ provides guidance on when air quality is relevant to a planning application. It states that:

“Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.”

The PPG also states that, when deciding whether air quality is relevant to a planning application, the applicant should consider whether the proposal will:

- *“Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield.....*
- *Introduce new point sources of air pollution.....,*
- *Expose people to harmful concentrations of air pollutants,*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.....,*
- *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value.”*

2.2.3 Relevant Air Quality Standards

A summary of the relevant AQO and where they are applicable are presented in Table 2.1 and Table 2.2 respectively. The AQO listed in Table 2.1 are only applicable at locations where a member of the public could be reasonably expected to spend the relevant averaging period. Further examples of this are presented in Table 2.2.

¹⁶ National Planning Practice Guidance web-based resource. Accessible at:
<http://planningguidance.planningportal.gov.uk/>

¹⁷ Paragraph: 005 Ref ID 32-005-20140306, revision date 01.11.2019

Table 2.1: AQO relevant to the proposed development

Pollutant	Averaging Period	AQO ($\mu\text{g}/\text{m}^3$)	Exceedance Allowance	Percentile Equivalent
Nitrogen Dioxide (NO_2)	Annual	40	-	-
	1-hour	200	18 per annum	99.8 th
Particulate Matter (as PM_{10})	Annual	40	-	-
	24-hour	50	35 per annum	90.4 th
Particulate Matter (as $\text{PM}_{2.5}$) ^(a)	Annual	20	-	-

Source: Department for Environment Food and Rural Affairs (2016): 'Local Air Quality Management Technical Guidance' (TG.16).

Table 2.2: Examples of where the AQO should apply

Averaging period	Objectives should apply at	Objectives should not apply at
Annual	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24 Hour	All locations where the annual mean objective would apply, together with hotels and gardens of residential properties ^(a) .	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1 Hour	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably have expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Note:

- (a) "Such locations should represent parts of the garden where relevant public exposure to pollutants is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would

occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied."

Source: Department for Environment Food and Rural Affairs (2016): 'Local Air Quality Management Technical Guidance' (TG.16).

2.2.4 Statutory Nuisance

It is recognised that the planning system presents a way of protecting amenity. However, in cases where planning conditions are not applicable to a development/installation, the requirements of the Environmental Protection Act 1990 still apply. Under Part III of the Environmental Protection Act 1990, local authorities have a statutory duty to investigate any complaints of:

- *"any premises in such a state as to be prejudicial to health or a nuisance*
- *smoke emitted from premises so as to be prejudicial to health or a nuisance*
- *fumes or gases emitted from premises so as to be prejudicial to health or a nuisance*
- *any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*
- *any accumulation or deposit which is prejudicial to health or a nuisance"*

Where the local authority establishes any one of these issues constitutes a statutory nuisance and believes it to be unreasonably interfering with the use or enjoyment of someone's premises and/or is prejudicial to health, an abatement notice will be served on the person responsible for the offence or the owner / occupier. Failure to comply with the notice could lead to a prosecution. However, it is considered as a defence if the best practicable means to prevent or to counteract the effects of the nuisance are employed.

2.3 Local (Reading Borough Council)

2.3.1 Reading Borough Local Plan

The Reading Borough Local Plan¹⁸, adopted on 04 November 2019, sets out planning policies for development in the borough of Reading up to the year of 2036. This document is the main consideration in the decision making for planning applications. Policy EN15: Air Quality is a specific policy which relates to air quality within RBC. EN15 states:

"Development should have regard to the need to improve air quality and reduce the effects of poor air quality.

- Development that would detrimentally affect air quality will not be permitted unless the effect is to be mitigated. The following criteria should be taken into account:*

¹⁸ Reading Borough Council, (2019). 'Reading Borough Local Plan: Adopted November 2019'.

- *Whether the proposal, including when combined with the cumulative effect of other developments already permitted, would worsen air quality;*
 - *Whether the development is within, or accessed via, an Air Quality Management Area; and*
 - *Whether it can be demonstrated that a local worsening in air quality that would not detrimentally affect human health or the environment would be offset by an overall improvement in air quality, for instance through reduction in the need to travel.*
- ii. *Where a development would introduce sensitive uses (such as residential, schools and nurseries, hospitals, care facilities) into, or intensify such uses within, an Air Quality Management Area, detrimental effects on that use will be mitigated. Mitigation measures should be detailed in any planning application. If there are significant detrimental effects that cannot be mitigated, the application should be refused.*
- iii. *Where required, planning obligations will be used to secure contributions to measures to tackle poor air quality or for air quality monitoring.”*

Policy CC9: Securing Infrastructure, also makes direct reference to air quality. CC9 includes:

“Proposals for development will not be permitted unless infrastructure, services, resources, amenities or other assets lost or impacted upon as a result of the development or made necessary by the development will be provided through direct provision or financial contributions at the appropriate time.

.....

Other measures, as follows, should also be considered where a specific need is identified and justified:

.....

Measures to tackle poor air quality or for on-going air quality monitoring....”

There are numerous further policies specific to areas within Reading which refer to air quality; these largely refer to residential development and none cover the area of the proposed development.

3 Methodology

This section sets out the approach taken to assess the potential impacts on air quality during the construction and operational phases of the proposed development.

3.1 Scope of the Assessment

The assessment is based on the following scope of work presented in Table 3.1:

Table 3.1: Scope of Work

Scope	Consideration
Spatial	The assessment considers the impact of NO₂, PM₁₀ and PM_{2.5} emissions from the local roads on the proposed development site. Impacts on air quality arising from traffic related emissions are considered unnoticeable above background concentrations beyond 200 m from the source¹⁹. Hence, this assessment only considered receptors within 200 m from a road source. The model extent was agreed with the EHO at RBC.
Temporal	The construction phase impacts resulting from the proposed development have been considered for the earliest anticipated construction year (2022). The impact of the proposed development has been considered for the earliest possible year of operation (2024).

3.2 Construction Phase

The proposed development has the potential to generate dust during the construction phase of the project. Although there are no standards (such as AQO) for dust disamenity or annoyance, various 'customs and practice' criteria have become established.

For the purposes of this assessment, IAQM's 2016 Construction Dust Risk guidance²⁰ has been used to carry out a construction dust risk assessment. The IAQM guidance provides a methodology (Appendix B) to evaluate potential risk of dust generation for a development and the level of mitigation required. The impact of the development is described using one of the following three categories: 'Low Risk', 'Medium Risk' and 'High Risk'. Based on the risk level, appropriate mitigation measures can be considered to minimise any risk of dust impacts from the construction phase.

¹⁹ Highways England (2019), Design Manual for Roads and Bridges (DMRB), LA105 Air Quality. Available at: <https://www.standardsforhighways.co.uk/dmrb/search/10191621-07df-44a3-892e-c1d5c7a28d90>

²⁰ Institute of Air Quality Management (2016): 'Guidance on the Assessment of Dust from Demolition and Construction'

3.3 Operational Phase Assessment

3.3.1 Dispersion Model Selection

The assessment on identifying the impact of current traffic related emissions sources in the area of the proposed development has been carried out using the latest version of 'ADMS-Roads' Dispersion Modelling PC based software (version 5.0.0.1) developed by Cambridge Environmental Research Consultants Ltd (CERC). This model is commonly used in planning application and regulatory assessment of traffic related emissions.

3.3.2 Modelled Scenarios

As discussed in Section 1.1, this assessment focuses upon the potential impact on existing sensitive receptors from introduced traffic emissions associated with the operation of the proposed development.

The earliest possible year of operation is 2024. It is likely that the proposed development will not be operational in full for a few years after opening, but the conservative assumption has been made for this assessment that the school will be at full capacity from day one. Based on above the following scenarios have been considered with respect to traffic emissions:

- 2019 Model Verification Year;
- 2024 Without Proposed Development;
- 2024 With Proposed Development.

According to the guidance provided by Defra in their Air Quality Strategy, vehicle emissions are expected to decrease in future years because of advances in emissions control technologies. It is also expected that more stringent emission limits will be imposed upon manufacturers.

3.3.3 Meteorological Data

The key meteorological parameters for dispersion modelling are wind speed and wind direction. Other meteorological parameters, such as cloud cover, surface temperature, precipitation rate and relative humidity are also taken into account.

For dispersion modelling, hourly-resolved data are required and reliable data for these meteorological parameters at this resolution is typically only available from the nearest civil or military aerodrome.

Based on the above, meteorological data from Heathrow Airport was used, which is located approximately 36.8 km east of the proposed development site.

In order to account for a variety of meteorological conditions, the qualitative assessment and dispersion modelling have been carried out with meteorological data from the period 2018 to 2020. Figure 3.3 below presents the wind rose for each modelling year.

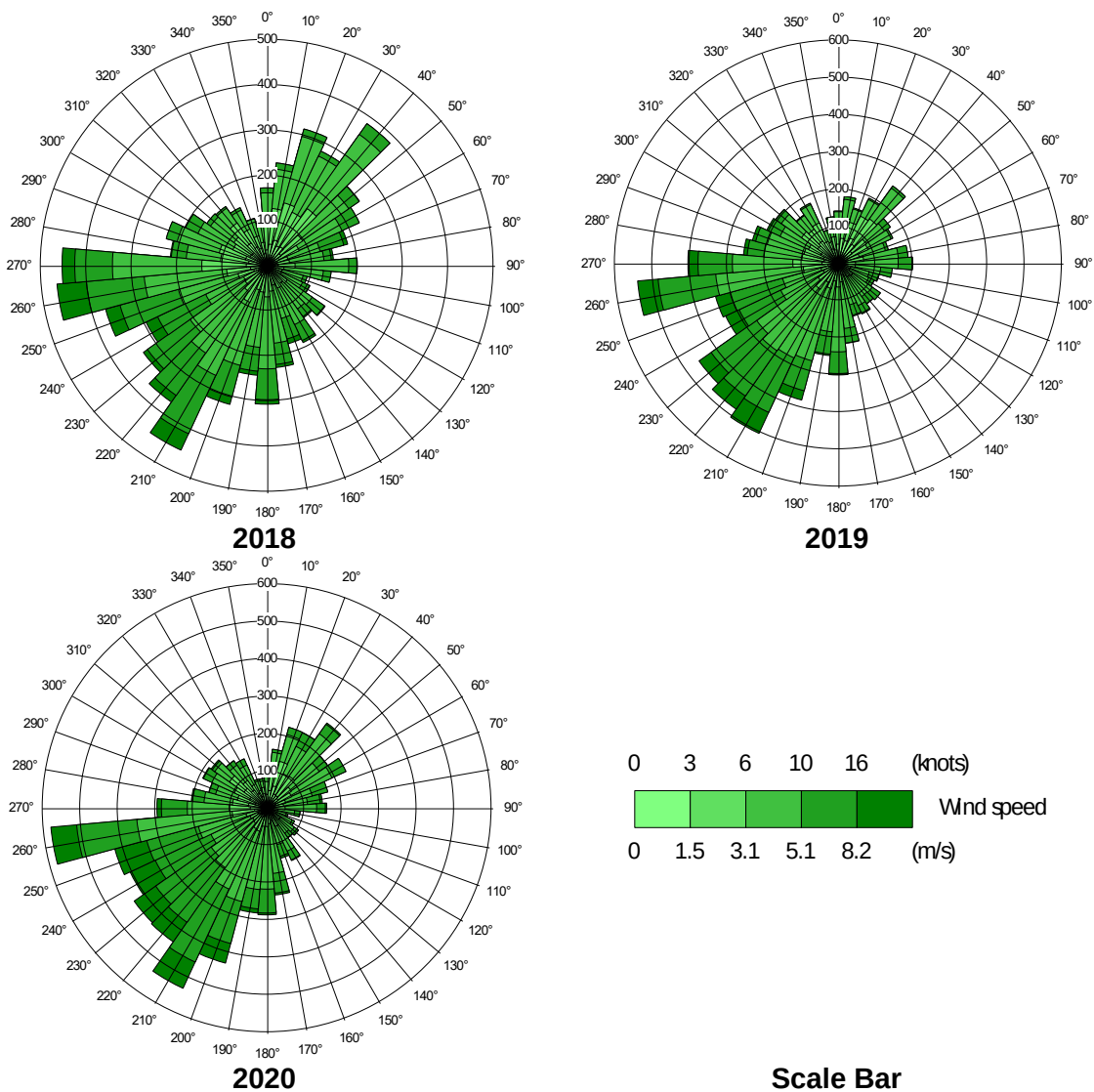


Figure 3.1: Wind roses for Heathrow Airport 2018-2020

3.3.4 Surface Roughness

The dispersion site surface roughness length (z_0) was set to 1.0 m.

The meteorological site surface roughness length (z_0) was set to 0.5 m.

3.3.5 Minimum Monin-Obukhov Length

The Minimum Monin-Obukhov Length (MMOL) provides a measure of the stability of the atmosphere.

An MMOL of 30 m (cities and large towns) was used in the dispersion modelling study to describe the modelling area. An MMOL of 100 m was used to describe the meteorological site. These values are considered appropriate for the nature of the surrounding areas.

3.3.6 Road Traffic Data

Traffic data was obtained from Hexa Consulting Ltd, the appointed transport consultant.

Road dimensions were determined from the interrogation of ordnance survey (OS) mapping sets and digital satellite images.

Vehicle speeds at 'busy' junctions were assumed to be 20 kph (defined by Defra as those with over 10,000 AADT) and vehicle speeds at minor junctions were assumed to be 10 kph below the road speed limit. Modelled links at the north of Prospect Street at the traffic light junction were modelled at 20 kph to improve model performance.

Table 3.2 shows the traffic data for the verification and Table 3.3 shows traffic data for 2024 Without Proposed Development and With Proposed Development scenarios.

Figure 3.2 shows the extent of the ADMS-Roads dispersion modelling network

Table 3.2: Verification traffic data 2019

Link	Road	Verification (2018)		
		AADT	HDV%	Speed (kph)
A	Portman Road	14440	1	48
B	Beresford Road	5234	2	48
C	Cow Lane	13347	2	48
D	Richfield Avenue (W of LC)	14094	1	48
E	Richfield Avenue (E of LC)	14929	1	48
F	Caversham Road	22109	3	48
G	Westerman Place	187	0	48
H	Roundabout (S end bridge)	18613	2	48
I	Caversham Bridge	21816	3	48
J	Church Road	11224	2	48
K	Church Street	13498	2	48
L	Prospect Street	8549	2	48
M	Peppard Road	7953	2	48
N	Henley Road	5199	2	48
O	Gosbrook Road	7154	1	48

Table 3.3: With/Without proposed development traffic data 2024

Link	Road	Without (2022)			With (2022)		
		AADT	HDV%	Speed (kph)	AADT	HDV%	Speed (kph)
A	Portman Road	15335	1	48	15545	1	48
B	Beresford Road	5558	2	48	5898	2	48
C	Cow Lane	14174	2	48	14724	2	48
D	Richfield Avenue (W of LC)	14967	1	48	15522	1	48
E	Richfield Avenue (E of LC)	15854	1	48	16179	1	48
F	Caversham Road	23478	3	48	23535	3	48
G	Westerman Place	198	0	48	198	0	48
H	Roundabout (S end bridge)	19765	2	48	19956	2	48
I	Caversham Bridge	23167	3	48	23435	3	48
J	Church Road	11918	2	48	11960	2	48
K	Church Street	14334	2	48	14560	2	48
L	Prospect Street	9078	2	48	9168	2	48
M	Peppard Road	8446	2	48	8500	2	48
N	Henley Road	5520	2	48	5556	2	48
O	Gosbrook Road	7597	1	48	7733	1	48

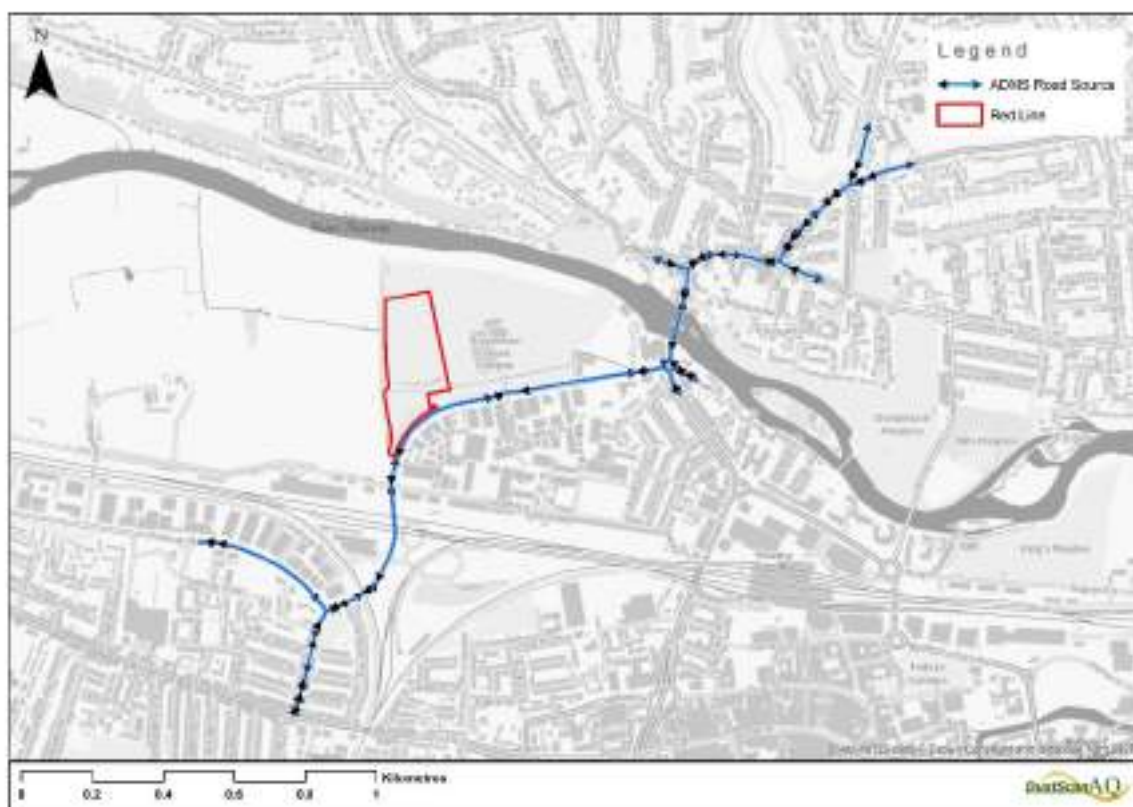


Figure 3.2: Modelled road network

3.3.7 Emission Factors

The NO_x, PM₁₀ and PM_{2.5} road source emissions are calculated from traffic flow data using the latest Defra Emission Factor Toolkit (EFT 11.0, November 2021)²¹. The EFT Version 11.0 has been developed for the UK by the National Atmospheric Emissions Inventory (NAEI) and Transport for London (TfL). The EFT is based on data collected from a number of sources including the European Environment Agency (EEA) COPERT (Computer Programme to calculate Emissions from Road Transport) emission calculator.

The earliest possible year of operation of the proposed development, 2024, has been used in the EFT.

A typical national 7-day diurnal profile derived from available DfT data has also been incorporated in the model, with the profile shown below in Figure 3.3. This profile has been applied to the base traffic on all links. A custom time varying emissions file was created for the generated traffic in the With Proposed Scheme 2024 scenario: further details can be found in Appendix D.

²¹ <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/>

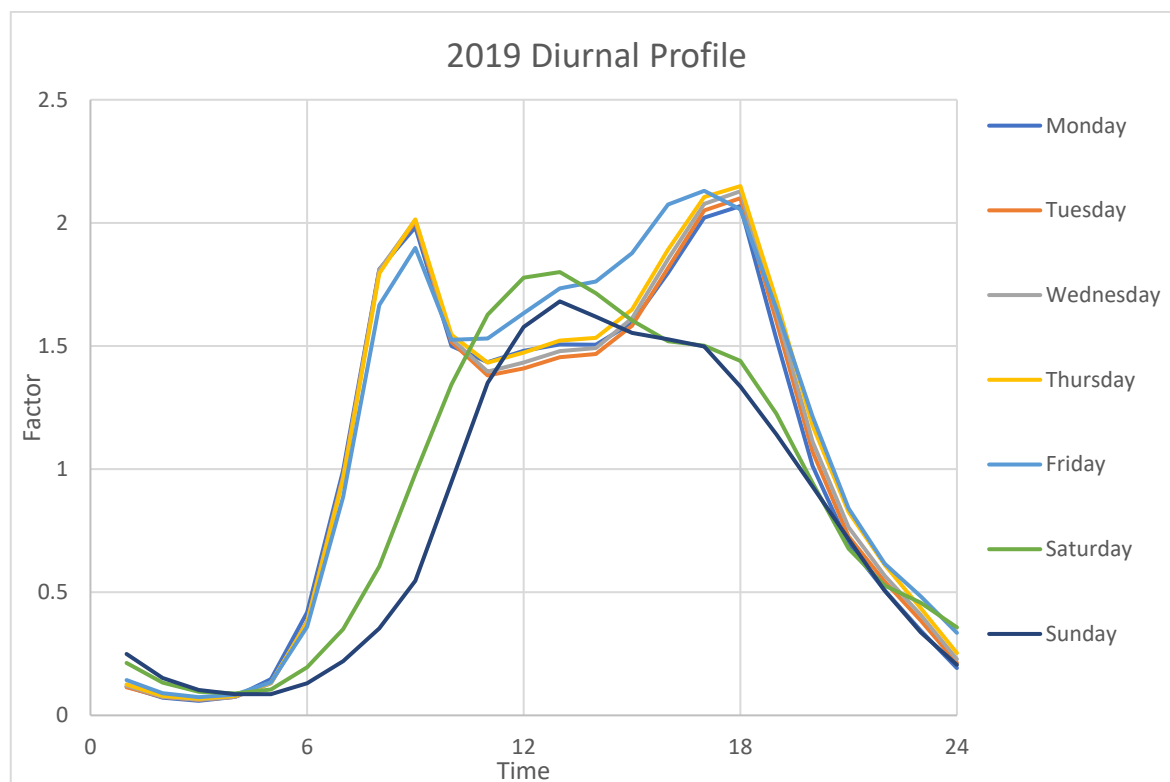


Figure 3.3: 7-Day Diurnal traffic profile based on DfT 2019 traffic data

3.3.8 Advanced Street Canyons

The advanced street canyon function in ADMS-Roads has been used in this assessment for the modelling of Prospect Street.

3.3.9 NO_x to NO₂ Relationship

As discussed in Section 1.3.1, emissions of NO_x will comprise contributions from both NO and NO₂. This assessment uses the latest NO_x to NO₂ conversion factor toolkit (Version 8.1 released August 2020), provided by Defra as a Microsoft Excel based calculation tool which is available from Defra's website²². This method is considered the most appropriate technique of determining NO₂ concentrations from road NO_x contributions.

3.3.10 Modelled Receptors

Worst-case human health receptors have been considered within this assessment to carry out a comparison against the AQO.

Local Air Quality Management (LAQM) guidance clarifies where likely exceedances of the objectives should be assessed and states that Review and Assessment should focus on: *"Locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the relevant air quality"*

²² Department for Environment Food and Rural Affairs. NO_x to NO₂ Calculator, available at: <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/>

objective"²³. The receptors most likely to experience the greatest change in pollution concentrations from the proposed scheme were selected based on professional judgement.

Modelled receptors are detailed below in Table 3.4 and shown in Figure 3.4 - Figure 3.6.

Table 3.4: Modelled receptor details

Receptor ID	X (m)	Y (m)	Z (m)
R1	470079.53	173509.69	1.5
R2	470091.28	173549.70	1.5
R3	470084.47	173574.62	1.5
R4	470093.09	173609.84	1.5
R5	470116.81	173650.70	1.5
R6	470126.34	173692.83	1.5
R7	470134.16	173796.75	1.5
R8	470037.22	173885.66	1.5
R9	470242.91	173818.34	1.5
R10	470991.94	174442.69	1.5
R11	471179.50	174648.78	1.5
R12	471160.97	174685.05	4.5
R13	471188.56	174745.16	4.5
R14	471123.56	174788.12	4.5
R15	471282.81	174789.19	4.5
R16	471442.59	174804.19	4.5
R17	471474.72	174835.44	4.5
R18	471502.16	174887.27	1.5
R19	471514.12	174899.97	1.5
R20	471534.97	174921.03	1.5
R21	471560.81	174946.73	1.5
R22	471577.56	174963.23	1.5
R23	471567.69	174936.05	1.5
R24	471587.88	174955.62	1.5
R25	471597.00	174964.20	1.5
R26	471606.72	174971.61	1.5

²³ Department for Environment, Food and Rural Affairs (2016), Local Air Quality Management – Technical Guidance (16)

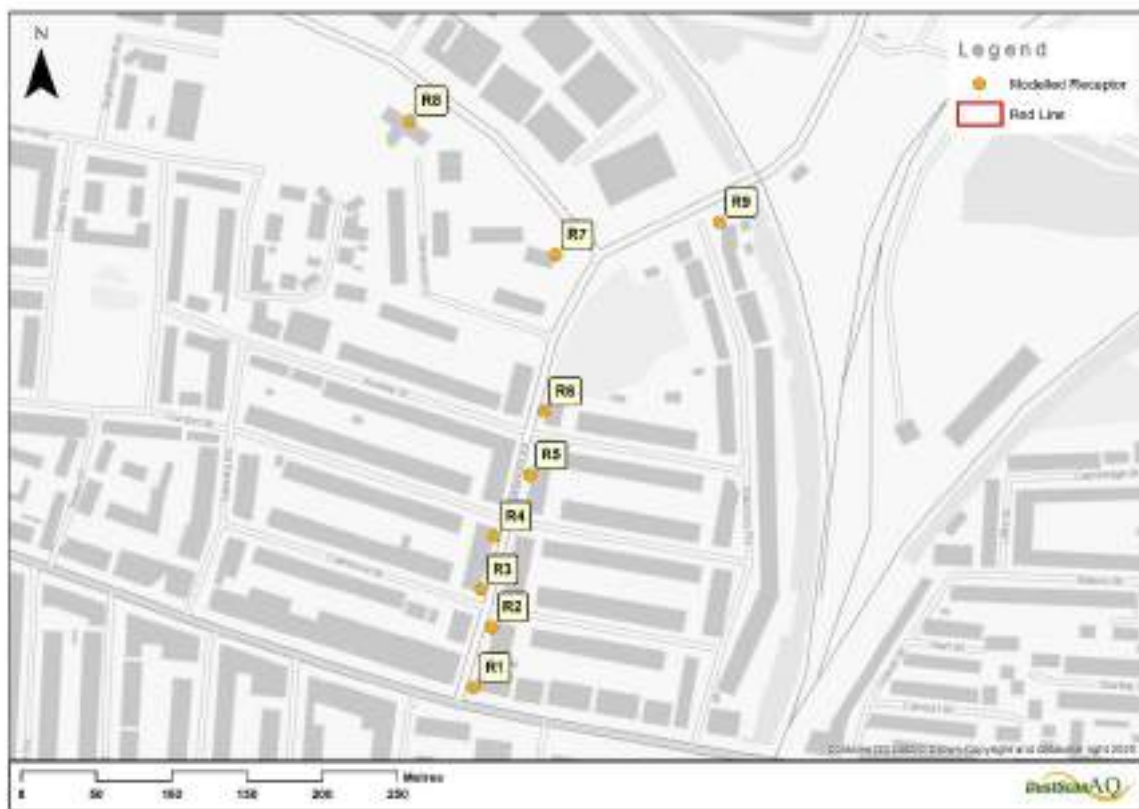


Figure 3.4: Modelled Receptors - Beresford Road

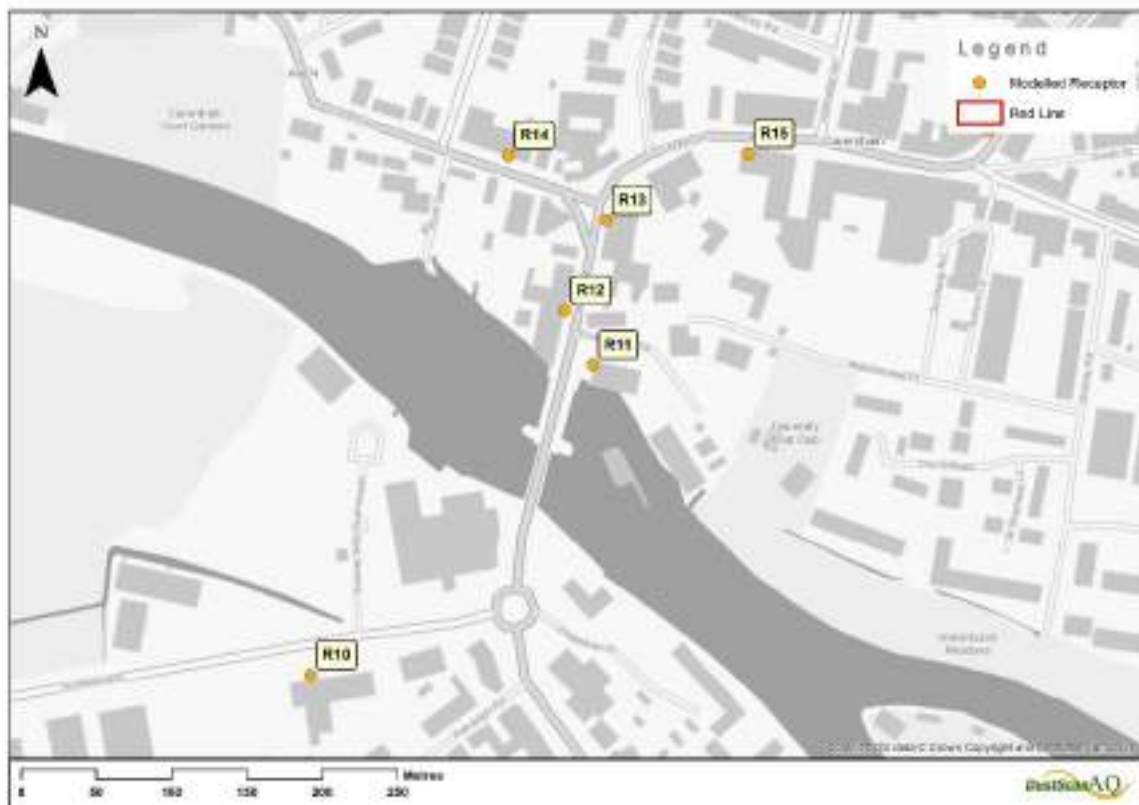


Figure 3.5: Modelled Receptors – Caversham Bridge

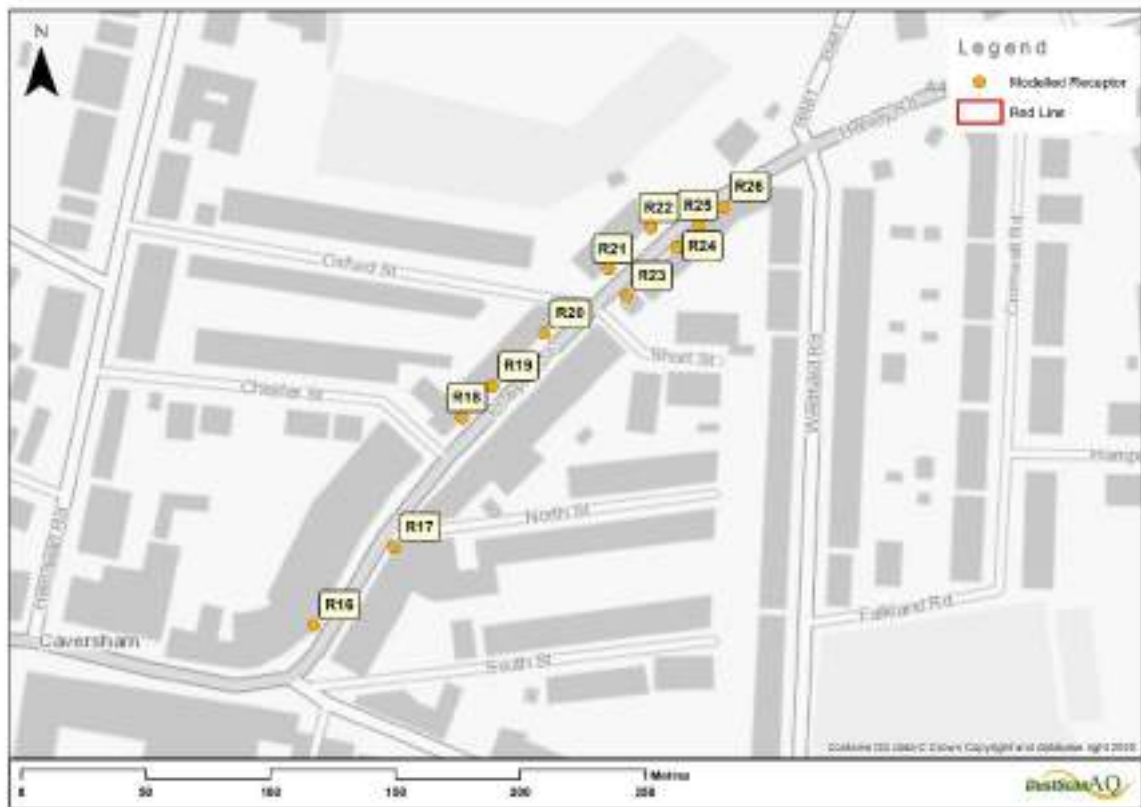


Figure 3.6: Modelled Receptors - Prospect Street

3.3.11 Estimating Hourly and Daily Mean Concentrations

The latest Local Air Quality Management (LAQM) Technical Guidance TG (16) has been used for predicting 1 hourly and 24-hourly pollutant concentrations.

The guidance states that the one hour mean NO₂ AQO of 200 µg/m³ is not likely to be exceeded at any roadside locations if the annual mean concentration is below 60 µg/m³. Based on this guidance, the hourly mean NO₂ AQO is only considered when the annual mean NO₂ concentrations are over 60 µg/m³.

In accordance with the guidance, the short term 24 hourly PM₁₀ mean concentration can be calculated using the following equation as presented below:

$$\text{Number of 24 hour mean exceedences} = 18.5 + 0.145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}} \right)$$

3.3.12 Significance Criteria

For the purposes of this assessment, the IAQM and EPUK (2017) criteria have been used for calculating the magnitude descriptors for predicted change in annual mean concentrations at individual receptors (Table 3.5). The IAQM recognise that professional judgement is required in the interpretation of air quality assessment significance. Table 3.5 is intended to be used as a tool to assist with interpretation of the air quality assessment.

Table 3.5: Impact descriptors for predicted change in annual mean concentrations at individual receptors (Reproduced from EPUK and IAQM Guidance)

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

- Notes:
- ¹ AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
 - ² The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The numbers are treated with their likely accuracy in order to avoid assumption of false level of precision. For example, Changes of 0%, i.e. less than 0.5% will be described as Negligible.
 - ³ The Table is only designed to be used with annual mean concentrations.
 - ⁴ Descriptors are used for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
 - ⁵ When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.

3.3.13 Modelling Assumptions and Uncertainties

Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Uncertainties regarding vehicle emissions;
- Data uncertainty due to errors in input data, emission estimates, operational procedures, land use characteristics and meteorology;
- Uncertainties with recorded meteorological data; and
- Simplifications made in the model algorithms or post processing of the data that describe atmospheric dispersion or chemical reactions.

Model verification for transport emissions, a two-stage process, is therefore applied. First, modelled concentrations are compared with monitored concentrations to identify any disparity. Where disparity occurs, the model inputs are revisited to identify any potential errors or opportunity for improvement of the model. Second, where disparity remains following the first stage, model results can be adjusted to account for systematic bias. Further details of the second stage of the model verification carried out for this assessment are presented within Appendix C.

Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- Choice of model - ADMS-Roads is a widely used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Emission rates –For transport emissions, emissions have been calculated using Defra's Emission Factor Toolkit based upon traffic data from the DfT and an appointed transport consultant. A year of 2024 has been used in the EFT;
- Receptor locations – Worst-case human health receptors along routes impacted by the proposed development have been modelled;
- Defra background concentrations – 2022 Defra backgrounds have been used, assuming no improvement in background conditions between now and the earlier possible year of opening.

4 Baseline Conditions

The following section sets out the baseline conditions in relation to air quality at the proposed development site. For the purpose of this assessment, data has been obtained from the RBC Annual Status Report for 2020²⁴ (ASR) and the Defra air quality resource website²⁵.

4.1 Existing Baseline Conditions (AQMA)

The southern portion of the proposed development, and the roads via which development traffic will disperse, are within the Reading AQMA. The Reading AQMA was declared on 19/08/2009 for exceedance of the NO₂ annual mean objective.

4.2 RBC Automatic Monitoring

RBC undertook automatic monitoring at three sites during 2019. None of these locations are representative of air quality at the site of the proposed development, or lie along the route of the modelled network.

²⁴ Reading Borough Council (2020). '2020 Air Quality Annual Status Report (ASR)'.

²⁵ Department for Environmental Food and Rural Affairs. Accessible at: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

4.3 RBC Non-Automatic (Diffusion Tube) Monitoring

RBC monitored NO₂ using diffusion tubes at 60 sites across its jurisdiction in 2019. Figure 4.1 shows the locations of the three monitoring locations within 500 m of the proposed development site.

Table 4.1 presents the results for the three RBC diffusion tubes outlined above. The NO₂ concentrations presented are for the latest three years of data available from RBC.

Table 4.1: RBC Diffusion Tube Monitoring Annual Mean Concentrations (µg/m³)

Site ID	Site Classification	Annual Mean NO ₂ Concentration (µg/m ³)		
		2017	2018	2019
DT29	Kerbside	33	29	34
DT44	Roadside	30	28	22
DT45	Roadside	28	23	19

Notes: Exceedance of the NO₂ annual mean AQO of 40 µg.m³ are shown in **bold**. NO₂ annual means in excess of 60 µg.m³, indicating a potential exceedance of the NO₂ hourly mean AQS objective are shown in **bold and underlined**. Means have been "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%.

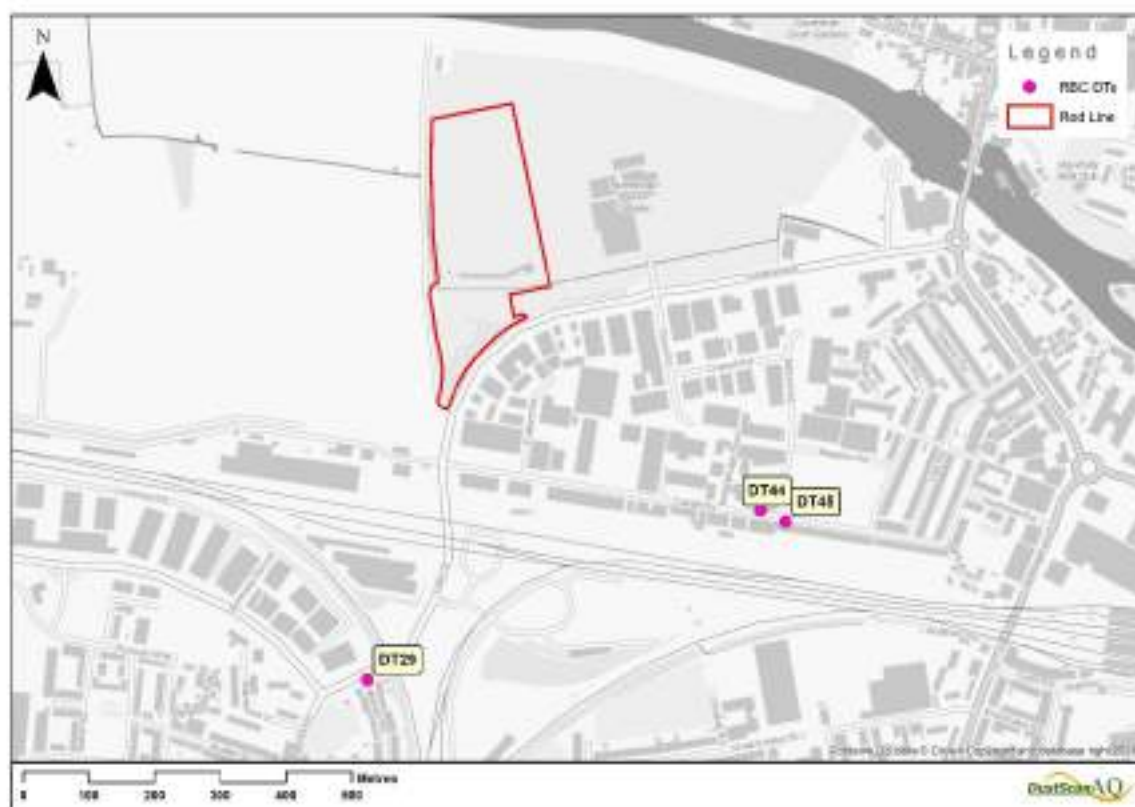


Figure 4.1: RBC Diffusion Tube Locations

4.4 DustScanAQ Diffusion Tube Monitoring

DustScanAQ carried out three months of diffusion tube monitoring at the site of the proposed development between 19/10/2021 and 18/01/2022. The locations of the monitoring sites are shown below in Figure 4.2. The processed results of the survey are presented in Table 4.2. The results of the DustScanAQ monitoring survey show that the site of the proposed development is suitable for the introduction of new high sensitivity human health receptors. Full details of the survey can be found in the appended monitoring report in Appendix E.



Figure 4.2: DustScanAQ Diffusion Tube Sites

Table 4.2: DustScanAQ Diffusion Tube Monitoring Results

Site ID	NO ₂ Concentration (µg/m ³)		
	Monitoring Period	2021 Annualised	2021 Annualised and Bias Adjusted
1	14.4	12.8	13.8
2	17.4	15.5	16.8
3	17.6	15.7	17.0

4.5 Defra Modelled Background Pollution Concentrations

Defra provides background pollution concentration estimates to assist local authorities in undertaking their 'Review and Assessment' work. This data is available to download from the Defra air quality resource website for NO_x, NO₂, PM₁₀ and PM_{2.5} for every 1 km X 1 km grid square for all local authorities. The current dataset is based on 2018 background data and future year projections are available for 2018 to 2030. The background dataset provides breakdown of pollution concentrations by different sources (both road and non-road sources).

Table 4.3 presents the predicted background concentrations for 2022 for the location of each modelled receptor. These figures have been used in the processing of modelled results, making the conservative assumption that ambient air quality conditions will not improve.

Table 4.3: Defra Projected Background Concentrations (for proposed development) (µg/m³)

Year	Receptor	Annual Mean Concentration (µg/m ³)		
		NO ₂	PM ₁₀	PM _{2.5}
2022	R1	20.07	16.65	11.58
2022	R2	20.07	16.65	11.58
2022	R3	20.07	16.65	11.58
2022	R4	20.07	16.65	11.58
2022	R5	20.07	16.65	11.58
2022	R6	20.07	16.65	11.58
2022	R7	20.07	16.65	11.58
2022	R8	20.07	16.65	11.58
2022	R9	20.07	16.65	11.58
2022	R10	16.93	14.81	10.22
2022	R11	20.71	16.87	11.98
2022	R12	20.71	16.87	11.98
2022	R13	20.71	16.87	11.98
2022	R14	20.71	16.87	11.98
2022	R15	20.71	16.87	11.98
2022	R16	20.71	16.87	11.98
2022	R17	20.71	16.87	11.98
2022	R18	20.71	16.87	11.98
2022	R19	20.71	16.87	11.98
2022	R20	20.71	16.87	11.98
2022	R21	20.71	16.87	11.98

Year	Receptor	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		
		NO ₂	PM ₁₀	PM _{2.5}
2022	R22	20.71	16.87	11.98
2022	R23	20.71	16.87	11.98
2022	R24	20.71	16.87	11.98
2022	R25	20.71	16.87	11.98
2022	R26	20.71	16.87	11.98

Note: Data presented within the table are derived from the following ordinance survey grid squares: 470500,173500; 470500,174500; 471500,174500.

4.6 Summary of Baseline Conditions

This assessment makes the conservative assumption that background air quality will not improve and therefore, 2022 background concentrations have been used throughout the assessment, representing a worst case.

5 Potential Impacts

5.1 Construction Phase

The earliest construction year is likely to be 2022, subject to planning. Impacts from demolition, earthworks construction and trackout have all been considered. To assess the worst-case scenario, it has been assumed that all activities will be carried out for the duration of the construction period. Figure 5.1 shows the construction dust assessment study area for earthworks based on the recommended distances by IAQM. Phases of construction have been considered separately with respect to their distance to sensitive receptors due to their different extents.



Figure 5.1: Risk buffer for earthworks

Magnitude and sensitivity descriptors that have been applied to assess the overall impact of the construction phase are presented in Appendix B.

The existing single storey structure will be demolished. The associated dust emission magnitude for demolition is expected to be 'Small'.

The dust emission magnitude for earthworks is expected to be 'Large', with the total site area approximately 54,325 m².

The dust emission magnitude for construction is expected to be 'Medium', with the total building volume expected to be approximately than 44,970 m³.

It is anticipated that the outward daily peak HGV movements could be greater than 10 per day, therefore the dust emission magnitude for trackout has been assigned as 'Medium'.

There are no ecological receptors within 50 m of the site, therefore the risk of construction dust impacts on ecological receptors are considered to be negligible and are not considered further within the construction dust risk assessment.

Table 5.1: Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction	Medium
Trackout	Medium

It is considered that the nearby receptors have a 'Medium' sensitivity to dust soiling and human health impacts. Table 5.2 presents the sensitivity of the surrounding area to effects caused by construction activities and is based on the criteria presented in Appendix B.

Table 5.2: Sensitivity of Study Area

Potential Impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low	Medium
Human Health	Low	Low	Low	Low

The overall risk of dust soiling and human health impacts to medium sensitivity receptors are presented in Table 5.3. The risk is based on the criteria presented in Appendix B.

Table 5.3: Summary of the Risk of Construction Dust Effects

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	Low Risk	Low Risk	Low Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk

Based upon the above, the highest risk with respect to dust soiling is 'Low'. With respect to human health impacts the risk is no greater than 'Low'.

Mitigation measures appropriate for the proposed development are presented in Section 6, Table 6.1.

The mitigation measures set out in Section 6 are from IAQM's 2016 guidance for construction dust and are appropriate for the mitigation of the risk determined. The points below can be formally adopted into a construction dust management plan.

5.2 Operational Phase

The below sections detail the results of the modelling study.

Table 5.4 presents modelled NO₂, PM₁₀ and PM_{2.5} concentrations from both the 2024 Without Proposed Scheme and With Proposed Scheme scenarios for all modelled receptors.

Table 5.4: Modelled NO₂, PM₁₀ and PM_{2.5} Concentrations in 2024 without and with proposed scheme

Receptor ID	Without proposed scheme (2024)				With proposed scheme (2024)			
	Annual Mean (µg/m ³)			No. of exceedances of 24-hour mean PM ₁₀ AQO	Annual Mean (µg/m ³)			No. of exceedances of 24-hour mean PM ₁₀ AQO
	NO ₂	PM ₁₀	PM _{2.5}		NO ₂	PM ₁₀	PM _{2.5}	
R1	22.8	17.5	12.0	1	22.9	17.5	12.1	1
R2	23.4	17.7	12.2	1	23.5	17.8	12.2	1
R3	22.7	17.5	12.0	1	22.7	17.5	12.1	1
R4	22.6	17.5	12.0	1	22.7	17.5	12.0	1
R5	23.9	17.9	12.3	1	24.0	17.9	12.3	1
R6	24.3	18.0	12.3	1	24.4	18.0	12.4	1
R7	23.7	17.7	12.1	1	23.7	17.7	12.2	1
R8	22.5	17.4	12.0	1	22.5	17.4	12.0	1
R9	25.1	18.2	12.4	2	25.1	18.2	12.5	2
R10	20.8	16.0	10.9	0	20.9	16.0	10.9	0
R11	27.9	19.2	13.3	2	28.0	19.2	13.3	2
R12	26.3	18.6	13.0	2	26.4	18.6	13.0	2
R13	29.7	19.2	13.3	2	29.8	19.2	13.3	3

Receptor ID	Without proposed scheme (2024)				With proposed scheme (2024)			
	Annual Mean (µg/m ³)			No. of exceedances of 24-hour mean PM ₁₀ AQO	Annual Mean (µg/m ³)			No. of exceedances of 24-hour mean PM ₁₀ AQO
	NO ₂	PM ₁₀	PM _{2.5}		NO ₂	PM ₁₀	PM _{2.5}	
R14	23.9	17.8	12.5	1	23.9	17.8	12.5	1
R15	24.8	18.1	12.7	1	24.9	18.1	12.7	1
R16	34.5	21.1	14.3	5	34.6	21.1	14.4	5
R17	31.3	20.1	13.8	4	31.3	20.1	13.8	4
R18	32.6	20.8	14.2	4	32.7	20.8	14.2	4
R19	32.4	20.7	14.1	4	32.4	20.7	14.1	4
R20	32.7	20.8	14.2	5	32.8	20.9	14.2	5
R21	34.7	21.5	14.6	6	34.8	21.5	14.6	6
R22	34.5	21.4	14.5	5	34.6	21.4	14.5	5
R23	34.8	21.6	14.6	6	34.9	21.6	14.6	6
R24	34.7	21.4	14.5	5	34.8	21.5	14.5	5
R25	34.0	20.2	13.9	4	34.1	20.2	13.9	4
R26	35.6	20.6	14.1	4	35.6	20.6	14.1	4
Corresponding AQO	40	40	25	35	40	40	25	35

Note: Exceedances of annual mean objective highlighted in Bold

From the above Table 5.4, it can be determined that modelled concentrations for all pollutants are comfortable below their respective AQO for all receptors. This demonstrates that the operation of the proposed development will not significantly impact air quality at existing sensitive human health receptors.

According to Defra LAQM.TG (16) guidance, exceedance of the one-hour NO₂ mean objective is generally unlikely to occur where annual mean concentrations do not exceed

60 $\mu\text{g}/\text{m}^3$. The annual mean NO_2 concentration at all receptors falls comfortably below 60 $\mu\text{g}/\text{m}^3$ in the With Proposed Development scenario. Therefore, exceedances of the one-hour NO_2 mean are unlikely to occur at existing residential receptors.

It should be noted that results presented in this section are the maximum forecast over a three-year modelling period combined with 2022 ambient concentrations, thus representative of a conservative approach.

Significance of impact has been determined for NO_2 , PM_{10} and $\text{PM}_{2.5}$ using the impact descriptors matrix illustrated in Table 3.5. The significance of the impact of the proposed development on local air quality is presented below in Table 5.5, Table 5.6, and Table 5.7 respectively

Table 5.5: NO_2 Annual Mean Concentration Changes and Associated Impact at Modelled Receptors in 2024

Receptor ID	Predicted Annual Mean NO_2 Concentration ($\mu\text{g}/\text{m}^3$)	Long Term Average Concentration at Receptor	Pollutant Concentration Change ($\mu\text{g}/\text{m}^3$)	% Change Relative to AQAL	Impact Descriptor
R1	22.9	75% or less of AQAL	0.09	<0.5	Negligible
R2	23.5	75% or less of AQAL	0.10	<0.5	Negligible
R3	22.7	75% or less of AQAL	0.07	<0.5	Negligible
R4	22.7	75% or less of AQAL	0.07	<0.5	Negligible
R5	24.0	75% or less of AQAL	0.12	<0.5	Negligible
R6	24.4	75% or less of AQAL	0.13	<0.5	Negligible
R7	23.7	75% or less of AQAL	0.05	<0.5	Negligible
R8	22.5	75% or less of AQAL	0.02	<0.5	Negligible
R9	25.1	75% or less of AQAL	0.09	<0.5	Negligible
R10	20.9	75% or less of AQAL	0.03	<0.5	Negligible
R11	28.0	75% or less of AQAL	0.05	<0.5	Negligible

Receptor ID	Predicted Annual Mean NO ₂ Concentration (µg/m ³)	Long Term Average Concentration at Receptor	Pollutant Concentration Change (µg/m ³)	% Change Relative to AQAL	Impact Descriptor
R12	26.4	75% or less of AQAL	0.03	<0.5	Negligible
R13	29.8	75% or less of AQAL	0.05	<0.5	Negligible
R14	23.9	75% or less of AQAL	0.01	<0.5	Negligible
R15	24.9	75% or less of AQAL	0.03	<0.5	Negligible
R16	34.6	76-94% of AQAL	0.07	<0.5	Negligible
R17	31.3	76-94% of AQAL	0.05	<0.5	Negligible
R18	32.7	76-94% of AQAL	0.06	<0.5	Negligible
R19	32.4	76-94% of AQAL	0.06	<0.5	Negligible
R20	32.8	76-94% of AQAL	0.06	<0.5	Negligible
R21	34.8	76-94% of AQAL	0.07	<0.5	Negligible
R22	34.6	76-94% of AQAL	0.07	<0.5	Negligible
R23	34.9	76-94% of AQAL	0.07	<0.5	Negligible
R24	34.8	76-94% of AQAL	0.07	<0.5	Negligible
R25	34.1	76-94% of AQAL	0.06	<0.5	Negligible
R26	35.6	76-94% of AQAL	0.07	<0.5	Negligible

Table 5.6: PM₁₀ Annual Mean Concentration Changes and Associated Impact at Modelled Receptors in 2024

Receptor ID	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)	Long Term Average Concentration at Receptor	Pollutant Concentration Change (µg/m ³)	% Change Relative to AQAL	Impact Descriptor
R1	17.5	75% or less of AQAL	0.03	<0.5	Negligible
R2	17.8	75% or less of AQAL	0.03	<0.5	Negligible
R3	17.5	75% or less of AQAL	0.02	<0.5	Negligible
R4	17.5	75% or less of AQAL	0.02	<0.5	Negligible
R5	17.9	75% or less of AQAL	0.04	<0.5	Negligible
R6	18.0	75% or less of AQAL	0.04	<0.5	Negligible
R7	17.7	75% or less of AQAL	0.01	<0.5	Negligible
R8	17.4	75% or less of AQAL	0.01	<0.5	Negligible
R9	18.2	75% or less of AQAL	0.03	<0.5	Negligible
R10	16.0	75% or less of AQAL	0.01	<0.5	Negligible
R11	19.2	75% or less of AQAL	0.01	<0.5	Negligible
R12	18.6	75% or less of AQAL	0.01	<0.5	Negligible
R13	19.2	75% or less of AQAL	0.01	<0.5	Negligible
R14	17.8	75% or less of AQAL	0.00	<0.5	Negligible
R15	18.1	75% or less of AQAL	0.01	<0.5	Negligible
R16	21.1	75% or less of AQAL	0.02	<0.5	Negligible
R17	20.1	75% or less of AQAL	0.02	<0.5	Negligible

Receptor ID	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)	Long Term Average Concentration at Receptor	Pollutant Concentration Change (µg/m ³)	% Change Relative to AQAL	Impact Descriptor
R18	20.8	75% or less of AQAL	0.02	<0.5	Negligible
R19	20.7	75% or less of AQAL	0.02	<0.5	Negligible
R20	20.9	75% or less of AQAL	0.02	<0.5	Negligible
R21	21.5	75% or less of AQAL	0.02	<0.5	Negligible
R22	21.4	75% or less of AQAL	0.02	<0.5	Negligible
R23	21.6	75% or less of AQAL	0.02	<0.5	Negligible
R24	21.5	75% or less of AQAL	0.02	<0.5	Negligible
R25	20.2	75% or less of AQAL	0.02	<0.5	Negligible
R26	20.6	75% or less of AQAL	0.02	<0.5	Negligible

Table 5.7: PM_{2.5} Annual Mean Concentration Changes and Associated Impact at Modelled Receptors in 2024

Receptor ID	Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)	Long Term Average Concentration at Receptor	Pollutant Concentration Change (µg/m ³)	% Change Relative to AQAL	Impact Descriptor
R1	12.1	75% or less of AQAL	0.01	<0.5	Negligible
R2	12.2	75% or less of AQAL	0.02	<0.5	Negligible
R3	12.1	75% or less of AQAL	0.01	<0.5	Negligible
R4	12.0	75% or less of AQAL	0.01	<0.5	Negligible
R5	12.3	75% or less of AQAL	0.02	<0.5	Negligible

Receptor ID	Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)	Long Term Average Concentration at Receptor	Pollutant Concentration Change (µg/m ³)	% Change Relative to AQAL	Impact Descriptor
R6	12.4	75% or less of AQAL	0.02	<0.5	Negligible
R7	12.2	75% or less of AQAL	0.01	<0.5	Negligible
R8	12.0	75% or less of AQAL	0.00	<0.5	Negligible
R9	12.5	75% or less of AQAL	0.02	<0.5	Negligible
R10	10.9	75% or less of AQAL	0.01	<0.5	Negligible
R11	13.3	75% or less of AQAL	0.01	<0.5	Negligible
R12	13.0	75% or less of AQAL	0.01	<0.5	Negligible
R13	13.3	75% or less of AQAL	0.01	<0.5	Negligible
R14	12.5	75% or less of AQAL	0.00	<0.5	Negligible
R15	12.7	75% or less of AQAL	0.01	<0.5	Negligible
R16	14.4	75% or less of AQAL	0.01	<0.5	Negligible
R17	13.8	75% or less of AQAL	0.01	<0.5	Negligible
R18	14.2	75% or less of AQAL	0.01	<0.5	Negligible
R19	14.1	75% or less of AQAL	0.01	<0.5	Negligible
R20	14.2	75% or less of AQAL	0.01	<0.5	Negligible
R21	14.6	75% or less of AQAL	0.01	<0.5	Negligible
R22	14.5	75% or less of AQAL	0.01	<0.5	Negligible
R23	14.6	75% or less of AQAL	0.01	<0.5	Negligible

Receptor ID	Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)	Long Term Average Concentration at Receptor	Pollutant Concentration Change (µg/m ³)	% Change Relative to AQAL	Impact Descriptor
R24	14.5	75% or less of AQAL	0.01	<0.5	Negligible
R25	13.9	75% or less of AQAL	0.01	<0.5	Negligible
R26	14.1	75% or less of AQAL	0.01	<0.5	Negligible

The above tables demonstrate that the proposed development will have no significant adverse impact on local air quality.

6 Mitigation Measures

6.1 Construction Phase

Construction phase mitigation measures are provided below in Table 6.1 based upon the construction dust risk assessment presented in section 5.1.

Table 6.1: Construction Phase Mitigation Measures

Mitigation Measures
Site management
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
Display the head or regional office contact information.
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
Make the complaints log available to the local authority when asked.
Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Preparing and maintaining the site
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
Avoid site runoff of water or mud.
Keep site fencing, barriers and scaffolding clean using wet methods.
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicle/machinery and sustainable travel
Ensure all vehicles switch off engines when stationary - no idling vehicles.

Mitigation Measures
Avoid the use of diesel- or petrol- powered generators and use mains electricity or battery powered equipment where practicable.
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un- surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Operations
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
Use enclosed chutes and conveyors and covered skips.
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management
Avoid bonfires and burning of waste materials.
Measures Specific to Construction
Avoid scabbling (roughening of concrete surfaces) if possible.
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Measures Specific to Trackout
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Record all inspections of haul routes and any subsequent action in a site log book.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

Following the implementation of these mitigation measures, the impacts from the construction phase of the proposed development on dust soiling and human health are considered to be not significant.

6.2 Operational Phase

The proposed development will implement a travel plan with the aim of reducing vehicle journeys to and from the school. The proposed development will also include eight car parking spaces with active EV charging provision, with passive provision provided for a further eight spaces.

7 Conclusion

This report provides an assessment of air quality impacts associated with the construction and operation of the proposed development at Richfield Driving Range, Richfield Avenue, Reading, Berkshire RG1 8EQ. The report includes:

- Nuisance, loss of amenity and health impacts associated with the construction phase of the proposed development on sensitive receptors;
- Characterisation of the baseline conditions at the site using monitored pollutant data from RBC and background concentrations from Defra background maps;
- Assessment of the suitability of air quality at the site for the proposed school;
- Assessment of the impact of the proposed development on existing sensitive receptors from transport emissions; and
- If required, make recommendations for mitigation measures.

An assessment of the construction and operational air quality impact has been undertaken for the proposed development.

A qualitative assessment of the construction phase activities has been carried out. The largest risk of these activities with respect to dust soiling was considered to be 'Low', while that towards human health was also considered to be 'Low'. Following proper implementation of the mitigation measures recommended in Section 6.1, the impact of emissions during construction of the proposed development are likely to be 'Negligible' and therefore 'Not Significant'.

The modelling work undertaken as part of this assessment has assumed a conservative scenario with regards to ambient concentrations, in that there is no reduction in ambient concentrations from 2022 onwards. In reality, ambient concentrations are expected to improve.

This assessment considered transport emissions associated with the proposed development for the earliest year of operation (2024). The annual mean and one hour mean NO₂ objectives are forecast to be met at all modelled receptors. The PM₁₀ and PM_{2.5} concentrations are also forecast to meet their respective long and short term AQO by a considerable margin at all modelled receptors.

The air quality impact will be negligible. The proposed development will not result in a significant negative effect on local air quality.

Diffusion tube monitoring carried out by DustScanAQ shows that ambient air quality conditions at the site of the proposed development are suitable for the introduction of new sensitive human health receptors.

It can therefore be concluded that the proposed development is not considered to conflict with national, regional and local air quality planning guidance because it does not result in significant negative impact on air quality.

Appendix A: Operational Impact Assessment

Methodology

The EPUK & IAQM guidance refers to the Town and Country Planning (Development Management Procedure) Order (England) 2010 [(Wales) 2012] for a definition of a 'major' development when scoping assessments required for the planning process. Based on the guidance, a 'major' development is such development where:

- The number of dwellings is 10 or above;
- The residential development is carried out of a site of more than 0.5ha where the number of dwellings is unknown;
- The provision of more than 1,000 m² commercial floorspace; or,
- Development carried out on land of 1ha or more.

It is recommended that consideration should be given to reduce impacts from any 'major' developments by considering:

- The impact of existing sources in the local area on the proposed development; and
- The impacts of the proposed development on the local area.

The assessment process involves two stages where:

Stage 1 scope out the need for an air quality assessment and **Stage 2** provide guidance of determining the level of assessment required for a project.

Table A 1 below sets out the Stage 1 criteria to determine the need to assess impacts arising from small developments and **Table A 2** provides more specific guidance as to when an air quality assessment is likely to be required to assess the impacts of the proposed development on the local area.

Table A 1: Stage 1 Criteria to Proceed to Stage 2

Criteria to Proceed to Stage 2	
A	If any of the following apply: • 10 or more residential units of a site area of more than 0.5ha • More than 1,000m² of floor space for all other uses or a site area greater than 1ha
B	Coupled with any of the following: • The development has more than 10 parking spaces • The development will have a centralised energy facility or other centralised combustion process

Table A 2: Indicative Criteria for Requiring an Air Quality Assessment

The development will	Indicative Criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
3. Realign roads, i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA.
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. NB. this includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	Typically, any combustion plant where the single or combined NO _x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.

Appendix B: Construction Dust Risk Assessment Criteria

IAQM guidance framework on assessing the risk of dust proposes the construction phase should be split into phases dependent on their potential impacts, determining the risk for each individually. Therefore, this assessment has determined the risk of the four construction categories put forward by the IAQM guidance:

- Demolition;
- Earthworks;
- Construction; and
- Track out (transport of dust and dirt onto the public road network).

The IAQM guidance framework states that the risk of dust impacts from the four categories can be defined as 'negligible', 'low risk', 'medium risk' or 'high risk' depending upon the scale and nature of the construction activity and the sensitivity and proximity of receptors to the construction site boundary. This categorisation is used to put forward appropriate mitigation measures, reducing the level of effects from the dust impacts so they are not significant.

The assessment of dust impacts using the IAQM guidance considers three separate effects from dust:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to significant increase in exposure to PM₁₀.

Step 1 of the assessment is set out to screen for the requirement for a more detailed assessment for the proposed development. The screening criteria states:

A 'human receptor' within:

- 350 m of the boundary of the application site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

An 'ecological receptor' within:

- 50 m of the boundary of the application site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

Where there are no receptors and the level of risk is deemed 'negligible', there is no need for further assessment.

Step 2A of the assessment enables the overall dust emission magnitude (small, medium or large) from each dust source (demolition, earthworks, construction and trackout) to be identified in relation with the criteria outlined in Table B.1.

Table B.1: Dust emission magnitude

Source	Large	Medium	Small
Demolition	Total building volume >50,000 m ³ , potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level.	Total building volume 20,000 m ³ – 50,000 m ³ , potentially dusty construction material, demolition activities <10 – 20 m above ground level.	Total building volume <20,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.
Earthworks	Total site area >10,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes.	Total site area 2,500 m ² – 10,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes.	Total site area <2,500 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes, earthworks during wetter months.
Construction	Total building volume >100,000 m ³ , on site concrete batching or sandblasting.	Total building volume 25,000 m ³ – 100,000 m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching.	Total building volume <25,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber).
Track out	>50 HDV (>3.5t) outward movements ^a in any one day ^b , potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.	10-50 HDV (>3.5t) outward movements ^a in any one day ^b , moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.	<10 HDV (>3.5t) outward movements ^a in any one day ^b , surface material with low potential for dust release, unpaved road length <50 m.
Notes: ^a Vehicle movement is a one-way journey. i.e. from A to B, and excludes the return journey. ^b HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average.			

Step 2B allows for the sensitivity of the area (high, medium or low) to be assessed and takes into account a number of factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM₁₀, the existing local background concentration; and
- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Receptor sensitivity has been based on the highest of any criteria being met thus, the assessment is considered as robust. The sensitivity of the area is further determined for dust soiling, human health and ecosystem effects by considering the criteria presented in Table B.2.

Table B.2: Magnitude of Receptor Sensitivity

Source	High	Medium	Low
Sensitivities of people to dust soiling effects	• Users can reasonably expect enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling; and • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks^b and car showrooms.	• Users would expect^a to enjoy a reasonable level of amenity, but would not reasonably expect^a to enjoy the same level of amenity as in their home; or • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property wouldn't reasonably be expected^a to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Indicative examples include parks and places of work.	• The enjoyment of amenity would not reasonably be expected^a; or • Property would not reasonably be expected^a to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks^b and roads.
Sensitivities of people to health effects of PM₁₀	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).^c	• Locations where the people exposed are workers^d, and exposure is over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	• Locations where human exposure is transient.^e • Indicative examples include public footpaths, playing fields, parks and shopping streets.

Source	High	Medium	Low
	Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM₁₀, as protection is covered by Health and Safety at Work legislation.	
Sensitivities of receptors to ecological effects	- Locations with an international or national designation and the designated features may be affected by dust soiling; or - Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. - Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	- Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or - Locations with a national designation where the features may be affected by dust deposition. - Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	- Locations with a local designation where the features may be affected by dust deposition. - Indicative example is a local Nature Reserve with dust sensitive features.

Notes:

^a People's expectations will vary depending on the existing dust deposition in the area, see Section 4.2.

^b Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with work place or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.

^c This follows Defra guidance as set out in LAQM.TG (09).

^d Notwithstanding the fact that the air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM₁₀. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

^e There are no standards that apply to short-term exposure, e.g. one or two hours, but there is still a risk of health impacts, aRBCit less certain.

^f Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

The final step, Step 2C allows for the risk of impacts to be defined. The dust emission magnitude derived in Step 2A is combined with the sensitivity of the area defined in step 2B to determine the risk of effects on:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to an increase in exposure to PM₁₀.

The criteria for each of the dust sources are presented in

Table B.3, Table B.4, Table B.5 and Table B.6.

Table B.3: Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table B.4: Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table B.5: Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table B.6: Track out

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Appendix C: Verification

Overview

Model verification is a process by which checks are carried out to determine the performance of a dispersion model at a local level, primarily by comparison of modelled results with monitoring data. Differences between modelled and monitored data may occur as a result of uncertainties associated with a number of model inputs including:

- Traffic flows, speeds and vehicle splits;
- Emissions estimates;
- Background concentrations;
- Meteorological data; and
- Surface roughness length and terrain.

The verification process benefits an assessment by investigating uncertainties and minimising them either through informed refinement of model input parameters or adjustment of the model output if it is deemed necessary.

Verification of NO₂ concentrations has been carried out using 2019 monitored results from selected RBC roadside diffusion tube sites. Data from Heathrow Airport meteorological station in 2019 was used in the modelling, with all other inputs as per the main assessment.

Methodology

Guidance produced by Defra provides a methodology for model verification including calculation methods and directions on the suitability of monitoring data.

Verification of NO₂ concentrations has been carried out using 2019 results from six diffusion tube sites.

In accordance with guidance the model verification has been based on 2019 meteorological data. Background concentrations used in the model verification have been taken from Defra, consistent with the main model with individual background concentrations being obtained for each monitoring location. These are presented in Table C.1.

Table C.1: Background Concentrations used in Model Verification

Site Name	Annual Mean Concentration 2019 (µg/m ³)	
	NO _x	NO ₂
DT55	34.5	22.7
DT56	34.5	22.7
DT59	34.5	22.7
DT58	34.5	22.7
DT29	33.7	22.3
DT57	34.5	22.7

Table C.2 presents the monitored data used within the verification, the location of the monitoring sites and monitored pollutant concentrations.

Table C.2: Monitored Data used in Model Verification

Site Name	Type of Monitor	Annual Mean Concentration 2019 ($\mu\text{g}/\text{m}^3$)	
		NO _x	NO ₂
DT55	DT	47.5	35.0
DT56	DT	49.6	36.0
DT59	DT	35.0	29.0
DT58	DT	60.7	41.0
DT29	DT	45.8	34.0
DT57	DT	43.3	33.0

Verification Results

Table C.3 and Figure C.1 present the results of the model verification for NO₂. It can be seen that the modelled NO₂ concentrations at all locations are below the monitored values. On this basis it has been concluded that the model is under predicting annual mean NO₂ concentrations within the study area. Therefore, an adjustment factor has been calculated.

Table C.3: Model Verification Results for NO₂

Site Name	Monitored Total NO ₂ ($\mu\text{g}/\text{m}^3$)	Modelled Total NO ₂ ($\mu\text{g}/\text{m}^3$)	% Difference
DT55	35.0	27.0	-23.0
DT56	36.0	28.0	-22.2
DT59	29.0	29.0	0.0
DT58	41.0	28.4	-30.7
DT29	34.0	26.1	-23.3
DT57	33.0	29.3	-11.2

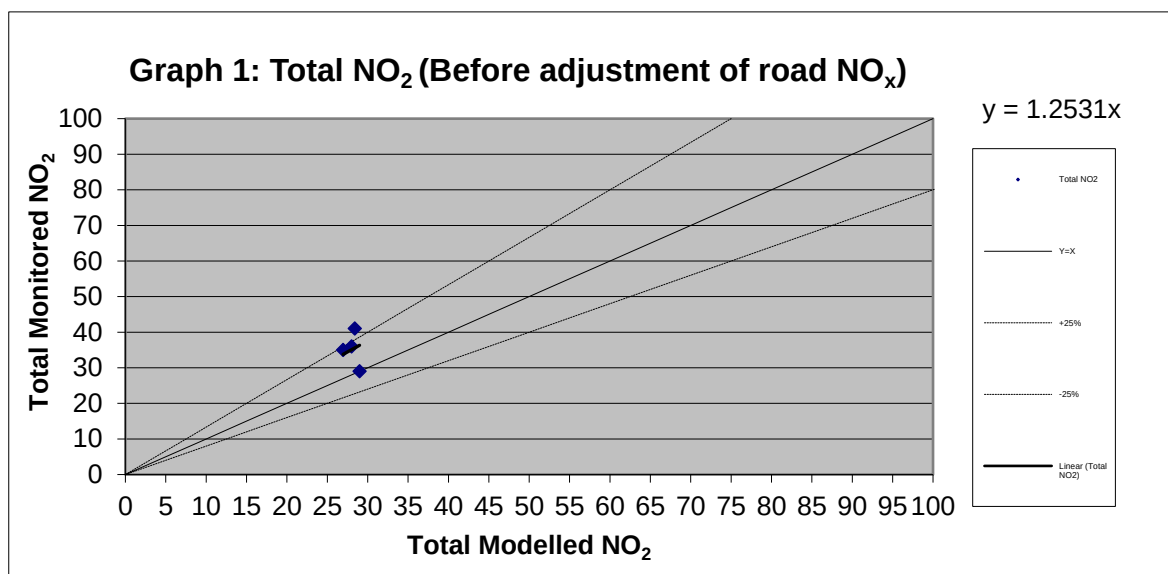


Figure C.1: Model Verification Results for NO₂

To derive the adjustment factor for this assessment the modelled road NO_x contribution has been compared to monitored road NO_x contribution. An individual adjustment factor has been calculated for each modelled location. All results showed the model performing well. Taking a very conservative approach, the maximum adjustment factor has been used, rather than an average, as it pertained to DT58 which is an area of very poor air quality. The adjustment factor used for the study area was 3.415.

The adjustment factor has been applied to the modelled road NO_x contributions and added to background NO_x concentrations to give total corrected NO_x at each of the verification sites.

The final stage of the verification process involves applying the NO_x to NO₂ relationship presented in Section 3.3.9. Table C.4 presents the total adjusted modelled NO₂ and the monitored NO₂ after the adjustment factor has been applied. Figure C.2 presents the correlation between the total corrected NO₂ and the monitored NO₂. Following the application of the adjustment factor the site is within 10 % of monitored concentrations, with a good overall agreement. This indicates that overall, the model is performing acceptably.

Table C.4: Adjusted Modelled NO₂ Results

Site Name	Monitored Total NO ₂ (µg/m ³)	Modelled Total NO ₂ (µg/m ³)	% Difference
DT55	35	36.6	4.49
DT56	36	39.8	10.53
DT59	29	42.8	47.59
DT58	41	41.0	0.00
DT29	34	34.7	2.18
DT57	33	43.7	32.42

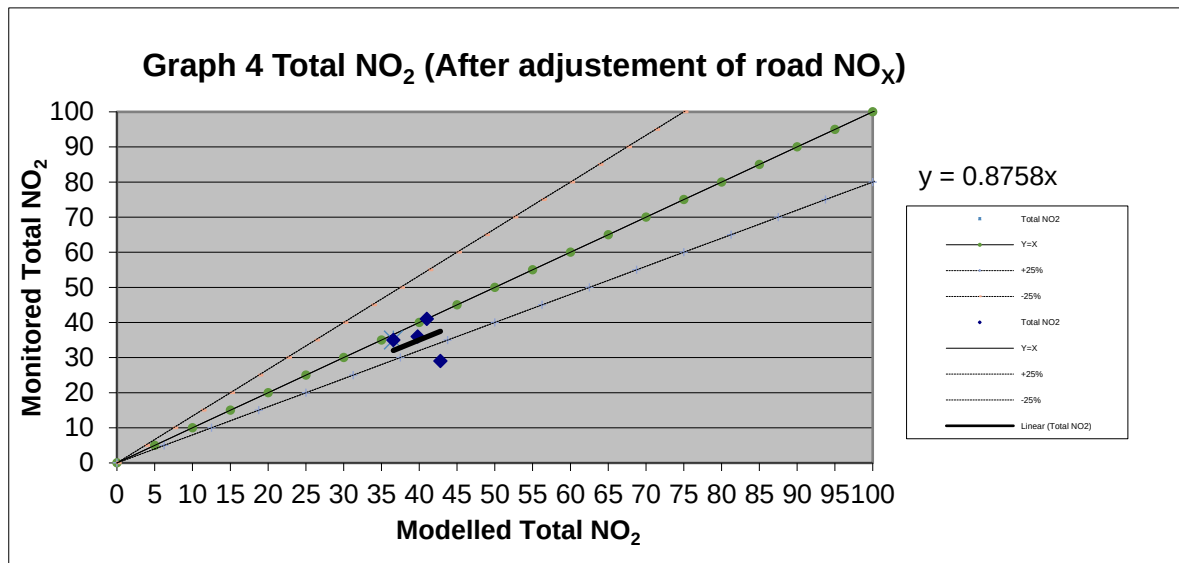


Figure C.2: Adjusted Model NO₂ Verification Results

Summary

In accordance with Defra guidance, the road contributed NO_x adjustment factor was also applied to the road contributed PM concentration. The total PM₁₀ and PM_{2.5} concentrations are derived by adding the adjusted road contribution value to the Defra background concentrations.

An adjustment factor of 3.415 has been applied across the study area for NO₂, PM₁₀ and PM_{2.5}.

Appendix D: With Proposed Scheme 2024 Time Varying Emissions

The operational nature of a school means that the national time varying emissions factors shown in section 3.3.7 are not appropriate to apply to school generated traffic. Generated traffic from the school is very 'peaky', only happening at certain hours in the weekday, and not at all on weekends and some months. Therefore, a custom time varying emissions file was produced to apply to the generated traffic associated with the operation of the proposed development.

Assumptions on the weekday hours and number of vehicles in each of those hours were provided by the transport consultant. It has been assumed that development traffic will travel from 8.00-10.00 in the morning, and 15.00-17.00 in the afternoon. For the hours 8.00-9.00 and 16.00-17.00 it has been assumed that generated traffic will comprise 100% of staff journeys and 20% of pupil journeys (147.2 vehicle movements per hour). For the hours 9.00-10.00 and 15.00-16.00 it has been assumed that generated traffic will comprise 80% of pupil traffic (284.8 vehicle movements per hour).

For each 24 hour period for which there is development traffic (weekdays), the factors applied to the inputted emissions must average to one. Using this principle, and the assumptions outlined, the factors shown below in Table D.1 are produced.

Table D.1: Weekly Time Varying Emission Factors

Hour	Weekday	Weekend
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	0.00
8	0.00	0.00
9	4.09	0.00
10	7.91	0.00
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
16	7.91	0.00
17	4.09	0.00
18	0.00	0.00

Hour	Weekday	Weekend
19	0.00	0.00
20	0.00	0.00
21	0.00	0.00
22	0.00	0.00
23	0.00	0.00
24	0.00	0.00

Because school's do not operate uniformly throughout the year, a monthly profile was also derived. The factors were derived by comparing the number of term dates within a calendar month with the number of weekdays in that month. Example term dates for RBC were sources online²⁶ for the year closest to the earliest possible opening year. The term dates presented in Table D.2 are for a particular year, but variation between years is minor with respect to factor derivation. The resultant monthly factor derivation is presented in Table D.3.

Table D.2: 2023 RBC Term Dates

Term Start Date	Term End Date
04/01/2023	10/02/2023
20/02/2023	31/03/2023
17/04/2023	26/05/2023
05/06/2023	21/07/2023
04/09/2023	20/10/2023
30/10/2023	20/12/2023

Table D.3: Month Factors Derivation

Month	Term days in month	Weekdays in month	Factor (in term/in month)
1	20	22	0.9
2	15	20	0.8
3	23	23	1.0
4	10	20	0.5
5	20	23	0.9
6	20	22	0.9
7	15	21	0.7
8	0	23	0.0
9	20	21	1.0
10	17	22	0.8
11	22	22	1.0

²⁶ <https://brighterfuturesforchildren.org/for-parents-carers/schools/term-dates/?mode=1>

Month	Term days in month	Weekdays in month	Factor (in term/in month)
12	14	21	0.7

Appendix E: DustScanAQ 3-Month Diffusion Tube Survey Report

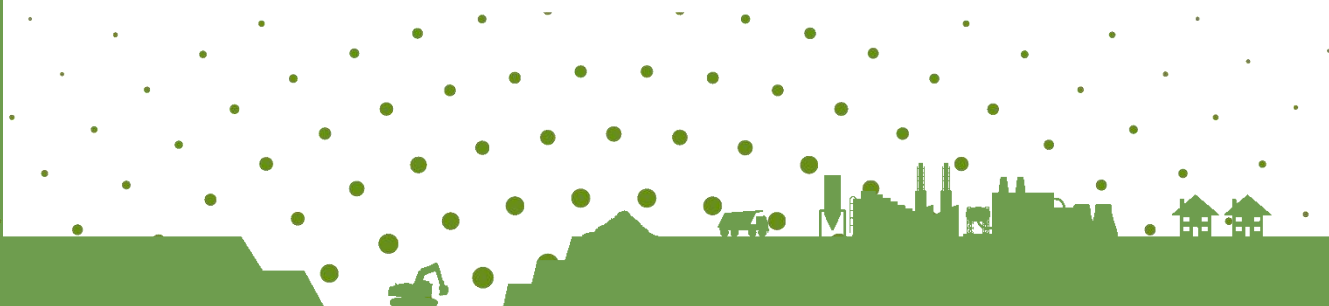


3-month diffusion tube survey report

River Academy, Reading

February, 2022

Bowmer and Kirkland Ltd



Document Control Sheet

Project Information

Title	River Academy, Reading
Job Code	ZBKRAR
Report Ref	ZBKRAR_AQA
Report Type	Diffusion tube survey results
Client	Bowmer and Kirkland Ltd
Client Contact	Andy Taylor (Bowmer and Kirkland Ltd)
Revision	A
Status	Final
Date of Issue	21 February 2022

Revision History

Revision	Date	Author	Reviewer	Approver	Status
A	21 February 2022	Paul Eaton	John Bruce	John Bruce	Final

Distribution

Organisation	Contact	Date of Issue	Copies
Bowmer and Kirkland	Andy Taylor	21 February 2022	1

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1 Introduction

1.1 Overview

DustScanAQ (DS) have been commissioned by Bowmer and Kirkland Ltd to conduct a three-month diffusion tube survey and process and report the results to help inform the ventilation strategy of the proposed River Academy, Reading. This report presents the results of this survey.

1.2 Objective

The purposes of this report are outlined below:

- Present the results of the NO₂ diffusion tube monitoring survey.

1.3 Proposed Site Location

The development is located within the jurisdiction of Reading Borough Council (RBC) along Richfield Avenue, Reading, RG1 8EQ. The proposed development site is bounded to the north by the River Thames; to the east by Rivermead Leisure Complex and Caversham Bridge Garden Centre; to the south by Richfield Avenue and a large industrial complex with open fields; and agricultural ground to the west of the site.

The extent of the proposed development is shown in Figure 1.1.

There are no Special Areas of Conservation (SACs), Special Protection Areas (SPAs), designated wetlands (Ramsar Sites) or Sites of Special Scientific Interest (SSSIs) within close proximity of the proposed development. The closest designed wildlife site to the proposed development is the Sulham and Tidmarsh Woods and Meadows SSSI, approximately 6.2 km to the west.

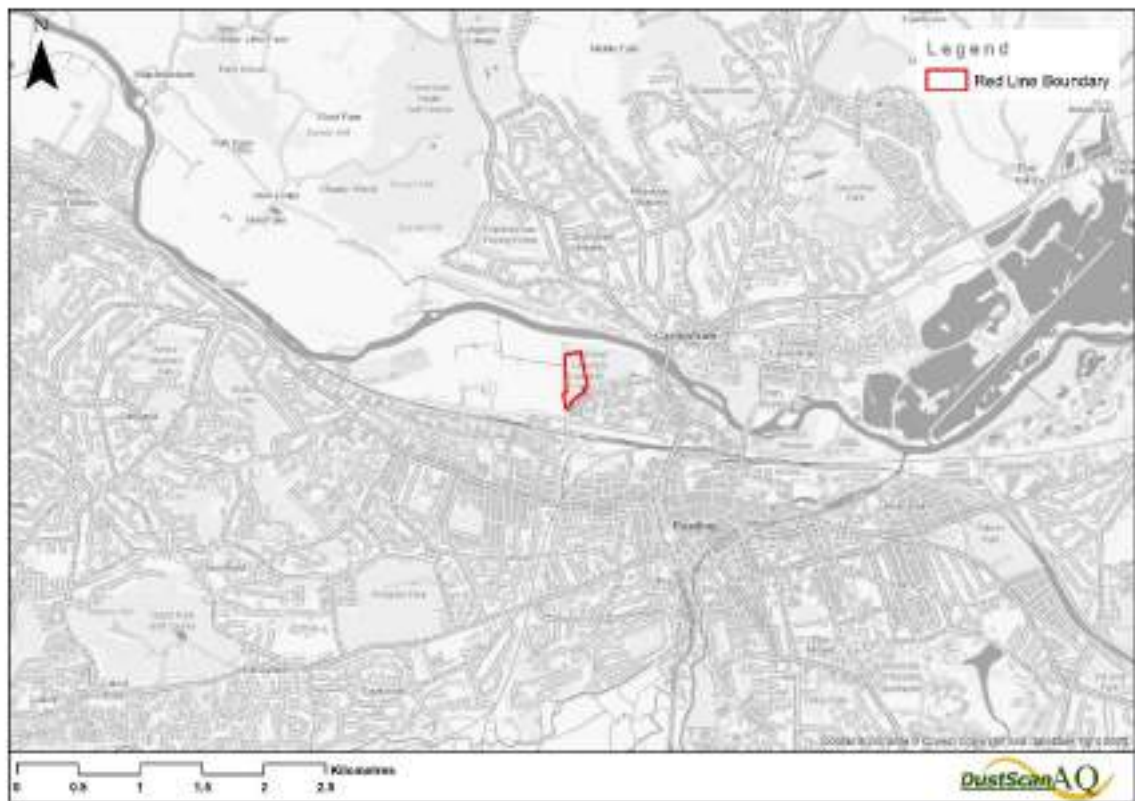


Figure 1.1: Development site location

1.4 Key Pollutants

1.4.1 Nitrogen Dioxide (NO₂)

This diffusion tube survey relates to concentration of nitrogen dioxide. NO₂ and nitric oxide (NO) are collectively referred to as oxides of nitrogen (NO_x). During fuel combustion, atmospheric nitrogen combines with oxygen to form NO, which is not considered harmful. Through a chemical reaction with ozone (O₃), NO further combines with oxygen to create NO₂ which can be harmful to human health and vegetation. The foremost sources of NO₂ in the UK are combustion activities, mainly road transport and power generation.

2 Monitoring Survey

A total of seven NO₂ diffusion tubes were utilised as part of the three-month survey. The diffusion tubes were installed in accordance with LAQM.TG (16) and other nationally recognised guidance¹, with six tubes being mounted at three duplicate locations around the front of the development site. One tube per month was reserved as a travel blank.

Monitoring locations were chosen to assess:

- The air quality at worst-case locations along the presently standing building within the development site: the building of the former driving range. The existing structure is close to the location proposed buildings will stand and locations therefore monitored data will indicate the quality of the air potentially drawn into building ventilation systems.

The monitoring locations are shown below in Plate 2.1 - Plate 2.3 below, and illustrated in Figure 2.1.

¹ Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance for Laboratories and Users. Report to Defra and the Devolved Administrations. The Defra Working Group (Feb 2008).



Plate 2.1: Site 1 at the eastern end of the former driving range building



Plate 2.2: Site 2 at the centre of the former driving range building



Plate 2.3: Site 3 towards the west of the former driving range building



Figure 2.1: Duplicate Diffusion Tube Sites

The diffusion tubes were prepared using a solution of 50% tri-ethanolamine (TEA) in acetone and were supplied and analysed by Gradko International. These details are consistent with those tubes currently deployed by RBC as part of their LAQM obligations.

The diffusion tubes were changed on a monthly basis and returned to the supplier for analysis. The survey was completed on 18 January 2022 after which a total of three months monitoring had been carried out.

A final tube was used as a travel blank in accordance with the guidance documentation. Further information is provided in Table 2.1.

Table 2.1: Diffusion Tube Summary

Site ID	Site Classification	Description
1	Background	Southern façade former driving range building (east)
2	Background	Southern façade former driving range building (centre)
3	Background	Shipping container (west)

2.1 Monitoring Results

The results of the diffusion tube survey are presented below in Table 2.2. The second column presents the average NO₂ concentrations over the monitoring period, as provided from the analysis laboratory. These results are the average of all concentration measurements at each duplicate site with the measured travel blank concentrations subtracted.

The third column presents the 2021 annualised NO₂ concentrations. Annualisation has been carried out for the year 2021. More than half of the third monitoring period was in 2022 and therefore this monitoring period has been projected back to 2021. A projection factor of 1.020126 was derived using Defra background maps for square 470500, 174500. Further details on the annualisation process are presented in Appendix A.

The fourth column presents the 2021 annualised and bias adjusted NO₂ concentrations. A secondary correction has been applied to the results to adjust for 'bias', which accounts for the potential differences between data collected using automated and non-automated techniques. At the time of reporting 2021 bias adjustment factors have yet to be published and therefore a factor derived from 2020 has been used. A factor of 1.08 has been applied to correct the raw results.

The bias adjustment factor was obtained from the latest bias adjustment spreadsheet², which provides a 2020 factor for RBC urban background 50% TEA in acetone diffusion tubes supplied and analysed by Gradko International.

Table 2.2: Diffusion Tube Monitoring Results

Site ID	NO ₂ Concentration (µg/m ³)		
	Monitoring Period	2021 Annualised	2021 Annualised and Bias Adjusted
1	14.4	12.8	13.8
2	17.4	15.5	16.8
3	17.6	15.7	17.0

The results from the diffusion tube survey indicated that typical NO₂ concentrations across the site ranged from 13.8 to 17.0 µg/m³, well below the NO₂ annual mean objective.

According to Defra LAQM.TG (16) guidance, exceedance of the one-hour NO₂ mean objective is generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m³. Annual mean NO₂ concentrations at all monitoring locations fall well below 60 µg/m³ and therefore it is anticipated that there will be no exceedances of the one-hour mean AQO.

² <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/national-bias/>

3 Conclusion

This report presented the results from a 3-month diffusion tube monitoring survey at River Academy, Reading.

The key objectives of the report were:

- Present the results of the NO₂ diffusion tube monitoring survey.

Following the completion of a 3-month NO₂ monitoring survey, it has been shown that NO₂ concentrations recorded at all monitoring sites were considerably below the NO₂ annual mean objective. The short-term one-hour NO₂ mean objective is also expected to be met at all monitoring locations comfortably.

Appendix A: Derivation of Annualisation Factor

All calculations were carried out in accordance with guidance provided in LAQM.TG (16) Box 7.10.

For the purpose of annualisation, data was collected from four AURN monitoring sites. These sites correspond to the sites used by RBC for their own annualisation purpose. All sites had a data capture greater than 75%. The sites selected were:

- London Harlington;
- Reading London Road;
- Oxford St Ebbes; and
- London Hillingdon.

Data were collected over two specific time frames: the period mean (Pm) and the annual mean (Am).

The Pm time period used was 01/01/21 – 18/01/21, 19/10/21 – 31/12/21.

The Am included the entire 2021 calendar year. The results of the calculations are summarised below in Table A.1.

Table A.1: AURN Monitoring Results

AURN Site	NO ₂ Concentration (µg/m ³)		
	Annual Mean 2021 (Am)	Period Mean 2021 (Pm)	Ratio (Am/Pm)
London Harlington	19.5	22.5	0.87
Reading London Rd	20.6	21.4	0.96
Oxford St Ebbes	11.3	13.0	0.87
London Hillingdon	25.0	28.9	0.86
Average (Ra)	-	-	0.89

The Ra value derived above in Table A.1 is the annualisation factor which has been applied to the monitored NO₂ concentration results for all locations in the survey.

Appendix B: Gradko Diffusion Tube Results

The raw diffusion tube data as received from the Gradko laboratory is presented below in Figure B.1, B.2 and B.3 for months October/November, November/December and December/January.

LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBERP08384R

BOOKING IN REFERENCEP08384

DESPATCH NOTE89422

CUSTOMERDustscan AQ Attn: Paul Eaton
Unit 8 Nimrod
De Havilland Way
Winney
OX29 0YG

DATE SAMPLES RECEIVED24/11/2021

JOB NUMBERZBKRAR

Location	Sample Number	Exposure Data			$\mu\text{g}/\text{m}^3$ *	ppb *	$\mu\text{g NO}_2$ on tube
		Date On*	Date Off*	Time* (hr.)			
1 East	1858388	19/10/2021	18/11/2021	724.52	13.84	7.23	0.73
1 East	1858389	19/10/2021	18/11/2021	724.52	13.98	7.29	0.74
2 Centre	1858390	19/10/2021	18/11/2021	724.58	18.13	9.48	0.96
2 Centre	1858391	19/10/2021	18/11/2021	724.58	20.24	10.56	1.07
3 West	1858392	19/10/2021	18/11/2021	724.67	19.27	10.06	1.02
3 West	1858393	19/10/2021	18/11/2021	724.67	19.31	10.08	1.02
Travel Blank	1858394	19/10/2021	18/11/2021	720.00	0.32	0.17	0.02
Laboratory Blank				724.67	0.17	0.09	0.009

Comment: Results are not blank subtracted

Customer comment: Tubes 1858388 & 1858389 were found on the ground.

Results have been corrected to a temperature of 293 K (20°)

Overall M.U.±9.7%

Limit of Detection0.037 $\mu\text{g}/\text{m}^3$

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of $k=2$, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Tube Preparation: 50% TEA (Acetone)

Analysed on UV CARY3

Analyst NameKumuthu Amaradasa

Report Checked ByAdam Robinson

Date of Analysis06/12/2021

Date of Report06/12/2021

Analysis carried out in accordance with documented in-house Laboratory Method GLM7

Figure B.1: Month 1 Results

LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER Q00126R
BOOKING IN REFERENCE Q00126
DESPATCH NOTE 90172
CUSTOMER Dustscan AQ, Attn: Paul Eaton
Unit 8 Nimrod
De Havilland Way
Witney
OX29 0YG
DATE SAMPLES RECEIVED 20/12/2021
JOB REFERENCE ZBKRRAR

Location	Sample Number	Exposure Data			$\mu\text{g}/\text{m}^3$ *	ppb *	$\mu\text{g NO}_2$ on tube
		Date On*	Date Off*	Time* (hr.)			
1 East	1883548	18/11/2021	17/12/2021	691.08	14.41	7.52	0.72
1 East	1883549	18/11/2021	17/12/2021	691.08	15.81	8.25	0.79
2 Centre	1883550	18/11/2021	17/12/2021	691.02	14.97	7.61	0.75
2 Centre	1883551	18/11/2021	17/12/2021	691.02	16.86	8.60	0.85
3 West	1883552	18/11/2021	17/12/2021	690.83	15.16	7.91	0.79
3 West	1883553	18/11/2021	17/12/2021	690.83	12.99	6.76	0.65
Travel Blank	1883554	18/11/2021	17/12/2021	696.00	0.20	0.10	0.01
Laboratory Blank				696.00	0.14	0.07	0.007

Comment: Results are not blank subtracted

Results have been corrected to a temperature of 293 K (20°)

Overall M.U. $\pm 9.7\%$

Limit of Detection 0.043 μgNO_2

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of $k=2$, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Tube Preparation: 50% TEA /Acetone

Analysed on UV CARY1

Analyst Name Isra Otman

Report Checked By Adam Robinson

Date of Analysis 10/01/2022

Date of Report 10/01/2022

Analysis carried out in accordance with documented in-house Laboratory Method GLM7

Figure B.2: Month 2 Results

LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER Q00923R
BOOKING IN REFERENCE Q00923
DESPATCH NOTE 90772
CUSTOMER Dustscan AQ Attn: Paul Eaton
Unit 8 Nimrod
De Havilland Way
Witney
OX29 0YQ
DATE SAMPLES RECEIVED 21/01/2022
JOB REFERENCE ZBKRRAR

Location	Sample Number	Exposure Data		Time* (hr.)	$\mu\text{g}/\text{m}^3$ *	ppb *	$\mu\text{g NO}_2$ on tube
		Date On*	Date Off*				
3 West	1904830	17/12/2021	18/01/2022	768.00	20.30	10.59	1.13
3 West	1904831	17/12/2021	18/01/2022	768.00	18.83	9.83	1.05
Travel Blank	1904832	17/12/2021	18/01/2022	768.00	0.20	0.10	0.01
Laboratory Blank				768.00	0.16	0.08	0.009

Comment: Results are not blank subtracted

Customer noted missing tubes: 1904826, 1904827, 1904828 & 1904829

Results have been corrected to a temperature of 293 K (20°)

Overall M.U. $\pm 9.7\%$

Limit of Detection 0.040 μgNO_2

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of $k=2$, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Tube Preparation: 50% TEA /Acetone

Analysed on UV CARY2

Analyst Name Alison Wright

Report Checked By Adam Robinson

Date of Analysis 02/02/2022

Date of Report 03/02/2022

Analysis carried out in accordance with documented in-house Laboratory Method GLM7

Figure B.3: Month 3 Results

For the third monitoring period, diffusion tubes from Sites 1 and 2 were found smashed on the ground having been forcefully extricated from their holders. Therefore, no results from Sites 1 and 2 were recorded for month three.

Appendix 2: Email Consultation with Reading Borough Council

Gordon Allison

From: Moon, Rebecca <Rebecca.Moon@reading.gov.uk>
Sent: 18 October 2022 15:24
To: Paul Eaton
Subject: RE: Planning Condition - Air Quality Mitigation Plan

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Hi Paul

Sorry, this slipped off my radar. Unfortunately I don't have an example to send to you, as we haven't had many of these so far, with most developments predicting not to worsen air quality. However the type of thing I would expect to see would be an analysis of the main contributions to the worsening of air quality, followed by measures that could be put in place to mitigate or offset this worsening, quantifiable where possible.

Does this make sense?

Thanks
Rebecca

Rebecca Moon
Senior Environmental Health Officer
Environmental Protection & Nuisance Team
Regulatory Services | Directorate of Economic Growth & Neighbourhood Services

Reading Borough Council
Civic Centre
Bridge Street
Reading
RG1 2LU

0118 9372325 (72325)
Working days Monday | Tuesday | Wednesday | Thursday

[Website](#) | [Facebook](#) | [Twitter](#) | [YouTube](#)



From: Paul Eaton <PaulE@dustscan.co.uk>

Sent: 18 October 2022 15:20

To: Moon, Rebecca <Rebecca.Moon@reading.gov.uk>

Subject: FW: Planning Condition - Air Quality Mitigation Plan

This is an EXTERNAL EMAIL. STOP THINK before you CLICK links or OPEN attachments.

Hi Rebecca,

I hope you're well, and I'm conscious that you're likely to have a high workload, but have to had a chance to look at the below? It's be very much appreciated. I can arrange a quick Teams meeting if it's easier.

Kind regards,

Paul Eaton | BSc AMIAQM AMIEnvSc

Consultant

Air Quality and Dust



Unit 8 Nimrod, De Havilland Way, Witney OX29 0YG. United Kingdom

Telephone: +44 (0)1608 810110

Mobile: +44 (0)7780 146644

Email: PaulE@dustscan.co.uk

Twitter: [@DustScan](https://twitter.com/DustScan)

Key Services – Air Quality | Dust | Exposure | Odour | EIA

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From: Paul Eaton
Sent: 12 October 2022 11:25
To: Moon, Rebecca <Rebecca.Moon@reading.gov.uk>
Subject: RE: Planning Condition - Air Quality Mitigation Plan [Filed 12 Oct 2022 11:25]

Hi Rebecca,

It's for the River Academy project, planning reference 212061.

Kind regards,

Paul Eaton | BSc AMIAQM AMIEnvSc

Consultant
Air Quality and Dust



Unit 8 Nimrod, De Havilland Way, Witney OX29 0YG. United Kingdom
Telephone: +44 (0)1608 810110
Mobile: +44 (0)7780 146644
Email: PaulE@dustscan.co.uk
Twitter: [@DustScan](https://twitter.com/DustScan)

Key Services – Air Quality | Dust | Exposure | Odour | EIA

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From: Moon, Rebecca <Rebecca.Moon@reading.gov.uk>
Sent: 12 October 2022 11:18
To: Paul Eaton <PaulE@dustscan.co.uk>
Subject: RE: Planning Condition - Air Quality Mitigation Plan

Hi Paul

Sorry to not get back to you sooner. Can you let me know which development/permission this relates to so I can advise better?

Thanks
Rebecca

Rebecca Moon
Senior Environmental Health Officer
Environmental Protection & Nuisance Team
Regulatory Services | Directorate of Economic Growth & Neighbourhood Services

Reading Borough Council
Civic Centre
Bridge Street
Reading
RG1 2LU

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From: Paul Eaton <PaulE@dustscan.co.uk>
Sent: 04 October 2022 16:45
To: Moon, Rebecca <Rebecca.Moon@reading.gov.uk>
Subject: Planning Condition - Air Quality Mitigation Plan

This is an EXTERNAL EMAIL. STOP THINK before you CLICK links or OPEN attachments.
Hi Rebecca,

I hope you're well. I tried your phone number just now but couldn't get through.

I am currently working to discharge the following condition:

No development shall take place above foundation level until a detailed air quality report is approved in writing by the Local Planning Authority. The Air Quality Mitigation Plan set out in the approved air quality report, Reference ZBKRARA AQA, dated 17/05/2022, shall be implemented to ensure that the detrimental impact from the development will be mitigated and that the development will not contribute to the increase of air pollutants to the satisfaction of the Council.

Would you be able to give some further indication of what the council is expecting to see? And potentially some examples of Air Quality Mitigation Plans that have been accepted by the council.

I would be grateful for your thoughts.

Kind regards,

Paul Eaton | BSc AMIAQM AMIEnvSc

Consultant
Air Quality and Dust



Unit 8 Nimrod, De Havilland Way, Witney OX29 0YG. United Kingdom

Telephone: +44 (0)1608 810110
Mobile: +44 (0)7780 146644
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Twitter: [@DustScan](https://twitter.com/DustScan)

Key Services – Air Quality | Dust | Exposure | Odour | EIA

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Appendix 3: Transport Assessment



River Academy Reading

Transport Assessment

Hexa ref: 600353-HEX-00-TP-RP-X-0001-V02

Date: 16th December 2021

Revision: V02

Revision	Description	Issued	Checked	Date
V01	Draft	MP	JG	12/12/21
V02	Capacity Modelling Updates	MP	JG	16/12/21

Author	Signature	Date
Matt Price BSc MSc CTP FCIHT Transport Planning Director		16/12/21

Checker	Signature	Date
James Garment CEng MICE Director		16/12/21

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Appendix B – RBC Pre-Application Scoping Note

Appendix C – RBC Pre-Application Response

Appendix D – Access Design, Swept Path Analysis and Visibility Splays

Appendix E – Trip Generation and Distribution Diagrams

Appendix F – Arcady Modelling Outputs

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1.0 Introduction

Hexa Consulting have been appointed by Bowmer & Kirkland on behalf of the Department for Education to provide traffic and transportation advice in relation to the proposed development of the River Academy on Richfield Avenue in Reading.

The proposals include the development of a new secondary school and sixth form with capacity for up to 1,500 pupils from the ages of 11 to 18 years and an estimated 156 Full Time Equivalent (FTE) staff members. The proposed development site is on land to the north of Richfield Avenue / Cow Lane and adjacent to the Rivermead Leisure Centre.

The proposed new school shall be accessed from an upgraded Cow Lane / Richfield Avenue access with a segregated pedestrian and cycle access to the east on Richfield Avenue. In addition to the main teaching blocks, the proposals include a new sports hall, outdoor games area, Multi-Use Games Area (MUGA), car park and secure cycle parking facilities.

It is noted that deliveries to the adjacent garden centre are currently routed through the proposed car parking area and these arrangements shall continue in a controlled and coordinated fashion post development. It is also the case that the annual Reading music festival makes use of the site during the school summer holiday periods. Future access to the site for these purposes shall continue to be available to support the festival activities at times when the school is not operational.

The proposed site benefits from excellent level of accessibility by sustainable modes of transport including walking and cycling with segregated off-road cycle lanes within the vicinity of the site. The proposed site masterplan is included as **Appendix A** of this report.

1.1 Purpose of this Report

This Transport Assessment (TA) has been prepared in order to consider the development proposals and their potential impact on the surrounding area from a traffic and transportation perspective. It has been developed in response to the pre-application engagement undertaken with highways officers from Reading Borough Council (RBC) and also been used to inform the highway related design aspects of the associated proposals.

1.2 Scope of this Report

The contents of the report are consistent with the former DfT's '*Guidance for Transport Assessment*' and locally published planning guidance from RBC. A pre-application meeting was held between

planning officers from RBC and the Client team on the 14th October 2021. The response from RBC to the pre-application engagement is included as **Appendix C**.

This TA has been prepared for submission to RBC to detail the likely transport matters which have emerged from the development proposals in the context of a planning submission. In accordance with the National Planning Policy Framework [NPPF], July 2021, it also identifies the expected highways impact of the scheme within the local transport network and considers both local and national policy to ensure that the development adheres to relevant transport policies.

On this basis, this TA contains the following:

- A description of the highway network in the vicinity of the site;
- A review of the accident record in the immediate vicinity of the site for a five-year period;
- A summary of the development proposals including car parking provision;
- A summary of relevant transport planning policy;
- A review of accessibility by all sustainable modes of travel;
- Information regarding traffic generation and trip rates; and
- Analysis on the highway impacts associated with the development proposals.

In addition to this TA, a School Travel Plan (STP) has been prepared and is designed to be read alongside this report. The STP contains a series of measures and schemes which shall be promoted to future staff and students which would lessen their dependency on single occupancy vehicle trips. This would further reduce any potential negative residual highway impacts which may be associated with these development proposals.

1.3 Structure of this Report

Following this introduction, **Section 2** of the report provides a comprehensive description of the existing site and its location. This includes the local highway network and facilities for pedestrians, cyclists and public transport users.

Section 2 also reviews the local area in terms of highways safety by way of obtaining records of incidents adjacent to the site over the most recent five-year period available.

The development proposals summarised in **Section 3**, including the proposed parking provision and access arrangements.

The accessibility of the site by sustainable modes of travel is assessed in **Section 4**.

Section 5 outlines the traffic forecasting methodology used to establish the likely traffic generation associated with the development proposals including local junction capacity modelling.

Relevant local and national transport policy is summarised in **Section 6**.

The report is summarised and concluded in **Section 7**.

2.0 Existing Site and Highway Layout

The proposed site is located approximately 1.3km to the northwest of the centre of Reading off Richmond Avenue and is located at the former Linerboard Golf Club. The northern rectangular section of the site is currently used as an activity centre, with the southern triangular section currently unused, the two sections are separated by a roadway and drainage ditch.

The site is bound by Rivermead Local Green Space, Rivermead Leisure Centre and Caversham Bridge Garden Centre to the east, Rivermead Local Green Space to the north, Cow Lane to the west and Richfield Avenue to the south. The built environment in the immediate vicinity of the site (predominantly to the south and east) is light industrial.

There are currently two pedestrian and vehicular access points to the site which are located to the south and to the east of the site, accessed via Richfield Avenue / Cow Lane and an unnamed access road respectively. The unnamed access road services the Rivermead Leisure Complex to the east of the site.

The site within its local surrounding are demonstrated in **Figure 2.1** and **Figure 2.2** below.



Figure 2.1 – Site location



Figure 2.2 – Local site location with approx. site boundary

Figure 2.3 sets out the proposed development layout and formation of an improved site access from Cow Lane. A fuller plan of the development proposals is included as **Appendix A**.

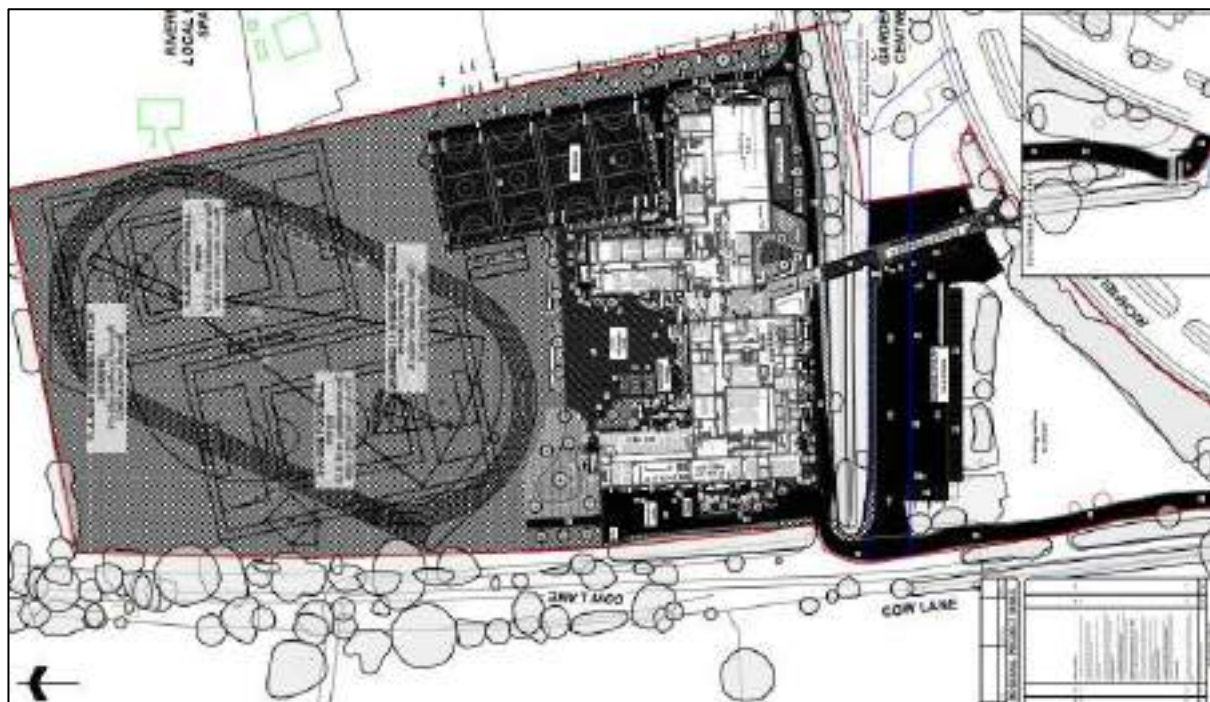


Figure 2.3 – Site layout

2.1 Existing Use

The site measures approximately 55,000sqm and is owned by the Local Authority. The northern rectangular section of the site is currently used as an activity centre, with the southern triangular section currently unused, the two sections are separated by a roadway and drainage ditch. The northern section features a semi-enclosed linear block which will require demolition. No other permanent buildings are thought to feature on either section of the site.



Figure 2.4 – Existing site access to be upgraded from Cow Lane

2.5 Surrounding Highway Network

Richfield Avenue

Richfield Avenue is located to the southeast of the site. The road begins to the south of the site where it transitions into Richfield Avenue from Cow Lane and continues easterly ending at the four-arm roundabout with the Caversham Road (A4155) and Waterman Place. Mid way along Richfield Avenue there is a roundabout which connects to the unnamed leisure centres access road and Tessa Road.

Richfield Avenue is a single carriageway that is approximately 9m wide with traffic lanes separated by diagonal white lines in the middle of the carriageway. The road is subject to a 30mph speed limit and is lined with double yellow lines.



Figure 2.5 – Richfield Avenue east in vicinity of site access

Fronting the site and in the vicinity of proposed new site entrance there is a good level of pedestrian and cycle infrastructure with wide footway measuring over 2m in width set back from the edge of the carriageway by grassed verges and sections of segregated cycle lanes.

Street lighting is present and surfaces appear reasonably well maintained. There are also a number of pedestrian crossing refuges along the length of Richfield Avenue.

Cow Lane

Cow Lane is located to the south of the site and has recently undergone significant improvements that finished in 2019. Cow Lane begins at the south of the site, continuing southbound ending at the junction with Beresford Road and Portman Road and a mini-roundabout.

The single carriageway road is approximately 10m wide, narrowing to approximately 7m wide towards the bridge south of the site.

Regularly spaced street lighting denotes a 30mph speed limit and given recent improvements, the condition of footways, cycle lanes and wayfinding signage is good. There are also sensibly located zebra crossings and pedestrian refuges located on Cow Lane.



Figure 2.6 – Cow Lane zebra crossing

Caversham Road

Caversham Road is located approximately 700m east of the site, beginning southeast of the site as the A329 continuing northbound over Caversham bridge transitioning into Bridge Street (A4155), ending at the junction with Church Road (A4074) and Church Street.

Caversham Road connects central Reading to northern Reading over the River Thames and forms part of the strategic road network. Caversham Road within the vicinity of the site is a dual carriageway approximately 11m wide and is subject to a 30mph speed limit. There are on street parking bays along the west side of Caversham road approximately 250m south of the four-arm roundabout with Richfield Avenue and Waterman Place.

Parking restrictions are in place Monday to Saturday between 09:15 and 16:30 with a maximum stay of 30 minutes.



Figure 2.7 – Caversham Road north toward River Thames

2.6 Highway Safety

In order to assess if the proposed development will contribute to a worsening of local highway safety concerns, an analysis of the local highway safety and reported incidents has been undertaken.

Personal Injury Accident (PIA) data for the highway network adjacent to the site has been obtained from CrashMap for the most recent five years, the period being 2016 to 2020. The location of these incidents is shown in **Figure 2.9** whilst a breakdown of the information is contained in **Table 2.1**.



Figure 2.8 – CrashMap Personal Injury Accident results

Junction/Link	Slight	Serious	Fatal	Totals
Cow Lane	5	1	0	6
Richfield Avenue	3	0	0	3
Caversham Road roundabout	4	0	0	4
Total	12	1	0	13

Table 2.1 – Personal Injury Accident summary

There has been a total of 13 reported incidents within the vicinity of the site within the last five-year period for when data is available. Of the recorded incidents, 12 have been categorised as 'slight' whilst one has been categorised as 'serious'.

Of those incidents reported, only three occurred on Richfield Avenue and none occurred along the direct frontage of the site. The incidents reported on Cow Lane appear to be clustered around the Cardiff Road junction and all were reported in 2017-2018. It is noted that during this time a considerable amount of highway works were taking place and temporary traffic restrictions and control measures were in place. There have been no reported incidents in this area since those works were complete.

The remainder of the locally observed incidents reported at the Caversham Round roundabout and were reported as 'slight'. Given the volume of traffic passing through the roundabout this level of reported incidents is quite typical and not suggestive of poor highway design or maintenance.

Typically, it is accepted that a 'low risk' is immaterial and consideration of mitigation would not be required. Where 'medium risk' ratings are indicated, mitigation is not pre-requisite, but practical solutions should be considered where possible. 'High risk' ratings indicate that mitigation would be desirable, whereas 'very high risk' would require immediate intervention.

		Incident Frequency			
		> Once a year (Frequent)	Between 1-3 years (Occasional)	Between 4-7 years (Rare)	Between 8-20 years (Very Rare)
Severity	Fatal	Very High	High	High	Medium
	Serious	High	High	Medium	Medium
	Slight	High	Medium	Medium	Low
	Damage	Medium	Medium	Low	Low

Table 2.2 – Institute of Highways & Transportation (IHT) Personal Injury Collision plot

Relating the above to the safety performance and future risk of a collision occurring on the study area highway network, it is evident that there is a medium to high risk associated with the wider study area. It is noted however that the Cow Lane incidents occurred before recent highway improvements we're delivered and the Caversham Bridge roundabout incidents are fairly typical for a network with observed levels of traffic. It is therefore concluded there are no pre-existing highway safety concerns that shall require mitigation.

To help deliver improvements however and better support the school community, the Travel Plan prepared by the school proposes measures to educate pupils on highway safety and also cycle confidence training. These measures will help to ensure that site users are best placed to access the site safely. Appropriate 'School Keep Clear' signage and road markings shall also be introduced to prevent obstructive parking on the frontage of the site.

3.0 Development Proposals

The proposals include the development of a new secondary school and sixth form with capacity for up to 1,500 pupils from the ages of 11 to 18 years and an estimated 156 Full Time Equivalent (FTE) staff members. The proposed development site is on land to the north of Richfield Avenue / Cow Lane and adjacent to the Rivermead Leisure Centre.

The proposed new school shall be accessed from an upgraded Cow Lane / Richfield Avenue access with a segregated pedestrian and cycle access to the east on Richfield Avenue. In addition to the main teaching blocks, the proposals include a new sports hall, outdoor games area, Multi-Use Games Area (MUGA), car park and secure cycle parking facilities.

The school day will start at 08:30 for breakfast clubs with the main teaching day commencing at 09:30 and ending at 15:30, Mon-Fri. After-school activity clubs shall be offered each day and these shall run from 15:30 – 16:30.

3.1 Proposed Access

The proposed vehicular access shall be taken from the existing Cow Lane junction, though it shall be upgraded as shown in **Appendix D**. This includes the formalisation of the access and bound surfacing. Dropped kerbs and tactile paving will also be provided alongside newly installed 'School Keep Clear' zigzag road markings and an accompanying Traffic Regulation Order.

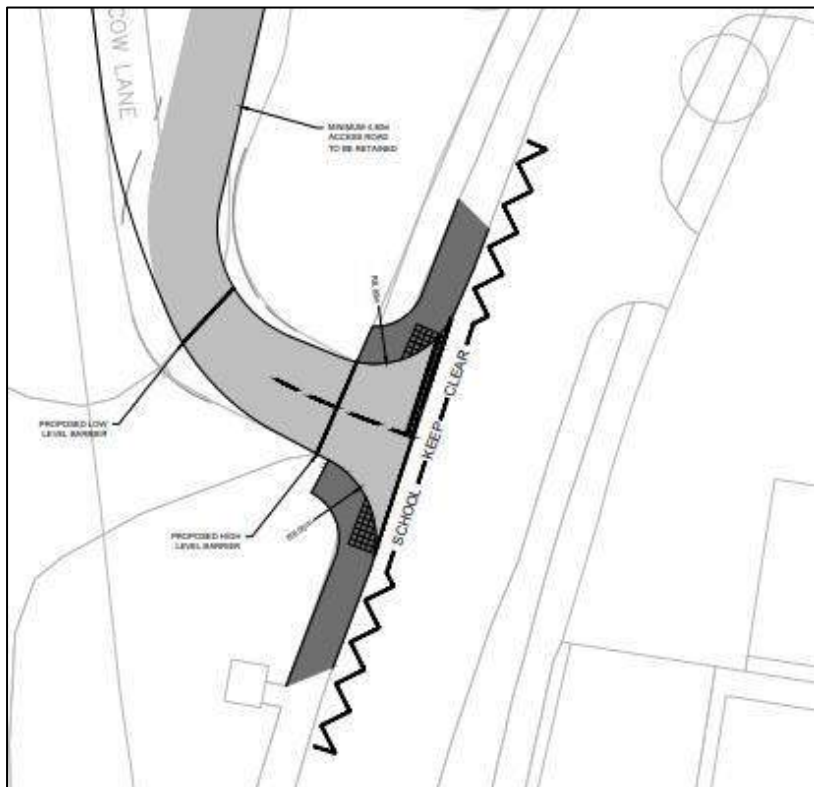


Figure 3.1 – Proposed Cow Lane access

The proposed access shall also be used to serve the adjacent garden centre for their deliveries which occur every 2-3 times per week. For this purpose the swept path analysis included in **Appendix D** also includes the movements of large articulated vehicles. For this purpose the site access shall include two lockable barriers. One low-level barrier shall be used to prevent vehicular access during times when the school site is closed but shall otherwise be open during the teaching day. The second barrier shall be a height restricted HGV barrier that shall remain closed at all times unless the garden centre are taking bulky deliveries outside of school peak periods. In keeping with the current arrangements of the garden centre, their staff shall open and close the height restricted barrier as and when it is required.

Appendix D demonstrates how refuse collection and service vehicles can safely access the site to service the proposed development and also that appropriate visibility splays for the 30mph road can be achieved.

In addition to the formalised vehicular access, a segregated pedestrian and cycle access shall also be provided to the site from Richfield Avenue as indicated below. This access shall also benefit from 'School Keep Clear' yellow zigzag road markings and accompanying TRO.

3.2 Car Parking

The proposed scheme includes the provision of 82 car parking spaces of which six shall be for blue badge holders. This figure is deemed an appropriate level of parking to accommodate staff and visitor parking demands given the good levels of accessibility benefiting the site. The provision has also been derived from the RBC Car Parking standards guidance which states that for development in Zone 2, a parking space should be provided for 2 FTE staff members.

In addition to the blue badge holder spaces, an allocation of parking spaces shall also be marked and reserved for car sharers only. This is to promote the uptake of car sharing amongst staff and reduce the site's residual trip generation impacts.

3.3 Cycle Parking

The development proposals include the creation of 120 secure and sheltered cycle parking spaces.

3.4 Highway Alterations

In addition to the improved site vehicular access and the formation of a segregated pedestrian and cycle access, wider improvements to the surrounding highway network are also proposed. It was noted that there are limited crossing facilities along Cow Lane from the segregated R5 cycle path from the east side of Cow Lane to the West side.

Whilst a pedestrian crossing refuge is in place, it is proposed this is upgraded to a Tiger Crossing which would provide a safer and more direct crossing opportunity for school users approaching from the south. This improvement would also be beneficial to wider residents and employees in the local area. The Tiger Crossing is proposed for the location shown in Figure 3.2 below.



Figure 3.2 – Pedestrian refuge to be upgraded

4.0 Accessibility by Sustainable Modes of Travel

A key element of national, regional and local policy is to ensure that new developments are located in areas where sustainable modes of travel are available. It is important to ensure that developments are not isolated but are located close to complementary land uses. This supports the aims of integrating planning and transport, providing more sustainable transport choices, and reducing overall travel and car use.

The accessibility of the proposed development is considered in this context for the following modes of travel:

- Pedestrian Accessibility;
- Accessibility by Cycle; and
- Accessibility by Public Transport.

4.1 Pedestrian Accessibility

Research has indicated that acceptable walking distances depend on a number of factors, including the quality of the development, the type of amenity offered, the surrounding area, and other local facilities. The Chartered Institution for Highways and Transportation (CIHT) document entitled '*Providing for Journeys on Foot*' suggests walking distances which are relevant to this planning application. These are reproduced in **Table 4.1**.

	Town Centres (m)	Commuting/School/ Sightseeing (m)	Elsewhere/Local Services (m)
Desirable	200	500	400
Acceptable	400	1,000	800
Preferred Maximum	800	2,000	1,200

Table 4.1 – CIHT Suggested Acceptable Walking Distances

Figure 4.1 below denotes an 2km isochrone or 25 minute walk from the site and demonstrates that large areas of developed residential suburbs to the west of Reading are accessible within a permitted walking distance from the site. These include Caversham, Battle and Reading West. Also included within the isochrone are Reading West and Reading rail stations.

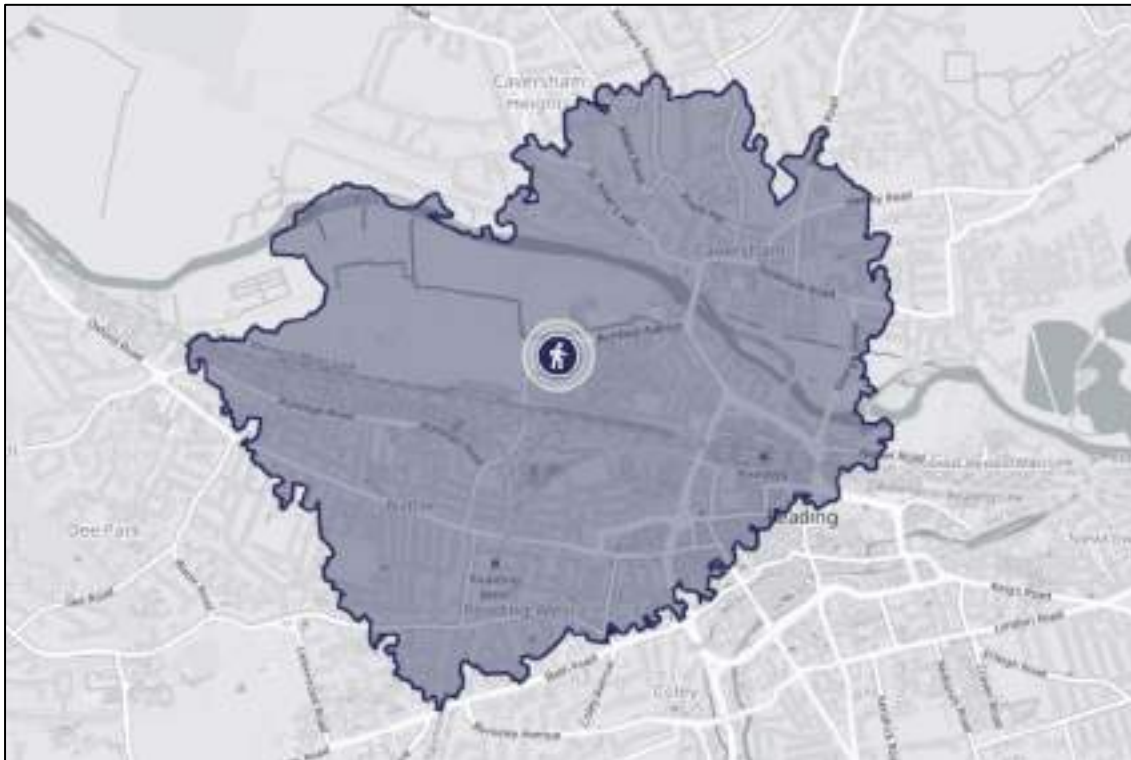


Figure 4.1 – 2km isochrone

Locally, the footways along Richfield avenue are in good condition with frequent street lighting provided along the length of the road. The southern footway is approximately 2.5m wide lined with a 2.5m wide grass verge. The northern footway is approximately 3m wide lined with a 2m grass verge. The northern footway is also a designated cycle route. Good levels of street lighting and dropped kerbs with tactile paving and pedestrian refuges at appropriate locations.

There are frequent crossing facilities located along Richfield Avenue at 80m to 100m intervals. The majority of crossings provide a refuge island. There is a pelican crossing located 40m west of the four-arm roundabout junction with the Caversham and Waterman with dropped kerbs provided.

Footways along Cow Lane are in good condition and are approximately 3m wide. The eastern footway is also lined with a grass verge ranging in 3m to 6m in width. Approximately 30m south of the site, the eastern footway transitions into a raised segregated footway and cycleway with guard rails, which continues south under the railway bridge. The footway on the west side of the carriageway runs along Cow Lane for approximately 30m and then comes to an end.

There is an uncontrolled crossing located along Cow Lane approximately 40m south of the site. The crossing is benefited by tactile paving and a refuge island though this is proposed to be upgraded into a Tiger Crossing as discussed above.

There is frequent street lighting present along Caversham Road. There are two pelican crossings, both benefited by tactile paving located along Caversham road 50m and 250m south of the roundabout with Richfield Avenue and Waterman Place respectively.

There is a public right of way (PRoW) that can be accessed south of the proposed development site at the site's southernmost access point. The PRoW runs parallel to the east of the site, connecting Cow Lane to the Thames Path.

Thames Path is also a PRoW that runs parallel to the River Thames north of the site connecting to a number of integrated footways located to the east of the site. These footways can be accessed by Richfield Avenue or Caversham Road. These footways pass through the Rivermead Leisure Complex, providing access to the east of the site.



Figure 4.2 – Cow Lane pedestrian crossing

4.2 Accessibility by Bicycle

Given the low traffic speeds in the vicinity of the site and the availability of cycle infrastructure such as Advanced Stop Lanes (ASL) at local signalised junctions and dedicated off-road cycle lanes, it is possible to determine that the site is well connected to the wider cycle network and accessible by bike.

Figure 4.3 below demonstrates that a wide area of Reading and the outlying towns and villages are accessible by cycle within the 30 minute journey time including Sonning Common to the north, Woodley to the east, Whitley Wood to the south and Pangbourne to the west.

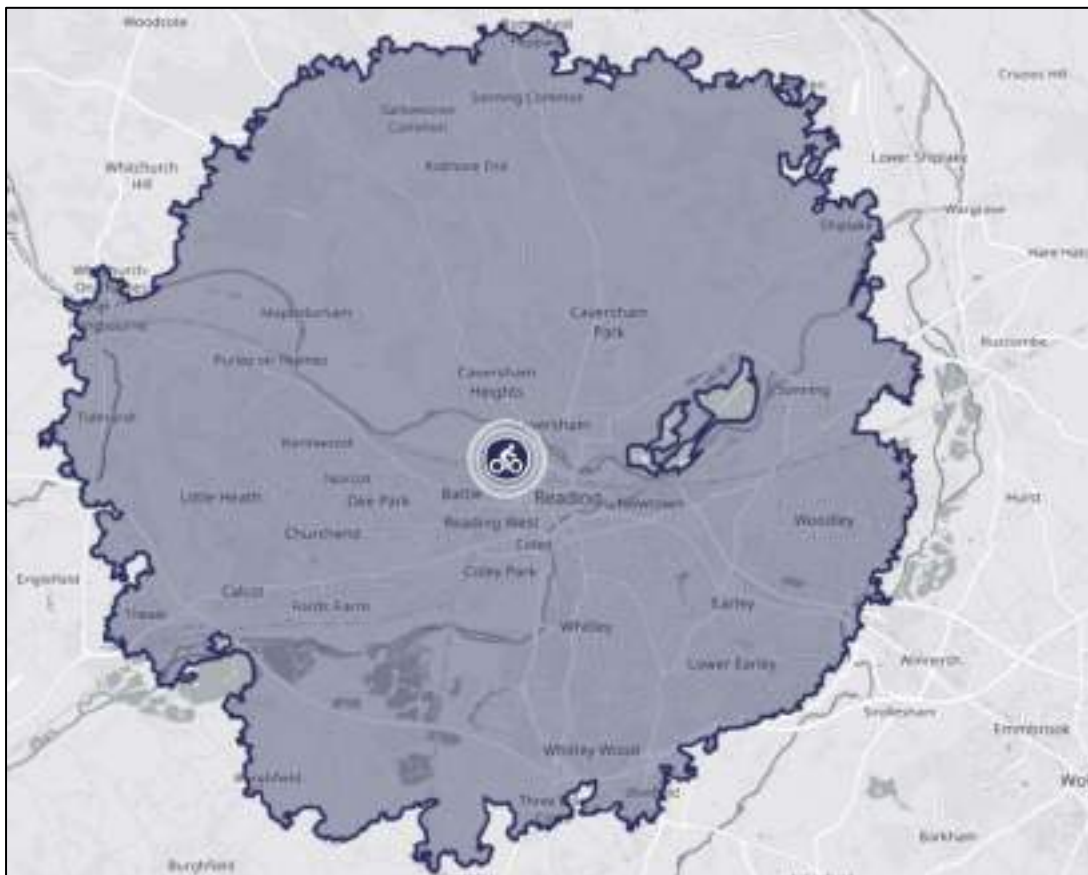


Figure 4.3 – 30 minute cycle isochrone

East of the site, Reading's R40 cycle route starts along Richfield Avenue, south of Rivermead leisure centre providing connections to north Reading, Caversham and Emmer Green and the National Cycle Network (NCN) route five. The R40 cycle route also provides a cycle route to Reading Station. There is shared cycle path that runs southbound along the eastern footway of Caversham Bridge.

South of the site, the linking cycle route continues along Cow Lane intersecting the R5 Reading cycle route along Portman Road. The R5 cycle route connects Reading West Station to Tilehurst Station and Danefield School further west.

Overall the proposed development is served a number of cycle routes within the vicinity of the site that provide connections to areas both north and south of the River Thames and it is considered the site is well connected to the wider cycle network.

4.3 Accessibility by Public Transport

The closest bus stop to the site is located along Richfield Avenue which is approximately 250m (three-minutes' walk) east from the site. This stop is served by the 42, 42a and 60a, F10, F11 and F12. It should be noted that the 42a only runs in the evening and the 60a on Sundays.



Figure 4.4 – Caversham Road bus stop

There are also two other bus stops located further east along Caversham Road approximately 750m (nine-minutes' walk) from the site. These bus stops serve an additional three routes. The local bus stops vary between the provision of shelters and also stops with a more simple pole and flag arrangement. The bus routes that serve the aforementioned bus stops are summarised in Table 4.3 below.

A summary of locally available bus services is provided in **Table 4.3** below.

Bus Route	Stop Location	From	To	AM Peak Frequency	PM Peak Frequency
42	Rivermead LC	Kenavon Drive	Reading	1	2
22	The Moderation	Reading	Reading	2	2
23	The Moderation	Caversham	Reading	3	2
24	The Moderation	Reading	Emmer Green	2	2
27	The Moderation	Caversham	Reading	0	1
800	The Moderation	Reading	High Wycombe	1	1
X38	The Moderation	Reading	Oxford	1	1

Table 4.3 – Local bus services

The nearest National Rail station to the site is Reading West, located approximately 1km (12- minutes' walk) south of the site. Reading West Station is managed and operated by Great Western Railway. Services are provided from Reading to Newbury and Basingstoke.

Reading Station is located approximately 1.25km (15 minutes' walk) southeast of the site. Reading Station is managed by Network Rail and operated by Great Western Railway, CrossCountry and South Western Railway. Reading Station provides services to London, the Midlands, the north and south west of England.

4.4 Accessibility Summary

The site is well connected to a large number of destinations and services by good quality and well-maintained pedestrian and cycle infrastructure. The site also benefits from good connectivity to local bus and rail services which collectively offers many for pupils, staff and visitors to access the site without the need to rely upon private vehicles.

5.0 Traffic Forecasting and Highway Impact

The following section contains trip generation analysis and impact upon the wider highway network. The proposed scheme will include capacity for up to 1,500 pupils and 156 FTE staff members.

5.1 Trip Generation and Assignment

In order to establish the levels of trip generation associated with the proposals. It would be expected that the introduction and implementation of the Travel Plan shall serve to reduce the proportion of single occupancy vehicle trips generated by the site. For the purpose of this assessment however any Travel Plan benefits through a reduction in vehicular trip generation have not been taken into account.

Whilst the proposed catchment area for the school cannot be defined at present, it is anticipated to be no more than 3 miles upon first opening. As the school fills to capacity, increased demand for admission would result in places being allocated to pupils who live the closest. This would therefore result in a tightening of the area from which pupils are drawn over time. In order to establish a baseline modal split for the purposes of assessment, the 2011 census travel to secondary school mode share data for schools across Reading has been used to estimate the mode share of pupils attending River Academy.

	Walk	Cycle	Car/ Van	Bus	Train
% Mode Share	42%	3%	19%	27%	9%
Estimated Pupil Numbers	630	45	285	405	135

Table 5.1 – Pupil trip rate

As shown in **Table 5.1** above, the most popular form of transport are journeys on foot with 42% then bus with 27% of pupils arriving by public bus services. The next most popular mode of travel is car / van with 19% of pupils expected to arrive this way.

When considering the number of car / van trips generated by pupils of the proposed school, UK Government Department for Transport (DfT) statistics drawn from the National Travel Survey show that the median average car occupancy level for educational trips is 2.0. These kinds of trips are defined as those “to school or college, etc. by full time students, students on day-release and part time students following vocational courses”. In the figure provided, escort trips, those “when the traveller has no purpose of his or her own, other than to escort or accompany another person; for example, taking a child to school” are also included.

The DfT data provides that in 37% of educational trips by car there was a single occupant in the vehicle; it therefore follows that for the remaining 63% of car trips that the average car occupancy will be 2.0 or more. As most school pupils cannot drive to school, we have assumed that all trips to school will be a

constituent part of the aforementioned 63%, so we have calculated the average value for this group to use in the traffic diagrams and models.

If total average is 2.0 but we know that for 37% of vehicles the occupancy is 1.0, then the remaining 63% will have a different average result, that we can calculate as follows: $37 \times 1.0 + 63 \times X = 100 \times 2.0$ then $X = 2.6$.

The average occupancy value for cars used by 2 or more travellers is 2.6 thus if we assume that one is the parent it is possible to say that the average number of children per car is 1.6. This figure accounts for siblings / friends / neighbours who would reasonably be expected to share a ride within an informal car share agreement between parents / guardians with children at the same school.

The above car share factor has therefore been built into the calculation below to calculate pupil car trips (as opposed to the number of pupils travelling by car).

	Walk	Cycle	Car/ Van	Bus	Train
% Mode Share	42%	3%	19%	27%	9%
Estimated Pupil Trip Generation	630	45	178	405	135

Table 5.2 – Pupil trip rate with car share factor applied

Following development and once at full capacity, the school would generate 178 pupil car trips, whilst 630 pupils would walk to the site, 45 would cycle, 405 would catch the bus and the remaining 135 would use the local train services.

When considering staff journeys the 2011 Census Travel To Work data has been interrogated to establish the proposed modal split. The following results in Table 5.3 below show the typical travel to work modal split trends for the Reading 007 Middle Super Output Area (MSOA).

Mode	Census
Underground, metro, light rail, tram	0.2%
Train	5.5%
Bus, minibus or coach	7.8%
Taxi	0.4%
Driving a car or van	64.2%
Passenger in a car or van	5.0%
Bicycle	4.6%
On foot	12.4%

Table 5.3 – Reading 007 MSA Travel To Work Mode Split

Given the local Car Parking Design Guidance in place which restricts parking spaces for new development to one space per two staff members, it is anticipated this would suppress what would otherwise lead to 'average' levels of travel to work by car amongst River Academy staff.

In order to correct the staff modal split projects the level of car parking available on site has been considered and the following modal split projects developed based upon this.

	Census	Adjustment	Proposed
Underground, metro, light rail, tram	0.2%		0%
Train	5.5%	2.3%	8%
Bus, minibus or coach	7.8%	3.3%	11%
Taxi	0.4%		0%
Driving a car or van	64.2%	-15.0%	49%
Passenger in a car or van	5.0%	2.1%	7%
Bicycle	4.6%	2.0%	7%
On foot	12.4%	5.3%	18%

Table 5.4 – Proposed River Academy Staff Mode Split

It is proposed that 49% (76) of staff shall travel to work as a car / van driver with 18% arriving on foot, 19% using public transport and the remainder using cycles or as a car share arrangement.

5.2 Trip Distribution

The distribution of the proposed new trips has been derived from Census Population Weighting for Reading MSOAs for pupils, and Location of Usual Residence and Place of Work by Method of Travel to Work data for staff trips.

The number of new trips and distribution across the local highway network are shown in **Appendix E** of this report. These distribution plans also include the allocation of the above trips to the wider network at different times of the school day.

Based on the provision of pre-school breakfast clubs and also after-school activity clubs operated by the Trust at other sites, it is estimated that 20% of pupils shall arrive early for breakfast clubs and 20% of pupils shall stay behind at the end of the school day for post-school activity clubs.

The trip distribution profile is therefore as follows:

- **08:00 – 09:00** – 100% of staff and 20% of pupil arrivals (two-way trips in the case of pupils arriving by car / van)
- **09:00 – 10:00** – 80% of pupils arrivals (two-way in the case of those arriving by car / van)
- **15:30-16:30** – 80% of pupils depart
- **16:30 – 17:30** – 20% of pupils and 100% of staff depart

5.3 Junction Capacity Analysis

Based on the pre-application engagement with planning and highways officers from RBC (**Appendix C**), it was requested that this TA investigate the impacts of the proposed development upon local junctions which were:

- Beresford Road / Cow Lane mini-roundabout;
- Rivermead / Richfield Avenue roundabout;
- Caversham Bridge Roundabout.

It is considered necessary to assess the impact of the new access on the free flow of traffic at the above junction locations in order to assess if the residual development trips shall result in an unacceptable level of impacts on the surrounding highway network.

5.4 Baseline Traffic & Future Year Scenarios

Manual Classified Counts and Queue Length surveys were commissioned and undertaken at the above junctions and is summarised in **Appendix G**. The surveys were undertaken on Tuesday 30th November 2021. No road works were reported in the vicinity of the surveys at the time and weather conditions were acceptable. The above counts have been utilised for modelling the 2021 Baseline scenario.

The 2028 Future Year scenario (including TemPro growing factors) have also been developed to align with the period when the school is expected to reach full capacity given the incremental increases in pupil intake during the intervening period. The Future Year With Development scenario is therefore based around the 2028 scenario but also includes the proposed development trips highlighted above.

Taking the above proposed trip generation levels, turning counts and future year background traffic flows into account, it is possible to undertake a detailed junction capacity modelling assessment of the junctions most likely to be effected.

5.5 Beresford Road / Cow Lane Mini-Roundabout Arcady Analysis

To model the impact on this mini-roundabout, this assessment has utilised Junctions 10 and Arcady modelling software. The Junctions 10 models results generated provide a Ratio to Flow capacity (RFC) along with an estimate of the likely traffic queues.

RFC values between 0.00 and 0.85 are generally accepted as representing stable and acceptable operating conditions. Values between 0.85 and 1 and represent variable operation (i.e. possible queues building up at the junction during the period under consideration and increases in vehicular delay moving through the junction). RFC values in excess of 1 represent overloaded conditions (i.e. congested conditions) where traffic queues will propagate through the time period (i.e. a greater number of arrivals than departures).

The results of the Arcady assessment for the Beresford Road / Cow Lane roundabout between 09:00-10:00 and 15:30-16:30 are summarised in Table 5.5 below.

- Arm 1 – Cow Lane
- Arm 2 – Beresford Road
- Arm 3 – Portman Road

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	3.7	20.54	0.80	C	D2	32.2	131.62	1.05	F
Arm 2		2.5	34.57	0.73	D		8.0	95.80	0.94	F
Arm 3		7.1	28.26	0.89	D		5.0	21.21	0.84	C
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	5.6	29.15	0.86	D	D4	63.6	246.28	1.14	F
Arm 2		4.2	56.39	0.84	F		12.7	138.46	1.00	F
Arm 3		13.9	51.56	0.96	F		8.3	33.31	0.91	D
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	8.9	43.71	0.92	E	D6	89.0	377.74	1.20	F
Arm 2		8.0	96.90	0.94	F		19.4	190.30	1.06	F
Arm 3		21.5	74.54	1.00	F		11.8	45.88	0.94	E

Table 5.5 – Beresford Road / Cow Lane roundabout between 09:00-10:00 and 15:30-16:30 modelling performance

The results of the above modelling work demonstrate that the current operation of the roundabout is stretched beyond its theoretical capacity during the PM period. This is compounded in the Future Year scenario without the development as would be expected once background growth is added.

When considering the Future Year scenario With Development then there is a slight worsening of performance at this junction, however it is considered to be relatively minor in comparison to the existing and future year performance changes.

The full modelling outputs are included as **Appendix F**.

The results of the Arcady assessment for the Beresford Road / Cow Lane roundabout between 08:00-09:00 and 16:30-17:30 are summarised in Table 5.6 below.

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	2.5	15.06	0.72	C	D2	54.9	204.65	1.11	F
Arm 2		2.0	27.64	0.68	D		6.4	80.93	0.90	F
Arm 3		5.2	21.53	0.85	C		3.9	16.93	0.80	C
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	3.3	19.04	0.78	C	D4	93.0	393.52	1.21	F
Arm 2		3.1	40.09	0.77	E		9.5	111.45	0.96	F
Arm 3		8.9	34.87	0.92	D		5.8	24.09	0.87	C
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	3.6	20.09	0.79	C	D6	124.3	541.59	1.27	F
Arm 2		4.6	55.13	0.85	F		9.1	106.39	0.95	F
Arm 3		13.4	50.62	0.96	F		6.2	25.40	0.87	D

Table 5.6 – Beresford Road / Cow Lane roundabout between 08:00-09:00 and 16:30-17:30 modelling performance

As with Table 5.5, there is a worsening of performance on all arms of the junction when considering the changes from existing to future year scenarios. Indeed as is the case during the PM period on Cow Lane, the existing baseline scenario suggests the junction is currently operating beyond theoretical capacity.

The Future Year scenario with development does again contribute to a slight worsening of performance as it the case with the previous time periods modelled, but again the differences between Future Year and Future Year with Development are considered to be minor and for some movements, no change at all.

5.6 Rivermead / Richfield Avenue Roundabout Arcady Analysis

The results of the Arcady assessment for the Rivermead / Richfield Avenue roundabout between 09:00-10:00 and 15:30-16:30 are summarised in Table 5.7 below.

- Arm 1 – Rivermead
- Arm 2 – Richfield Ave (E)
- Arm 3 – Tessa Road
- Arm 4 – Richfield Ave (W)

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	0.0	4.17	0.03	A	D2	0.0	4.05	0.03	A
Arm 2		1.7	7.17	0.62	A		2.0	7.96	0.67	A
Arm 3		0.2	8.54	0.18	A		0.4	10.11	0.27	B
Arm 4		2.1	8.32	0.67	A		1.7	7.13	0.62	A
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	0.0	4.39	0.04	A	D4	0.0	4.26	0.03	A
Arm 2		2.0	8.16	0.66	A		2.6	9.36	0.72	A
Arm 3		0.3	9.20	0.20	A		0.4	11.32	0.31	B
Arm 4		2.6	9.85	0.72	A		2.0	8.18	0.67	A
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	0.0	4.77	0.04	A	D6	0.0	4.62	0.03	A
Arm 2		2.9	10.64	0.74	B		3.9	12.85	0.80	B
Arm 3		0.3	10.40	0.22	B		0.5	13.31	0.34	B
Arm 4		4.0	13.61	0.80	B		2.9	10.71	0.75	B

Table 5.7 – Rivermead / Richfield Avenue roundabout between 09:00-10:00 and 15:30-16:30 modelling performance

The modelling work undertaken finds that all arms of this junction currently operate within the theoretical capacity during these periods. When future year growth, with and without development are considered then the junction continues to operate within acceptable tolerances with only minor increases in queue length and delay projected.

The results of the Arcady assessment for the Rivermead / Richfield Avenue roundabout between 08:00-09:00 and 16:30-17:30 are summarised in Table 5.8 below.

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	0.0	4.10	0.02	A	D2	0.1	4.15	0.07	A
Arm 2		1.5	6.78	0.60	A		1.8	7.29	0.64	A
Arm 3		0.2	7.81	0.13	A		0.3	9.21	0.22	A
Arm 4		1.8	7.55	0.64	A		1.7	7.37	0.62	A
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	0.0	4.31	0.03	A	D4	0.1	4.37	0.07	A
Arm 2		1.8	7.61	0.64	A		2.2	8.39	0.69	A
Arm 3		0.2	8.28	0.14	A		0.3	10.15	0.25	B
Arm 4		2.3	8.73	0.69	A		2.1	8.49	0.67	A
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	0.0	4.40	0.03	A	D6	0.1	4.61	0.08	A
Arm 2		2.3	8.89	0.69	A		2.4	8.93	0.71	A
Arm 3		0.2	8.87	0.15	A		0.4	10.50	0.26	B
Arm 4		2.5	9.33	0.71	A		2.6	10.17	0.73	B

Table 5.8 – Rivermead / Richfield Avenue roundabout between 08:00-09:00 and 16:30-17:30 modelling performance

As with the 09:00-10:00 and 15:30-16:30 modelling assessment, the modelling work undertaken for 08:00-09:00 and 16:30-17:30 finds that all arms of this junction currently operate within the theoretical capacity during these periods. When future year growth, with and without development are considered then the junction continues to operate within acceptable tolerances with only minor increases in queue length and delay projected.

5.7 Caversham Bridge Roundabout Arcady Analysis

The results of the Arcady assessment for the Caversham Bridge roundabout between 09:00-10:00 and 15:30-16:30 are summarised in Table 5.9 below.

- Arm 1 – Caversham Bridge
- Arm 2 – Waterman Place
- Arm 3 – Caversham Road
- Arm 4 – Richfield Avenue

AM						PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
Existing Layout - 2021 Baseline										
Arm 1	D1	2.9	7.78	0.74	A	D2	2.7	7.27	0.73	A
Arm 2		0.7	252.30	0.49	F		0.6	197.95	0.44	F
Arm 3		1.6	5.12	0.60	A		3.2	6.47	0.76	A
Arm 4		1.0	3.72	0.48	A		1.2	4.44	0.54	A
Existing Layout - 2028 Future Baseline										
Arm 1	D3	4.1	10.55	0.81	B	D4	3.8	9.69	0.79	A
Arm 2		6.1	1425.76	999999999.00	F		6.7	1426.30	999999999.00	F
Arm 3		2.0	5.93	0.65	A		4.8	11.81	0.83	B
Arm 4		1.2	4.18	0.53	A		1.5	5.20	0.59	A
Existing Layout - 2028 Future Baseline + Development										
Arm 1	D5	5.7	14.38	0.85	B	D6	5.0	12.71	0.84	B
Arm 2		6.2	1465.39	999999999.00	F		6.7	1463.13	999999999.00	F
Arm 3		2.4	7.00	0.70	A		7.1	16.95	0.88	C
Arm 4		1.5	4.74	0.59	A		1.9	6.13	0.66	A

Table 5.9 – Caversham Bridge roundabout between 09:00-10:00 and 15:30-16:30 modelling performance

With the exception of the Waterman Place arm, the current, future and proposed scenarios would each fall within acceptable levels of capacity. There are small incremental increases in projected traffic flows and therefore utilisation of capacity between the future year scenario and future year with development scenario.

The results for the Waterman Place arm have been double checked within the software and junction flows and geometry reviewed to ensure accuracy. The outlying and clearly erroneous projections for the performance of this arm are likely due to the acute disparities between traffic flows on the remaining arms and Waterman Place.

As can be seen from the traffic counts included as **Appendix G**, there are very few observed trips on this arm of the roundabout and no proposed changes as a result of the development proposals. The modelling outputs for this arm are therefore discounted from the broader assessment.

The results of the Arcady assessment for the Caversham Bridge roundabout between 08:00-09:00 and 16:30-17:30 are summarised in Table 5.10 below.

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	3.3	8.49	0.77	A	D2	2.4	6.79	0.71	A
Arm 2		0.5	287.34	0.40	F		0.4	115.73	0.30	F
Arm 3		2.2	6.20	0.68	A		3.0	7.98	0.75	A
Arm 4		1.1	4.21	0.52	A		1.2	4.69	0.55	A
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	5.0	11.93	0.83	B	D4	3.3	8.78	0.77	A
Arm 2		3.9	1411.79	9999999999.00	F		6.7	1419.45	9999999999.00	F
Arm 3		2.9	7.63	0.73	A		4.5	11.03	0.82	B
Arm 4		1.4	4.85	0.57	A		1.6	5.56	0.61	A
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	5.8	13.84	0.86	B	D6	3.7	9.83	0.79	A
Arm 2		3.9	1422.89	9999999999.00	F		6.7	1431.64	9999999999.00	F
Arm 3		3.4	8.75	0.77	A		4.9	11.92	0.83	B
Arm 4		1.5	5.03	0.58	A		1.9	6.24	0.65	A

Table 5.10 – Caversham Bridge roundabout between 08:00-09:00 and 16:30-17:30 modelling performance

As was the case with the School Peak Period trip generation times modelled within Table 5.9, the current, future and proposed scenarios would each fall within acceptable levels of capacity. There are small incremental increases in projected traffic flows and therefore utilisation of capacity between the future year scenario and future year with development scenario.

The results for the Waterman Place arm have been double checked within the software and junction flows and geometry reviewed to ensure accuracy. The outlying and clearly erroneous projections for the performance of this arm are likely due to the acute disparities between traffic flows on the remaining arms and Waterman Place.

5.8 Traffic Forecasting Conclusions

The assessment of the proposed impact on the local highway network above is based upon a review of the proposed school's vehicular trip generation levels during various periods including school peak (AM and PM) and network peak (AM and PM).

It is concluded that for the Rivermead roundabout and also the Caversham Bridge roundabout, there remains theoretical capacity in each of the baseline year, future year and future year with development scenarios on all arms. It is noted that the proposed development contributes to a slight deterioration of performance however this is less significant than the increases anticipated due to future year growth.

The modelled performance of the Cow Lane / Beresford Road mini-roundabout is notable in that the future year scenario with development suggests all arms will begin operating close to, or beyond their theoretical capacity levels. It is also the case however that the junction currently performs this way and when future year growth is taken into account, will continue to operate beyond theoretical capacity.

When reviewing the future year with development scenario, the RFC increases of 0.06, 0.10 and 0.04 in the AM period for arms 1, 2 and 3 respectively and 0.06, 0.06 and 0.03 in the PM period for arms 1, 2 and 3 respectively are considered to be minor increases.

Similarly when reviewing the traffic count data against the proposed development trip generation data for these arms, 48 additional trips will be allocated to Cow Lane, 23 to Beresford Road and 26 to Portman Road. This ranges from one additional trip every 1.25 minutes to 2.6 minutes and would generally be considered as imperceptible.

The modelling work undertaken does not take into account the natural tendency for drivers to alter their journeys to different routes when levels of delay are experienced in any location. It is therefore considered that the assessment of the Cow Lane roundabout presents a worst case scenario and in reality, the re-distribution / diversion by some drivers plus the impact of the school travel plan shall serve to reduce impacts on this junction from those extrapolated from the modelling work.

It is therefore considered the residual impacts of the proposed development trips can be accommodated within the wider highway network and no further capacity enhancements shall be required.

6.0 Transport Planning Policy

When developing the scheme proposals, it is important to understand the national and local transport related planning policies. This section aims to outline the key policies throughout relevant policy and guidance documents.

6.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) sets out transport planning policy and the Minister for Planning's Foreword lays the foundations for the policy rationale;

'The purpose of planning is to contribute to the achievement of sustainable development....'

Paragraph 11 states that at the heart of NPPF is:

'Plans and decisions should apply a presumption in favour of sustainable development.'

Paragraph 103 of the NPPF is entitled Promoting Sustainable Transport and outlines the important role that transport policies have to play in facilitating sustainable development. The section states that:

"Significant development should be focussed on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes".

Paragraph 109 of the NPPF states that:

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

Paragraph 110 of the NPPF continues to set out the hierarchy of consideration which are to:

- give priority to pedestrian and cycle movements, both within the scheme and neighbouring areas; and second – so far as is 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 ;
- address the needs of people with disabilities and reduced mobility in relation to all modes of transport;
- 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;
- allow for the efficient delivery of goods, and access by service and emergency vehicles; and
- be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations.

In addition to the NPPF, the government has published the National Planning Policy Guidance (NPPG). This document contains a section which clarifies the over-arching principles on Travel Plans, Transport Assessments and Transport Statements.

The guidance on Transport Assessments and Statements reiterates the circumstances in which either document would usually be required. It also clarifies the process for establishing a scope for the assessment, and what the document should contain. The NPPG has been considered in the production of this TA.

The guidance on Travel Plans reinforces the requirement for a Travel Plan, the scope of the document, and need for monitoring to continue the strategy into the future. The NPPG has been considered in the production of the accompanying Travel Plan.

6.2 Emerging & Adopted Local Planning Policy

Reading Borough Council, Local Plan 2019

A Transport Assessment is required where a proposed development is likely to have an impact on the local highway network and related environmental impacts. The Reading Borough Council Local Plan (2019) outlines:

“All developments will be assessed for their impact upon the transport network, including the local and trunk road and motorway networks and, where relevant, the rail network. Development should provide mitigation measures in line with their impacts on these networks, taking account of levels of development that have already been accepted, and mitigation measures that have already been agreed or implemented. It will be a condition of planning permission that appropriate measures are in place to secure any remedial transport measures required. Where necessary, a transport assessment of the scheme will be required. This will measure the impacts both of the development proposal and of any remedial measures proposed by the developer to address those impacts. Once a satisfactory package of remedial measures has been negotiated, contributions may be sought from developers to secure their delivery.”

Parking Standards

Revised Parking Standards and Design Supplementary Planning Document (SPD) was adopted on the 31st October 2011. This document helps provide good design and efficient land use and sets out maximum and minimum parking standards. These standards are reflected in some of the Council's Core Strategy Policies.

Car parking

Car parking standards are set in line with a four zone system based on the analysis of the urban environment and transport links. The development site lies within Zone 2, Primary Core Area which is defined as;

“This zone directly surrounds the Central Core Area and extends to walking distances of 2 kilometres from the centre of Reading. Typically, this zone is well served by public transport, with buses continuing either into or out of the Central Core Area via this zone. Much of this area is within acceptable walking distance (400m) of either the main railway station or Reading West railway station. Walking and cycling in this area tends to be encouraged through the provision of wide and safe footways, with some dedicated or shared cycle ways. The areas within Zone 2 also typically have smaller local centres, providing day-to-day access to retail and some commercial facilities. Future growth in these areas is likely to be more mixed than in the core area, with larger amounts of residential than commercial space.”

The maximum car parking standards for the proposed development are 1 space per 2 FTE staff. The proposed parking levels are broadly in accordance with this.

With accordance to the newly adopted Local Plan policy TR5:

“Development should provide car parking and cycle parking that is appropriate to the accessibility of locations within the Borough to sustainable transport facilities, particularly public transport. Development should make the following provision for electric vehicle charging points:

- *All new houses with dedicated off-street parking should provide charging points;*
- *Within communal car parks for residential or non-residential developments of at least 10 spaces, 10% of spaces should provide an active charging point.”*

Taking the above into consideration, 8 EV charge spaces are to be included as part of the development.

Cycle parking

For Use Class D1 Secondary Education the guidance states the 1 cycle parking space should be provided 10% of building users (FTE staff and students) up to 500 plus 7% for building users in the range of 501-1000 plus 5% for building user over 1000.

There are proposed to be a total of 1,656 users (students and FTE staff) so this would equate to the provision of 118 cycle parking spaces. The proposed development includes the provision of 120 secure and sheltered cycle parking spaces and it is therefore considered that a generous level of cycle parking is proposed.

Travel Plans

The Reading Local Plan (2019) policy TR1 outlines the following regarding the requirements for Travel Plans.

“Proposed development should contribute appropriately to meeting the objectives of the most upto date Local Transport Plan or any successor document, including sub-strategies, specific projects identified and the local action plans. Planning permission will not be granted for major development proposals unless there is a commitment to implement measures to promote and improve sustainable transport facilities, such as through provision to encourage walking, cycling and the use of public transport; and through agreed travel plans, safe routes to local facilities and services, including schools and parks, and similar measures.

All development proposals should make appropriate provision for works and contributions to ensure an adequate level of accessibility and safety by all modes of transport from all parts of a development, particularly by public transport, walking and cycling, in accordance with any agreed transport assessment submitted as part of the application.”

6.3 Summary

The development proposals are considered to be consistent with local and national transport planning policy. The site has been identified as a location which benefits from excellent levels of sustainable travel connectivity as per regional and national guidelines. The comparative low levels of existing vehicular trip generation proposed in addition to the implementation of a Travel Plan further support the aims and objectives of applicable local and national planning policies.

The provision of car parking, electric vehicle charging infrastructure and cycle parking is aligned with the local policy requirements and the proposals also include for local pedestrian and cycle infrastructure enhancements. It is therefore considered the proposals are consistent and complementary to local and national planning policy and design guidance.

7.0 Summary and Conclusions

Hexa Consulting have been appointed by Bowmer & Kirkland on behalf of the Department for Education to provide traffic and transportation advice in relation to the proposed development of the River Academy on Richfield Avenue in Reading.

The proposals include the development of a new secondary school and sixth form with capacity for up to 1,500 pupils from the ages of 11 to 18 years and an estimated 156 Full Time Equivalent (FTE) staff members. The proposed development site is on land to the north of Richfield Avenue / Cow Lane and adjacent to the Rivermead Leisure Centre.

The proposed new school shall be accessed from an upgraded Cow Lane / Richfield Avenue access with a segregated pedestrian and cycle access to the east on Richfield Avenue. In addition to the main teaching blocks, the proposals include a new sports hall, outdoor games area, Multi-Use Games Area (MUGA), car park and secure cycle parking facilities.

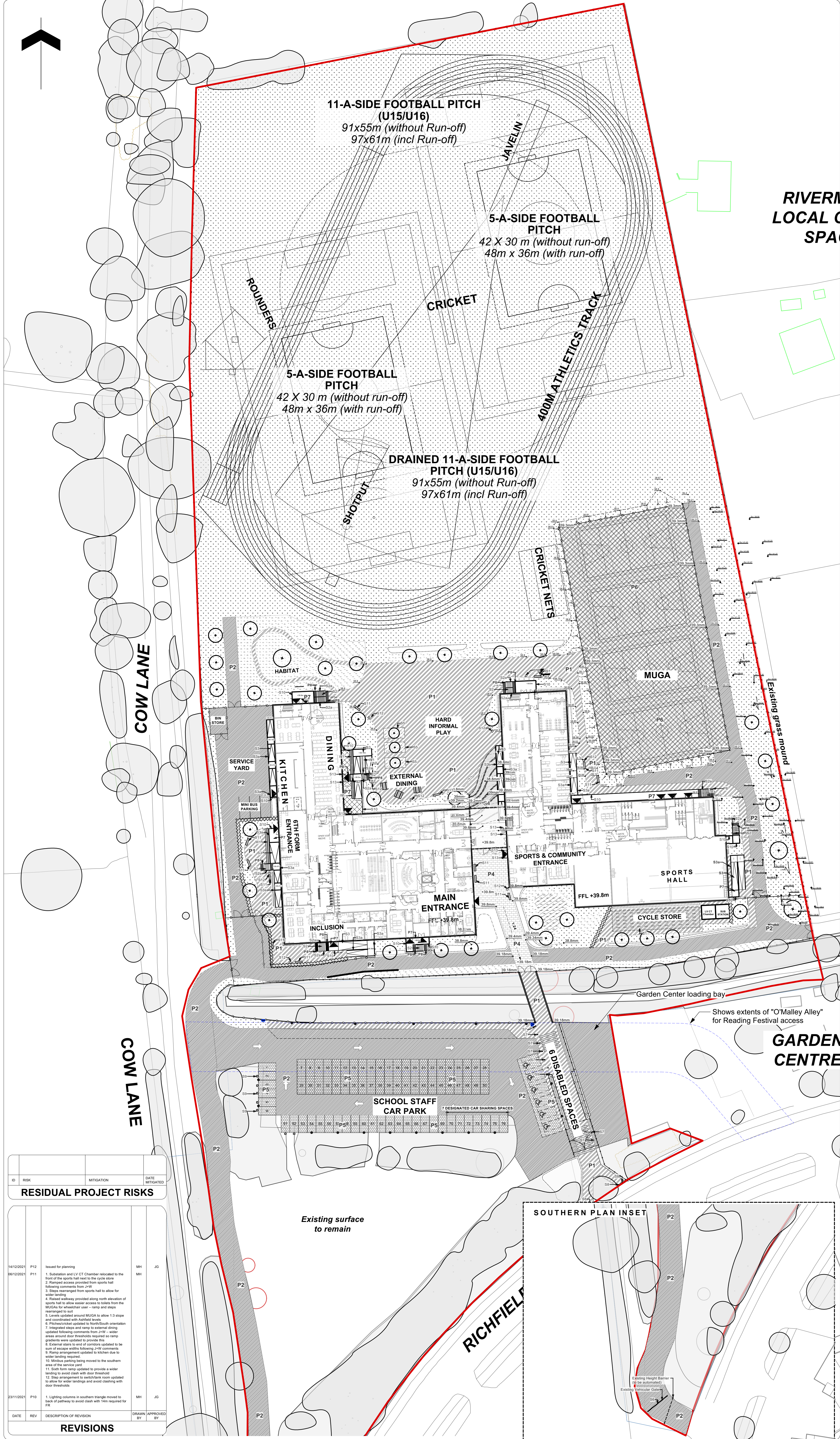
The site is located in an accessible area of Reading which provides good travel opportunities by public transport and also active travel modes. The analysis of the latest PIA data also demonstrates there are no underlying highway safety concerns that could be exasperated by the proposals.

It has been demonstrated that the proposals shall result in a comparatively low level of residual car trips which can be accommodated by the existing local highway network without resulting in severe detrimental impacts.

When considering the local and national planning policy guidance in respect of transport and highway design, it is asserted that these proposals are consistent with the broader aims and objectives of RBC.

Finally, it is therefore concluded that the development proposals should be acceptable to Planning and Highways Officers at RBC and that they may provide their approval in principle for the scheme.

Appendix A – Site Masterplan



Note

1. Do not scale from this drawing
2. To be read in conjunction with Project Risk Register REF: XXX
3. To be read in conjunction with all other Landscape Architect's drawings

- KEY**
- Application Boundary
 - Existing Trees
 - Proposed Building
 - Ground Floor Cut-Through (First and Second Floor Connection)
 - Building Entrance/Exit Point

- HARD LANDSCAPE**
- P1** PEDESTRIAN TARMAC
To Engineer's Specification
 - P2** VEHICULAR TARMAC
To Engineer's Specification
 - P4** PEDESTRIAN BLOCK PAVING
Pedestal Paving
200x100x60mm
Supplier: Tobermore
Colour: Natural
Location: Entrance Plaza
Q24/110A
 - P5** PERMEABLE BLOCK PAVING
Priora Paving
200x100x60mm
Supplier: Marshalls
Colour: Charcoal with white marker blocks
Location: Parking Bays
Q24/110C
 - P6** PERMEABLE TARMAC
To Engineer's Specification
 - P7** RAISED PLATFORMS
Concrete raised platforms to steps/ramp access
 - P8** HAZARD WARNING PAVING
Corduroy Paving
400x400x50mm
Supplier: Marshalls
Colour: Charcoal with white marker blocks
Location: To top and bottom of steps/crossings
Q24/320

- SOFT LANDSCAPE**
- PROPOSED GRASS SEED
Refer to Planting Plan
 - PROPOSED AMENITY PLANTING
Refer to Planting Plan
 - PROPOSED MEADOW PLANTING
Refer to Planting Plan
 - PROPOSED RAIN GARDEN PLANTING
Refer to Planting Plan
 - PROPOSED DRY SWALE
Refer to Planting Plan
 - PROPOSED TREE PLANTING
Refer to Planting Plan
 - PROPOSED HEDGE PLANTING
Refer to Planting Plan

- SITE FURNITURE**
- S1** CYCLE STAND WITH CANOPY
120 cycle spaces
Mallford Cycle Hoop and Sheldon Canopy
Q50/210E & B91/330B
 - S2** STEPS
Details TBC
 - S2a** HANDRAILS FOR STEPS
Details TBC
 - S3** RAMP
Details TBC
 - S3a** HANDRAILS FOR RAMP
Details TBC
 - S4** PRE-CAST CONCRETE STEP UNITS
Details TBC
 - S5** RAIN GARDEN WITH INTEGRATED SEATING
Details TBC
 - S6** PROPOSED VEHICLE GATE
Details TBC
 - S7** REMOVABLE BOLLARD
Stainless Steel Bollard
Supplier: Kensington Systems
Location: To car park crossings
Q50/196
 - S8** FIXED BOLLARD
Stainless Steel Bollard
Supplier: Kensington Systems
Location: To car park crossings
Q50/196A
 - S9** EV CHARGING POINT
Details TBC
 - S10** BALUSTRADE
Details TBC
 - S11** BENCH
Concrete Bench
Supplier: Langley Designs
Q50/220A
 - S12** BIN
Supplier: Langley Designs
Wood Finish
Q50/240A
 - S13** DOOR PROTECTION HOOP
Supplier: Langley Designs
Product: Mallford Door Barrier
Q50/210D
 - S15** LIGHTING LOCATION TBC

- FENCING**
- Fencing
Refer to Fencing Plan
 - Pedestrian Parapet
Refer to Fencing Plan
 - Single-leaf Gate
Refer to Fencing Plan
 - Double-leaf Gate
Refer to Fencing Plan
 - Sliding Gate
Refer to Fencing Plan

- STRUCTURES**
- W1** Gabion Retaining Wall
Details TBC

STATUS

S2 - PLANNING

ares
LANDSCAPE ARCHITECTS

Area Landscape Architects LTD
Formal House
60 St Georges Place
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GL50 3PN
t: 01242 700 931
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CLIENT :

Bowmer & Kirkland

PROJECT TITLE :

River Academy

DRAWING TITLE :

Landscape General Arrangement Plan

DRAWING SCALE: 1:500
PAPER SIZE: A1

DRAWN BY: MH
APPROVED BY: JG

DRAWN DATE: 10.09.2021
ALA PROJECT CODE: ALA691

DRAWING NUMBER: FS0949-ALA-XX-DZ-RR-L-0002 S2
STATUS: P12

ID	RISK	MITIGATION	DATE MITIGATED
RESIDUAL PROJECT RISKS			
14/12/2021	P12	Issued for planning	MH JG
06/12/2021	P11	1. Substation and LV CT Chamber relocated to the front of the sports hall next to the cycle store 2. Ramped access provided from sports hall following comments from JMW 3. Steps rearranged from sports hall to allow for wider landing 4. Raised walkway provided along north elevation of sports hall to allow easier access to toilets from the MUGAs for wheelchair user - ramp and steps rearranged to suit 5. Levels updated around MUGA to allow 1:3 slope and coordinated with Allfield levels 6. Pitch/cricket updated to North/South orientation 7. Integrated steps and ramp to external dining updated following comments from J+W - wider areas around door thresholds required to ramp gradients were updated to provide this 8. External stairs to end of corridor updated to be turn of escape width following J+W comments 9. Ramp arrangement updated to kitchen due to wider landing required 10. Minibus parking being moved to the southern area of the service yard 11. Sixth form ramp updated to provide a wider landing to avoid clash with door threshold 12. Step arrangement to switch/tank room updated to allow for wider landings and avoid clashing with door thresholds	MH MH
23/11/2021	P10	1. Lighting columns in southern triangle moved to back of pathway to avoid clash with 14m required for FR	MH JG
DATE	REV	DESCRIPTION OF REVISION	DRAWN BY APPROVED BY
REVISIONS			

Appendix B - Highway Scoping Note

SCOPING STUDY FOR: River Academy, Richfield Avenue, Reading

LOCATION: Leaderboard Golf Centre, Richfield Avenue

LOCAL HIGHWAY AUTHORITY: Reading Borough Council (RBC)

DATE: 24th September 2021

This note defines the scope of assessment required to appropriately identify and where required, mitigate the residual highways and transport impacts as part of the proposed development of the new River Academy. We have set out the main details and scoping for a Transport Assessment (TA) and Travel Plan (TP) below. We invite Highways Officers at RBC to provide comment.

Ref	Item	Requirements	Comments
1	Level of planning approval sought?	Full Planning Application for the development of a new Secondary School with Sixth Form.	
2	Size and description of development proposals	Proposals include the development of a new 8FE Secondary School with Sixth Form with capacity for 1,500 pupils and circa 156 FTE staff members. The proposal would include a new main school building, separate sports block, MUGA, new playing pitches together with car and cycle parking works, new accesses onto the public highway and all ancillary works and landscaping. The control scheme developed includes the provision of 82 car parking spaces (76 staff and 6 visitors) which is based on the 1:2 ratio for RBC Car Parking SPD Zone 2. It is noted however that the northern part of the site falls within zone 4 which would allow for a 1:1 car parking to staff numbers ratio. Cycle parking and electric vehicle charging points shall also be provided in compliance with local planning and design guidance requirements.	
3	Description of existing land uses.	The site is located to the north of Richfield Avenue. The 'southern triangle' on the southern end of the site is an area of bare open land enclosed by established hedgerows and trees with a ditch used for drainage running from west to east. To the east directly adjoining the site is Rivermead Leisure Centre. To the south of the site across Richfield Avenue is a large commercial/ industrial zone.	

4	Does the development involve the relocation of an existing use?	No	
5	How are existing trips going to be dealt with?	Though the site currently generates a small number of trips as part of the Leaderboard Golf use, it is not proposed that these will be calculated and netted off when considering future development proposals. As such the new trips associated with the school proposals shall be consider new trips on the local highway network. It is noted the site is also used as part of the annual Reading Festival though given this event occurs during school holiday periods, it is not considered that the development proposals shall contribute to an intensification of festival related trips. Similarly the principal vehicular site access from Cow Lane shall be shared with the adjacent garden centre to the east. These garden centre trips are already embedded within the local highway network and are not proposed to intensify as part of the development proposals.	
6	Are traffic surveys of the existing conditions available or required?	Yes, traffic counts to inform detailed junction capacity modelling proposed for the Richfield Ave / Caversham Rd roundabout and Cow Lane / Portman Rd roundabout. Peak period and inter-peak period turning counts and queue lengths surveys are proposed.	
7	Are further traffic surveys required?	An assessment of local PIA Highway Safety shall be undertaken, along with a detailed review of the site's accessibility by sustainable modes of travel.	
8	Details of any other developments to be taken into account.	The garden centre and leisure centre adjacent to the proposed development site benefit from recently consented planning applications. The construction and operational impacts of these consented schemes shall be taken into account when calculating the residual impacts of the proposed school.	
9	Details of any adjacent highway improvement proposals by others	None.	
10	When are the critical periods for assessments?	09:00-10:00 to coincide with school start times at 09:30 and then 15:00-16:00 to coincide with school finish times.	
11	What will be the trip generation for the proposals?	Based upon TRICS data for similarly located and comparable schools. This shall be validated against the 2011 Census data for travel to school in Reading statistics.	
12	Would traffic from adjacent sites be attracted to the site?	No.	

	Pass-by traffic?		
13	What is the assumed trip distribution?	The school proposes a catchment of circa 1 mile. The principal residential areas within the catchment shall be used to develop a model for calculating trip distribution.	
14	What is the extent of the study area to be considered?	Broadly 1 mile beyond the proposed development site.	
15	Capacity tests required for the proposed and existing junctions	Yes, see response to Item 6.	
16	Are adjacent junctions or links likely to become overloaded from the development traffic?	Historic traffic count data has suggested the local area experience the accumulation of highway peak period trips. This shall be assessed as part of future traffic counts.	
17	Is a new or modified highway access likely?	Yes, a new and improved shared site access shall be formed from Cow Lane to the south of the site. This shall also be used by the adjacent garden centre for deliveries (outside of school peak periods) and also the Reading Festival organisers (during school holidays).	
18	What are the visibility requirements? Are those requirements met?	Based on MfS, a 30mph speed limit would required 43m visibility splays from a 2.4m set back distance.	
19	What level of car parking is required?	Current scheme proposes 84 spaces though it is felt this is on the low side of what may be necessary to prevent staff and visitors from parking on Richfield Ave which is protected by double yellow lines. The scheme shall also consider the provision of a pupil drop-off and pick up bay in order to mitigate the chances of parents stopping and waiting on Richfield Ave.	
20	Are special provisions required for cyclists, pedestrians, mobility impaired individuals or public transport?	This shall be explored as part of the TA development and also within the Travel Plan which is proposed to be written with the Academy and submitted as part of a forthcoming application.	
21	Do the proposals comply with NPPF etc?	To be determined following undertaking of assessment.	
22	Are there any further transport related reports required?	None.	

23	Are there any other special circumstances relevant to this proposal?	None.	
24	Are any off-site highways works anticipated?	The formation of a new access and possible infrastructure improvements for pedestrian, cyclists and public transport users subject to outcomes of TA.	

Appendix C – RBC Pre-Application Response

1. Noted
2. Noted
3. Noted
4. Noted
5. Accepted
6. As has been mentioned during previous pre-application discussions the following junctions will need to be assessed:
 - Cow Lane / Beresford Road / Portman Road Roundabout
 - Richfield Avenue / Rivermead Roundabout
 - Caversham Road / Richfield Avenue / Caversham Bridge Roundabout
 - Caversham Bridge / Church Street / Church Road signalised junction
7. Noted
8. Noted
9. Noted
10. It is noted that the Maiden Erlegh Trusts two other schools in the Reading area open earlier i.e. 8.40 ish, it should therefore be confirmed why the later start time for the proposed school. To facilitate for any fluctuation in start times in the future a sensitivity test should be undertaken for between the hours of 8-9am to ensure that this is not going to create any undue harm to the Highway network.
11. In principle this is fine but it would have been helpful to have seen proposed TRICS data at the pre-application stage. I would also add that this data is based on the fact that it has been stated that the catchment is to be within a mile radius which is significantly reduced from the 3 mile plus radius that was previously identified during the pre-application discussions.
12. Noted
13. Noted, although as stated above I am aware that a 3 mile plus radius has previously been proposed.
14. Noted, although again this is dependant on no changes in the catchment area.
15. Noted, see my response to Item 6 above.
16. Noted
17. No designs of the proposed access have been provided as far as I can see but any redesign of the access must take into account the Public Right of Way that runs north - south along the western boundary of the school. The Public Right of Way must be improved as part of this proposal given the proposed increase in footfall and should not be worsened.
18. Visibility should be assessed in accordance with the Councils Geometric Design Guide for Accesses onto Classified Roads.
19. It is stated that parking in accordance with our standard is on the low side and may result in parking along Richfield Avenue, however as identified Richfield Avenue does have parking restrictions along its length and therefore it is highly unlikely that over spill parking would take place in this location. I am however aware that some areas of unrestricted parking does occur within the commercial zone to the south of the site. Irrespective the site is located within 225m of a bus stop on Richfield Avenue and 800m of a bus stop along Caversham Road with a cycle lane passing along the site frontage, the Highway Authority could not agree to any additional car parking unless justification for the increased demand were provided.

In terms of drop off / pick up bays the Councils standards do not include them for secondary schools and therefore justification would be required for them to be included as they could just encourage the use of the private car to drop off children. The site is located within close proximity to 2 public car parks that could be used for pick up and drop offs.

20. There are no dedicated controlled crossing facilities provided that link the cycle lane through Cow Lane Bridges to the cycle lane on the northern side of Richfield avenue. Given that the proposal will increase both cycle and pedestrian movements in the area the pedestrian refuge island should be upgraded to a tiger crossing.

What provisions have been made for those pedestrians and cyclists that are travelling from the north and in particular from the footpath along the River.

Bus route Buzz 42 is funded by the Council through S106 contributions and is currently in the form of a mini bus, the applicant should assess whether the proposal will result in the current service will exceed existing capacity and if it does a contribution will be required to upgrade the mini bus to a standard single deck bus or provide an additional mini bus to increase capacity.

21. Noted

22. Noted

23. The Highway Authority are not aware of any at this time other than those specified above.

24. The Highway Authority are not aware of any at this time other than those specified above.

Additional Comments

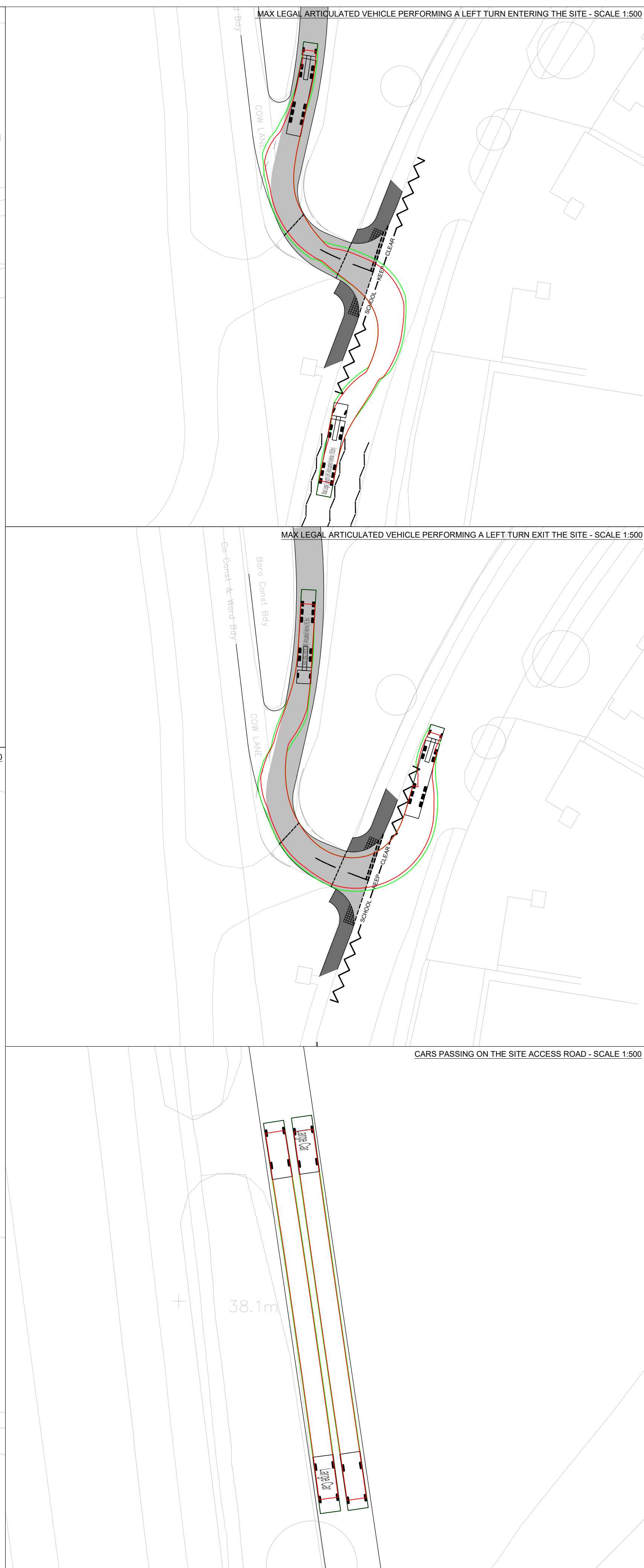
An assessment of pedestrian and cycle desire lines from Richfield Avenue through the school grounds should be undertaken to ensure that suitable and safe access is provided from each access point.

The scheme should include what changes to highway restrictions will be required i.e. the provision of school keep clear markings and these should be illustrated on submitted plans.

Tracking will be required to ascertain that delivery vehicles servicing the school can enter and exit the service yard in forward gear.

Tracking will be required to ascertain that vehicles associated with the adjacent garden centre will be required.

Appendix D – Swept Path Analysis & Visibility Splays



1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.

The figure contains two technical drawings with dimensions. The top drawing is a side profile of a truck with various measurements: a total length of 13.6, a front overhang of 6.53, a wheelbase of 4.78, a distance from the front axle to the first rear axle of 1.37, a distance from the front axle to the second rear axle of 1.28, a distance from the front axle to the third rear axle of 6.4, a distance from the front axle to the fourth rear axle of 7.8, a distance from the front axle to the fifth rear axle of 1.4, a distance from the front axle to the sixth rear axle of 1.4, and a distance from the front axle to the seventh rear axle of 2.52. The truck has a 'Max 80° Horiz' and 'Max 90° Vert' articulation point. The bottom drawing is a side profile of a car with a total length of 4.988, a wheelbase of 2.87, and a front overhang of 0.89.

Specification	Value
Max Legal Length (UK) Articulated Vehicle (16.5m)	16.500m
Overall Length	2.550m
Overall Width	3.681m
Min Body Ground Clearance	0.411m
Max Track Width	2.680m
Lock to lock time	6.00s
Kerb to Kerb Turning Radius	6.530m

Specification	Value
Large Car	4.988m
Overall Length	1.793m
Overall Width	1.502m
Min Body Ground Clearance	0.287m
Track Width	1.700m
Lock to lock time	4.00s
Kerb to Kerb Turning Radius	6.200m

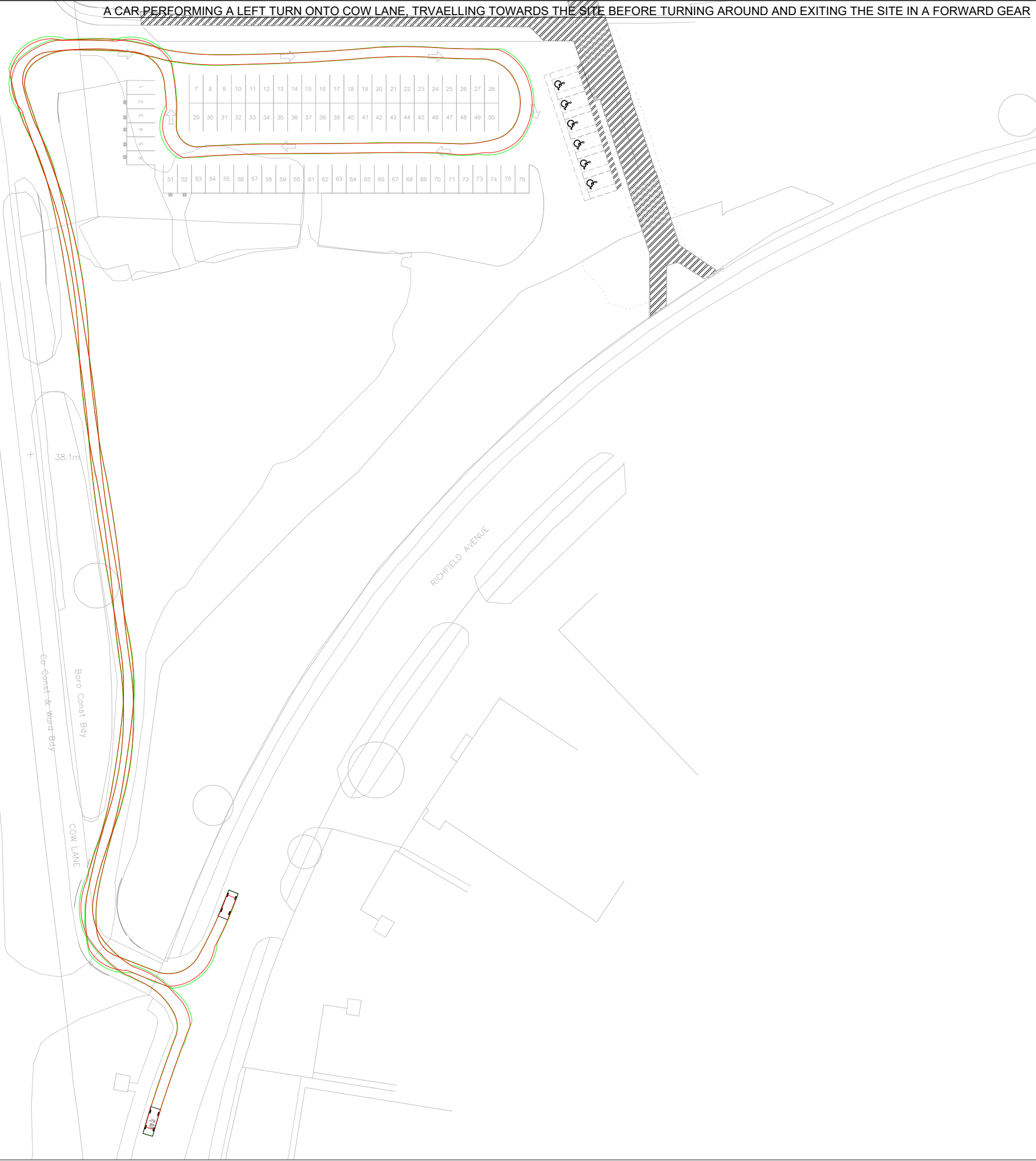
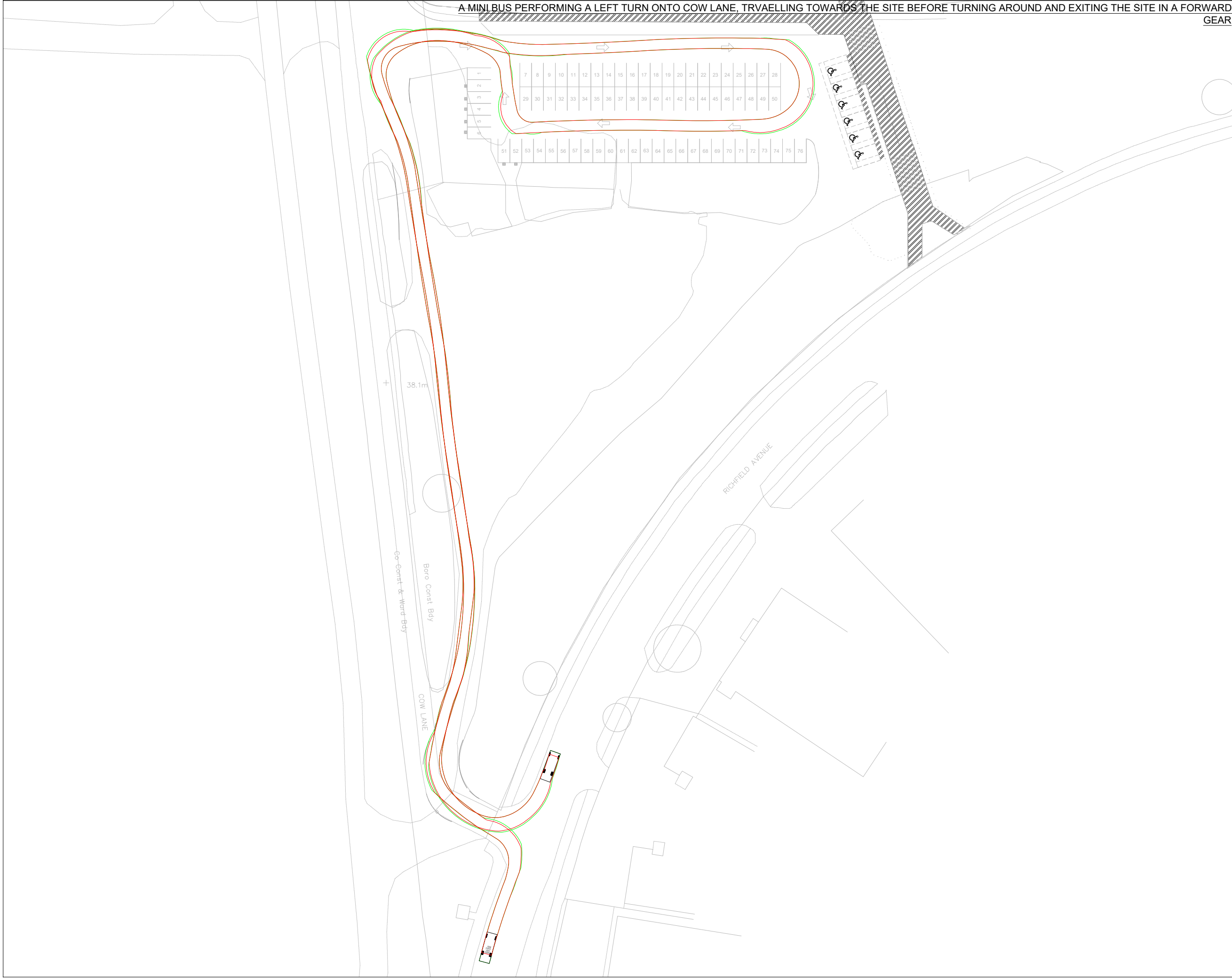
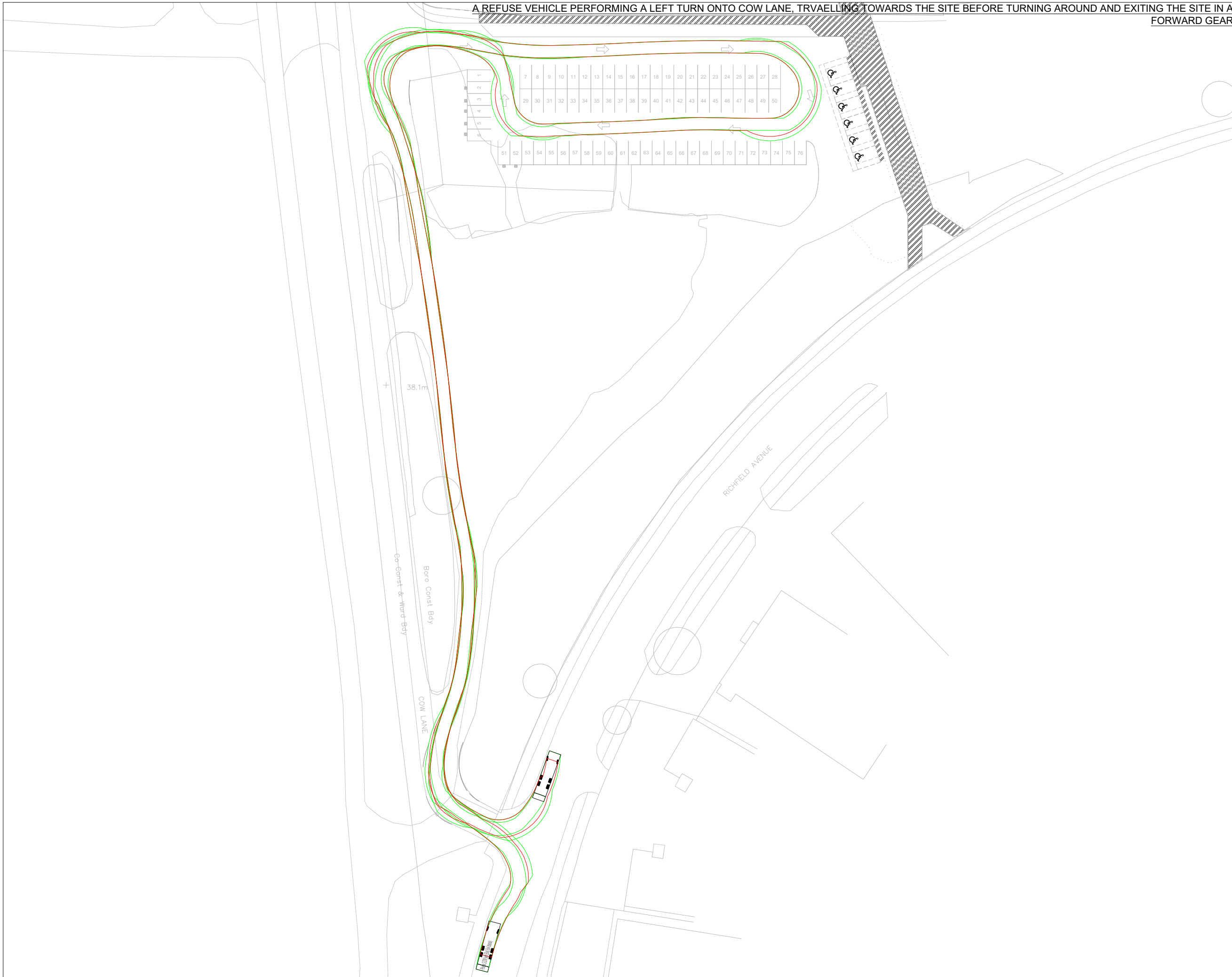
P01	14.12.21	Preliminary Issue	ND	AH
Rev	Date	Details of issue / revision	Drw	Rev

Project Title

RIVER ACADEMY

Drawn:	N.DAVIE	Reviewed:	M.PRICE
Hexa Ref:	600353	Scale@A1:	AS SHOWN

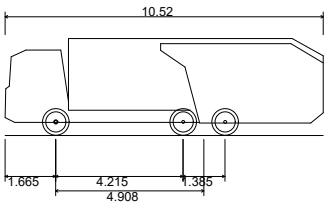
Purpose of Issue	Status
Planning	S0
Project - Originator - Zone - Level - Type - Role - Number	Rev
600353-HEX-00-00-DR-TP-0500	P01



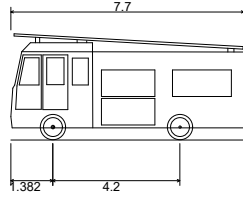
Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
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3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.

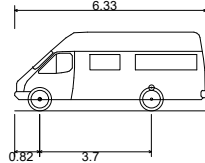
Key Plan



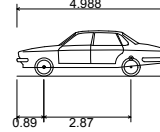
Phoenix 2-23W (with Elite 2 6x4 chassis)
Overall Length 10.52m
Overall Width 2.530m
Overall Body Height 3.211m
Min Body Ground Clearance 0.416m
Track Width 2.530m
Lock to lock time 4.00s
Kerb to Kerb Turning Radius 9.950m



Dennis Sabre Fire Tender (LWB)
Overall Length 7.700m
Overall Width 2.430m
Overall Body Height 3.512m
Min Body Ground Clearance 0.397m
Track Width 2.380m
Lock to lock time 5.00s
Kerb to Kerb Turning Radius 7.400m



Mini Bus
Overall Length 6.330m
Overall Width 2.192m
Overall Body Height 2.801m
Min Body Ground Clearance 0.374m
Track Width 2.192m
Lock to lock time 4.00s
Kerb to Kerb Turning Radius 6.450m



Large Car
Overall Length 4.988m
Overall Width 1.793m
Overall Body Height 1.502m
Min Body Ground Clearance 0.287m
Track Width 1.700m
Lock to lock time 4.00s
Kerb to Kerb Turning Radius 6.200m

P01	03.12.21	Preliminary Issue	ND	MP
Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

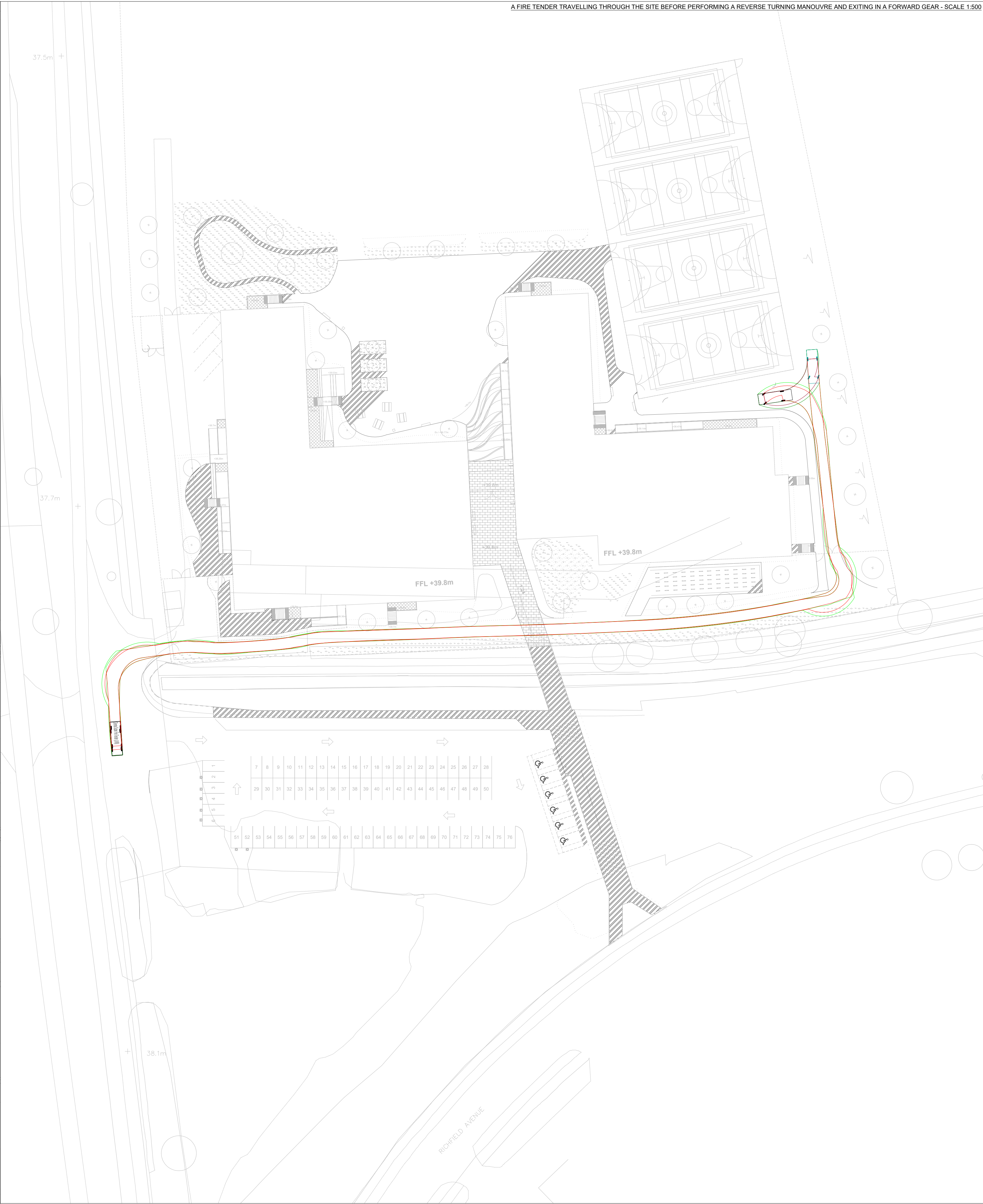


Client
BOWMER AND KIRKLAND

Project Title
RIVER ACADEMY

Drawing Title
**OPERATIONAL VEHICLE
SWEEP-PATH ANALYSIS**

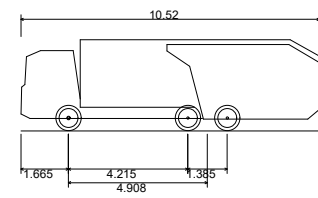
Drawn:	N.DAVIE	Reviewed:	M.PRICE
Hexa Ref:	600353	Scale@A1:	1:750
Purpose of Issue			Status
Work in Progress			S0
Project - Originator - Zone - Level - Type - Role - Number			Rev
600353-HEX-00-00-DR-TP-0200			P01



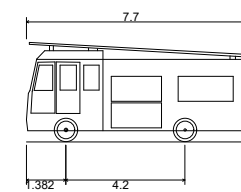
Notes

- Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
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- All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
- Any discrepancies noted on site are to be reported to the engineer immediately.

Key Plan



Phoenix 2-23W (with Elite 2 6x4 chassis)
Overall Length 10.520m
Overall Width 2.530m
Overall Body Height 3.211m
Min Body Ground Clearance 0.416m
Track Width 2.530m
Lock to lock time 4.05s
Kerb to Kerb Turning Radius 9.950m



Dennis Sabre Fire Tender (LWB)
Overall Length 7.700m
Overall Width 2.430m
Overall Body Height 3.512m
Min Body Ground Clearance 0.387m
Track Width 2.380m
Lock to lock time 5.00s
Kerb to Kerb Turning Radius 7.400m

P01	07.12.21	Preliminary Issue	ND	MP
Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

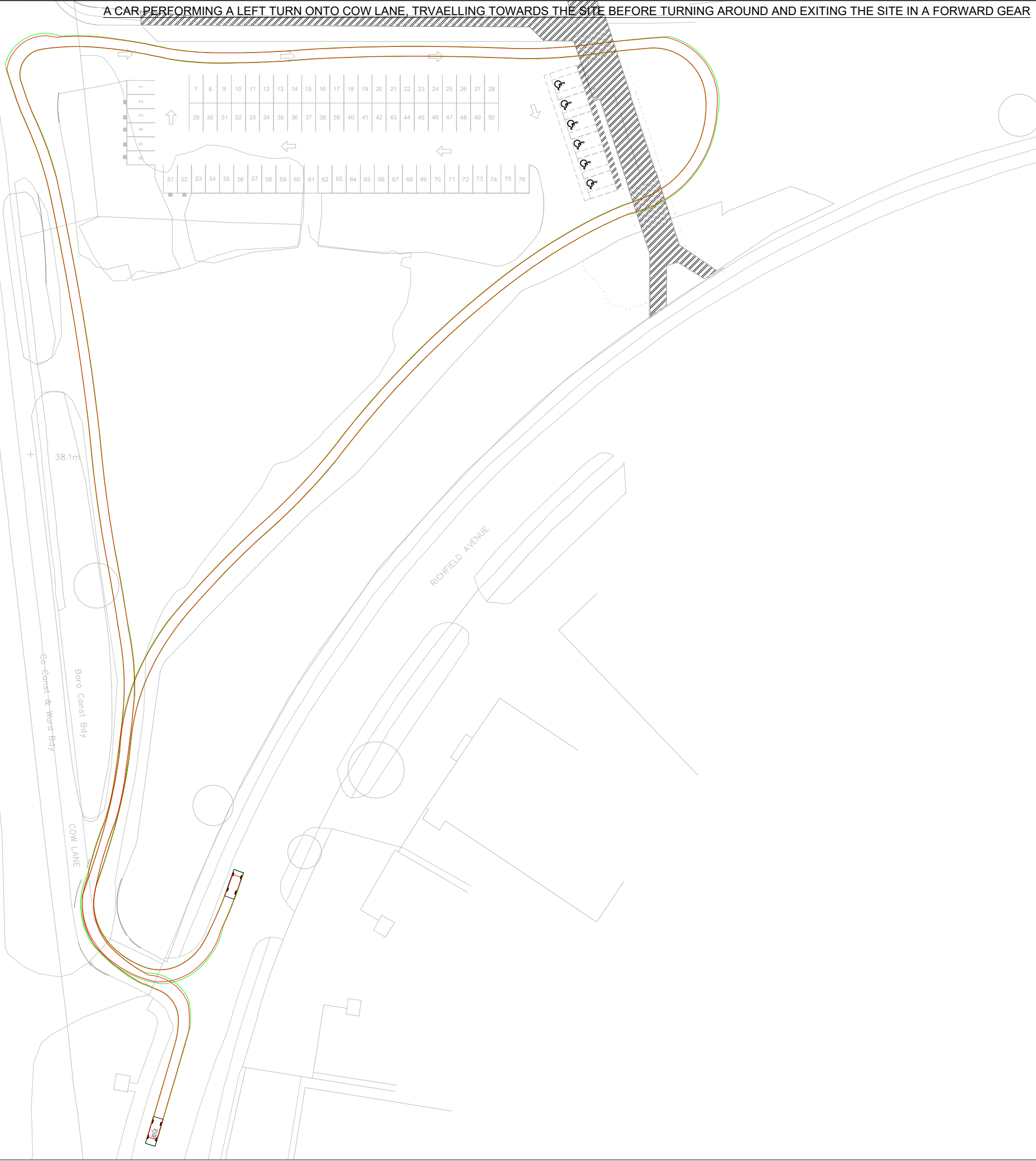
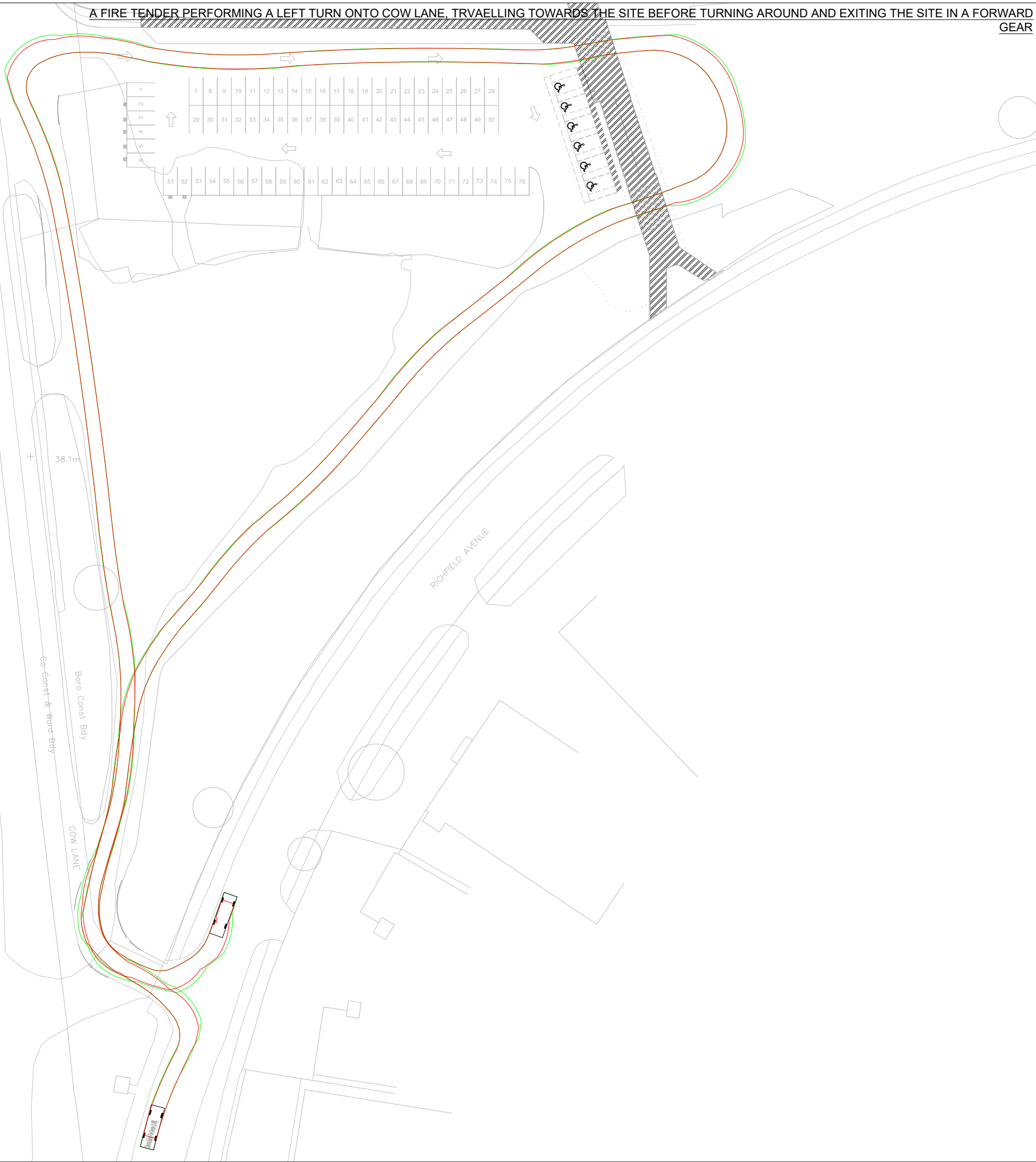


Client
BOWMER AND KIRKLAND

Project Title
RIVER ACADEMY

Drawing Title
**SERVICING VEHICLE
SWEEP-PATH ANALYSIS**

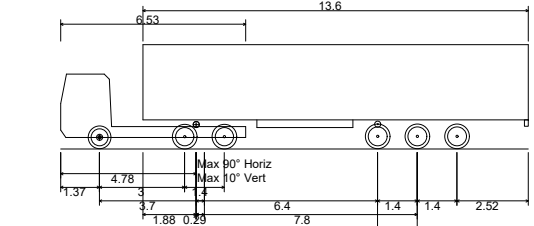
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Purpose of Issue			Status
Work in Progress			S0
Project - Originator - Zone - Level - Type - Role - Number			Rev
600353-HEX-00-00-DR-TP-0300			P01



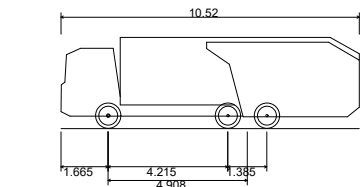
Notes

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3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
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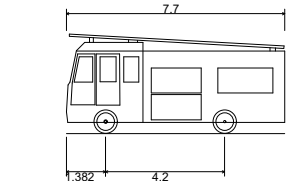
Key Plan



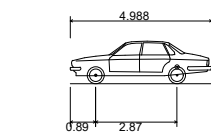
Max Legal Length (UK) Articulated Vehicle (16.5m)
Overall Length 16.500m
Overall Width 2.530m
Overall Body Height 3.661m
Min Body Ground Clearance 0.411m
Max Track Width 2.530m
Lock to lock time 6.00s
Kerb to Kerb Turning Radius 6.530m



Phoenix 2-23W (with Elite 2 6x4 chassis)
Overall Length 10.520m
Overall Width 2.530m
Overall Body Height 3.211m
Min Body Ground Clearance 0.416m
Track Width 2.530m
Lock to lock time 4.00s
Kerb to Kerb Turning Radius 9.950m



Dennis Sabre Fire Tender (LWB)
Overall Length 7.700m
Overall Width 2.430m
Overall Body Height 3.12m
Min Body Ground Clearance 0.397m
Track Width 2.530m
Lock to lock time 5.00s
Kerb to Kerb Turning Radius 7.400m



Large Car
Overall Length 4.989m
Overall Width 1.793m
Overall Body Height 1.502m
Min Body Ground Clearance 0.287m
Track Width 1.700m
Lock to lock time 4.00s
Kerb to Kerb Turning Radius 6.200m

P01	07.12.21	Preliminary Issue	ND	MP
Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

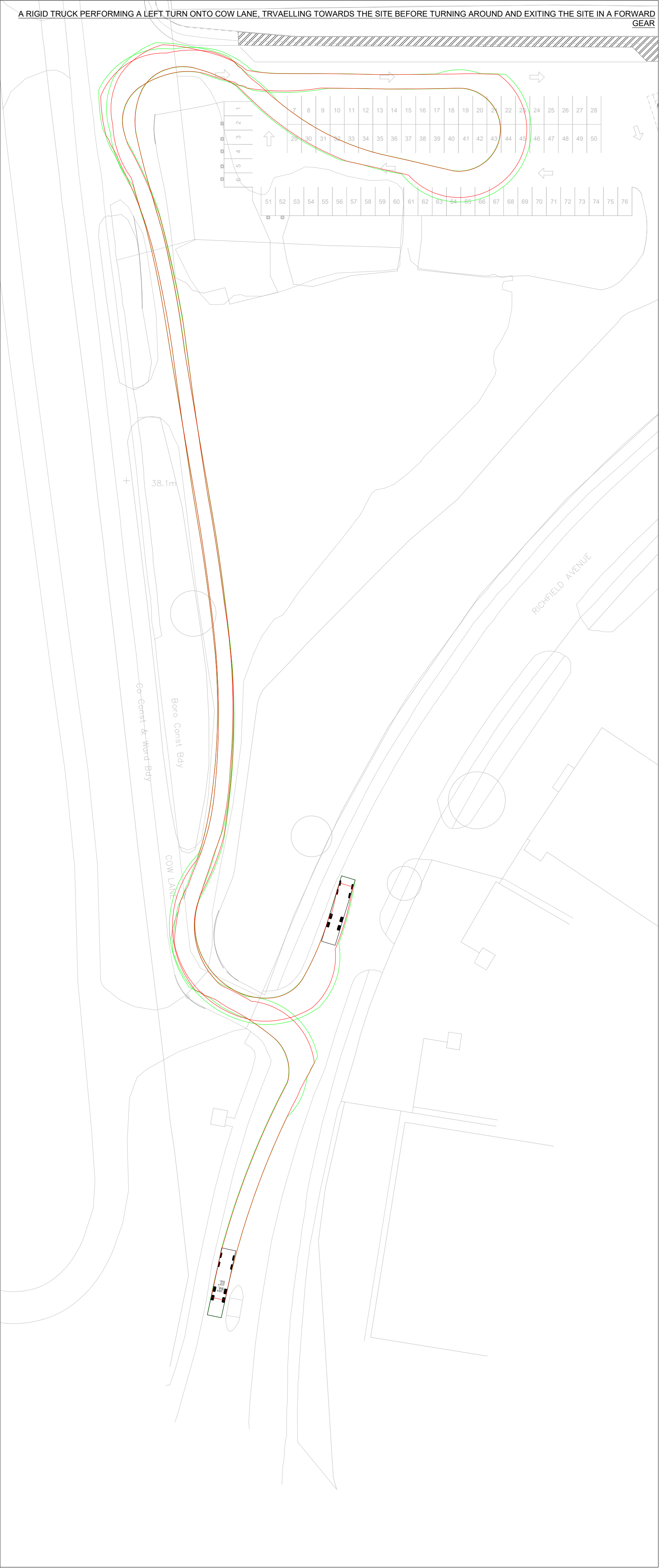
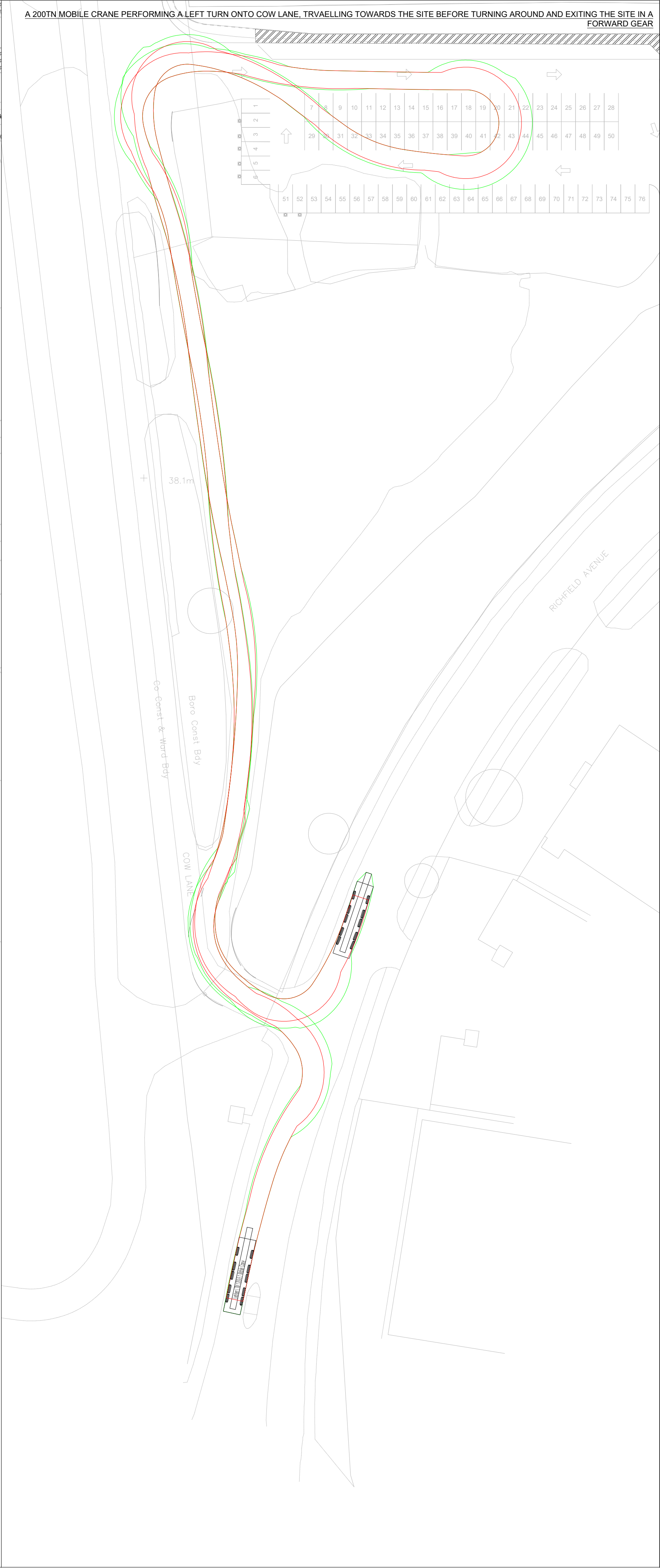
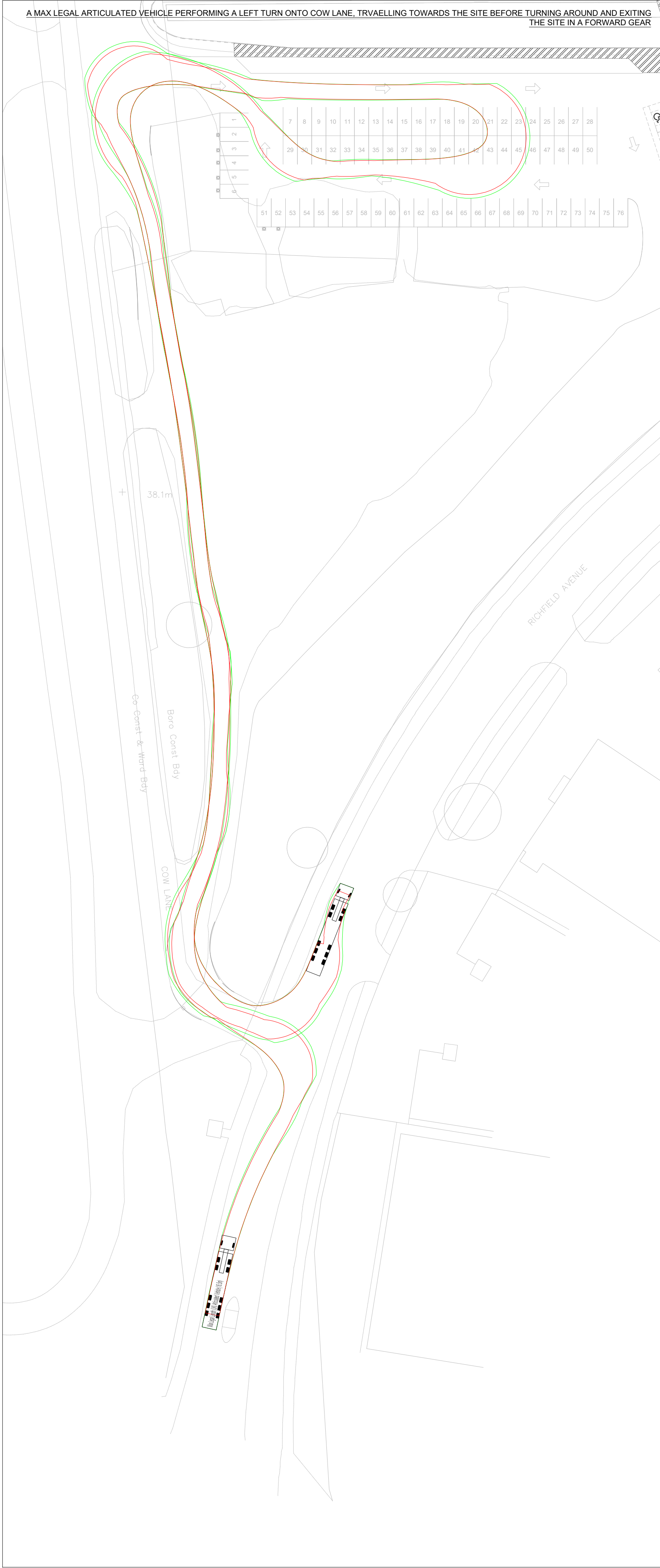


Client
BOWMER AND KIRKLAND

Project Title
RIVER ACADEMY

Drawing Title
**GARDEN CENTRE
OPERATIONAL VEHICLE
SWEEP-PATH ANALYSIS**

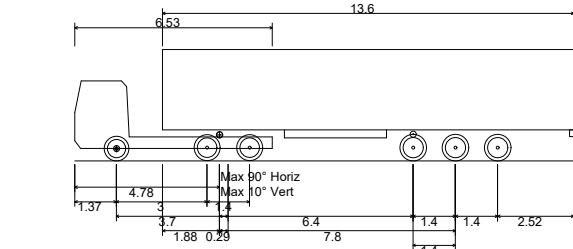
Drawn:	N.DAVIE	Reviewed:	M.PRICE
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Purpose of Issue Work in Progress			Status S0
Project - Originator - Zone - Level - Type - Role - Number 600353-HEX-00-00-DR-TP-0300			Rev P01



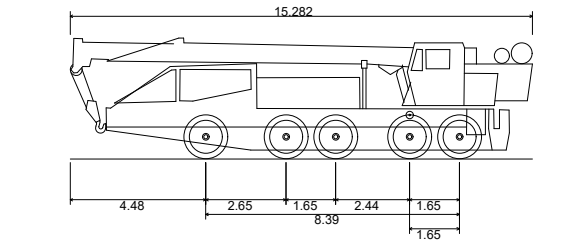
Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.

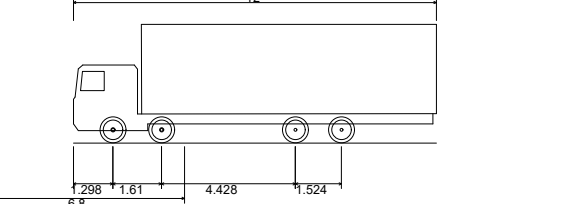
Key Plan



Max Legal Length (UK) Articulated Vehicle (16.5m)
Overall Length 16.500m
Overall Width 2.500m
Overall Body Height 3.681m
Min Body Ground Clearance 0.411m
Max Track Width 2.500m
Lock to lock time 6.50s
Kerb to Kerb Turning Radius 6.530m



Liebherr LTM 1200-5.1 Mobile Crane
Overall Length 15.282m
Overall Width 3.000m
Overall Body Height 4.000m
Min Body Ground Clearance 0.300m
Track Width 3.000m
Lock to lock time 4.0s
Kerb to Kerb Turning Radius 9.775m



Rigid Truck
Overall Length 12.000m
Overall Width 2.500m
Overall Body Height 3.928m
Min Body Ground Clearance 0.412m
Track Width 2.471m
Lock to lock time 6.0s
Kerb to Kerb Turning Radius 11.500m

P01	02.12.21	Preliminary Issue		ND	MP
Rev	Date	Details of issue / revision		Dw	Rev

Issues & Revisions



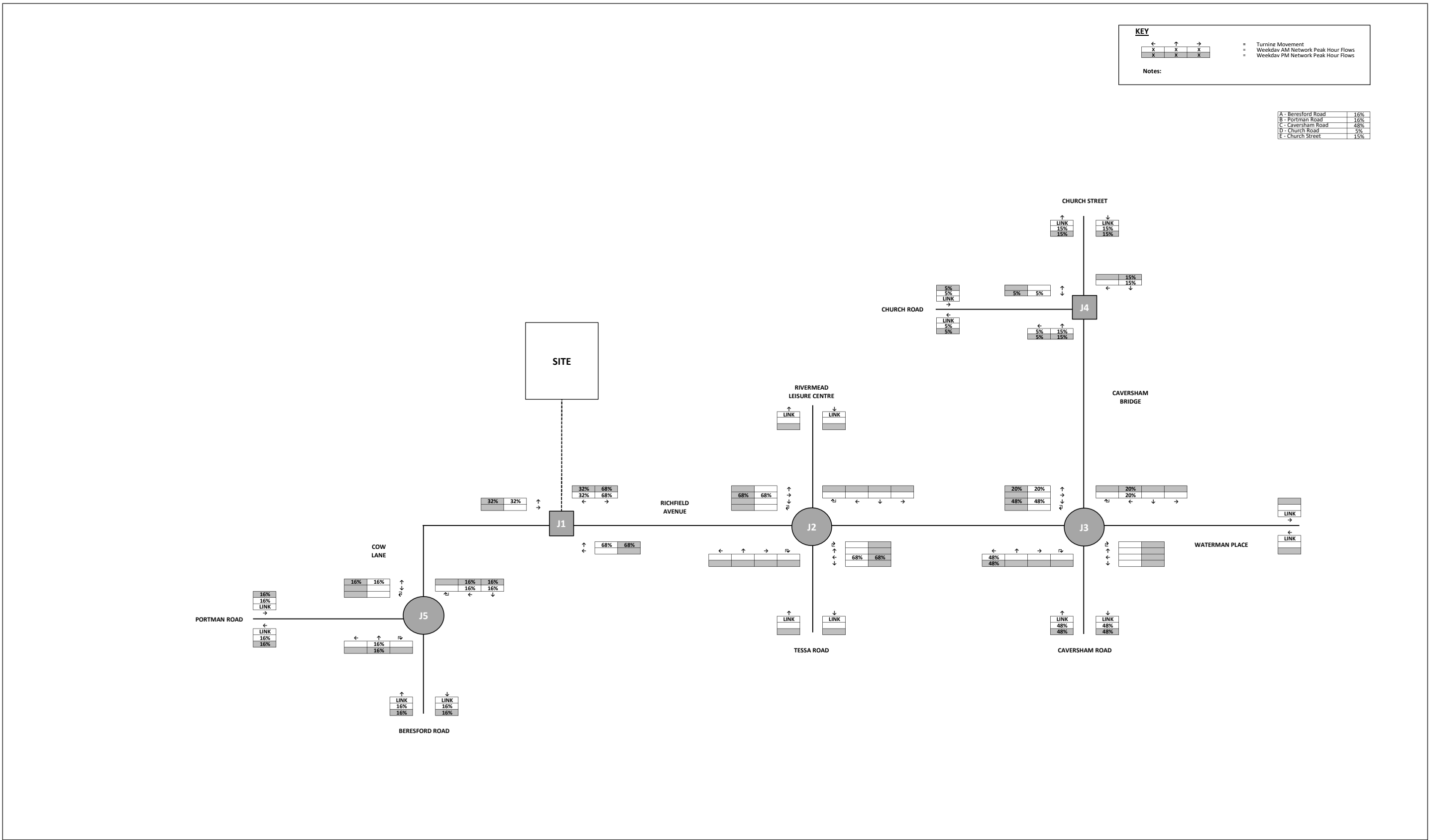
Client
BOWMER AND KIRKLAND

Project Title
RIVER ACADEMY

Drawing Title
**CONSTRUCTION VEHICLE
SWEEP-PATH ANALYSIS**

Drawn:	N.DAVIE	Reviewed:	M.PRICE
Hexa Ref:	600353	Scale@A1:	1:500
Purpose of Issue Work in Progress			Status S0
Project - Originator - Zone - Level - Type - Role - Number 600353-HEX-00-00-DR-TP-0100			Rev P01

Appendix E – Trip Generation & Distribution



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Turnpike Movement

Weekday AM Network Peak Hour Flows

Weekday PM Network Peak Hour Flows

Notes:

AM School Peak - 09:00 - 10:00

PM School Peak - 15:30 - 16:30

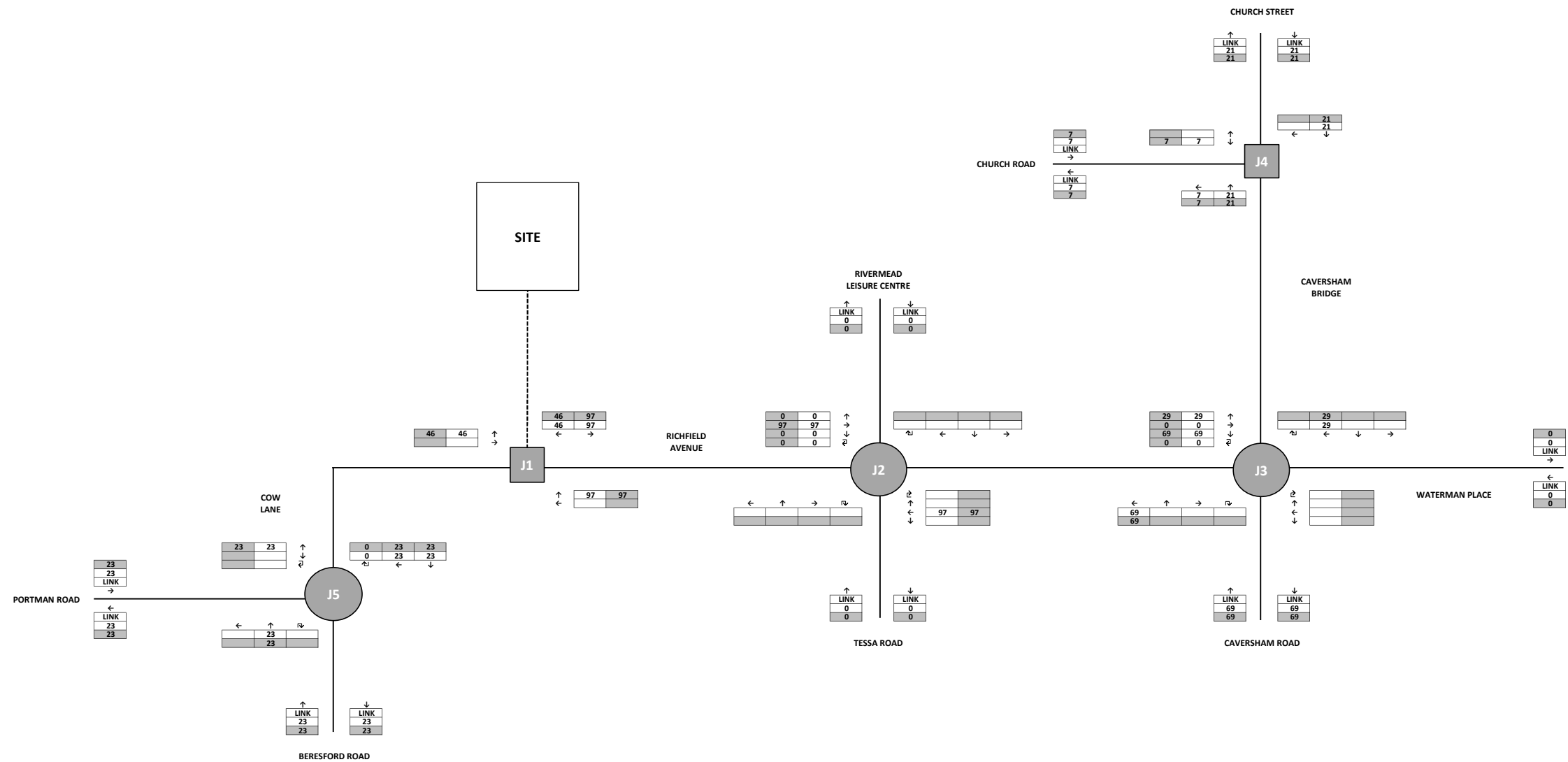


FIGURE 2

PUPIL DEVELOPMENT TRIP ASSIGNMENT (SCHOOL PEAK)

RIVER ACADEMY, READING

JOB NUMBER: 600353

DRAWN BY: AH

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Turnpike Movement

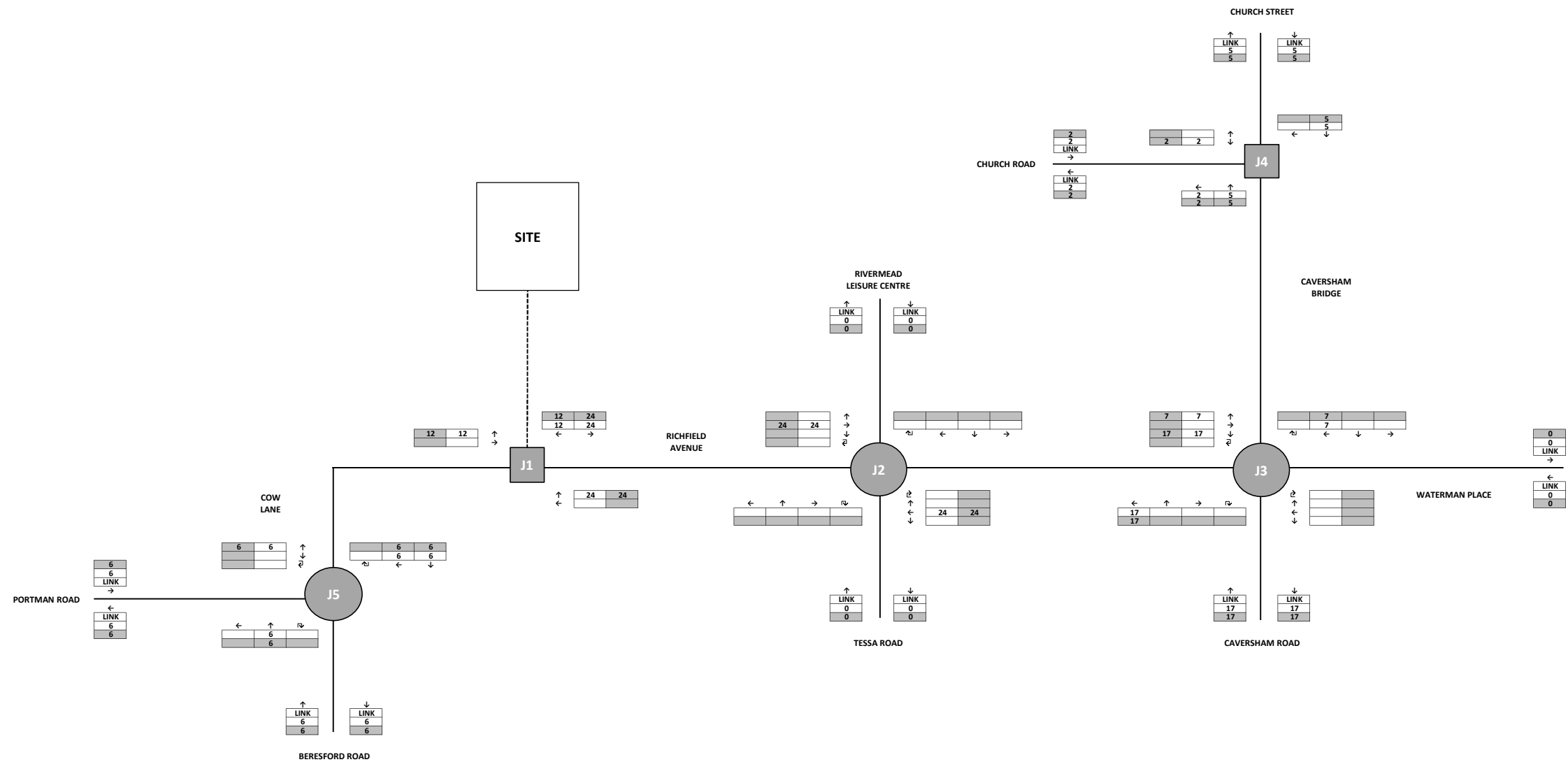
Weekday AM Network Peak Hour Flows

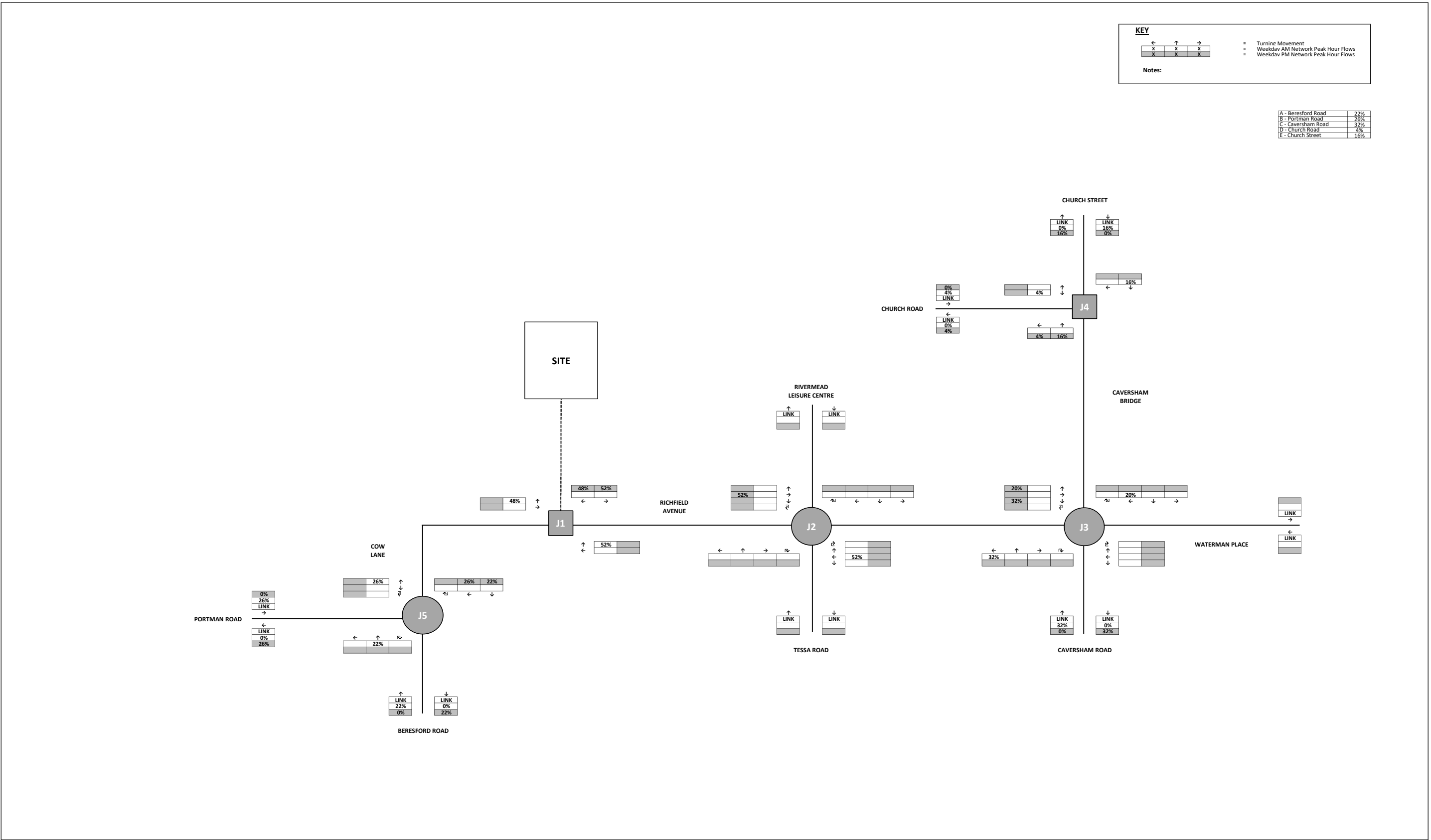
Weekday PM Network Peak Hour Flows

Notes:

Pre AM School Peak - 08:00 - 09:00

Post PM School Peak - 16:30 - 17:30





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Turnpike Movement

Weekday AM Network Peak Hour Flows

Weekday PM Network Peak Hour Flows

Notes:

Pre AM School Peak - 08:00 - 09:00

Post PM School Peak - 16:30 - 17:30

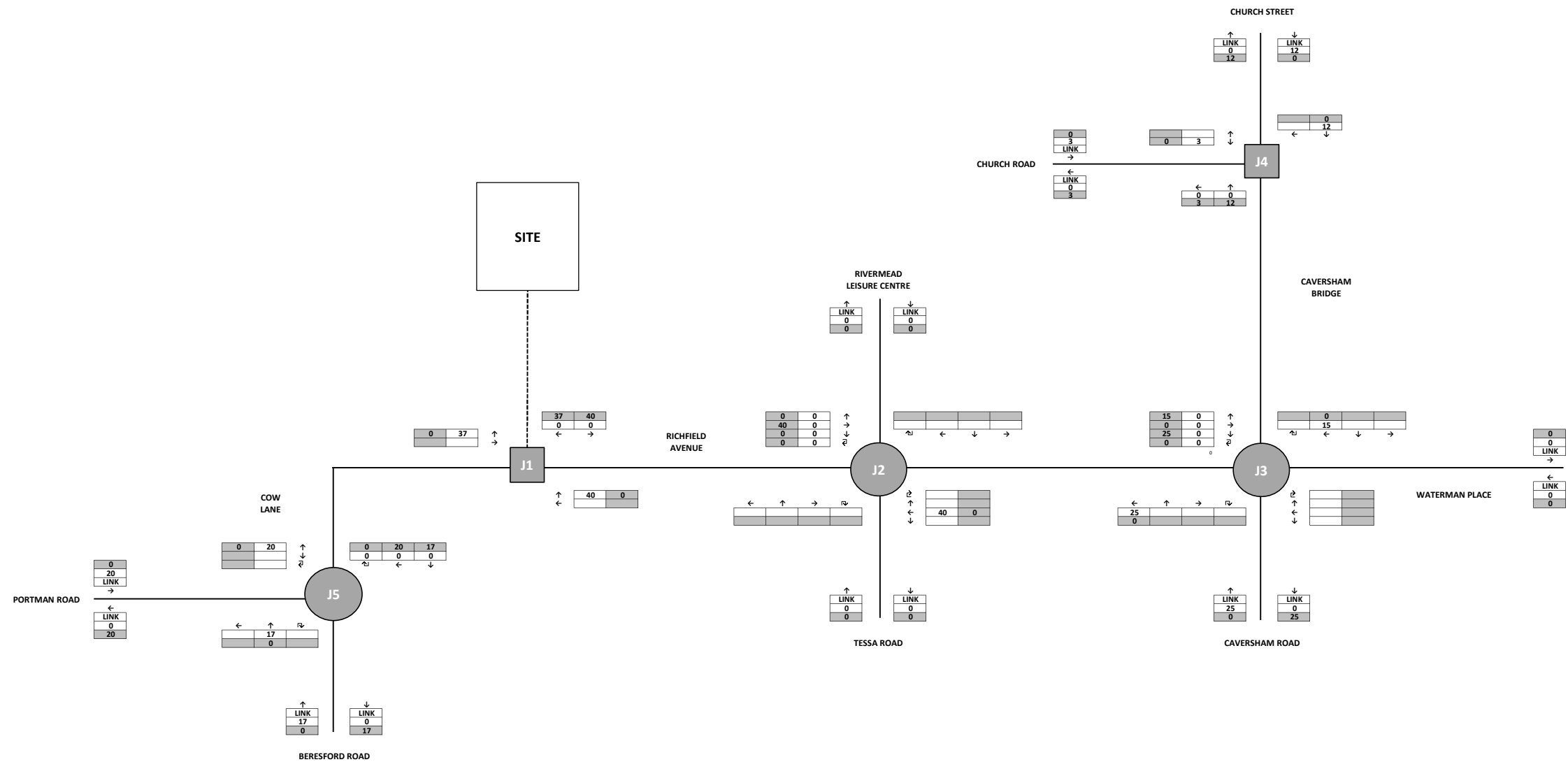


FIGURE 5
 STAFF DEVELOPMENT TRIP ASSIGNMENT
RIVER ACADEMY, READING
 JOB NUMBER: 600353
 DRAWN BY: AH

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Turnpike Movement

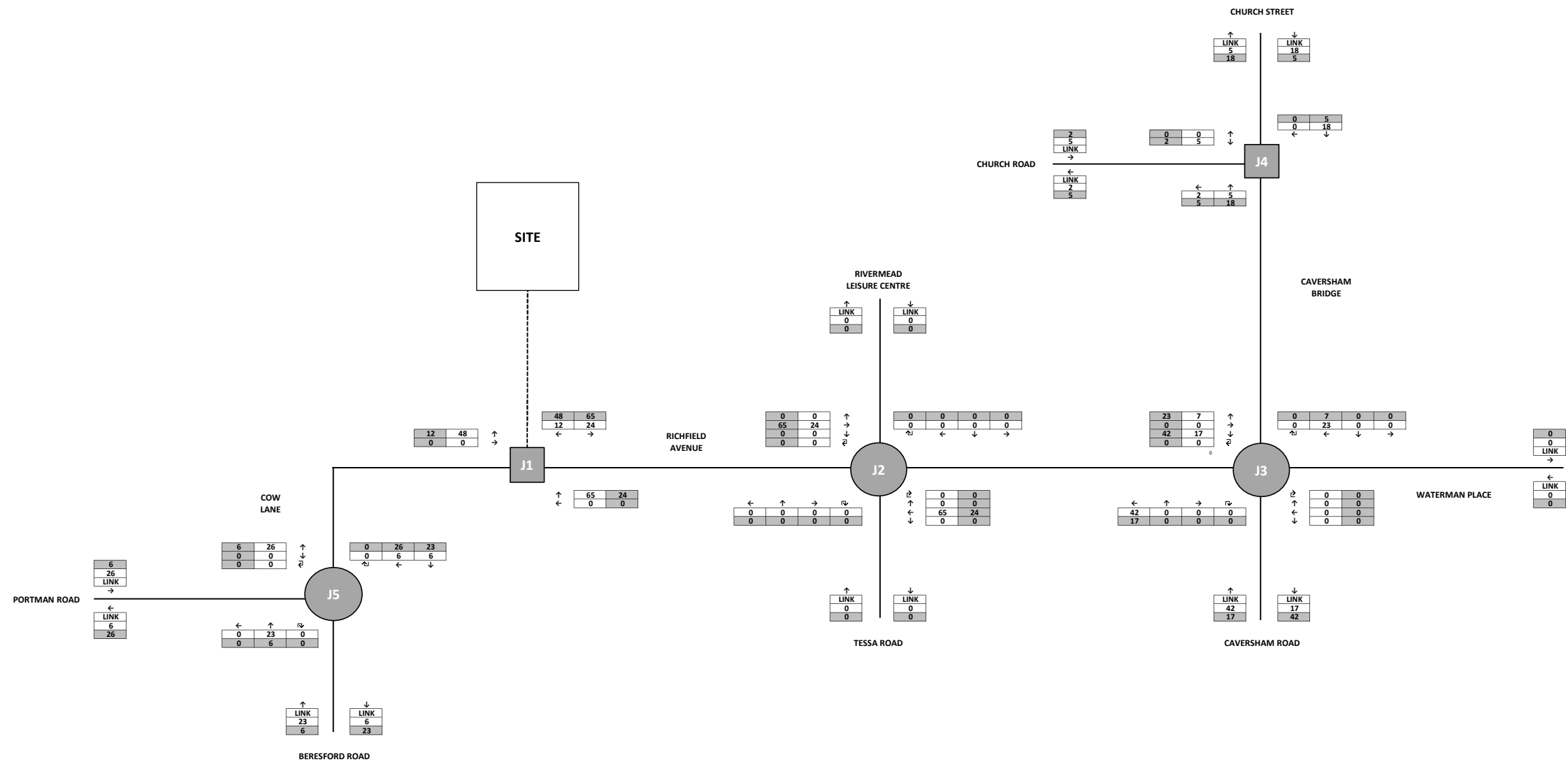
Weekday AM Network Peak Hour Flows

Weekday PM Network Peak Hour Flows

Notes:

Pre AM School Peak - 08:00 - 09:00

Post PM School Peak - 16:30 - 17:30

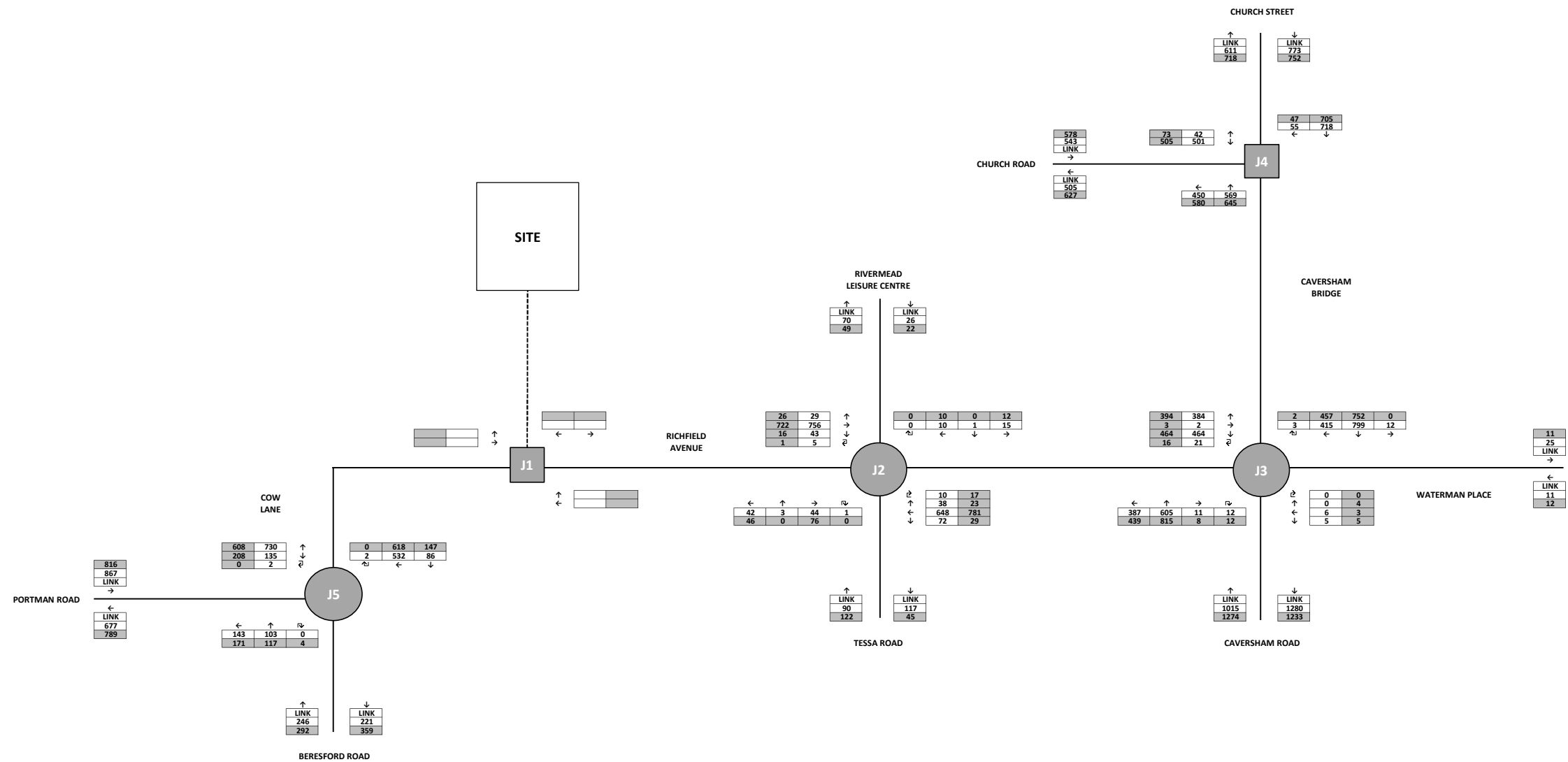


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x	x	x

= Turnine Movement
 = Weekdav AM Network Peak Hour Flows
 = Weekdav PM Network Peak Hour Flows

Notes:
 AM School Peak - 09:00 - 10:00
 PM School Peak - 15:30 - 16:30



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x	x	x
x	x	x

= Turnline Movement
 = Weekday AM Network Peak Hour Flows
 = Weekday PM Network Peak Hour Flows

Notes:
 AM School Peak - 09:00 - 10:00
 PM School Peak - 15:30 - 16:30

TEMPro Growth Factors	
Weekday AM	1.073
Weekday PM	1.072

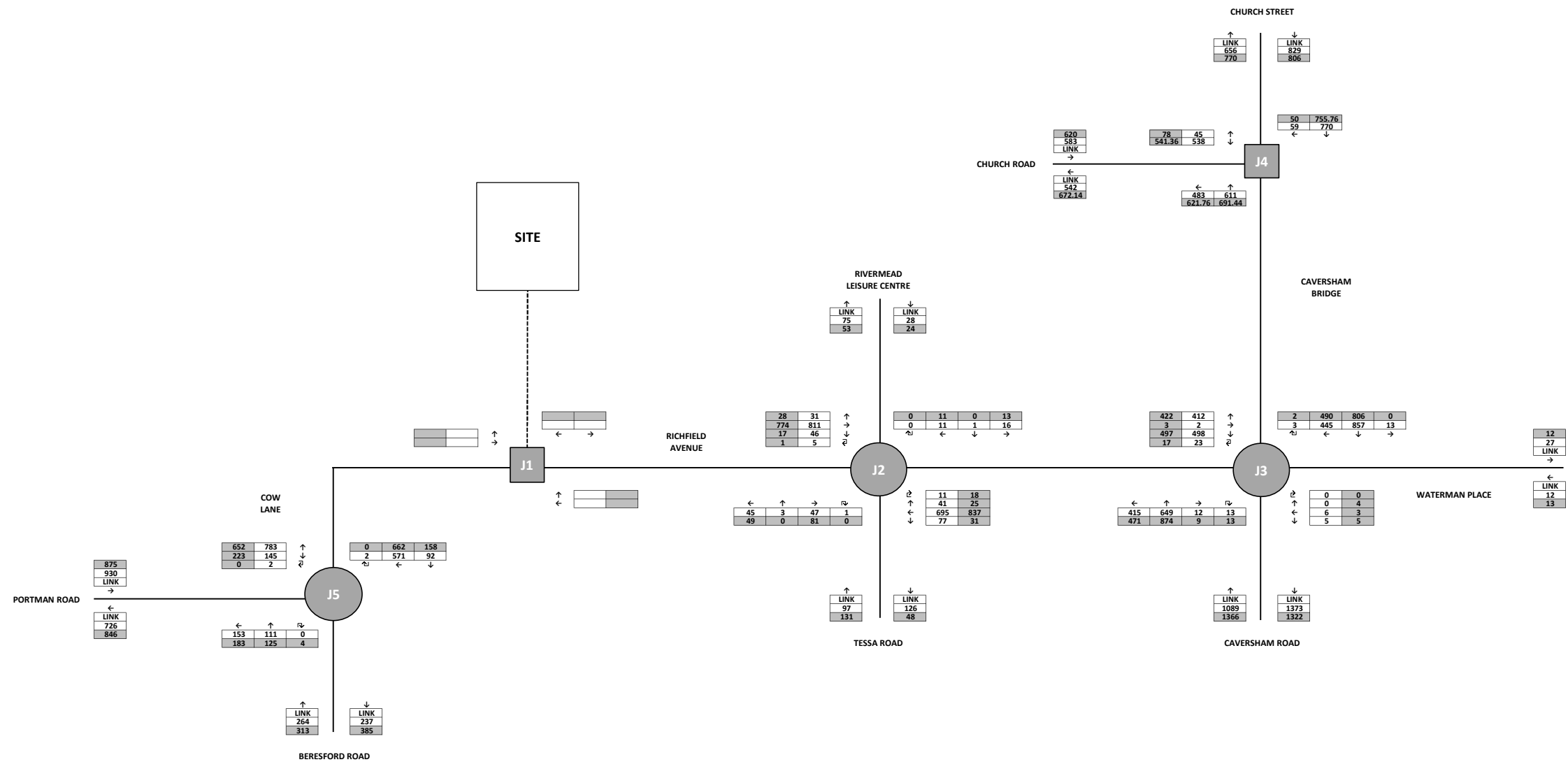


FIGURE 8
 FUTURE YEAR 2028 BASELINE FLOWS (SCHOOL PEAK)
 RIVER ACADEMY, READING
 JOB NUMBER: 600353
 DRAWN BY: AH

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= Turnpike Movement
 = Weekday AM Network Peak Hour Flows
 = Weekday PM Network Peak Hour Flows

Notes:
 AM School Peak - 09:00 - 10:00
 PM School Peak - 15:30 - 16:30

TEMPro Growth Factors	
Weekday AM	1.073
Weekday PM	1.072

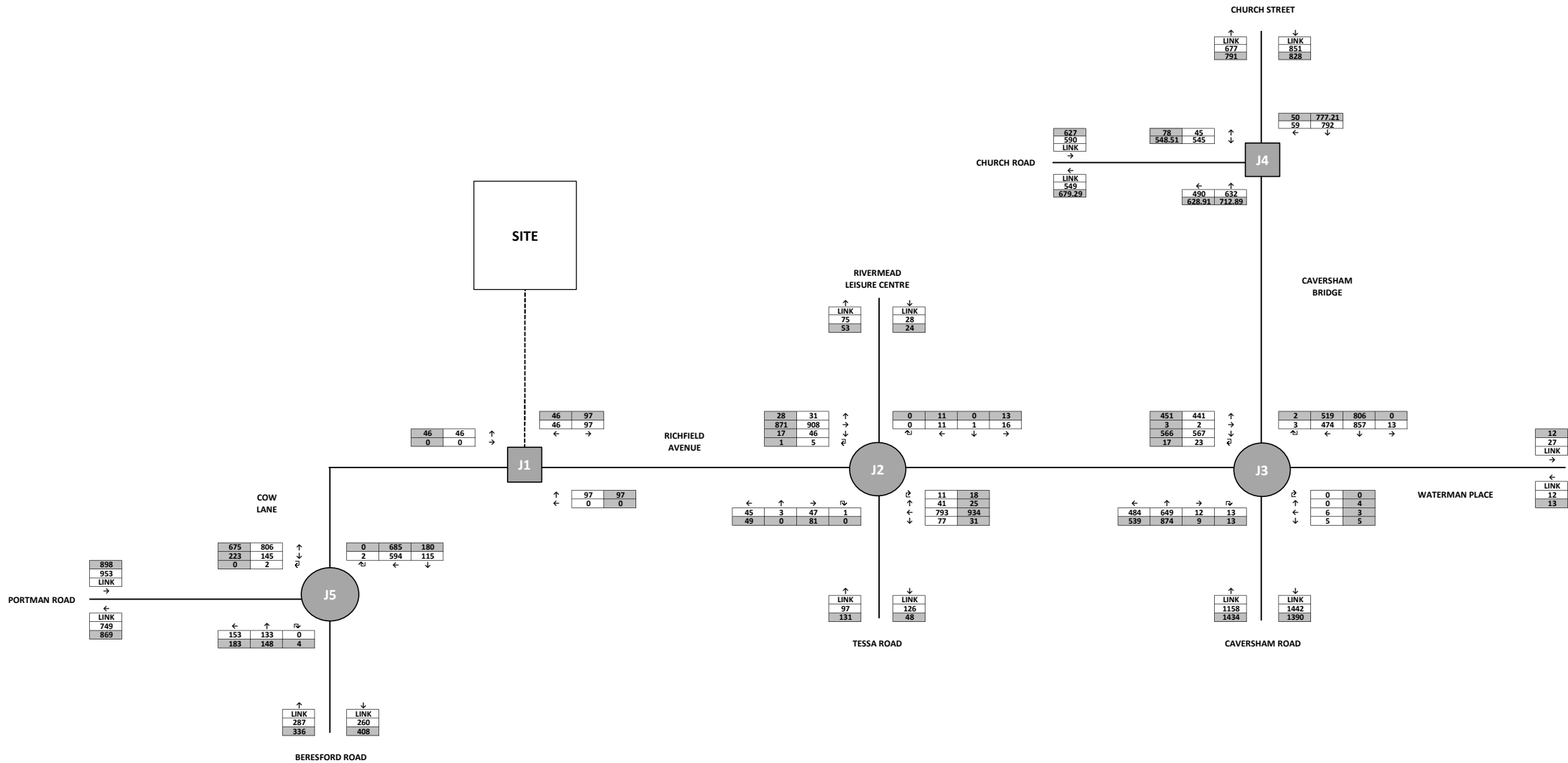


FIGURE 9
 2028 FUTURE YEAR + DEVELOPMENT TRAFFIC (SCHOOL PEAK)
 RIVER ACADEMY, READING
 JOB NUMBER: 600353
 DRAWN BY: AH

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Turnine Movement

Weekdav AM Network Peak Hour Flows

Weekdav PM Network Peak Hour Flows

Notes:

Pre AM School Peak - 08:00 - 09:00

Post PM School Peak - 16:30 - 17:30

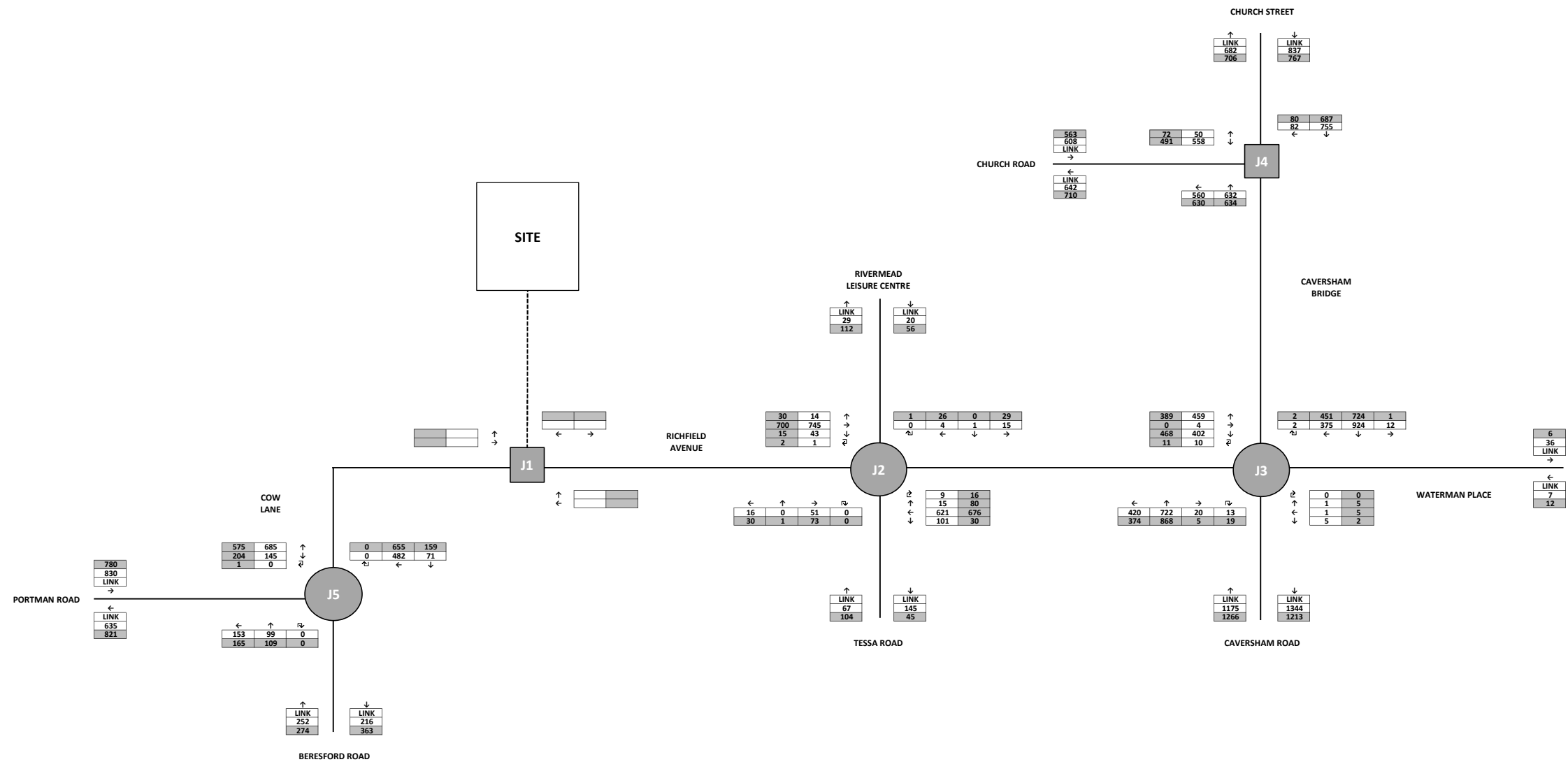


FIGURE 10
OBSERVED 2021 BASELINE FLOWS (PRE / POST SCHOOL PEAK)
RIVER ACADEMY, READING
JOB NUMBER: 600353
DRAWN BY: AH

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TEMPro Growth Factors	
Weekday AM	1.073
Weekday PM	1.072

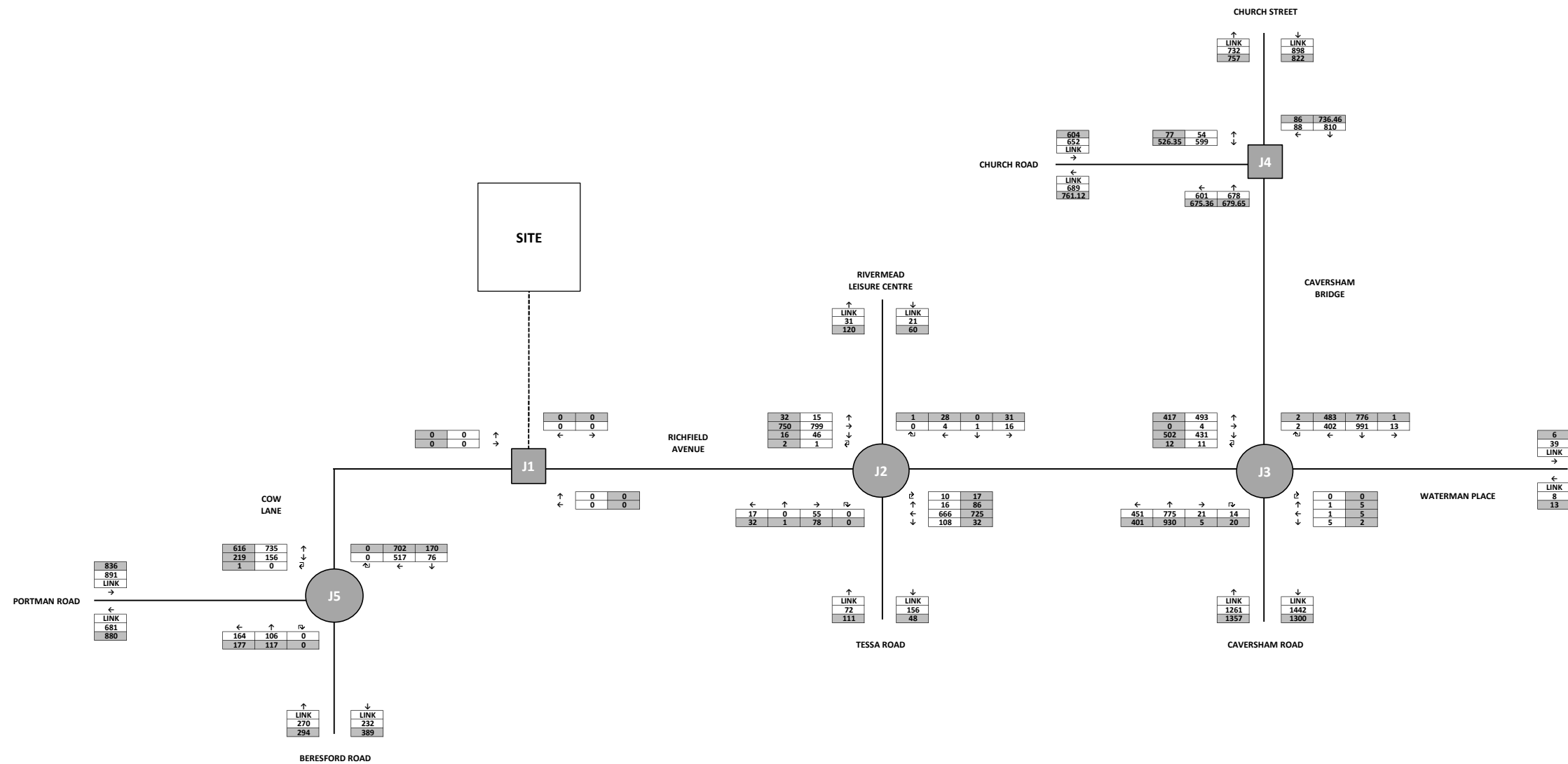


FIGURE 11
 FUTURE YEAR 2028 BASELINE FLOWS (PRE / POST SCHOOL PEAK)
RIVER ACADEMY, READING
 JOB NUMBER: 600353
 DRAWN BY: AH

Appendix F – Arcady Modelling Outputs

Junctions 10									
ARCADY 10 - Roundabout Module									
Version: 10.0.1.1519									
© Copyright TRL Software Limited, 2021									
For sales and distribution information, program advice and maintenance, contact TRL Software:									
+44 (0)1344 379777 software@trl.co.uk trlsoftware.com									
The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution									

Filename: Rivermead Roundabout Pre-Post Peak ARCADY.j10

Path: S:\Shared Folders\Projects\600353 - River Academy Reading\5 - TP\4 - Working\ARCADY\Rivermead Richfield

Report generation date: 14/12/2021 20:21:23

- »Existing Layout - 2021 Baseline, AM
- »Existing Layout - 2021 Baseline, PM
- »Existing Layout - 2028 Future Baseline, AM
- »Existing Layout - 2028 Future Baseline, PM
- »Existing Layout - 2028 Future Baseline + Development, AM
- »Existing Layout - 2028 Future Baseline + Development, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	0.0	4.10	0.02	A	D2	0.1	4.15	0.07	A
Arm 2		1.5	6.78	0.60	A		1.8	7.29	0.64	A
Arm 3		0.2	7.81	0.13	A		0.3	9.21	0.22	A
Arm 4		1.8	7.55	0.64	A		1.7	7.37	0.62	A
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	0.0	4.31	0.03	A	D4	0.1	4.37	0.07	A
Arm 2		1.8	7.61	0.64	A		2.2	8.39	0.69	A
Arm 3		0.2	8.28	0.14	A		0.3	10.15	0.25	B
Arm 4		2.3	8.73	0.69	A		2.1	8.49	0.67	A
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	0.0	4.40	0.03	A	D6	0.1	4.61	0.08	A
Arm 2		2.3	8.89	0.69	A		2.4	8.93	0.71	A
Arm 3		0.2	8.87	0.15	A		0.4	10.50	0.26	B
Arm 4		2.5	9.33	0.71	A		2.6	10.17	0.73	B

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

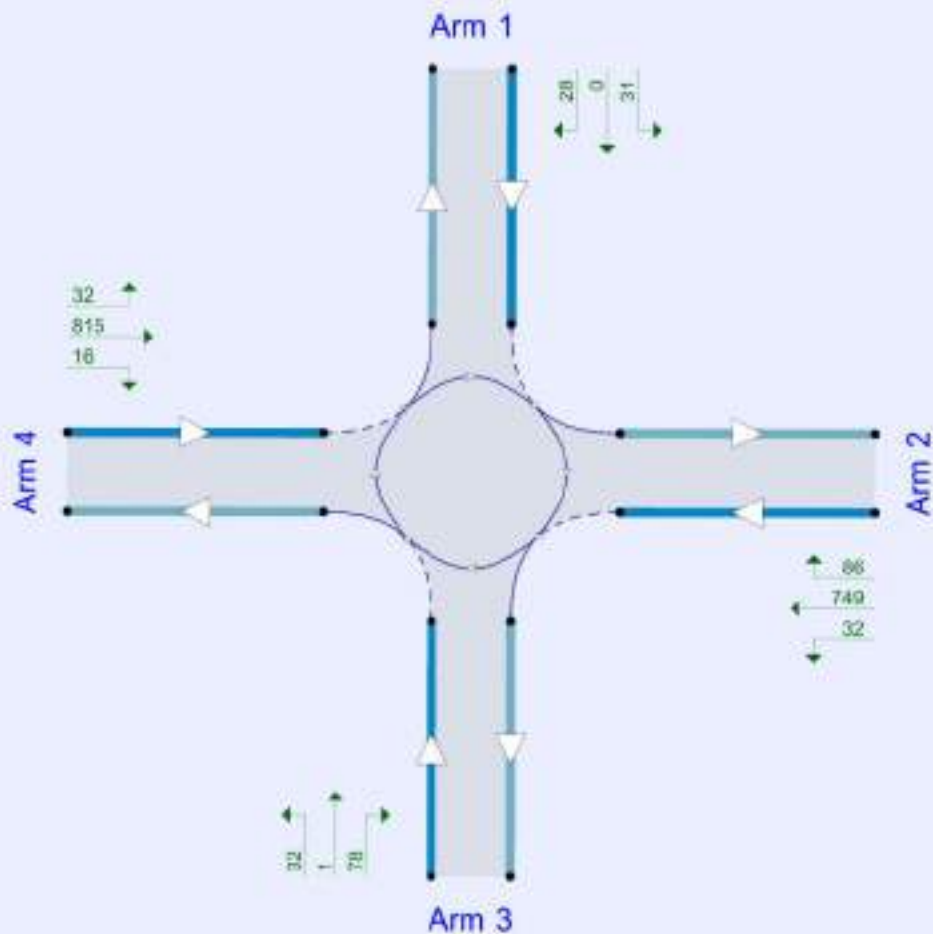
File summary

File Description

Title	Rivermead / Richfield Avenue Roundabout
Location	Reading
Site number	
Date	14/12/2021
Version	
Status	Preliminary
Identifier	
Client	
Jobnumber	600353
Enumerator	
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



Flow data input to Junctions 10

The junction diagram reflects the last run of Junctions.

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	2021 Baseline	AM	ONE HOUR	07:45	09:15	15
D2	2021 Baseline	PM	ONE HOUR	16:15	17:45	15
D3	2028 Future Baseline	AM	ONE HOUR	07:45	09:15	15
D4	2028 Future Baseline	PM	ONE HOUR	16:15	17:45	15
D5	2028 Future Baseline + Development	AM	ONE HOUR	07:45	09:15	15
D6	2028 Future Baseline + Development	PM	ONE HOUR	16:15	17:45	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Existing Layout	100.000

Existing Layout - 2021 Baseline, AM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	7.17	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.17	A

Arms

Arms

Arm	Name	Description	No give-way line
1	Rivermead		
2	Richfield Avenue (E)		
3	Tessa Road		
4	Richfield Avenue (W)		

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)	Entry only	Exit only
1	3.67	5.52	12.6	32.3	24.0	40.0		
2	3.40	6.09	12.0	8.5	27.0	29.0		
3	3.53	3.53	0.0	4.6	24.0	24.5		
4	4.00	6.22	4.3	24.0	24.0	39.0		

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.610	1469
2	0.581	1410
3	0.456	915
4	0.600	1433

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	2021 Baseline	AM	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		✓	20	100.000
2		✓	746	100.000
3		✓	67	100.000
4		✓	803	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	0	15	1	4
	2	15	9	101	621
	3	0	51	0	16
	4	14	745	43	1

Vehicle Mix

Heavy Vehicle Percentages

	To				
	1	2	3	4	
From	1	0	0	0	0
	2	2	0	5	5
	3	0	14	0	5
	4	0	5	4	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.02	4.10	0.0	A
2	0.60	6.78	1.5	A
3	0.13	7.81	0.2	A
4	0.64	7.55	1.8	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	15	636	1081	0.014	15	0.0	3.375	A
2	562	37	1389	0.404	559	0.7	4.535	A
3	50	487	693	0.073	50	0.1	6.253	A
4	605	56	1400	0.432	601	0.8	4.707	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	18	762	1004	0.018	18	0.0	3.648	A
2	671	44	1384	0.484	670	1.0	5.275	A
3	60	583	649	0.093	60	0.1	6.829	A
4	722	67	1393	0.518	721	1.1	5.602	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	22	932	901	0.024	22	0.0	4.096	A
2	821	54	1379	0.596	819	1.5	6.721	A
3	74	714	590	0.125	74	0.2	7.791	A
4	884	82	1384	0.639	881	1.8	7.470	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	22	935	899	0.024	22	0.0	4.104	A
2	821	54	1378	0.596	821	1.5	6.775	A
3	74	716	589	0.125	74	0.2	7.808	A
4	884	83	1384	0.639	884	1.8	7.552	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	18	766	1002	0.018	18	0.0	3.661	A
2	671	44	1384	0.485	673	1.0	5.322	A
3	60	586	648	0.093	60	0.1	6.851	A
4	722	68	1393	0.518	725	1.1	5.675	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	15	641	1078	0.014	15	0.0	3.387	A
2	562	37	1388	0.405	563	0.7	4.578	A
3	50	490	691	0.073	51	0.1	6.275	A
4	605	57	1399	0.432	606	0.8	4.767	A

Existing Layout - 2021 Baseline, PM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	7.34	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.34	A

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	2021 Baseline	PM	ONE HOUR	16:15	17:45	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		✓	56	100.000
2		✓	802	100.000
3		✓	104	100.000
4		✓	747	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
From		1	2	3	4
	1	1	29	0	26
	2	80	16	30	676
	3	1	73	0	30
	4	30	700	15	2

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.07	4.15	0.1	A
2	0.64	7.29	1.8	A
3	0.22	9.21	0.3	A
4	0.62	7.37	1.7	A

Main Results for each time segment

16:15 - 16:30

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	42	604	1101	0.038	42	0.0	3.399	A
2	604	33	1391	0.434	601	0.8	4.587	A
3	78	600	641	0.122	78	0.1	6.505	A
4	562	128	1356	0.415	560	0.7	4.587	A

16:30 - 16:45

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	50	723	1028	0.049	50	0.1	3.681	A
2	721	40	1387	0.520	720	1.1	5.441	A
3	93	719	587	0.159	93	0.2	7.427	A
4	672	153	1341	0.501	670	1.0	5.459	A

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	62	885	930	0.066	62	0.1	4.147	A
2	883	48	1382	0.639	880	1.8	7.214	A
3	115	879	514	0.223	114	0.3	9.165	A
4	822	188	1321	0.623	820	1.6	7.289	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	62	887	928	0.066	62	0.1	4.155	A
2	883	48	1382	0.639	883	1.8	7.289	A
3	115	882	513	0.223	114	0.3	9.211	A
4	822	188	1320	0.623	822	1.7	7.367	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	50	727	1026	0.049	50	0.1	3.691	A
2	721	40	1387	0.520	724	1.1	5.507	A
3	93	723	586	0.160	94	0.2	7.471	A
4	672	154	1341	0.501	674	1.0	5.524	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	42	608	1098	0.038	42	0.0	3.411	A
2	604	33	1391	0.434	605	0.8	4.639	A
3	78	604	639	0.122	79	0.1	6.546	A
4	562	129	1356	0.415	564	0.7	4.638	A

Existing Layout - 2028 Future Baseline, AM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	8.15	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	8.15	A

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 Future Baseline	AM	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		✓	21	100.000
2		✓	800	100.000
3		✓	72	100.000
4		✓	861	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	0	16	1	4
	2	16	10	108	666
	3	0	55	0	17
	4	15	799	46	1

Vehicle Mix

Heavy Vehicle Percentages

	To				
	1	2	3	4	
From	1	0	0	0	0
	2	2	0	5	5
	3	0	14	0	5
	4	0	5	4	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.03	4.31	0.0	A
2	0.64	7.61	1.8	A
3	0.14	8.28	0.2	A
4	0.69	8.73	2.3	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	16	682	1053	0.015	16	0.0	3.469	A
2	602	39	1387	0.434	599	0.8	4.771	A
3	54	522	677	0.080	54	0.1	6.450	A
4	648	61	1397	0.464	645	0.9	4.993	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	19	817	971	0.019	19	0.0	3.781	A
2	719	47	1383	0.520	718	1.1	5.666	A
3	65	625	630	0.103	65	0.1	7.114	A
4	774	73	1390	0.557	772	1.3	6.099	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	23	999	860	0.027	23	0.0	4.302	A
2	881	57	1377	0.640	878	1.8	7.529	A
3	79	765	566	0.140	79	0.2	8.252	A
4	948	89	1380	0.687	944	2.2	8.589	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	23	1003	857	0.027	23	0.0	4.314	A
2	881	57	1377	0.640	881	1.8	7.611	A
3	79	767	565	0.140	79	0.2	8.277	A
4	948	89	1380	0.687	948	2.3	8.735	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	19	823	967	0.020	19	0.0	3.798	A
2	719	47	1383	0.520	722	1.2	5.740	A
3	65	629	628	0.103	65	0.1	7.142	A
4	774	73	1389	0.557	778	1.3	6.209	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	16	688	1050	0.015	16	0.0	3.483	A
2	602	39	1387	0.434	604	0.8	4.829	A
3	54	526	675	0.080	54	0.1	6.482	A
4	648	61	1397	0.464	650	0.9	5.068	A

Existing Layout - 2028 Future Baseline, PM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	8.41	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	8.41	A

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 Future Baseline	PM	ONE HOUR	16:15	17:45	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		✓	60	100.000
2		✓	860	100.000
3		✓	111	100.000
4		✓	800	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
	1	2	3	4
From	1	31	0	28
	2	86	17	725
	3	1	78	32
	4	32	750	16

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.07	4.37	0.1	A
2	0.69	8.39	2.2	A
3	0.25	10.15	0.3	B
4	0.67	8.49	2.1	A

Main Results for each time segment

16:15 - 16:30

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	45	646	1075	0.042	45	0.0	3.494	A
2	647	35	1389	0.466	644	0.9	4.857	A
3	84	643	622	0.134	83	0.2	6.807	A
4	602	137	1351	0.446	599	0.8	4.859	A

16:30 - 16:45

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	54	774	997	0.054	54	0.1	3.816	A
2	773	42	1385	0.558	772	1.3	5.909	A
3	100	771	564	0.177	100	0.2	7.906	A
4	719	164	1335	0.539	718	1.2	5.932	A

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	66	947	892	0.074	66	0.1	4.359	A
2	947	52	1380	0.686	943	2.1	8.263	A
3	122	942	486	0.252	122	0.3	10.079	B
4	881	201	1313	0.671	877	2.0	8.362	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	66	950	890	0.074	66	0.1	4.370	A
2	947	52	1380	0.686	947	2.2	8.392	A
3	122	946	484	0.253	122	0.3	10.147	B
4	881	201	1312	0.671	881	2.1	8.494	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	54	779	994	0.054	54	0.1	3.833	A
2	773	42	1385	0.558	777	1.3	6.009	A
3	100	776	561	0.178	100	0.2	7.970	A
4	719	165	1334	0.539	723	1.2	6.034	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	45	651	1072	0.042	45	0.0	3.508	A
2	647	35	1389	0.466	649	0.9	4.925	A
3	84	648	619	0.135	84	0.2	6.859	A
4	602	138	1350	0.446	604	0.8	4.924	A

Existing Layout - 2028 Future Baseline + Development, AM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	9.05	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	9.05	A

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)
D5	2028 Future Baseline + Development	AM	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		✓	21	100.000
2		✓	865	100.000
3		✓	72	100.000
4		✓	886	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	0	16	1	4
	2	16	10	108	731
	3	0	55	0	17
	4	15	824	46	1

Vehicle Mix

Heavy Vehicle Percentages

	To				
		1	2	3	4
From	1	0	0	0	0
	2	2	0	5	5
	3	0	14	0	5
	4	0	5	4	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.03	4.40	0.0	A
2	0.69	8.89	2.3	A
3	0.15	8.87	0.2	A
4	0.71	9.33	2.5	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	16	701	1042	0.015	16	0.0	3.507	A
2	651	39	1387	0.469	648	0.9	5.079	A
3	54	570	655	0.083	54	0.1	6.687	A
4	667	61	1397	0.478	663	0.9	5.118	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	19	840	957	0.020	19	0.0	3.836	A
2	778	47	1383	0.562	776	1.3	6.203	A
3	65	684	603	0.107	65	0.1	7.464	A
4	796	73	1390	0.573	795	1.4	6.326	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	23	1026	843	0.027	23	0.0	4.389	A
2	952	57	1377	0.692	949	2.3	8.739	A
3	79	836	534	0.148	79	0.2	8.834	A
4	976	89	1380	0.707	971	2.4	9.141	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	23	1030	841	0.028	23	0.0	4.402	A
2	952	57	1377	0.692	952	2.3	8.890	A
3	79	839	533	0.149	79	0.2	8.872	A
4	976	89	1380	0.707	975	2.5	9.325	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	19	846	953	0.020	19	0.0	3.852	A
2	778	47	1383	0.562	781	1.4	6.321	A
3	65	688	601	0.108	65	0.1	7.506	A
4	796	73	1389	0.573	801	1.4	6.459	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	16	707	1038	0.015	16	0.0	3.520	A
2	651	39	1387	0.470	653	0.9	5.155	A
3	54	575	653	0.083	54	0.1	6.725	A
4	667	61	1397	0.478	669	1.0	5.200	A

Existing Layout - 2028 Future Baseline + Development, PM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	9.45	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	9.45	A

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)
D6	2028 Future Baseline + Development	PM	ONE HOUR	16:15	17:45	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		✓	60	100.000
2		✓	884	100.000
3		✓	111	100.000
4		✓	865	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	31	0	28	
	2	86	17	32	749
	3	1	78	0	32
	4	32	815	16	2

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.08	4.61	0.1	A
2	0.71	8.93	2.4	A
3	0.26	10.50	0.4	B
4	0.73	10.17	2.6	B

Main Results for each time segment

16:15 - 16:30

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	45	695	1046	0.043	45	0.0	3.597	A
2	666	35	1389	0.479	662	0.9	4.974	A
3	84	661	614	0.136	83	0.2	6.909	A
4	651	137	1351	0.482	647	0.9	5.189	A

16:30 - 16:45

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	54	832	962	0.056	54	0.1	3.966	A
2	795	42	1385	0.574	793	1.3	6.123	A
3	100	792	554	0.180	100	0.2	8.076	A
4	778	164	1335	0.583	776	1.4	6.541	A

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	66	1017	849	0.078	66	0.1	4.597	A
2	973	52	1380	0.705	969	2.3	8.770	A
3	122	968	474	0.258	122	0.3	10.416	B
4	952	201	1313	0.725	948	2.6	9.917	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	66	1022	846	0.078	66	0.1	4.614	A
2	973	52	1380	0.705	973	2.4	8.934	A
3	122	972	472	0.259	122	0.4	10.496	B
4	952	201	1312	0.726	952	2.6	10.174	B

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	54	839	957	0.056	54	0.1	3.987	A
2	795	42	1385	0.574	799	1.4	6.243	A
3	100	798	551	0.181	100	0.2	8.149	A
4	778	165	1334	0.583	782	1.4	6.710	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	45	701	1042	0.043	45	0.0	3.614	A
2	666	35	1389	0.479	667	0.9	5.051	A
3	84	667	611	0.137	84	0.2	6.964	A
4	651	138	1350	0.482	653	1.0	5.279	A

Junctions 10									
ARCADY 10 - Roundabout Module									
Version: 10.0.1.1519									
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Filename: Caversham Road Roundabout Peak ARCADY.j10

Path: S:\Shared Folders\Projects\600353 - River Academy Reading\5 - TP\4 - Working\ARCADY\Caversham Road Roundabout

Report generation date: 14/12/2021 21:21:34

- »Existing Layout - 2021 Baseline, AM
- »Existing Layout - 2021 Baseline, PM
- »Existing Layout - 2028 Future Baseline, AM
- »Existing Layout - 2028 Future Baseline, PM
- »Existing Layout - 2028 Future Baseline + Development, AM
- »Existing Layout - 2028 Future Baseline + Development, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	2.9	7.79	0.74	A	D2	2.7	7.27	0.73	A
Arm 2		0.7	252.30	0.49	F		0.6	197.96	0.44	F
Arm 3		1.6	5.12	0.60	A		3.2	8.47	0.76	A
Arm 4		1.0	3.72	0.48	A		1.2	4.44	0.54	A
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	4.1	10.55	0.81	B	D4	3.8	9.69	0.79	A
Arm 2		6.1	1425.76	999999999.00	F		6.7	1426.30	999999999.00	F
Arm 3		2.0	5.93	0.65	A		4.8	11.81	0.83	B
Arm 4		1.2	4.18	0.53	A		1.5	5.20	0.59	A
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	5.7	14.38	0.85	B	D6	5.0	12.71	0.84	B
Arm 2		6.2	1465.39	999999999.00	F		6.7	1463.13	999999999.00	F
Arm 3		2.4	7.00	0.70	A		7.1	16.95	0.88	C
Arm 4		1.5	4.74	0.59	A		1.9	6.13	0.66	A

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

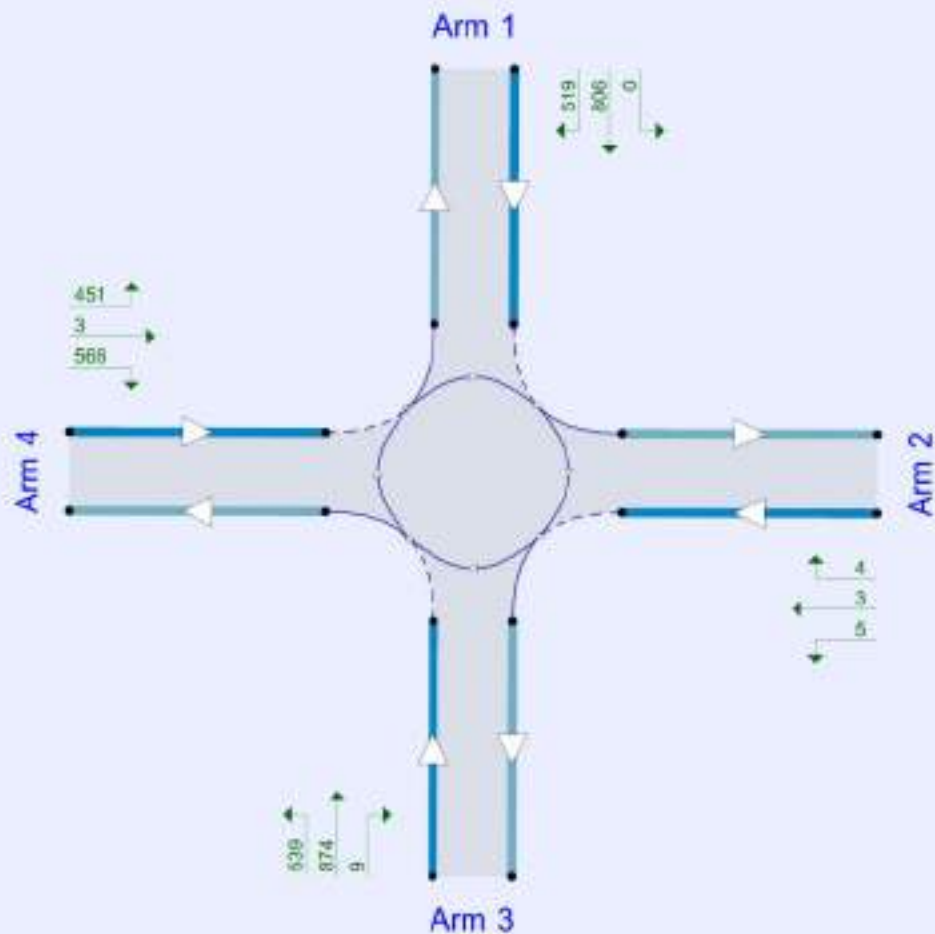
File summary

File Description

Title	Caversham Road Roundabout
Location	Reading
Site number	
Date	14/12/2021
Version	
Status	Preliminary
Identifier	
Client	
Jobnumber	600353
Enumerator	
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



Flow data input to Junctions 10

The junction diagram reflects the last run of Junctions.

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	2021 Baseline	AM	ONE HOUR	08:45	10:15	15
D2	2021 Baseline	PM	ONE HOUR	15:15	16:45	15
D3	2028 Future Baseline	AM	ONE HOUR	08:45	10:15	15
D4	2028 Future Baseline	PM	ONE HOUR	15:15	16:45	15
D5	2028 Future Baseline + Development	AM	ONE HOUR	08:45	10:15	15
D6	2028 Future Baseline + Development	PM	ONE HOUR	15:15	16:45	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Existing Layout	100.000

Existing Layout - 2021 Baseline, AM

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	6.65	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.65	A

Arms

Arms

Arm	Name	Description	No give-way line
1	Caversham Bridge		
2	Waterman Place		
3	Caversham Road		
4	Richfield Avenue		

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)	Entry only	Exit only
1	4.66	8.97	14.9	64.0	38.0	14.1		
2	2.70	5.05	2.0	7.0	38.7	37.0		
3	5.95	8.34	30.0	9.4	39.0	33.1		
4	4.96	9.97	24.0	35.0	39.0	17.6		

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.789	2276
2	0.441	856
3	0.729	2222
4	0.837	2567

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	2021 Baseline	AM	ONE HOUR	08:45	10:15	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		✓	1229	100.000
2		✓	11	100.000
3		✓	1015	100.000
4		✓	871	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	3	12	799	415
	2	0	0	5	6
	3	605	11	12	387
	4	384	2	464	21

Vehicle Mix

Heavy Vehicle Percentages

	To				
	1	2	3	4	
From	1	0	4	4	4
	2	0	0	0	0
	3	6	3	0	7
	4	4	0	8	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.74	7.79	2.9	A
2	0.49	252.30	0.7	F
3	0.60	5.12	1.6	A
4	0.48	3.72	1.0	A

Main Results for each time segment

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	925	383	1974	0.469	922	0.9	3.547	A
2	8	1286	290	0.029	8	0.0	12.777	B
3	764	334	1979	0.386	761	0.7	3.136	A
4	656	473	2171	0.302	654	0.5	2.511	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	1105	458	1914	0.577	1103	1.4	4.602	A
2	10	1539	178	0.055	10	0.1	21.332	C
3	912	399	1931	0.473	911	0.9	3.749	A
4	783	567	2093	0.374	782	0.6	2.910	A

09:15 - 09:30

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	1353	561	1833	0.738	1347	2.8	7.614	A
2	12	1881	28	0.438	10	0.6	190.984	F
3	1118	487	1867	0.599	1115	1.6	5.071	A
4	959	693	1987	0.483	958	1.0	3.702	A

09:30 - 09:45

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	1353	562	1833	0.738	1353	2.9	7.795	A
2	12	1887	25	0.487	11	0.7	252.302	F
3	1118	490	1865	0.599	1117	1.6	5.116	A
4	959	695	1985	0.483	959	1.0	3.716	A

09:45 - 10:00

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	1105	459	1913	0.577	1111	1.4	4.698	A
2	10	1547	175	0.057	13	0.1	22.556	C
3	912	403	1928	0.473	915	1.0	3.788	A
4	783	569	2091	0.374	784	0.6	2.925	A

10:00 - 10:15

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	925	384	1972	0.469	927	0.9	3.587	A
2	8	1293	287	0.029	8	0.0	12.942	B
3	764	336	1977	0.386	765	0.7	3.161	A
4	656	476	2169	0.302	656	0.5	2.525	A

Existing Layout - 2021 Baseline, PM

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	7.67	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.67	A

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	2021 Baseline	PM	ONE HOUR	15:15	16:45	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		✓	1211	100.000
2		✓	12	100.000
3		✓	1274	100.000
4		✓	877	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	0	752	457
	2	4	0	5	3
	3	815	8	12	439
	4	394	3	464	16

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.73	7.27	2.7	A
2	0.44	197.96	0.6	F
3	0.76	8.47	3.2	A
4	0.54	4.44	1.2	A

Main Results for each time segment

15:15 - 15:30

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	912	378	1978	0.461	908	0.9	3.429	A
2	9	1278	293	0.031	9	0.0	12.648	B
3	959	361	1958	0.490	955	1.0	3.647	A
4	660	631	2039	0.324	658	0.5	2.656	A

15:30 - 15:45

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	1089	452	1919	0.567	1087	1.3	4.410	A
2	11	1529	183	0.059	11	0.1	20.903	C
3	1145	433	1907	0.601	1143	1.5	4.796	A
4	788	755	1935	0.407	788	0.7	3.199	A

15:45 - 16:00

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	1333	553	1840	0.725	1328	2.6	7.122	A
2	13	1869	33	0.401	11	0.5	158.095	F
3	1403	528	1837	0.763	1396	3.2	8.199	A
4	966	921	1796	0.538	964	1.2	4.404	A

16:00 - 16:15

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	1333	554	1839	0.725	1333	2.7	7.271	A
2	13	1875	30	0.437	13	0.6	197.963	F
3	1403	530	1835	0.764	1402	3.2	8.467	A
4	966	926	1792	0.539	966	1.2	4.443	A

16:15 - 16:30

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	1089	453	1918	0.568	1094	1.4	4.492	A
2	11	1537	179	0.060	13	0.1	21.972	C
3	1145	437	1904	0.602	1152	1.6	4.927	A
4	788	761	1930	0.409	790	0.7	3.230	A

16:30 - 16:45

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	912	379	1977	0.461	914	0.9	3.470	A
2	9	1285	290	0.031	9	0.0	12.811	B
3	959	364	1957	0.490	961	1.0	3.696	A
4	660	635	2036	0.324	661	0.5	2.675	A

Existing Layout - 2028 Future Baseline, AM

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	11.91	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	11.91	B

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 Future Baseline	AM	ONE HOUR	08:45	10:15	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		✓	1318	100.000
2		✓	11	100.000
3		✓	1089	100.000
4		✓	935	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	3	13	857	445
	2	0	0	5	6
	3	649	12	13	415
	4	412	2	498	23

Vehicle Mix

Heavy Vehicle Percentages

	To				
	1	2	3	4	
From	1	0	4	4	0
	2	0	0	0	0
	3	6	3	0	7
	4	4	0	8	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.81	10.55	4.1	B
2	999999999.00	1425.76	6.1	F
3	0.65	5.93	2.0	A
4	0.53	4.18	1.2	A

Main Results for each time segment

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	992	411	1951	0.509	988	1.1	3.818	A
2	8	1379	249	0.033	8	0.0	14.961	B
3	820	358	1961	0.418	817	0.8	3.335	A
4	704	508	2142	0.329	702	0.5	2.646	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	1185	492	1887	0.628	1182	1.7	5.217	A
2	10	1650	129	0.077	10	0.1	30.073	D
3	979	428	1910	0.513	978	1.1	4.097	A
4	841	608	2058	0.408	840	0.7	3.129	A

09:15 - 09:30

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	1451	602	1801	0.806	1442	4.0	10.044	B
2	12	2015	0	999999999.000	0	3.1	1425.764	F
3	1199	515	1846	0.649	1196	1.9	5.848	A
4	1029	743	1945	0.529	1028	1.2	4.151	A

09:30 - 09:45

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	1451	603	1800	0.806	1451	4.1	10.546	B
2	12	2024	0	999999999.000	0	6.1	-35678.450	?
3	1199	518	1844	0.650	1199	2.0	5.927	A
4	1029	745	1943	0.530	1029	1.2	4.175	A

09:45 - 10:00

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	1185	494	1886	0.628	1194	1.8	5.410	A
2	10	1664	123	0.080	34	0.1	51.207	F
3	979	445	1897	0.516	982	1.1	4.196	A
4	841	611	2056	0.409	842	0.7	3.147	A

10:00 - 10:15

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	992	413	1950	0.509	995	1.1	3.880	A
2	8	1388	245	0.034	9	0.0	15.246	C
3	820	360	1959	0.418	821	0.8	3.367	A
4	704	511	2140	0.329	705	0.5	2.660	A

Existing Layout - 2028 Future Baseline, PM

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	14.03	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	14.03	B

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 Future Baseline	PM	ONE HOUR	15:15	16:45	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		✓	1298	100.000
2		✓	12	100.000
3		✓	1367	100.000
4		✓	939	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	0	806	490
	2	4	0	5	3
	3	874	9	13	471
	4	422	3	497	17

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.79	9.69	3.8	A
2	999999999.00	1426.30	6.7	F
3	0.83	11.81	4.8	B
4	0.59	5.20	1.5	A

Main Results for each time segment

15:15 - 15:30

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	977	404	1957	0.499	973	1.0	3.727	A
2	9	1369	253	0.036	9	0.0	14.726	B
3	1029	387	1940	0.531	1025	1.1	3.991	A
4	707	676	2001	0.353	705	0.6	2.828	A

15:30 - 15:45

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	1167	484	1894	0.616	1164	1.6	5.027	A
2	11	1638	135	0.080	11	0.1	28.950	D
3	1229	463	1885	0.652	1226	1.9	5.549	A
4	844	809	1890	0.447	843	0.8	3.506	A

15:45 - 16:00

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	1429	592	1809	0.790	1421	3.7	9.296	A
2	13	2000	0	999999999.000	0	3.4	1426.305	F
3	1505	557	1816	0.829	1494	4.6	11.056	B
4	1034	982	1745	0.592	1031	1.5	5.126	A

16:00 - 16:15

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	1429	593	1808	0.791	1429	3.8	9.690	A
2	13	2009	0	999999999.000	0	6.7	-33523.838	?
3	1505	560	1814	0.830	1504	4.8	11.806	B
4	1034	988	1740	0.594	1034	1.5	5.203	A

16:15 - 16:30

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	1167	486	1892	0.617	1175	1.7	5.193	A
2	11	1651	129	0.084	37	0.1	50.526	F
3	1229	482	1870	0.657	1240	2.0	5.928	A
4	844	827	1875	0.450	847	0.8	3.581	A

16:30 - 16:45

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	977	406	1955	0.500	980	1.0	3.785	A
2	9	1377	250	0.036	9	0.0	14.996	B
3	1029	390	1938	0.531	1032	1.2	4.069	A
4	707	681	1997	0.354	708	0.6	2.852	A

Existing Layout - 2028 Future Baseline + Development, AM

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	13.66	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	13.66	B

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)
D5	2028 Future Baseline + Development	AM	ONE HOUR	08:45	10:15	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		✓	1347	100.000
2		✓	11	100.000
3		✓	1158	100.000
4		✓	1033	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	3	13	857	474
	2	0	0	5	6
	3	649	12	13	484
	4	441	2	567	23

Vehicle Mix

Heavy Vehicle Percentages

	To			
	1	2	3	4
From	1	0	4	4
	2	0	0	0
	3	6	3	0
	4	4	0	8

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.85	14.38	5.7	B
2	999999999.00	1465.39	6.2	F
3	0.70	7.00	2.4	A
4	0.59	4.74	1.5	A

Main Results for each time segment

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	1014	463	1910	0.531	1009	1.2	4.134	A
2	8	1452	216	0.038	8	0.0	17.269	C
3	872	379	1946	0.448	868	0.9	3.541	A
4	778	508	2142	0.363	775	0.6	2.789	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	1211	554	1839	0.659	1208	2.0	5.902	A
2	10	1738	91	0.109	10	0.1	44.200	E
3	1041	454	1891	0.550	1039	1.3	4.482	A
4	929	608	2058	0.451	928	0.9	3.373	A

09:15 - 09:30

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	1483	678	1741	0.852	1469	5.4	13.150	B
2	12	2117	0	999999999.000	0	3.1	1465.393	F
3	1275	546	1824	0.699	1271	2.4	6.854	A
4	1137	743	1945	0.585	1135	1.5	4.698	A

09:30 - 09:45

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	1483	679	1740	0.852	1482	5.7	14.377	B
2	12	2132	0	999999999.000	0	6.2	-21137.250	?
3	1275	550	1821	0.700	1275	2.4	7.003	A
4	1137	745	1943	0.585	1137	1.5	4.738	A

09:45 - 10:00

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	1211	556	1837	0.659	1226	2.1	6.265	A
2	10	1757	82	0.121	34	0.1	105.700	F
3	1041	473	1877	0.555	1045	1.3	4.626	A
4	929	611	2055	0.452	931	0.9	3.402	A

10:00 - 10:15

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	1014	465	1909	0.531	1018	1.2	4.218	A
2	8	1462	212	0.039	9	0.0	17.746	C
3	872	382	1943	0.449	874	0.9	3.583	A
4	778	511	2139	0.364	779	0.6	2.809	A

Existing Layout - 2028 Future Baseline + Development, PM

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	17.09	C

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	17.09	C

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)
D6	2028 Future Baseline + Development	PM	ONE HOUR	15:15	16:45	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		✓	1327	100.000
2		✓	12	100.000
3		✓	1435	100.000
4		✓	1037	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	0	806	519
	2	4	0	5	3
	3	874	9	13	539
	4	451	3	566	17

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.84	12.71	5.0	B
2	999999999.00	1463.13	6.7	F
3	0.88	16.95	7.1	C
4	0.66	6.13	1.9	A

Main Results for each time segment

15:15 - 15:30

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	999	456	1916	0.521	995	1.1	3.975	A
2	9	1442	221	0.041	9	0.0	16.968	C
3	1080	408	1924	0.561	1075	1.3	4.303	A
4	781	676	2001	0.390	778	0.6	2.997	A

15:30 - 15:45

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	1193	546	1845	0.647	1190	1.8	5.590	A
2	11	1725	96	0.112	10	0.1	41.826	E
3	1290	489	1866	0.691	1286	2.2	6.300	A
4	932	808	1890	0.493	931	1.0	3.825	A

15:45 - 16:00

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	1461	667	1749	0.835	1449	4.8	11.815	B
2	13	2103	0	999999999.000	0	3.4	1463.127	F
3	1580	588	1794	0.881	1562	6.6	14.884	B
4	1142	978	1748	0.653	1138	1.9	5.984	A

16:00 - 16:15

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	1461	669	1748	0.836	1460	5.0	12.713	B
2	13	2116	0	999999999.000	0	6.7	-20596.842	?
3	1580	592	1790	0.882	1578	7.1	16.954	C
4	1142	988	1740	0.656	1142	1.9	6.134	A

16:15 - 16:30

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	1193	549	1843	0.647	1205	1.9	5.882	A
2	11	1743	88	0.122	37	0.2	101.446	F
3	1290	510	1850	0.697	1309	2.4	7.013	A
4	932	831	1871	0.498	936	1.0	3.943	A

16:30 - 16:45

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	999	459	1914	0.522	1002	1.1	4.049	A
2	9	1452	217	0.042	9	0.0	17.409	C
3	1080	412	1922	0.562	1085	1.3	4.414	A
4	781	682	1996	0.391	782	0.7	3.029	A

Junctions 10									
ARCADY 10 - Roundabout Module									
Version: 10.0.1.1519									
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Filename: Caversham Road Roundabout Pre-Post Peak ARCADY.j10

Path: S:\Shared Folders\Projects\600353 - River Academy Reading\5 - TP\4 - Working\ARCADY\Caversham Road Roundabout

Report generation date: 14/12/2021 21:34:56

- »Existing Layout - 2021 Baseline, AM
- »Existing Layout - 2021 Baseline, PM
- »Existing Layout - 2028 Future Baseline, AM
- »Existing Layout - 2028 Future Baseline, PM
- »Existing Layout - 2028 Future Baseline + Development, AM
- »Existing Layout - 2028 Future Baseline + Development, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	3.3	8.49	0.77	A	D2	2.4	6.79	0.71	A
Arm 2		0.5	287.34	0.40	F		0.4	115.73	0.30	F
Arm 3		2.2	6.20	0.68	A		3.0	7.98	0.75	A
Arm 4		1.1	4.21	0.52	A		1.2	4.69	0.55	A
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	5.0	11.93	0.83	B	D4	3.3	8.78	0.77	A
Arm 2		3.9	1411.79	999999999.00	F		6.7	1419.45	999999999.00	F
Arm 3		2.9	7.63	0.73	A		4.5	11.03	0.82	B
Arm 4		1.4	4.85	0.57	A		1.6	5.56	0.61	A
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	5.8	13.84	0.86	B	D6	3.7	9.83	0.79	A
Arm 2		3.9	1422.89	999999999.00	F		6.7	1431.64	999999999.00	F
Arm 3		3.4	8.75	0.77	A		4.9	11.92	0.83	B
Arm 4		1.5	5.03	0.58	A		1.9	6.24	0.65	A

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

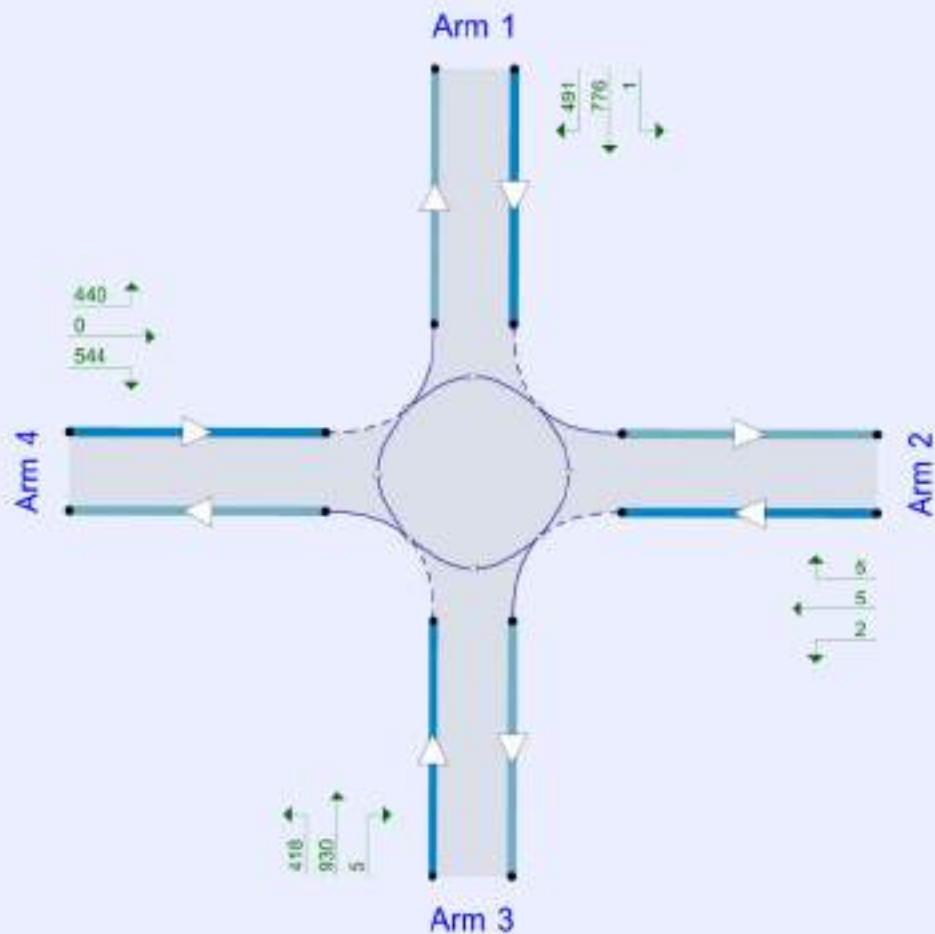
File summary

File Description

Title	Caversham Road Roundabout
Location	Reading
Site number	
Date	14/12/2021
Version	
Status	Preliminary
Identifier	
Client	
Jobnumber	600353
Enumerator	
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



Flows show signal split demand (PCU/hr)

The junction diagram reflects the last run of Junctions.

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	2021 Baseline	AM	ONE HOUR	08:45	10:15	15
D2	2021 Baseline	PM	ONE HOUR	15:15	16:45	15
D3	2028 Future Baseline	AM	ONE HOUR	08:45	10:15	15
D4	2028 Future Baseline	PM	ONE HOUR	15:15	16:45	15
D5	2028 Future Baseline + Development	AM	ONE HOUR	08:45	10:15	15
D6	2028 Future Baseline + Development	PM	ONE HOUR	15:15	16:45	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Existing Layout	100.000

Existing Layout - 2021 Baseline, AM

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	7.16	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.16	A

Arms

Arms

Arm	Name	Description	No give-way line
1	Caversham Bridge		
2	Waterman Place		
3	Caversham Road		
4	Richfield Avenue		

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)	Entry only	Exit only
1	4.66	8.97	14.9	64.0	38.0	14.1		
2	2.70	5.05	2.0	7.0	38.7	37.0		
3	5.95	8.34	30.0	9.4	39.0	33.1		
4	4.96	9.97	24.0	35.0	39.0	17.6		

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.789	2276
2	0.441	856
3	0.729	2222
4	0.837	2567

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	2021 Baseline	AM	ONE HOUR	08:45	10:15	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		✓	1313	100.000
2		✓	7	100.000
3		✓	1175	100.000
4		✓	875	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	12	924	375
	2	1	0	5	1
	3	722	20	13	420
	4	459	4	402	10

Vehicle Mix

Heavy Vehicle Percentages

	To				
	1	2	3	4	
From	1	0	4	4	4
	2	0	0	0	0
	3	6	3	0	7
	4	4	0	8	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.77	8.49	3.3	A
2	0.40	287.34	0.5	F
3	0.68	6.20	2.2	A
4	0.52	4.21	1.1	A

Main Results for each time segment

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	988	337	2010	0.492	985	1.0	3.638	A
2	5	1295	286	0.018	5	0.0	12.821	B
3	885	292	2009	0.440	881	0.8	3.380	A
4	659	569	2091	0.315	657	0.5	2.650	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	1180	403	1958	0.603	1178	1.6	4.789	A
2	6	1549	174	0.036	6	0.0	21.475	C
3	1056	349	1967	0.537	1055	1.2	4.183	A
4	787	680	1997	0.394	786	0.7	3.140	A

09:15 - 09:30

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	1446	493	1886	0.766	1439	3.3	8.237	A
2	8	1893	22	0.344	6	0.4	212.504	F
3	1294	426	1911	0.677	1290	2.2	6.114	A
4	963	832	1871	0.515	962	1.1	4.180	A

09:30 - 09:45

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	1446	494	1886	0.767	1445	3.3	8.488	A
2	8	1900	19	0.403	7	0.5	287.341	F
3	1294	428	1910	0.677	1294	2.2	6.203	A
4	963	834	1868	0.516	963	1.1	4.205	A

09:45 - 10:00

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	1180	405	1957	0.603	1187	1.6	4.909	A
2	6	1559	169	0.037	8	0.0	22.593	C
3	1056	352	1965	0.538	1060	1.2	4.243	A
4	787	684	1994	0.394	788	0.7	3.162	A

10:00 - 10:15

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	988	338	2009	0.492	991	1.0	3.688	A
2	5	1302	283	0.019	5	0.0	12.991	B
3	885	294	2008	0.441	886	0.8	3.413	A
4	659	572	2088	0.315	660	0.5	2.667	A

Existing Layout - 2021 Baseline, PM

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	7.08	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.08	A

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	2021 Baseline	PM	ONE HOUR	15:15	16:45	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		✓	1178	100.000
2		✓	12	100.000
3		✓	1256	100.000
4		✓	868	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	1	724	451
	2	5	0	2	5
	3	868	5	19	364
	4	389	0	468	11

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.71	6.79	2.4	A
2	0.30	115.73	0.4	F
3	0.75	7.98	3.0	A
4	0.55	4.69	1.2	A

Main Results for each time segment

15:15 - 15:30

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	887	378	1978	0.448	884	0.8	3.353	A
2	9	1257	303	0.030	9	0.0	12.251	B
3	946	355	1963	0.482	942	0.9	3.577	A
4	653	674	2003	0.326	652	0.5	2.716	A

15:30 - 15:45

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	1059	452	1919	0.552	1057	1.2	4.260	A
2	11	1504	194	0.056	11	0.1	19.646	C
3	1129	425	1912	0.591	1127	1.5	4.659	A
4	780	807	1892	0.413	779	0.7	3.299	A

15:45 - 16:00

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	1297	553	1840	0.705	1292	2.4	6.667	A
2	13	1838	46	0.286	12	0.3	102.461	F
3	1383	519	1844	0.750	1377	3.0	7.755	A
4	956	985	1742	0.549	954	1.2	4.646	A

16:00 - 16:15

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	1297	554	1839	0.705	1297	2.4	6.785	A
2	13	1844	44	0.302	13	0.4	115.731	F
3	1383	522	1842	0.751	1383	3.0	7.975	A
4	956	990	1738	0.550	956	1.2	4.692	A

16:15 - 16:30

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	1059	453	1918	0.552	1064	1.3	4.329	A
2	11	1512	190	0.057	12	0.1	20.342	C
3	1129	429	1909	0.591	1135	1.5	4.774	A
4	780	813	1886	0.414	782	0.7	3.336	A

16:30 - 16:45

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	887	379	1977	0.449	889	0.8	3.389	A
2	9	1263	300	0.030	9	0.0	12.397	B
3	946	358	1961	0.482	948	1.0	3.623	A
4	653	678	1999	0.327	654	0.5	2.733	A

Existing Layout - 2028 Future Baseline, AM

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	11.30	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	11.30	B

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 Future Baseline	AM	ONE HOUR	08:45	10:15	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		✓	1408	100.000
2		✓	7	100.000
3		✓	1261	100.000
4		✓	939	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	13	991	402
	2	1	0	5	1
	3	775	21	14	451
	4	493	4	431	11

Vehicle Mix

Heavy Vehicle Percentages

	To				
	1	2	3	4	
From	1	0	4	4	0
	2	0	0	0	0
	3	6	3	0	7
	4	4	0	8	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.83	11.93	5.0	B
2	999999999.00	1411.79	3.9	F
3	0.73	7.63	2.9	A
4	0.57	4.85	1.4	A

Main Results for each time segment

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	1060	361	1991	0.532	1055	1.2	3.937	A
2	5	1388	245	0.022	5	0.0	15.019	C
3	949	313	1994	0.476	946	1.0	3.634	A
4	707	610	2057	0.344	705	0.6	2.810	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	1266	432	1935	0.654	1263	1.9	5.482	A
2	6	1661	125	0.050	6	0.1	30.355	D
3	1134	374	1949	0.582	1132	1.5	4.666	A
4	844	730	1956	0.432	843	0.8	3.416	A

09:15 - 09:30

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	1550	528	1859	0.834	1539	4.8	11.174	B
2	8	2025	0	999999999.000	0	2.0	1411.790	F
3	1388	454	1891	0.734	1383	2.8	7.439	A
4	1034	890	1822	0.568	1032	1.4	4.805	A

09:30 - 09:45

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	1550	530	1858	0.834	1550	5.0	11.930	B
2	8	2037	0	999999999.000	0	3.9	570.882	F
3	1388	457	1889	0.735	1388	2.9	7.628	A
4	1034	894	1819	0.568	1034	1.4	4.849	A

09:45 - 10:00

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	1266	434	1934	0.655	1278	2.0	5.745	A
2	6	1677	117	0.054	22	0.1	43.296	E
3	1134	383	1943	0.583	1139	1.5	4.790	A
4	844	737	1950	0.433	846	0.8	3.457	A

10:00 - 10:15

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	1060	363	1990	0.533	1063	1.2	4.010	A
2	5	1397	241	0.022	5	0.0	15.312	C
3	949	315	1992	0.477	951	1.0	3.683	A
4	707	613	2053	0.344	708	0.6	2.832	A

Existing Layout - 2028 Future Baseline, PM

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	13.55	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	13.55	B

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 Future Baseline	PM	ONE HOUR	15:15	16:45	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		✓	1262	100.000
2		✓	12	100.000
3		✓	1356	100.000
4		✓	931	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	1	776	483
	2	5	0	2	5
	3	930	5	20	401
	4	417	0	502	12

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.77	8.78	3.3	A
2	999999999.00	1419.45	6.7	F
3	0.82	11.03	4.5	B
4	0.61	5.56	1.6	A

Main Results for each time segment

15:15 - 15:30

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	950	404	1957	0.486	946	1.0	3.629	A
2	9	1346	263	0.034	9	0.0	14.152	B
3	1021	380	1945	0.525	1016	1.1	3.930	A
4	701	721	1963	0.357	699	0.6	2.900	A

15:30 - 15:45

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	1135	484	1894	0.599	1132	1.5	4.818	A
2	11	1611	147	0.074	11	0.1	26.448	D
3	1219	455	1890	0.645	1216	1.8	5.415	A
4	837	863	1845	0.454	836	0.8	3.639	A

15:45 - 16:00

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	1389	592	1809	0.768	1382	3.3	8.492	A
2	13	1968	0	999999999.000	0	3.4	1419.453	F
3	1493	544	1825	0.818	1483	4.3	10.425	B
4	1025	1047	1691	0.606	1022	1.5	5.473	A

16:00 - 16:15

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	1389	593	1808	0.769	1389	3.3	8.781	A
2	13	1976	0	999999999.000	0	6.7	-37574.287	?
3	1493	547	1823	0.819	1492	4.5	11.033	B
4	1025	1053	1685	0.608	1025	1.6	5.562	A

16:15 - 16:30

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	1135	486	1892	0.600	1142	1.6	4.948	A
2	11	1622	141	0.076	37	0.1	43.457	E
3	1219	481	1872	0.651	1229	1.9	5.794	A
4	837	883	1828	0.458	840	0.9	3.727	A

16:30 - 16:45

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	950	407	1955	0.486	952	1.0	3.677	A
2	9	1354	260	0.035	9	0.0	14.391	B
3	1021	383	1943	0.525	1024	1.1	4.005	A
4	701	727	1959	0.358	702	0.6	2.925	A

Existing Layout - 2028 Future Baseline + Development, AM

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	12.42	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	12.42	B

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)
D5	2028 Future Baseline + Development	AM	ONE HOUR	08:45	10:15	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		✓	1431	100.000
2		✓	7	100.000
3		✓	1303	100.000
4		✓	964	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	13	991	425
	2	1	0	5	1
	3	775	21	14	493
	4	500	4	449	11

Vehicle Mix

Heavy Vehicle Percentages

	To			
	1	2	3	4
From	1	0	4	4
	2	0	0	0
	3	6	3	0
	4	4	0	8

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.86	13.84	5.8	B
2	999999999.00	1422.89	3.9	F
3	0.77	8.75	3.4	A
4	0.58	5.03	1.5	A

Main Results for each time segment

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	1077	374	1980	0.544	1072	1.2	4.102	A
2	5	1418	231	0.023	5	0.0	15.905	C
3	981	330	1982	0.495	977	1.0	3.792	A
4	726	609	2057	0.353	723	0.6	2.850	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	1286	448	1922	0.669	1283	2.1	5.827	A
2	6	1697	109	0.058	6	0.1	35.099	E
3	1171	394	1934	0.606	1169	1.6	4.983	A
4	867	729	1956	0.443	866	0.8	3.487	A

09:15 - 09:30

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	1576	548	1843	0.855	1562	5.6	12.693	B
2	8	2068	0	999999999.000	0	2.0	1422.891	F
3	1435	478	1874	0.766	1428	3.3	8.449	A
4	1061	890	1822	0.583	1059	1.5	4.972	A

09:30 - 09:45

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	1576	549	1842	0.855	1575	5.8	13.843	B
2	8	2082	0	999999999.000	0	3.9	592.333	F
3	1435	482	1871	0.767	1434	3.4	8.750	A
4	1061	894	1819	0.584	1061	1.5	5.027	A

09:45 - 10:00

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	1286	450	1921	0.670	1301	2.2	6.180	A
2	6	1717	100	0.063	22	0.1	54.267	F
3	1171	404	1927	0.608	1178	1.7	5.156	A
4	867	737	1950	0.445	869	0.9	3.533	A

10:00 - 10:15

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	1077	376	1979	0.544	1081	1.3	4.187	A
2	5	1428	227	0.023	5	0.0	16.271	C
3	981	332	1980	0.496	983	1.1	3.849	A
4	726	614	2053	0.353	727	0.6	2.874	A

Existing Layout - 2028 Future Baseline + Development, PM

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	14.31	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	14.31	B

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)
D6	2028 Future Baseline + Development	PM	ONE HOUR	15:15	16:45	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		✓	1270	100.000
2		✓	12	100.000
3		✓	1373	100.000
4		✓	996	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	2	1	776	491
	2	5	0	2	5
	3	930	5	20	418
	4	440	0	544	12

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.79	9.83	3.7	A
2	999999999.00	1431.64	6.7	F
3	0.83	11.92	4.9	B
4	0.65	6.24	1.9	A

Main Results for each time segment

15:15 - 15:30

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	956	436	1932	0.495	952	1.0	3.740	A
2	9	1384	247	0.037	9	0.0	15.129	C
3	1034	386	1941	0.533	1029	1.2	4.004	A
4	750	721	1963	0.382	747	0.6	3.015	A

15:30 - 15:45

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	1142	522	1864	0.612	1139	1.6	5.058	A
2	11	1655	127	0.085	11	0.1	30.895	D
3	1234	462	1885	0.655	1231	1.9	5.582	A
4	895	863	1845	0.485	894	1.0	3.859	A

15:45 - 16:00

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	1398	637	1773	0.789	1390	3.6	9.419	A
2	13	2021	0	999999999.000	0	3.4	1431.643	F
3	1512	553	1819	0.831	1501	4.7	11.147	B
4	1097	1046	1691	0.648	1093	1.8	6.105	A

16:00 - 16:15

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	1398	640	1771	0.790	1398	3.7	9.833	A
2	13	2031	0	999999999.000	0	6.7	-30873.252	?
3	1512	556	1817	0.832	1511	4.9	11.919	B
4	1097	1053	1685	0.651	1096	1.9	6.239	A

16:15 - 16:30

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	1142	525	1862	0.613	1150	1.6	5.227	A
2	11	1669	121	0.089	37	0.1	56.516	F
3	1234	488	1866	0.661	1246	2.0	6.016	A
4	895	884	1827	0.490	899	1.0	3.974	A

16:30 - 16:45

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	956	438	1930	0.495	959	1.0	3.797	A
2	9	1392	243	0.037	9	0.0	15.433	C
3	1034	389	1938	0.533	1037	1.2	4.083	A
4	750	727	1959	0.383	751	0.6	3.046	A

Junctions 10									
ARCADY 10 - Roundabout Module									
Version: 10.0.1.1519									
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Filename: Beresford Road, Portman Road Mini-Roundabout Peak.j10

Path: S:\Shared Folders\Projects\600353 - River Academy Reading\5 - TP\4 - Working\ARCADY\Beresford Road Portman

Report generation date: 14/12/2021 20:34:04

- »Existing Layout - 2021 Baseline, AM
- »Existing Layout - 2021 Baseline, PM
- »Existing Layout - 2028 Future Baseline, AM
- »Existing Layout - 2028 Future Baseline, PM
- »Existing Layout - 2028 Future Baseline + Development, AM
- »Existing Layout - 2028 Future Baseline + Development, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
Existing Layout - 2021 Baseline										
Arm 1	D1	3.7	20.54	0.80	C	D2	32.2	131.62	1.05	F
Arm 2		2.5	34.57	0.73	D		8.0	95.80	0.94	F
Arm 3		7.1	28.26	0.89	D		5.0	21.21	0.84	C
Existing Layout - 2028 Future Baseline										
Arm 1	D3	5.6	29.15	0.86	D	D4	63.6	246.28	1.14	F
Arm 2		4.2	56.39	0.84	F		12.7	138.46	1.00	F
Arm 3		13.9	51.56	0.96	F		8.3	33.31	0.91	D
Existing Layout - 2028 Future Baseline + Development										
Arm 1	D5	8.9	43.71	0.92	E	D6	89.0	377.74	1.20	F
Arm 2		8.0	96.90	0.94	F		19.4	190.30	1.06	F
Arm 3		21.5	74.54	1.00	F		11.8	45.88	0.94	E

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

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

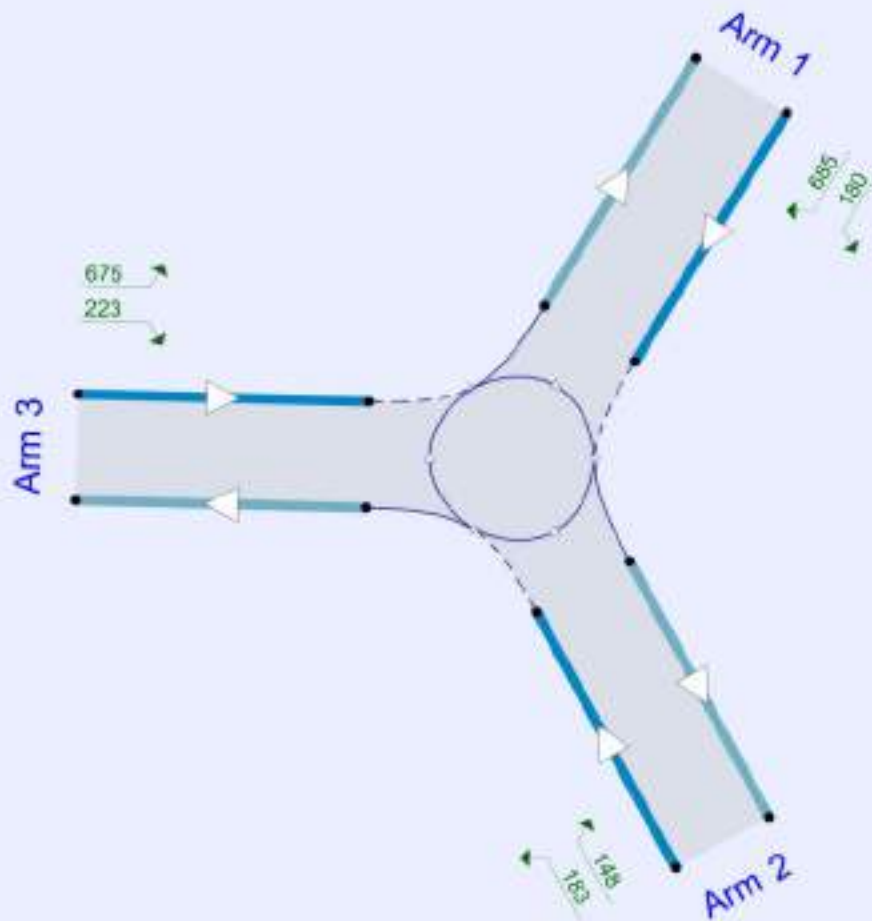
File summary

File Description

Title	Beresford Road / Portman Road Mini-Roundabout
Location	Reading
Site number	
Date	14/12/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	600353
Enumerator	Preliminary
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



Flow data input to Junctions 10

The junction diagram reflects the last run of Junctions.

Analysis Options

Mini-roundabout model	Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
JUNCTIONS 9			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	2021 Baseline	AM	ONE HOUR	08:45	10:15	15
D2	2021 Baseline	PM	ONE HOUR	15:15	16:45	15
D3	2028 Future Baseline	AM	ONE HOUR	08:45	10:15	15
D4	2028 Future Baseline	PM	ONE HOUR	15:15	16:45	15
D5	2028 Future Baseline + Development	AM	ONE HOUR	08:45	10:15	15
D6	2028 Future Baseline + Development	PM	ONE HOUR	15:15	16:45	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Existing Layout	100.000

Existing Layout - 2021 Baseline, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 85% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	26.40	D

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		26.40	D

Arms

Arms

Arm	Name	Description
1	Cow Lane	
2	Beresford Road	
3	Portman Road	

Mini Roundabout Geometry

Arm	Approach road half-width (m)	Minimum approach road half-width (m)	Entry width (m)	Effective flare length (m)	Distance to next arm (m)	Entry corner kerb line distance (m)	Gradient over 50m (%)	Kerbed central island
1	3.32	3.32	3.86	0.1	15.89	15.66	0.0	
2	2.85	2.85	3.42	0.6	11.12	8.72	0.0	
3	3.65	3.65	5.81	22.2	17.03	12.76	0.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.638	953
2	0.591	721
3	0.685	1153

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	2021 Baseline	AM	ONE HOUR	08:45	10:15	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		✓	620	100.000
2		✓	246	100.000
3		✓	867	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
	1	2	3	
From	1	2	86	532
	2	103	0	143
	3	730	135	2

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.80	20.54	3.7	C
2	0.73	34.57	2.5	D
3	0.89	28.26	7.1	D

Main Results for each time segment

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	467	102	888	0.526	462	1.1	8.454	A
2	185	400	485	0.382	183	0.6	11.828	B
3	653	78	1099	0.594	647	1.4	7.862	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	557	123	875	0.637	555	1.7	11.262	B
2	221	480	438	0.505	220	1.0	16.397	C
3	779	94	1089	0.716	775	2.4	11.349	B

09:15 - 09:30

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	683	148	858	0.795	675	3.6	19.087	C
2	271	584	376	0.720	266	2.3	31.178	D
3	955	113	1075	0.888	939	6.4	23.938	C

09:30 - 09:45

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	683	150	857	0.797	682	3.7	20.539	C
2	271	590	373	0.727	270	2.5	34.570	D
3	955	115	1074	0.889	952	7.1	28.265	D

09:45 - 10:00

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	557	126	873	0.639	565	1.8	12.079	B
2	221	488	432	0.511	227	1.1	17.932	C
3	779	97	1087	0.717	797	2.7	13.122	B

10:00 - 10:15

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	467	104	887	0.526	470	1.1	8.765	A
2	185	406	481	0.385	187	0.6	12.308	B
3	653	80	1098	0.594	657	1.5	8.249	A

Existing Layout - 2021 Baseline, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 84% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	77.93	F

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		77.93	F

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	2021 Baseline	PM	ONE HOUR	15:15	16:45	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		✓	765	100.000
2		✓	292	100.000
3		✓	816	100.000

Origin-Destination Data

Demand (PCU/hr)

	To		
	1	2	3
From	1	0	147
	2	117	4
	3	608	208

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.05	131.62	32.2	F
2	0.94	95.80	8.0	F
3	0.84	21.21	5.0	C

Main Results for each time segment

15:15 - 15:30

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	576	158	852	0.676	568	2.0	12.450	B
2	220	459	450	0.489	216	0.9	15.169	C
3	614	90	1091	0.563	609	1.3	7.390	A

15:30 - 15:45

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	688	190	832	0.827	679	4.2	22.477	C
2	263	548	397	0.661	259	1.8	25.430	D
3	734	107	1079	0.680	730	2.1	10.222	B

15:45 - 16:00

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	842	230	806	1.045	778	20.3	71.935	F
2	321	629	350	0.919	305	5.9	64.476	F
3	898	126	1066	0.843	888	4.7	19.086	C

16:00 - 16:15

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	842	233	804	1.047	794	32.2	131.619	F
2	321	642	342	0.940	313	8.0	95.795	F
3	898	130	1064	0.844	897	5.0	21.211	C

16:15 - 16:30

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	688	194	829	0.829	790	6.6	89.536	F
2	263	639	344	0.764	279	3.8	62.906	F
3	734	116	1074	0.683	745	2.2	11.302	B

16:30 - 16:45

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	576	161	850	0.677	593	2.2	14.992	B
2	220	479	438	0.502	231	1.0	18.239	C
3	614	96	1087	0.565	618	1.3	7.730	A

Existing Layout - 2028 Future Baseline, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 85% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	44.23	E

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		44.23	E

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 Future Baseline	AM	ONE HOUR	08:45	10:15	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		✓	665	100.000
2		✓	264	100.000
3		✓	930	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
	1	2	3	
From	1	2	92	571
	2	111	0	153
	3	783	145	2

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.86	29.15	5.6	D
2	0.84	56.39	4.2	F
3	0.96	51.56	13.9	F

Main Results for each time segment

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	501	110	883	0.567	495	1.3	9.253	A
2	199	428	468	0.425	196	0.7	13.103	B
3	700	84	1095	0.639	693	1.7	8.809	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	598	131	869	0.688	594	2.1	13.054	B
2	237	514	417	0.569	235	1.3	19.527	C
3	836	101	1084	0.771	830	3.2	13.876	B

09:15 - 09:30

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	732	157	853	0.859	720	5.1	25.301	D
2	291	623	353	0.823	281	3.6	45.101	E
3	1024	120	1070	0.957	992	11.1	36.260	E

09:30 - 09:45

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	732	160	851	0.861	730	5.6	29.153	D
2	291	631	348	0.835	288	4.2	56.386	F
3	1024	123	1068	0.959	1013	13.9	51.555	F

09:45 - 10:00

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	598	139	864	0.692	611	2.4	14.971	B
2	237	528	409	0.580	248	1.5	23.766	C
3	836	106	1080	0.774	877	3.7	20.627	C

10:00 - 10:15

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	501	112	882	0.568	505	1.4	9.735	A
2	199	436	463	0.429	201	0.8	13.893	B
3	700	86	1094	0.640	708	1.8	9.495	A

Existing Layout - 2028 Future Baseline, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 84% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	136.67	F

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		136.67	F

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 Future Baseline	PM	ONE HOUR	15:15	16:45	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		✓	820	100.000
2		✓	312	100.000
3		✓	875	100.000

Origin-Destination Data

Demand (PCU/hr)

	To		
	1	2	3
From	1	0	158
	2	125	4
	3	652	223

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.14	246.28	63.6	F
2	1.00	138.46	12.7	F
3	0.91	33.31	8.3	D

Main Results for each time segment

15:15 - 15:30

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	617	169	845	0.731	607	2.6	14.691	B
2	235	490	431	0.544	230	1.1	17.526	C
3	659	95	1088	0.606	653	1.5	8.171	A

15:30 - 15:45

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	737	203	823	0.895	721	6.5	31.488	D
2	280	582	377	0.744	275	2.6	33.531	D
3	787	114	1075	0.732	782	2.6	12.110	B

15:45 - 16:00

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	903	245	797	1.133	785	35.9	112.191	F
2	344	634	346	0.992	318	8.9	86.962	F
3	963	132	1063	0.907	944	7.4	26.877	D

16:00 - 16:15

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	903	249	794	1.137	792	63.6	236.085	F
2	344	639	343	1.001	328	12.7	138.464	F
3	963	136	1060	0.909	959	8.3	33.305	D

16:15 - 16:30

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	737	210	819	0.900	806	46.3	246.275	F
2	280	651	337	0.834	305	6.6	114.179	F
3	787	126	1066	0.738	808	3.0	14.964	B

16:30 - 16:45

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	617	173	843	0.732	789	3.3	100.950	F
2	235	637	345	0.682	252	2.4	43.790	E
3	659	104	1081	0.609	664	1.6	8.736	A

Existing Layout - 2028 Future Baseline + Development, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 85% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	66.58	F

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		66.58	F

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)
D5	2028 Future Baseline + Development	AM	ONE HOUR	08:45	10:15	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		✓	711	100.000
2		✓	286	100.000
3		✓	953	100.000

Origin-Destination Data

Demand (PCU/hr)

	To		
	1	2	3
From	1	2	115 594
	2	133	0 153
	3	806	145 2

Vehicle Mix

Heavy Vehicle Percentages

From	To		
	1	2	3
	0	0	1
	0	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.92	43.71	8.9	E
2	0.94	96.90	8.0	F
3	1.00	74.54	21.5	F

Main Results for each time segment

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	535	109	883	0.606	529	1.5	10.098	B
2	215	445	458	0.470	212	0.9	14.434	B
3	717	100	1084	0.662	710	1.9	9.435	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	639	131	869	0.735	635	2.6	15.171	C
2	257	534	406	0.634	254	1.6	23.278	C
3	857	120	1071	0.800	850	3.7	15.771	C

09:15 - 09:30

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	783	155	854	0.916	763	7.6	34.010	D
2	315	642	342	0.921	298	5.9	64.952	F
3	1049	141	1057	0.993	1003	15.3	46.151	E

09:30 - 09:45

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	783	158	852	0.919	778	8.9	43.714	E
2	315	654	335	0.941	307	8.0	96.901	F
3	1049	145	1054	0.996	1025	21.5	74.541	F

09:45 - 10:00

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	639	143	862	0.742	662	3.1	19.949	C
2	257	557	392	0.656	281	2.1	37.664	E
3	857	132	1062	0.807	924	4.7	34.014	D

10:00 - 10:15

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	535	112	881	0.607	541	1.6	10.856	B
2	215	455	452	0.476	220	0.9	15.791	C
3	717	104	1082	0.663	728	2.0	10.463	B

Existing Layout - 2028 Future Baseline + Development, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 84% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	205.77	F

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		205.77	F

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)
D6	2028 Future Baseline + Development	PM	ONE HOUR	15:15	16:45	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		✓	865	100.000
2		✓	335	100.000
3		✓	898	100.000

Origin-Destination Data

Demand (PCU/hr)

	To		
	1	2	3
From	1	0	180
	2	148	4
	3	675	223

Vehicle Mix

Heavy Vehicle Percentages

From	To		
	1	2	3
	0	0	1
	0	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.20	377.74	89.0	F
2	1.06	190.30	19.4	F
3	0.94	45.88	11.8	E

Main Results for each time segment

15:15 - 15:30

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	651	169	845	0.771	639	3.1	16.718	C
2	252	506	422	0.597	247	1.4	19.925	C
3	676	112	1076	0.628	669	1.6	8.717	A

15:30 - 15:45

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	778	203	824	0.944	753	9.3	41.131	E
2	301	596	369	0.817	293	3.6	43.030	E
3	807	133	1062	0.760	802	3.0	13.562	B

15:45 - 16:00

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	952	243	798	1.193	792	49.4	147.593	F
2	369	627	350	1.052	332	12.6	111.735	F
3	989	151	1049	0.942	962	9.8	33.594	D

16:00 - 16:15

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	952	248	795	1.198	794	89.0	321.664	F
2	369	629	350	1.055	342	19.4	190.303	F
3	989	155	1047	0.945	980	11.8	45.879	E

16:15 - 16:30

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	778	213	817	0.952	808	81.4	377.744	F
2	301	640	343	0.878	332	11.8	185.051	F
3	807	150	1050	0.769	840	3.6	19.441	C

16:30 - 16:45

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	651	173	842	0.773	832	36.2	257.499	F
2	252	659	332	0.760	284	3.9	86.821	F
3	676	129	1065	0.635	683	1.8	9.607	A

Junctions 10									
ARCADY 10 - Roundabout Module									
Version: 10.0.1.1519									
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Filename: Beresford Road, Portman Road Mini-Roundabout Pre-Post Peak.j10

Path: S:\Shared Folders\Projects\600353 - River Academy Reading\5 - TPV4 - Working\ARCADY\Beresford Road Portman

Report generation date: 14/12/2021 20:37:36

- »Existing Layout - 2021 Baseline, AM
- »Existing Layout - 2021 Baseline, PM
- »Existing Layout - 2028 Future Baseline, AM
- »Existing Layout - 2028 Future Baseline, PM
- »Existing Layout - 2028 Future Baseline + Development, AM
- »Existing Layout - 2028 Future Baseline + Development, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
Existing Layout - 2021 Baseline										
Arm 1	D1	2.5	15.06	0.72	C	D2	54.9	204.65	1.11	F
Arm 2		2.0	27.64	0.68	D		6.4	80.93	0.90	F
Arm 3		5.2	21.53	0.85	C		3.9	16.93	0.80	C
Existing Layout - 2028 Future Baseline										
Arm 1	D3	3.3	19.04	0.78	C	D4	93.0	393.52	1.21	F
Arm 2		3.1	40.09	0.77	E		9.5	111.45	0.96	F
Arm 3		8.9	34.87	0.92	D		5.8	24.09	0.87	C
Existing Layout - 2028 Future Baseline + Development										
Arm 1	D5	3.6	20.09	0.79	C	D6	124.3	541.59	1.27	F
Arm 2		4.6	55.13	0.85	F		9.1	106.39	0.95	F
Arm 3		13.4	50.62	0.96	F		6.2	25.40	0.87	D

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

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

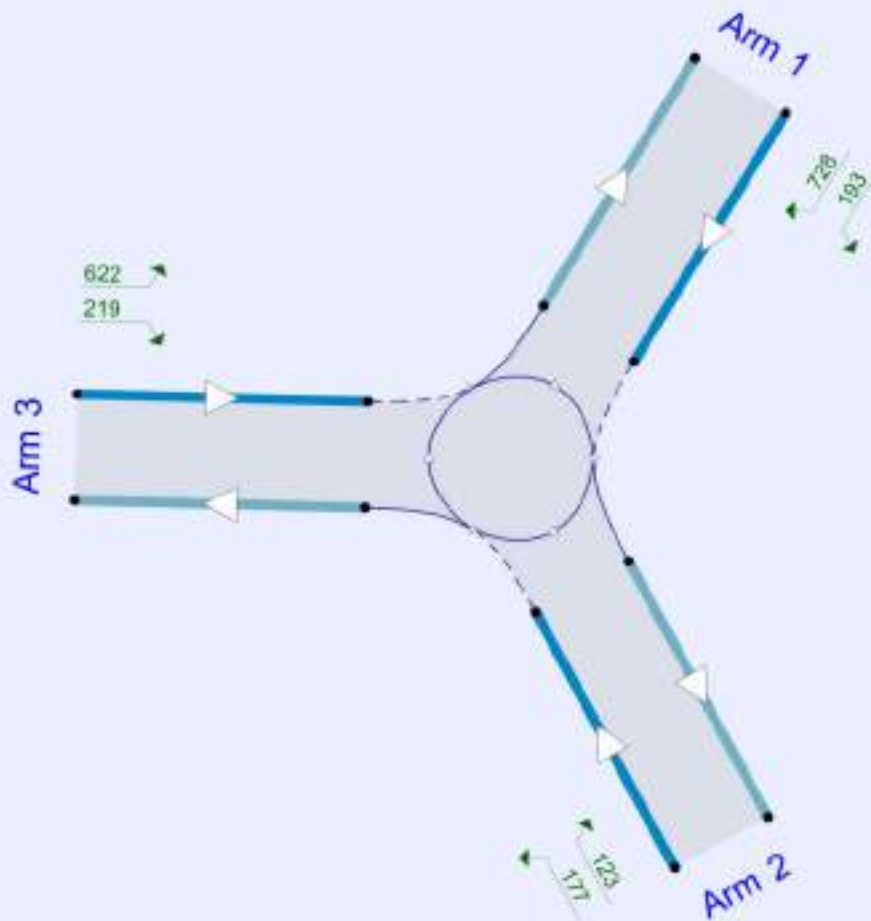
File summary

File Description

Title	Beresford Road / Portman Road Mini-Roundabout
Location	Reading
Site number	
Date	14/12/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	600353
Enumerator	Preliminary
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



Flow data input only (demand) (PCU/hr)

The junction diagram reflects the last run of Junctions.

Analysis Options

Mini-roundabout model	Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
JUNCTIONS 9			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	2021 Baseline	AM	ONE HOUR	07:45	09:15	15
D2	2021 Baseline	PM	ONE HOUR	16:15	17:45	15
D3	2028 Future Baseline	AM	ONE HOUR	07:45	09:15	15
D4	2028 Future Baseline	PM	ONE HOUR	16:15	17:45	15
D5	2028 Future Baseline + Development	AM	ONE HOUR	07:45	09:15	15
D6	2028 Future Baseline + Development	PM	ONE HOUR	16:15	17:45	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Existing Layout	100.000

Existing Layout - 2021 Baseline, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 84% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	20.28	C

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		20.28	C

Arms

Arms

Arm	Name	Description
1	Cow Lane	
2	Beresford Road	
3	Portman Road	

Mini Roundabout Geometry

Arm	Approach road half-width (m)	Minimum approach road half-width (m)	Entry width (m)	Effective flare length (m)	Distance to next arm (m)	Entry corner kerb line distance (m)	Gradient over 50m (%)	Kerbed central island
1	3.32	3.32	3.86	0.1	15.89	15.66	0.0	
2	2.85	2.85	3.42	0.6	11.12	8.72	0.0	
3	3.65	3.65	5.81	22.2	17.03	12.76	0.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.638	953
2	0.591	721
3	0.685	1153

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	2021 Baseline	AM	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		✓	555	100.000
2		✓	252	100.000
3		✓	830	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
	1	2	3	
From	1	2	71	482
	2	99	0	153
	3	685	145	0

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.72	15.06	2.5	C
2	0.68	27.64	2.0	D
3	0.85	21.53	5.2	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	418	108	884	0.473	414	0.9	7.678	A
2	190	361	508	0.374	187	0.6	11.166	B
3	625	75	1101	0.567	620	1.3	7.397	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	499	130	870	0.573	497	1.3	9.691	A
2	227	434	465	0.487	225	0.9	14.934	B
3	746	90	1091	0.684	743	2.1	10.245	B

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	611	158	852	0.717	607	2.4	14.521	B
2	277	529	408	0.679	273	2.0	25.878	D
3	914	110	1078	0.848	903	4.9	19.395	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	611	159	851	0.718	611	2.5	15.061	C
2	277	533	406	0.683	277	2.0	27.643	D
3	914	111	1077	0.849	913	5.2	21.529	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	499	132	868	0.575	503	1.4	10.064	B
2	227	439	462	0.491	231	1.0	15.857	C
3	746	92	1089	0.685	758	2.3	11.223	B

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	418	110	883	0.473	420	0.9	7.873	A
2	190	366	505	0.376	191	0.6	11.539	B
3	625	77	1100	0.568	629	1.3	7.687	A

Existing Layout - 2021 Baseline, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 85% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	108.06	F

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		108.06	F

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	2021 Baseline	PM	ONE HOUR	16:15	17:45	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		✓	814	100.000
2		✓	278	100.000
3		✓	780	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
From	1	0	159	655
	2	109	4	165
	3	575	204	1

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.11	204.65	54.9	F
2	0.90	80.93	6.4	F
3	0.80	16.93	3.9	C

Main Results for each time segment

16:15 - 16:30

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	613	156	853	0.718	603	2.4	14.014	B
2	209	486	434	0.482	206	0.9	15.546	C
3	587	84	1096	0.536	583	1.1	6.959	A

16:30 - 16:45

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	732	187	833	0.878	718	5.8	28.556	D
2	250	579	379	0.659	246	1.8	26.440	D
3	701	100	1084	0.647	699	1.8	9.272	A

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	896	228	807	1.110	793	31.6	100.042	F
2	306	639	343	0.891	293	5.1	59.573	F
3	859	119	1071	0.802	851	3.7	15.799	C

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	896	230	806	1.112	803	54.9	204.652	F
2	306	647	339	0.904	301	6.4	80.927	F
3	859	122	1069	0.803	858	3.9	16.931	C

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	732	190	832	0.880	817	33.7	197.525	F
2	250	658	332	0.752	261	3.5	55.731	F
3	701	106	1080	0.649	709	1.9	9.905	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	613	158	852	0.719	736	2.9	55.077	F
2	209	593	371	0.565	218	1.4	24.704	C
3	587	89	1092	0.538	590	1.2	7.210	A

Existing Layout - 2028 Future Baseline, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 84% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	30.31	D

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		30.31	D

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 Future Baseline	AM	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		✓	595	100.000
2		✓	270	100.000
3		✓	891	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
	1	2	3	
From	1	2	76	517
	2	106	0	164
	3	735	156	0

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.78	19.04	3.3	C
2	0.77	40.09	3.1	E
3	0.92	34.87	8.9	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	448	116	879	0.510	444	1.0	8.276	A
2	203	387	492	0.413	201	0.7	12.228	B
3	671	80	1098	0.611	665	1.5	8.202	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	535	139	864	0.619	533	1.6	10.885	B
2	243	465	447	0.544	241	1.1	17.348	C
3	801	96	1087	0.737	796	2.7	12.203	B

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	655	168	846	0.775	649	3.2	17.866	C
2	297	566	387	0.769	290	2.9	35.125	E
3	981	116	1073	0.914	960	7.8	27.851	D

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	655	171	844	0.776	655	3.3	19.041	C
2	297	571	384	0.775	296	3.1	40.095	E
3	981	118	1072	0.915	977	8.9	34.875	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	535	144	861	0.621	541	1.7	11.592	B
2	243	472	442	0.549	250	1.3	19.421	C
3	801	100	1084	0.739	825	3.0	14.980	B

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	448	118	877	0.511	450	1.1	8.556	A
2	203	393	489	0.416	205	0.7	12.798	B
3	671	82	1097	0.612	676	1.6	8.674	A

Existing Layout - 2028 Future Baseline, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 85% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	197.66	F

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		197.66	F

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 Future Baseline	PM	ONE HOUR	16:15	17:45	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		✓	872	100.000
2		✓	298	100.000
3		✓	836	100.000

Origin-Destination Data

Demand (PCU/hr)

	To		
	1	2	3
From	1	0	170
	2	117	4
	3	616	219

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.21	393.52	93.0	F
2	0.96	111.45	9.5	F
3	0.87	24.09	5.8	C

Main Results for each time segment

16:15 - 16:30

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	656	167	846	0.776	644	3.2	16.989	C
2	224	519	414	0.541	220	1.1	18.111	C
3	629	89	1092	0.577	624	1.3	7.615	A

16:30 - 16:45

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	784	200	825	0.950	758	9.8	42.508	E
2	268	611	360	0.744	262	2.5	34.902	D
3	752	106	1080	0.696	748	2.2	10.733	B

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	960	243	798	1.203	792	51.7	153.526	F
2	328	639	344	0.955	309	7.3	77.620	F
3	920	125	1067	0.863	908	5.4	21.086	C

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	960	246	796	1.206	795	93.0	334.602	F
2	328	641	342	0.959	319	9.5	111.450	F
3	920	130	1064	0.865	919	5.8	24.093	C

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	784	205	822	0.954	813	85.6	393.523	F
2	268	656	334	0.803	286	5.0	83.192	F
3	752	116	1073	0.700	765	2.4	12.160	B

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	656	170	845	0.777	835	41.1	276.199	F
2	224	673	324	0.693	234	2.5	43.613	E
3	629	95	1088	0.579	633	1.4	7.998	A

Existing Layout - 2028 Future Baseline + Development, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 83% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	41.17	E

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		41.17	E

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)
D5	2028 Future Baseline + Development	AM	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		✓	605	100.000
2		✓	293	100.000
3		✓	917	100.000

Origin-Destination Data

Demand (PCU/hr)

	To		
	1	2	3
From	1	0	82
	2	129	0
	3	761	156

Vehicle Mix

Heavy Vehicle Percentages

From	To		
	1	2	3
	0	0	1
	0	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.79	20.09	3.6	C
2	0.85	55.13	4.6	F
3	0.96	50.62	13.4	F

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	455	116	879	0.518	451	1.1	8.413	A
2	221	390	491	0.450	217	0.8	13.033	B
3	690	96	1087	0.635	684	1.7	8.779	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	544	139	864	0.629	541	1.7	11.173	B
2	263	468	444	0.593	261	1.4	19.373	C
3	824	115	1074	0.768	819	3.1	13.790	B

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	666	167	847	0.787	659	3.4	18.686	C
2	323	570	384	0.839	312	4.0	44.569	E
3	1010	137	1059	0.954	979	10.8	35.830	E

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	666	170	844	0.789	665	3.6	20.093	C
2	323	575	381	0.846	320	4.6	55.130	F
3	1010	141	1056	0.956	999	13.4	50.620	F

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	544	147	859	0.633	551	1.8	12.042	B
2	263	476	440	0.599	275	1.6	23.330	C
3	824	121	1070	0.771	864	3.6	20.206	C

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	455	119	877	0.519	458	1.1	8.724	A
2	221	396	487	0.453	223	0.8	13.809	B
3	690	98	1085	0.636	698	1.8	9.450	A

Existing Layout - 2028 Future Baseline + Development, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Mini-roundabout		Mini-roundabout appears to have unbalanced flows and may behave like a priority junction; treat results with caution. See User Guide for details.[Arms 1 and 3 have 85% of the total flow for the roundabout for one or more time segments]

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Mini-roundabout		1, 2, 3	267.63	F

Junction Network

Driving side	Lighting	Road surface	In London	Network delay (s)	Network LOS
Left	Normal/unknown	Normal/unknown		267.63	F

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)
D6	2028 Future Baseline + Development	PM	ONE HOUR	16:15	17:45	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		✓	921	100.000
2		✓	300	100.000
3		✓	842	100.000

Origin-Destination Data

Demand (PCU/hr)

	To		
	1	2	3
From	1	0	193
	2	123	0
	3	622	219

Vehicle Mix

Heavy Vehicle Percentages

From	To		
	1	2	3
	0	0	1
	0	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.27	541.59	124.3	F
2	0.95	106.39	9.1	F
3	0.87	25.40	6.2	D

Main Results for each time segment

16:15 - 16:30

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	693	164	848	0.818	677	4.0	19.734	C
2	226	536	404	0.559	221	1.2	19.179	C
3	634	91	1091	0.581	628	1.4	7.701	A

16:30 - 16:45

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	828	197	827	1.001	785	14.7	56.949	F
2	270	621	354	0.762	264	2.7	37.499	E
3	757	108	1079	0.702	753	2.3	10.935	B

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	1014	239	801	1.267	798	68.8	200.913	F
2	330	632	348	0.950	313	7.2	76.802	F
3	927	128	1065	0.870	913	5.7	21.970	C

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	1014	242	799	1.270	798	122.7	436.151	F
2	330	632	348	0.950	323	9.1	106.389	F
3	927	132	1062	0.873	925	6.2	25.401	D

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	828	202	824	1.005	822	124.3	541.595	F
2	270	650	337	0.801	287	4.9	79.222	F
3	757	117	1072	0.706	772	2.5	12.513	B

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	693	167	846	0.819	840	87.7	455.679	F
2	226	664	328	0.688	236	2.4	41.890	E
3	634	97	1087	0.583	638	1.4	8.104	A

Junctions 10									
ARCADY 10 - Roundabout Module									
Version: 10.0.1.1519									
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Filename: Rivermead Roundabout Peak ARCADY.j10

Path: S:\Shared Folders\Projects\600353 - River Academy Reading\5 - TP\4 - Working\ARCADY\Rivermead Richfield

Report generation date: 14/12/2021 20:26:05

- »Existing Layout - 2021 Baseline, AM
- »Existing Layout - 2021 Baseline, PM
- »Existing Layout - 2028 Future Baseline, AM
- »Existing Layout - 2028 Future Baseline, PM
- »Existing Layout - 2028 Future Baseline + Development, AM
- »Existing Layout - 2028 Future Baseline + Development, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2021 Baseline									
Arm 1	D1	0.0	4.17	0.03	A	D2	0.0	4.06	0.03	A
Arm 2		1.7	7.17	0.62	A		2.0	7.96	0.67	A
Arm 3		0.2	8.54	0.18	A		0.4	10.11	0.27	B
Arm 4		2.1	8.32	0.67	A		1.7	7.13	0.62	A
	Existing Layout - 2028 Future Baseline									
Arm 1	D3	0.0	4.39	0.04	A	D4	0.0	4.26	0.03	A
Arm 2		2.0	8.16	0.66	A		2.6	9.36	0.72	A
Arm 3		0.3	9.20	0.20	A		0.4	11.32	0.31	B
Arm 4		2.6	9.85	0.72	A		2.0	8.18	0.67	A
	Existing Layout - 2028 Future Baseline + Development									
Arm 1	D5	0.0	4.77	0.04	A	D6	0.0	4.62	0.03	A
Arm 2		2.9	10.64	0.74	B		3.9	12.85	0.80	B
Arm 3		0.3	10.40	0.22	B		0.5	13.31	0.34	B
Arm 4		4.0	13.61	0.80	B		2.9	10.71	0.75	B

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

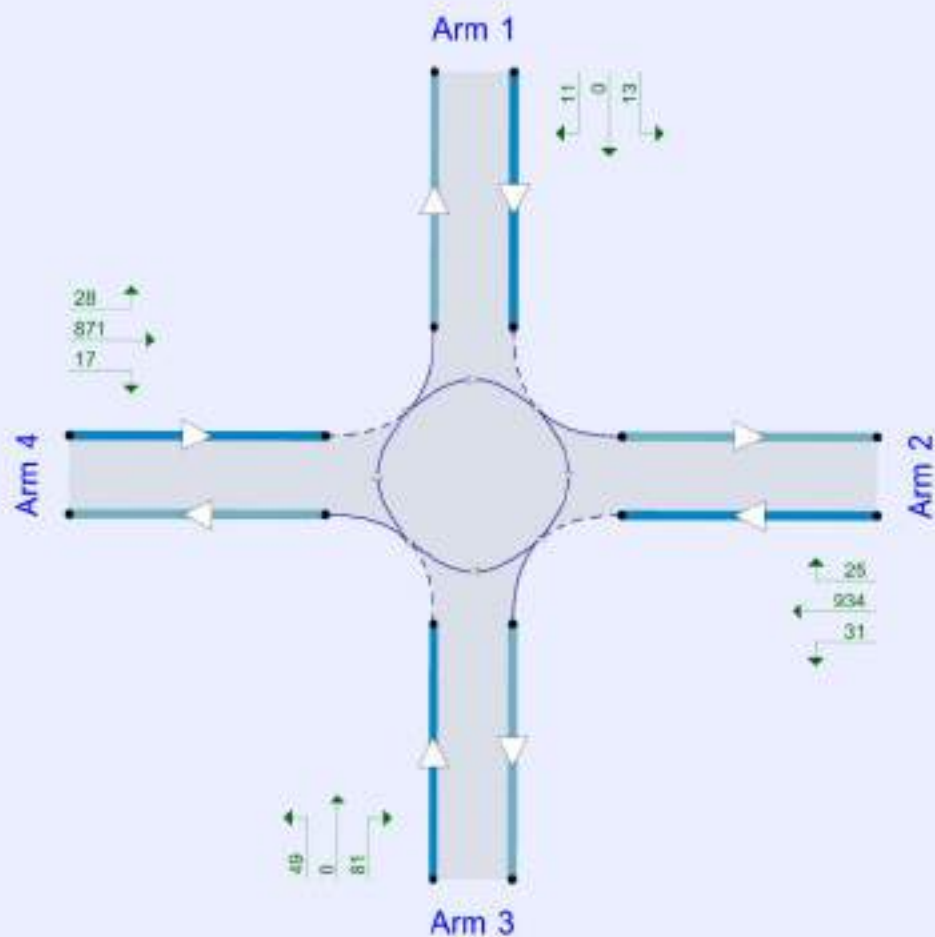
File summary

File Description

Title	Rivermead / Richfield Avenue Roundabout
Location	Reading
Site number	
Date	14/12/2021
Version	
Status	Preliminary
Identifier	
Client	
Jobnumber	600353
Enumerator	
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



Flow data input to Junctions 10

The junction diagram reflects the last run of Junctions.

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	2021 Baseline	AM	ONE HOUR	08:45	10:15	15
D2	2021 Baseline	PM	ONE HOUR	15:15	16:45	15
D3	2028 Future Baseline	AM	ONE HOUR	08:45	10:15	15
D4	2028 Future Baseline	PM	ONE HOUR	15:15	16:45	15
D5	2028 Future Baseline + Development	AM	ONE HOUR	08:45	10:15	15
D6	2028 Future Baseline + Development	PM	ONE HOUR	15:15	16:45	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Existing Layout	100.000

Existing Layout - 2021 Baseline, AM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	7.76	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.76	A

Arms

Arms

Arm	Name	Description	No give-way line
1	Rivermead		
2	Richfield Avenue (E)		
3	Tessa Road		
4	Richfield Avenue (W)		

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)	Entry only	Exit only
1	3.67	5.52	12.6	32.3	24.0	40.0		
2	3.40	6.09	12.0	8.5	27.0	29.0		
3	3.53	3.53	0.0	4.6	24.0	24.5		
4	4.00	6.22	4.3	24.0	24.0	39.0		

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.610	1469
2	0.581	1410
3	0.456	915
4	0.600	1433

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	2021 Baseline	AM	ONE HOUR	08:45	10:15	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		✓	26	100.000
2		✓	768	100.000
3		✓	90	100.000
4		✓	833	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	0	15	1	10
	2	38	10	72	648
	3	3	44	1	42
	4	29	756	43	5

Vehicle Mix

Heavy Vehicle Percentages

	To				
	1	2	3	4	
From	1	0	0	0	0
	2	2	0	5	5
	3	0	14	0	5
	4	0	5	4	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.03	4.17	0.0	A
2	0.62	7.17	1.7	A
3	0.18	8.54	0.2	A
4	0.67	8.32	2.1	A

Main Results for each time segment

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	20	643	1077	0.018	20	0.0	3.404	A
2	578	45	1384	0.418	575	0.7	4.649	A
3	68	533	672	0.101	67	0.1	6.479	A
4	627	72	1390	0.451	624	0.9	4.898	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	23	771	999	0.023	23	0.0	3.688	A
2	690	54	1379	0.501	689	1.0	5.463	A
3	81	638	624	0.130	81	0.2	7.217	A
4	749	86	1382	0.542	747	1.2	5.930	A

09:15 - 09:30

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	29	942	894	0.032	29	0.0	4.157	A
2	846	66	1372	0.617	843	1.7	7.106	A
3	99	781	559	0.177	99	0.2	8.515	A
4	917	105	1370	0.669	914	2.1	8.204	A

09:30 - 09:45

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	29	946	892	0.032	29	0.0	4.167	A
2	846	66	1371	0.617	846	1.7	7.169	A
3	99	783	558	0.178	99	0.2	8.544	A
4	917	106	1370	0.670	917	2.1	8.323	A

09:45 - 10:00

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	23	776	996	0.023	23	0.0	3.703	A
2	690	54	1378	0.501	693	1.1	5.521	A
3	81	641	623	0.130	81	0.2	7.248	A
4	749	87	1381	0.542	752	1.3	6.027	A

10:00 - 10:15

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	20	648	1074	0.018	20	0.0	3.414	A
2	578	45	1384	0.418	579	0.8	4.697	A
3	68	536	670	0.101	68	0.1	6.511	A
4	627	72	1390	0.451	629	0.9	4.965	A

Existing Layout - 2021 Baseline, PM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	7.70	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.70	A

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	2021 Baseline	PM	ONE HOUR	15:15	16:45	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		✓	22	100.000
2		✓	850	100.000
3		✓	122	100.000
4		✓	765	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
From		1	2	3	4
	1	0	12	0	10
	2	23	17	29	781
	3	0	76	0	46
	4	26	722	16	1

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.03	4.06	0.0	A
2	0.67	7.96	2.0	A
3	0.27	10.11	0.4	B
4	0.62	7.13	1.7	A

Main Results for each time segment

15:15 - 15:30

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	17	623	1089	0.015	17	0.0	3.355	A
2	640	20	1398	0.458	637	0.8	4.758	A
3	92	623	631	0.146	91	0.2	6.794	A
4	576	87	1381	0.417	573	0.7	4.524	A

15:30 - 15:45

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	20	747	1014	0.020	20	0.0	3.620	A
2	764	24	1396	0.547	763	1.2	5.735	A
3	110	747	575	0.191	109	0.2	7.888	A
4	688	104	1371	0.502	687	1.0	5.354	A

15:45 - 16:00

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	24	913	912	0.027	24	0.0	4.054	A
2	936	30	1393	0.672	933	2.0	7.854	A
3	134	913	499	0.269	134	0.4	10.043	B
4	842	127	1357	0.621	840	1.6	7.063	A

16:00 - 16:15

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	24	916	910	0.027	24	0.0	4.061	A
2	936	30	1393	0.672	936	2.0	7.961	A
3	134	916	498	0.270	134	0.4	10.109	B
4	842	128	1357	0.621	842	1.7	7.131	A

16:15 - 16:30

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	20	751	1011	0.020	20	0.0	3.633	A
2	764	24	1396	0.547	767	1.2	5.822	A
3	110	751	573	0.192	110	0.2	7.949	A
4	688	105	1370	0.502	690	1.0	5.415	A

16:30 - 16:45

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	17	628	1086	0.015	17	0.0	3.364	A
2	640	20	1398	0.458	641	0.9	4.819	A
3	92	628	629	0.146	92	0.2	6.845	A
4	576	88	1381	0.417	577	0.7	4.575	A

Existing Layout - 2028 Future Baseline, AM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	8.98	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	8.98	A

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 Future Baseline	AM	ONE HOUR	08:45	10:15	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		✓	28	100.000
2		✓	824	100.000
3		✓	96	100.000
4		✓	893	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
From		1	2	3	4
	1	0	16	1	11
	2	41	11	77	695
	3	3	47	1	45
	4	31	811	46	5

Vehicle Mix

Heavy Vehicle Percentages

	To				
From		1	2	3	4
	1	0	0	0	0
	2	2	0	5	5
	3	0	14	0	5
	4	0	5	4	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.04	4.39	0.0	A
2	0.66	8.16	2.0	A
3	0.20	9.20	0.3	A
4	0.72	9.85	2.6	A

Main Results for each time segment

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	21	689	1049	0.020	21	0.0	3.502	A
2	620	48	1382	0.449	617	0.8	4.909	A
3	72	571	655	0.110	72	0.1	6.727	A
4	672	77	1387	0.485	668	1.0	5.219	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	25	826	965	0.026	25	0.0	3.828	A
2	741	57	1376	0.538	739	1.2	5.907	A
3	86	685	603	0.143	86	0.2	7.590	A
4	803	92	1378	0.583	801	1.4	6.516	A

09:15 - 09:30

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	31	1009	854	0.036	31	0.0	4.375	A
2	907	70	1369	0.663	904	2.0	8.055	A
3	106	837	533	0.198	105	0.3	9.158	A
4	983	113	1365	0.720	979	2.6	9.630	A

09:30 - 09:45

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	31	1014	851	0.036	31	0.0	4.390	A
2	907	70	1369	0.663	907	2.0	8.163	A
3	106	840	532	0.199	106	0.3	9.200	A
4	983	113	1365	0.720	983	2.6	9.854	A

09:45 - 10:00

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	25	833	961	0.026	25	0.0	3.847	A
2	741	58	1376	0.538	744	1.2	5.996	A
3	86	689	601	0.144	87	0.2	7.635	A
4	803	93	1377	0.583	807	1.5	6.666	A

10:00 - 10:15

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	21	695	1045	0.020	21	0.0	3.515	A
2	620	48	1382	0.449	622	0.9	4.975	A
3	72	576	652	0.111	72	0.1	6.768	A
4	672	78	1387	0.485	674	1.0	5.309	A

Existing Layout - 2028 Future Baseline, PM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	8.91	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	8.91	A

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 Future Baseline	PM	ONE HOUR	15:15	16:45	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		✓	24	100.000
2		✓	911	100.000
3		✓	130	100.000
4		✓	820	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
From		1	2	3	4
	1	0	13	0	11
	2	25	18	31	837
	3	0	81	0	49
	4	28	774	17	1

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.03	4.26	0.0	A
2	0.72	9.36	2.6	A
3	0.31	11.32	0.4	B
4	0.67	8.18	2.0	A

Main Results for each time segment

15:15 - 15:30

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	18	667	1062	0.017	18	0.0	3.446	A
2	686	22	1397	0.491	682	1.0	5.060	A
3	98	668	611	0.160	97	0.2	7.141	A
4	617	93	1378	0.448	614	0.8	4.786	A

15:30 - 15:45

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	22	799	982	0.022	22	0.0	3.749	A
2	819	26	1395	0.587	817	1.4	6.280	A
3	117	800	550	0.212	117	0.3	8.460	A
4	737	111	1366	0.539	736	1.2	5.805	A

15:45 - 16:00

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	26	977	873	0.030	26	0.0	4.251	A
2	1003	32	1391	0.721	999	2.5	9.162	A
3	143	978	469	0.305	142	0.4	11.209	B
4	903	136	1352	0.668	900	2.0	8.057	A

16:00 - 16:15

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	26	981	871	0.030	26	0.0	4.262	A
2	1003	32	1391	0.721	1003	2.6	9.357	A
3	143	982	467	0.306	143	0.4	11.319	B
4	903	137	1351	0.668	903	2.0	8.175	A

16:15 - 16:30

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	22	805	978	0.022	22	0.0	3.764	A
2	819	26	1395	0.587	823	1.5	6.417	A
3	117	806	548	0.213	118	0.3	8.552	A
4	737	112	1366	0.540	740	1.2	5.897	A

16:30 - 16:45

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	18	672	1059	0.017	18	0.0	3.460	A
2	686	22	1397	0.491	688	1.0	5.145	A
3	98	673	608	0.161	98	0.2	7.206	A
4	617	94	1377	0.448	619	0.8	4.848	A

Existing Layout - 2028 Future Baseline + Development, AM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	11.99	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	11.99	B

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)
D5	2028 Future Baseline + Development	AM	ONE HOUR	08:45	10:15	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		✓	28	100.000
2		✓	922	100.000
3		✓	96	100.000
4		✓	990	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
From		1	2	3	4
	1	0	16	1	11
	2	41	11	77	793
	3	3	47	1	45
	4	31	908	46	5

Vehicle Mix

Heavy Vehicle Percentages

	To				
		1	2	3	4
From	1	0	0	0	0
	2	2	0	5	5
	3	0	14	0	5
	4	0	5	4	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.04	4.77	0.0	A
2	0.74	10.64	2.9	B
3	0.22	10.40	0.3	B
4	0.80	13.61	4.0	B

Main Results for each time segment

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	21	761	1005	0.021	21	0.0	3.658	A
2	694	48	1382	0.502	690	1.0	5.419	A
3	72	644	621	0.116	72	0.1	7.131	A
4	745	77	1387	0.537	741	1.2	5.791	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	25	912	913	0.028	25	0.0	4.056	A
2	829	57	1376	0.602	827	1.6	6.837	A
3	86	772	563	0.153	86	0.2	8.223	A
4	890	92	1378	0.646	887	1.9	7.646	A

09:15 - 09:30

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	31	1113	790	0.039	31	0.0	4.738	A
2	1015	70	1369	0.741	1010	2.9	10.346	B
3	106	943	485	0.218	105	0.3	10.316	B
4	1090	113	1365	0.798	1082	3.9	12.942	B

09:30 - 09:45

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	31	1120	786	0.039	31	0.0	4.767	A
2	1015	70	1369	0.742	1015	2.9	10.637	B
3	106	948	483	0.219	106	0.3	10.397	B
4	1090	113	1365	0.798	1090	4.0	13.612	B

09:45 - 10:00

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	25	923	906	0.028	25	0.0	4.087	A
2	829	58	1376	0.602	834	1.6	7.026	A
3	86	779	560	0.154	87	0.2	8.299	A
4	890	93	1377	0.646	898	2.0	7.999	A

10:00 - 10:15

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	21	769	1000	0.021	21	0.0	3.677	A
2	694	48	1382	0.502	696	1.1	5.521	A
3	72	650	619	0.117	72	0.1	7.187	A
4	745	78	1387	0.538	748	1.2	5.936	A

Existing Layout - 2028 Future Baseline + Development, PM

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	Rivermead / Richfield Avenue Roundabout	Standard Roundabout		1, 2, 3, 4	11.84	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	11.84	B

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)
D6	2028 Future Baseline + Development	PM	ONE HOUR	15:15	16:45	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		✓	24	100.000
2		✓	1008	100.000
3		✓	130	100.000
4		✓	917	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
From		1	2	3	4
	1	0	13	0	11
	2	25	18	31	934
	3	0	81	0	49
	4	28	871	17	1

Vehicle Mix

Heavy Vehicle Percentages

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

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.03	4.62	0.0	A
2	0.80	12.85	3.9	B
3	0.34	13.31	0.5	B
4	0.75	10.71	2.9	B

Main Results for each time segment

15:15 - 15:30

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	18	739	1018	0.018	18	0.0	3.598	A
2	759	22	1397	0.543	754	1.2	5.619	A
3	98	740	578	0.169	97	0.2	7.627	A
4	690	93	1378	0.501	686	1.0	5.278	A

15:30 - 15:45

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	22	886	929	0.023	22	0.0	3.967	A
2	906	26	1395	0.650	904	1.8	7.368	A
3	117	887	511	0.229	116	0.3	9.302	A
4	824	111	1367	0.603	822	1.5	6.717	A

15:45 - 16:00

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	26	1082	809	0.033	26	0.0	4.598	A
2	1110	32	1391	0.798	1102	3.7	12.264	B
3	143	1081	422	0.339	142	0.5	13.081	B
4	1010	136	1352	0.747	1004	2.9	10.395	B

16:00 - 16:15

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	26	1088	806	0.033	26	0.0	4.618	A
2	1110	32	1391	0.798	1109	3.9	12.848	B
3	143	1088	419	0.342	143	0.5	13.307	B
4	1010	136	1351	0.747	1009	2.9	10.710	B

16:15 - 16:30

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	22	894	924	0.023	22	0.0	3.991	A
2	906	26	1395	0.650	914	1.9	7.686	A
3	117	897	506	0.231	118	0.3	9.469	A
4	824	112	1366	0.604	830	1.6	6.913	A

16:30 - 16:45

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	18	746	1014	0.018	18	0.0	3.613	A
2	759	22	1397	0.543	762	1.2	5.752	A
3	98	747	574	0.170	98	0.2	7.719	A
4	690	94	1377	0.501	693	1.0	5.380	A

Appendix G – Traffic Count Data

TRAFFIC SURVEYS UK																										Job Number & Name: 29708 Reading
Site 1 - Cow Lane/Portman Road																										Client: HEXA Consulting
PCU Values																										Date: Tuesday 30 November 2021

	A to A								A to B								A to C								B to A								B to B								B to C								C to A								C to B								C to C								
Times	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total																	
08:00 - 08:15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	4.0	0.0	0.0	0.0	0.0	0.0	15.0	75.0	26.0	4.5	2.3	0.0	1.2	0.0	109.0	19.0	3.0	0.0	0.0	0.0	0.0	0.2	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	7.0	0.0	0.0	0.0	0.0	0.0	29.0	121.0	28.0	7.5	4.6	0.0	0.4	0.2	161.7	23.0	8.0	0.0	0.0	0.0	0.0	0.0	31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
08:15 - 08:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	5.0	1.5	0.0	0.0	0.0	0.0	16.5	82.0	26.0	12.0	6.9	0.0	0.4	0.4	127.7	13.0	6.0	0.0	0.0	0.0	0.0	0.0	19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	5.0	0.0	0.0	0.0	0.0	0.0	37.0	122.0	36.0	7.5	4.6	0.0	0.4	0.0	170.5	24.0	3.0	0.0	0.0	0.0	0.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
08:30 - 08:45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	3.0	0.0	0.0	0.0	0.0	0.0	11.0	87.0	32.0	3.0	0.0	0.0	0.8	0.0	122.8	23.0	5.0	0.0	2.3	0.0	0.0	0.0	30.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	5.0	0.0	0.0	0.0	0.0	0.2	30.2	147.0	41.0	9.0	2.3	0.0	1.6	0.2	201.1	40.0	4.0	0.0	0.0	0.0	0.0	0.8	0.0	44.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
08:45 - 09:00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0	1.0	0.0	0.0	0.0	0.4	0.0	28.4	89.0	20.0	7.5	4.6	0.0	0.8	0.4	123.3	24.0	3.0	0.0	0.0	0.0	0.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.0	5.0	0.0	0.0	0.0	0.0	0.0	57.0	110.0	32.0	4.5	4.6	0.0	0.4	0.0	151.5	33.0	9.0	0.0	0.0	0.0	0.0	0.0	42.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
09:00 - 09:15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	4.0	0.0	0.0	0.0	0.0	0.0	20.0	107.0	24.0	7.5	4.6	0.0	0.0	0.0	143.1	25.0	4.0	0.0	0.0	0.0	0.4	0.0	29.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.0	11.0	0.0	0.0	0.0	0.0	0.0	50.0	139.0	37.0	4.5	2.3	0.0	0.8	0.0	183.6	27.0	8.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
09:15 - 09:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	5.0	0.0	0.0	0.0	0.0	0.0	20.0	88.0	28.0	7.5	4.6	0.0	0.0	0.0	128.1	26.0	4.0	0.0	0.0	0.0	0.4	0.0	30.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	2.0	1.5	0.0	0.0	0.0	0.2	33.7	141.0	43.0	9.0	0.0	0.0	0.4	0.0	193.4	29.0	8.0	0.0	0.0	0.0	0.0	0.4	0.0	37.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09:30 - 09:45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	3.0	0.0	0.0	0.0	0.0	0.0	21.0	74.0	26.0	13.5	0.0	0.0	0.4	0.0	113.9	18.0	6.0	1.5	0.0	0.0	0.0	0.0	21.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	8.0	0.0	0.0	0.0	0.4	0.0	28.4	119.0	39.0	10.5	9.2	0.0	0.4	0.0	178.1	22.0	8.0	0.0	0.0	0.0	0.4	0.0	30.4	0.0	0.0	0.0	2.3	0.0	0.0	0.0	2.3	
09:45 - 10:00	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	15.0	6.0	1.5	2.3	0.0	0.0	0.0	24.8	107.0	33.0	4.5	2.3	0.0	0.0	0.0	146.8	13.0	5.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	8.0	0.0	0.0	0.0	0.4	0.0	30.4	127.0	37.0	6.0	4.6	0.0	0.0	0.2	174.8	27.0	5.0	0.0	0.0	0.0	0.4	0.0	32.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

15:00 - 15:15	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	27.0	5.0	0.0	0.0	0.0	0.0	0.2	32.2	125.0	48.0	6.0	0.0	4.0	1.2	0.0	184.2	24.0	4.0	1.5	0.0	0.0	0.0	0.2	29.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	10.0	1.5	0.0	0.0	0.0	0.2	41.7	102.0	24.0	3.0	2.3	0.0	0.4	0.0	131.7	31.0	8.0	0.0	0.0	0.0	0.0	0.0	39.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0				
15:15 - 15:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0	5.0	0.0	0.0	0.0	0.4	0.0	32.4	112.0	36.0	4.5	0.0	0.0	0.0	0.0	152.5	20.0	3.0	0.0	0.0	0.0	0.8	0.6	24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.0	3.0	1.5	0.0	0.0	0.0	0.0	43.5	106.0	24.0	12.0	4.6	0.0	1.6	0.2	148.4	32.0	9.0	0.0	0.0	0.0	0.8	0.0	41.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
15:30 - 15:45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0	3.0	0.0	0.0	0.0	0.0	0.0	30.0	120.0	29.0	6.0	0.0	0.0	0.4	0.0	155.4	21.0	2.0	1.5	0.0	0.0	0.4	0.2	25.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0	9.0	0.0	0.0	0.0	0.8	0.0	47.8	113.0	41.0	6.0	0.0	0.0	0.4	0.0	160.4	33.0	7.0	0.0	0.0	0.0	0.4	0.0	40.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
15:45 - 16:00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	4.0	1.5	0.0	0.0	0.0	1.2	0.0	36.7	110.0	39.0	6.0	0.0	0.0	0.4	0.0	151.4	24.0	9.0	0.0	0.0	0.0	0.4	0.0	33.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0	7.0	0.0	0.0	0.0	0.0	0.0	0.2	36.2	114.0	27.0	7.5	2.3	0.0	0.0	0.4	0.0	151.2	48.0	2.0	1.5	0.0	0.0	0.0	0.0	0.0	51.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16:00 - 16:15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	12.0	3.0	0.0	0.0	0.4	0.0	40.4	130.0	38.0	3.0	0.0	0.0	0.4	0.0	171.4	27.0	5.0	0.0	0.0	0.0	0.0	0.2	32.2	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	34.0	8.0	0.0	0.0	0.0	0.0	0.0	42.0	123.0	23.0	9.0	0.0	0.0	0.0	0.0	155.0	52.0	6.0	0.0	0.0	0.0	0.0	0.2	58.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
16:15 - 16:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	6.0	0.0	0.0	0.0	0.4	0.0	39.4	105.0	27.0	3.0	0.0	0.0	0.4	0.0	135.4	22.0	4.0	0.0	0.0	0.0	0.0	0.2	26.2	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	36.0	9.0	0.0	0.0	0.0	0.4	0.0	45.4	107.0	28.0	4.5	2.3	0.0	0.0	0.0	141.8	52.0	4.0	1.5	0.0	0.0	0.0	0.0	0.0												
16:30 - 16:45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0	4.0	0.0	0.0	0.0	0.8	0.2	31.0	121.0	42.0	1.5	0.0	0.0	0.0	0.0	164.5	20.0	2.0	0.0	0.0	0.0	1.2	0.2	23.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	51.0	121.0	24.0	3.0	2.3	0.0	0.4	0.4	151.1	46.0	5.0	0.0	0.0	0.0	1.2	0.2	52.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
16:45 - 17:00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	5.0	0.0	0.0	0.0	0.8	0.0	45.8	132.0	18.0	1.5	0.0	4.0	2.8	0.0	158.3	27.0	5.0	0.0	0.0	0.0	0.4	0.0	32.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	6.0	0.0	0.0	0.0	0.4	0.0	36.4	128.0	19.0	1.5	0.0	0.0	0.4	0.4	149.3	49.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
17:00 - 17:15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	8.0	0.0	0.0	0.0	1.2	0.0	45.2	134.0	22.0	4.5	0.0	0.0	0.8	0.2	161.5	26.0	2.0	0.0	0.0	0.0	0.8	0.2	29.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.0	8.0	0.0	0.0	0.0	0.4	0.0	42.4	105.0	21.0	6.0	0.0	0.0	0.0	0.0	132.0	50.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0												
17:15 - 17:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	3.0	0.0	0.0	0.0	1.2	0.0	37.2	153.0	15.0	1.5	0.0	0.0	0.8	0.0	179.3	21.0	3.0	0.0	0.0	0.0	0.4	0.2	24.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.0	3.0	1.5	0.0	0.0	0.0	0.0	0.0	35.5	127.0	14.0	0.0	0.0	0.0	1.2	0.0	142.2	37.0	1.0	0.0	0.0	0.0	0.4	0.2	38.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0			
17:30 - 17:45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	9.0	0.0	0.0	0.0	0.8	0.2	41.0	132.0	14.0	1.5	0.0	0.0	0.4	0.2	148.1	26.0	1.0	0.0	0.0	0.0	0.8	0.0	27.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	120.0	15.0	3.0	0.0	0.0	0.8	0.0	138.8	39.0	3.0	0.0	0.0	0.0	0.4	0.0	42.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
17:45 - 18:00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.0	3.0	0.0	0.0	0.0	1.2	0.4	35.6	123.0	13.0	0.0	0.0	0.0	1.6	0.2	137.8	16.0	4.0	0.0	0.0	0.0	0.4	0.2	20.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	22.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	120.0	8.0	0.0	0.0	0.0	0.4	0.2	128.6	37.0	2.0	1.5	0.0	0.0	0.0	0.0	0.0	40.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

	Cow Lane		Beresford Road		Portman Road	
Times	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
08:00 - 08:05	5		3	0	1	1
08:05 - 08:10	5		2	0	7	1
08:10 - 08:15	2		2	0	4	0
08:15 - 08:20	5		1	0	6	1
08:20 - 08:25	2		1	0	1	1
08:25 - 08:30	1		2	0	5	1
08:30 - 08:35	2		1	0	7	1
08:35 - 08:40	4		1	0	7	1
08:40 - 08:45	4		2	0	6	1
08:45 - 08:50	2		2	0	1	1
08:50 - 08:55	4		3	0	3	2
08:55 - 09:00	6		2	0	7	1
09:00 - 09:05	8		3	0	4	1
09:05 - 09:10	5		2	0	8	2
09:10 - 09:15	6		3	0	5	2
09:15 - 09:20	10		8	1	4	3
09:20 - 09:25	4		3	0	8	1
09:25 - 09:30	5		5	0	11	3
09:30 - 09:35	3		3	0	2	1
09:35 - 09:40	4		3	0	5	2
09:40 - 09:45	2		5	0	21	1
09:45 - 09:50	7		3	0	3	3
09:50 - 09:55	4		3	0	2	1
09:55 - 10:00	6		2	0	10	1

2 Count in Vehicles

2 Lane 1 = Nearest Kerb

TRAFFIC SURVEYS UK		Job Number & Name:	29708 Reading
Site 1 - Cow Lane/Portman Road		Client:	Hexa Consulting
Queue Lengths		Date:	Tuesday 30 November 2021

	Cow Lane		Beresford Road		Portman Road	
Times	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
15:00 - 15:05	19+		3	0	3	2
15:05 - 15:10	15		6	0	2	1
15:10 - 15:15	8		7	0	2	0
15:15 - 15:20	8		3	0	19	2
15:20 - 15:25	5		6	0	2	1
15:25 - 15:30	19		5	0	6	3
15:30 - 15:35	10		4	0	5	0
15:35 - 15:40	8		4	0	5	1
15:40 - 15:45	15		3	0	6	2
15:45 - 15:50	17		3	0	1	2
15:50 - 15:55	20+		6	0	3	3
15:55 - 16:00	4		12	0	6	3
16:00 - 16:05	18		9	0	4	2
16:05 - 16:10	19		8	0	14	1
16:10 - 16:15	21+		4	0	11	2
16:15 - 16:20	21+		3	0	14	2
16:20 - 16:25	22+		4	0	4	3
16:25 - 16:30	21+		7	0	0	4
16:30 - 16:35	21+		1	0	3	3
16:35 - 16:40	19+		7	0	5	3
16:40 - 16:45	20+		5	0	7	1
16:45 - 16:50	21+		5	0	4	1
16:50 - 16:55	22+		4	0	3	3
16:55 - 17:00	22+		4	0	7	0
17:00 - 17:05	22+		6	0	7	2
17:05 - 17:10	21+		4	0	11	1
17:10 - 17:15	20+		7	0	2	2
17:15 - 17:20	21+		3	0	2	3
17:20 - 17:25	20		5	0	2	2
17:25 - 17:30	7		4	0	4	1
17:30 - 17:35	18		2	0	3	1
17:35 - 17:40	21+		5	1	6	1
17:40 - 17:45	6		9	0	2	1
17:45 - 17:50	7		2	0	5	3
17:50 - 17:55	2		1	0	4	1
17:55 - 18:00	7		5	0	7	1

TRAFFIC SURVEYS UK		Job Number & Name:	29708 Reading
Site 2 - Richfield Avenue/Rivermead Road		Client:	Hexa Consulting
Queue Lengths		Date:	Tuesday 30 November 2021

	Rivermead Road		Richfield Avenue WB		Tessa Road		Richfield Avenue EB	
Times	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
08:00 - 08:05	0	0	0	0	1	0	3	0
08:05 - 08:10	1	0	4	0	1	0	5	0
08:10 - 08:15	1	0	0	0	1	0	6	0
08:15 - 08:20	0	1	2	0	1	0	9	0
08:20 - 08:25	1	0	2	0	0	0	12	0
08:25 - 08:30	1	0	1	0	1	0	10	0
08:30 - 08:35	0	0	3	0	0	0	2	1
08:35 - 08:40	0	0	0	0	3	0	8	0
08:40 - 08:45	1	0	2	0	2	0	8	0
08:45 - 08:50	0	0	1	0	1	0	17	0
08:50 - 08:55	0	0	3	0	3	0	14	0
08:55 - 09:00	0	1	0	0	1	0	0	0
09:00 - 09:05	0	0	4	0	2	0	10	0
09:05 - 09:10	0	1	3	0	3	0	7	0
09:10 - 09:15	1	0	7	0	1	0	6	0
09:15 - 09:20	0	1	2	0	1	0	12	0
09:20 - 09:25	0	1	1	0	1	0	4	0
09:25 - 09:30	1	0	2	0	1	0	7	0
09:30 - 09:35	0	1	3	0	2	0	3	0
09:35 - 09:40	0	0	1	0	2	0	4	1
09:40 - 09:45	1	0	0	0	0	0	2	0
09:45 - 09:50	1	0	4	0	5	0	31	0
09:50 - 09:55	0	0	1	0	1	0	7	0
09:55 - 10:00	1	1	2	0	1	0	9	0

Count in Vehicles

Lane 1 = Nearest Kerb

TRAFFIC SURVEYS UK		Job Number & Name:	29708 Reading
Site 2 - Richfield Avenue/Rivermead Road		Client:	Hexa Consulting
Queue Lengths		Date:	Tuesday 30 November 2021

	Rivermead Road		Richfield Avenue WB		Tessa Road		Richfield Avenue EB	
Times	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
15:00 - 15:05	0	2	2	0	2	0	7	0
15:05 - 15:10	0	0	4	0	1	0	7	0
15:10 - 15:15	0	0	1	0	2	0	1	0
15:15 - 15:20	0	0	2	0	1	0	1	0
15:20 - 15:25	0	0	3	0	2	0	4	0
15:25 - 15:30	1	0	0	0	2	0	5	0
15:30 - 15:35	0	0	0	0	2	0	8	0
15:35 - 15:40	0	0	5	0	1	0	6	0
15:40 - 15:45	0	1	1	0	2	0	5	0
15:45 - 15:50	0	0	5	0	4	0	3	0
15:50 - 15:55	0	0	0	0	2	0	2	0
15:55 - 16:00	0	1	3	0	2	0	7	0
16:00 - 16:05	0	0	1	0	2	0	9	0
16:05 - 16:10	0	0	1	0	3	0	6	0
16:10 - 16:15	0	0	0	0	2	0	11	0
16:15 - 16:20	1	0	1	0	3	0	11	0
16:20 - 16:25	0	1	2	0	1	0	3	0
16:25 - 16:30	1	1	20+	0	2	0	4	1
16:30 - 16:35	1	3	20+	0	2	0	8	0
16:35 - 16:40	0	1	10	0	2	0	3	0
16:40 - 16:45	0	0	4	0	2	0	4	0
16:45 - 16:50	1	1	10	0	2	0	2	0
16:50 - 16:55	1	0	7	0	1	0	16	0
16:55 - 17:00	1	1	3	0	1	0	5	2
17:00 - 17:05	0	2	0	0	2	0	18	1
17:05 - 17:10	1	1	8	0	3	0	7	0
17:10 - 17:15	0	1	0	0	2	0	1	0
17:15 - 17:20	0	1	1	0	1	0	9	0
17:20 - 17:25	1	0	1	0	3	0	12	0
17:25 - 17:30	0	1	4	0	4	0	17	0
17:30 - 17:35	0	1	0	0	3	0	11	0
17:35 - 17:40	1	1	1	0	3	0	10	1
17:40 - 17:45	1	1	5	0	2	0	3	0
17:45 - 17:50	1	0	2	0	1	0	1	0
17:50 - 17:55	1	0	2	0	2	0	12	0
17:55 - 18:00	1	1	1	0	1	0	2	0

TRAFFIC SURVEYS UK			Job Number & Name: 29708 Reading	
Site 3 - Richfield Avenue/Caversham Bridge			Client:	Hexa Consulting
Queue Lengths			Date:	Tuesday 30 November 2021

	Caversham Bridge			Waterman Place		Caversham Road			Richfield Avenue		
Times	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3
08:00 - 08:05	3	3	6	1		5	18+	13	1	6	9+
08:05 - 08:10	10+	3	2	0		4	10	11	6	4	8+
08:10 - 08:15	12	2	5	0		3	10	3	4	5	7
08:15 - 08:20	5	2	5	1		3	4	13	2	4	8+
08:20 - 08:25	9	2	5	0		5	12	5	2	4	4+
08:25 - 08:30	4	4	4	0		5	4	2	1	7+	8+
08:30 - 08:35	10	2	2	1		3	17	3	4	7+	8+
08:35 - 08:40	4	2	9	1		3	14	6	2	3	3
08:40 - 08:45	12	2	6	0		3	16+	15+	2	7+	8+
08:45 - 08:50	11+	2	7+	0		4	14	8+	3	8+	8+
08:50 - 08:55	4	1	5	0		6	13	7	2	7+	4
08:55 - 09:00	3	4	4	0		7	12	5	3	5	8+
09:00 - 09:05	2	1	7	1		2	2	4	2	5	3
09:05 - 09:10	4	4	11	0		5	3	7	3	9+	8+
09:10 - 09:15	10+	5	12+	2		4	5	4	2	4	8+
09:15 - 09:20	5	1	8	0		6	5	10	2	8+	3
09:20 - 09:25	3	1	4	0		3	3	3	2	7+	2
09:25 - 09:30	2	4	1	0		4	2	0	0	4	4
09:30 - 09:35	3	1	5	1		3	1	3	2	3	3
09:35 - 09:40	3	2	5	0		3	4	4	1	2	3
09:40 - 09:45	8	1	7	0		5	8	5	1	6	8+
09:45 - 09:50	9	3	3	1		5	3	4	1	2	8
09:50 - 09:55	12+	2	12	1		5	3	4	1	3	8+
09:55 - 10:00	6	3	2	1		5	3	2	2	4	2

Count in Vehicles

Lane 1 = Nearest Kerb

TRAFFIC SURVEYS UK			Job Number & Name: 29708 Reading	
Site 3 - Richfield Avenue/Caversham Bridge			Client: Hexa Consulting	
Queue Lengths			Date: Tuesday 30 November 2021	

	Caversham Bridge			Waterman Place		Caversham Road			Richfield Avenue		
Times	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3
15:00 - 15:05	8	1	11	0		5	15	17	2	3	8+
15:05 - 15:10	5	1	2	1		5	4	4	1	4	3
15:10 - 15:15	4	1	9	1		5	18	4	1	4	6
15:15 - 15:20	4	2	2	0		4	14	5	1	6	4
15:20 - 15:25	4	2	5	0		3	9	8	2	4	2
15:25 - 15:30	4	2	4	0		6	2	3	3	2	3
15:30 - 15:35	5	3	7	1		7	5	4	2	5	7
15:35 - 15:40	10	3	3	0		2	2	6	3	4	5
15:40 - 15:45	5	2	8	0		4	4	6	1	5	6
15:45 - 15:50	2	2	3	2		5	14	6	1	2	5
15:50 - 15:55	1	1	1	0		4	9	6	2	4	6+
15:55 - 16:00	3	1	5	2		4	8	4	2	2	8+
16:00 - 16:05	7	2	10	0		3	3	8	3	3	5
16:05 - 16:10	2	2	7	0		4	3	4	1	2	7+
16:10 - 16:15	7	1	3	0		6	15	13	1	3	9+
16:15 - 16:20	2	2	10	2		4	8	6	2	3	8+
16:20 - 16:25	3	2	5	1		4	4	3	2	4	8+
16:25 - 16:30	8	2	3	2		5	3	7	2	3	6
16:30 - 16:35	5	2	7	2		6	14+	4	1	4	4
16:35 - 16:40	8	2	12+	1		6	18+	13	1	2	7
16:40 - 16:45	3	2	6	2		7	16+	14	2	2	4
16:45 - 16:50	6	1	6	0		4	13	8	2	5	2
16:50 - 16:55	10	2	6	1		4	7	7	2	4	3
16:55 - 17:00	2	2	4	0		1	4	8	3	3	5
17:00 - 17:05	3	2	4	1		3	4	6	3	4	8+
17:05 - 17:10	8+	4	9	1		4	5	5	2	2	6
17:10 - 17:15	3	1	4	0		5	5	9	2	8+	8
17:15 - 17:20	3	2	9	1		2	5	4	1	3	5
17:20 - 17:25	3	2	9	1		7	13	4	1	3	8+
17:25 - 17:30	3	1	3	1		5	4	7	1	3	3
17:30 - 17:35	5	2	6	1		7	15+	6	2	7	5
17:35 - 17:40	3	2	5	1		3	5	10	1	3	6
17:40 - 17:45	2	2	1	1		2	6	6	2	9+	5
17:45 - 17:50	4	2	2	1		3	5	5	1	3	5
17:50 - 17:55	6	2	7	1		5	4	6	2	3	3
17:55 - 18:00	2	2	3	1		2	6	6	1	6	4

TRAFFIC SURVEYS UK										Job Number & Name: 29708 Reading									
Site 4 - Caversham Bridge/Church Road										Client: Hexa Consulting									
PCU Values										Date: Tuesday 30 November 2021									

	A to A								A to B								A to C								B to A								B to B								B to C								C to A								C to B								C to C														
Times	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total	Cars	LGV	OGV1	OGV2	PSV	M/B	Cyc	Total															
08:00 - 08:15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	161.0	21.0	3.0	2.3	2.0	0.0	0.0	189.3	18.0	5.0	0.0	0.0	2.0	0.0	0.0	25.0	109.0	27.0	13.5	9.2	4.0	0.0	0.0	162.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	121.0	27.0	7.5	2.3	2.0	0.8	0.0	160.6	9.0	2.0	1.5	2.3	0.0	0.0	0.0	14.8	139.0	9.0	3.0	9.2	0.0	0.4	0.8	161.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
08:15 - 08:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	133.0	35.0	12.0	2.3	4.0	0.0	0.2	186.5	19.0	3.0	1.5	0.0	2.0	0.0	0.0	25.5	107.0	40.0	12.0	2.3	0.0	0.4	0.0	161.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	108.0	22.0	3.0	0.0	0.0	0.8	0.2	134.0	11.0	4.0	0.0	0.0	0.0	0.0	0.0	15.9	95.0	10.0	1.5	4.6	0.0	0.0	0.2	111.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
08:30 - 08:45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	137.0	37.0	9.0	2.3	4.0	0.4	0.2	189.9	11.0	2.0	0.0	0.0	0.0	0.0	0.0	11.0	94.0	32.0	13.5	0.0	6.0	1.2	0.0	146.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	106.0	13.0	3.0	11.5	4.0	0.4	0.4	138.3	9.0	2.0	1.5	0.0	0.0	0.0	0.0	12.5	119.0	7.0	3.0	2.3	0.0	0.4	0.6	132.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
08:45 - 09:00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	154.0	21.0	4.5	2.3	6.0	0.8	0.4	189.0	12.0	6.0	0.0	0.0	0.0	0.0	0.0	18.0	107.0	32.0	16.5	4.6	0.0	0.8	0.0	160.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93.0	25.0	4.5	2.3	2.0	0.0	0.2	127.0	7.0	1.0	0.0	0.0	0.0	0.0	0.0	8.0	131.0	13.0	4.5	0.0	2.0	1.2	1.0	152.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
09:00 - 09:15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	160.0	20.0	16.5	0.0	6.0	0.8	0.0	209.3	11.0	2.0	1.5	0.0	0.0	0.0	0.2	14.7	96.0	32.0	3.0	4.6	2.0	2.0	0.0	139.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	72.0	22.0	10.5	4.6	0.0	0.0	0.2	109.3	14.0	1.0	0.0	0.0	0.0	0.0	0.0	15.0	113.0	15.0	4.5	2.3	0.0	1.2	0.4	136.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
09:15 - 09:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	137.0	27.0	10.5	0.0	6.0	0.8	0.4	181.7	10.0	3.0	0.0	0.0	0.0	0.0	0.0	13.0	105.0	36.0	9.0	2.3	4.0	0.4	0.0	156.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.0	18.0	6.0	0.0	0.0	0.4	0.2	113.6	4.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	53.0	10.0	3.0	4.6	4.0	0.0	0.6	75.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
09:30 - 09:45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	118.0	21.0	7.5	2.3	4.0	0.8	0.2	153.8	9.0	1.0	0.0	0.0	0.0	0.0	0.0	10.0	63.0	30.0	7.5	0.0	2.0	1.2	0.2	103.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.0	24.0	6.0	4.6	2.0	0.4	0.2	102.2	12.0	1.0	0.0	0.0	0.0	0.4	0.0	13.4	124.0	11.0	10.5	2.3	0.0	0.8	0.6	149.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09:45 - 10:00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	129.0	28.0	12.0	2.3	6.0	2.0	0.2	179.5	12.0	2.0	3.0	0.0	0.0	0.0	0.0	17.0	115.0	35.0	7.5	6.9	4.0	0.0	0.0	168.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.0	25.0	9.0	16.1	2.0	0.0	0.0	125.1	9.0	1.0	0.0	0.0	0.0	0.0	0.0	10.0	109.0	17.0	4.5	6.9	2.0	0.4	0.0	139.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

15:00 - 15:15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
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	Church Street		Caversham Bridge		Church Road	
Times	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
08:00 - 08:05	7+	6	10	18+	28+	
08:05 - 08:10	7+	6	5	19+	26+	
08:10 - 08:15	7+	4	8	21	25+	
08:15 - 08:20	7+	4	3	20+	25+	
08:20 - 08:25	7+	4	0	18+	26+	
08:25 - 08:30	7+	6	4	19+	25+	
08:30 - 08:35	7+	5	9	19+	28+	
08:35 - 08:40	7+	6	0	18+	26+	
08:40 - 08:45	7+	6	4	21+	25+	
08:45 - 08:50	7+	6	2	20+	26+	
08:50 - 08:55	7+	4	0	23+	26+	
08:55 - 09:00	7+	6	1	21+	24+	
09:00 - 09:05	7+	6	7	21+	26+	
09:05 - 09:10	7+	5	0	23+	25+	
09:10 - 09:15	7+	6	3	23+	18+	
09:15 - 09:20	6+	2	10	20+	17+	
09:20 - 09:25	7+	3	4	13	18+	
09:25 - 09:30	7+	3	9	10	18+	
09:30 - 09:35	7+	4	5	7	19+	
09:35 - 09:40	7+	4	2	11	23+	
09:40 - 09:45	7+	3	7	19+	24+	
09:45 - 09:50	7+	6	4	17+	22+	
09:50 - 09:55	7+	3	10	17+	23+	
09:55 - 10:00	7+	3	4	15	22+	

Count in Vehicles

Lane 1 = Nearest Kerb

TRAFFIC SURVEYS UK		Job Number & Name:	29708 Reading
Site 4 - Caversham Bridge/Church Road		Client:	Hexa Consulting
Queue Lengths		Date:	Tuesday 30 November 2021

	Church Street		Caversham Bridge		Church Road	
Times	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
15:00 - 15:05	7+	5	8	22+	25+	
15:05 - 15:10	7+	4	1	22+	23+	
15:10 - 15:15	7+	5	12	22	24+	
15:15 - 15:20	7+	4	4	17	24+	
15:20 - 15:25	7+	4	0	12	7	
15:25 - 15:30	6+	3	0	13	19	
15:30 - 15:35	7+	3	0	10	22	
15:35 - 15:40	7+	2	0	17+	17	
15:40 - 15:45	7+	3	1	23+	24+	
15:45 - 15:50	7+	2	3	21+	22+	
15:50 - 15:55	7+	2	6	23+	24+	
15:55 - 16:00	7+	5	1	18+	26+	
16:00 - 16:05	7+	3	8	21+	24+	
16:05 - 16:10	7+	2	3	17	27+	
16:10 - 16:15	7+	5	1	22+	25+	
16:15 - 16:20	7+	4	0	20+	26+	
16:20 - 16:25	7+	5	0	23+	24+	
16:25 - 16:30	7+	3	10	18+	26+	
16:30 - 16:35	7+	4	3	12	28+	
16:35 - 16:40	7+	4	0	14	26+	
16:40 - 16:45	7+	5	6	16	26+	
16:45 - 16:50	7+	5	1	23+	21	
16:50 - 16:55	7+	3	1	13	14	
16:55 - 17:00	7+	4	7	15+	21	
17:00 - 17:05	7+	4	10	16+	19	
17:05 - 17:10	7+	4	1	14	23+	
17:10 - 17:15	7+	6	0	20+	25+	
17:15 - 17:20	7+	5	12	21+	26	
17:20 - 17:25	7+	6	0	23+	28+	
17:25 - 17:30	6+	2	9	23+	24+	
17:30 - 17:35	7+	2	3	23+	25	
17:35 - 17:40	7+	3	3	24+	23+	
17:40 - 17:45	7+	5	3	22+	25+	
17:45 - 17:50	5	5	9	24+	28+	
17:50 - 17:55	7+	2	5	23+	25+	
17:55 - 18:00	7+	3	0	24+	26+	

Appendix 4: Energy Strategy