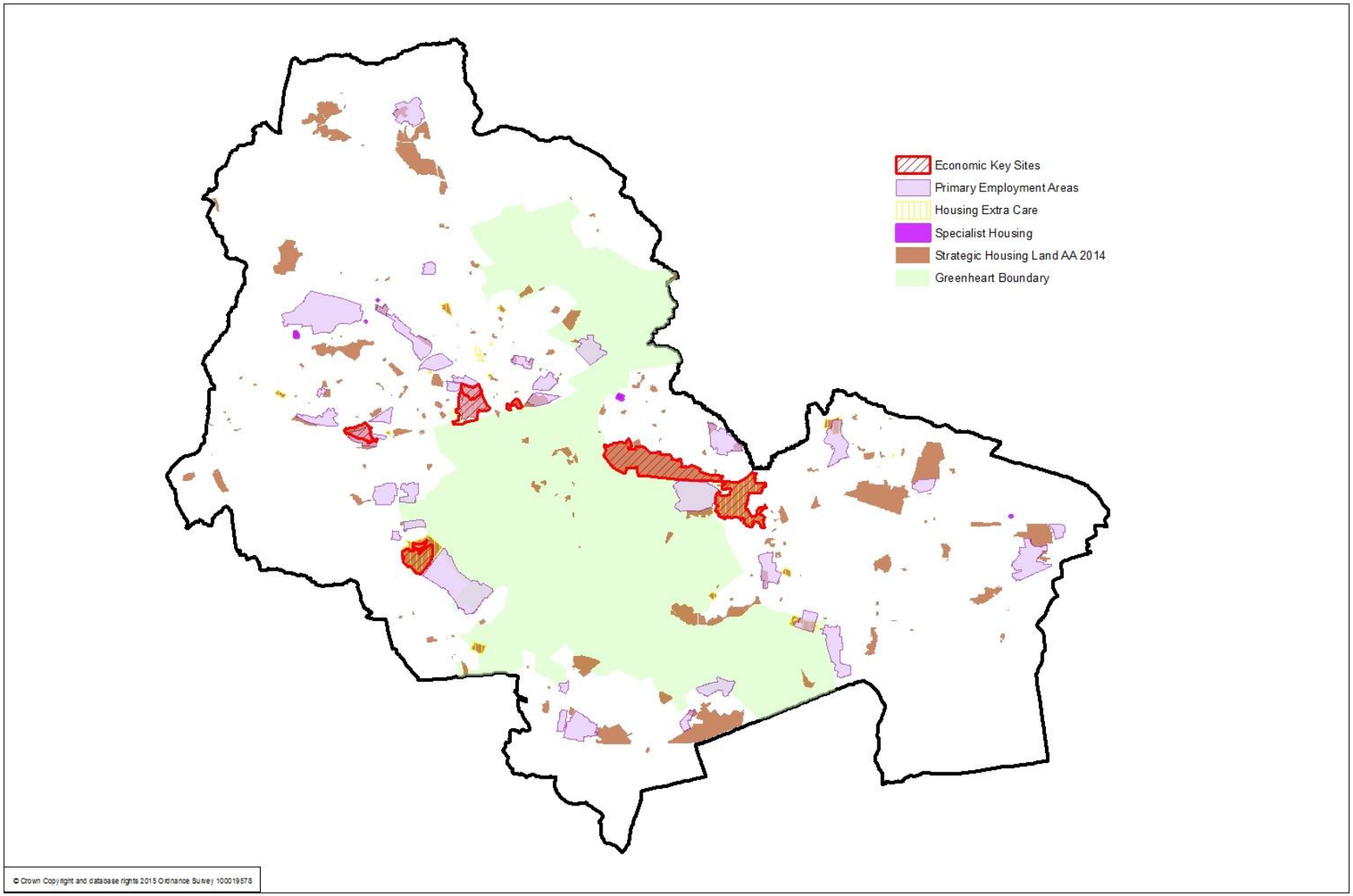
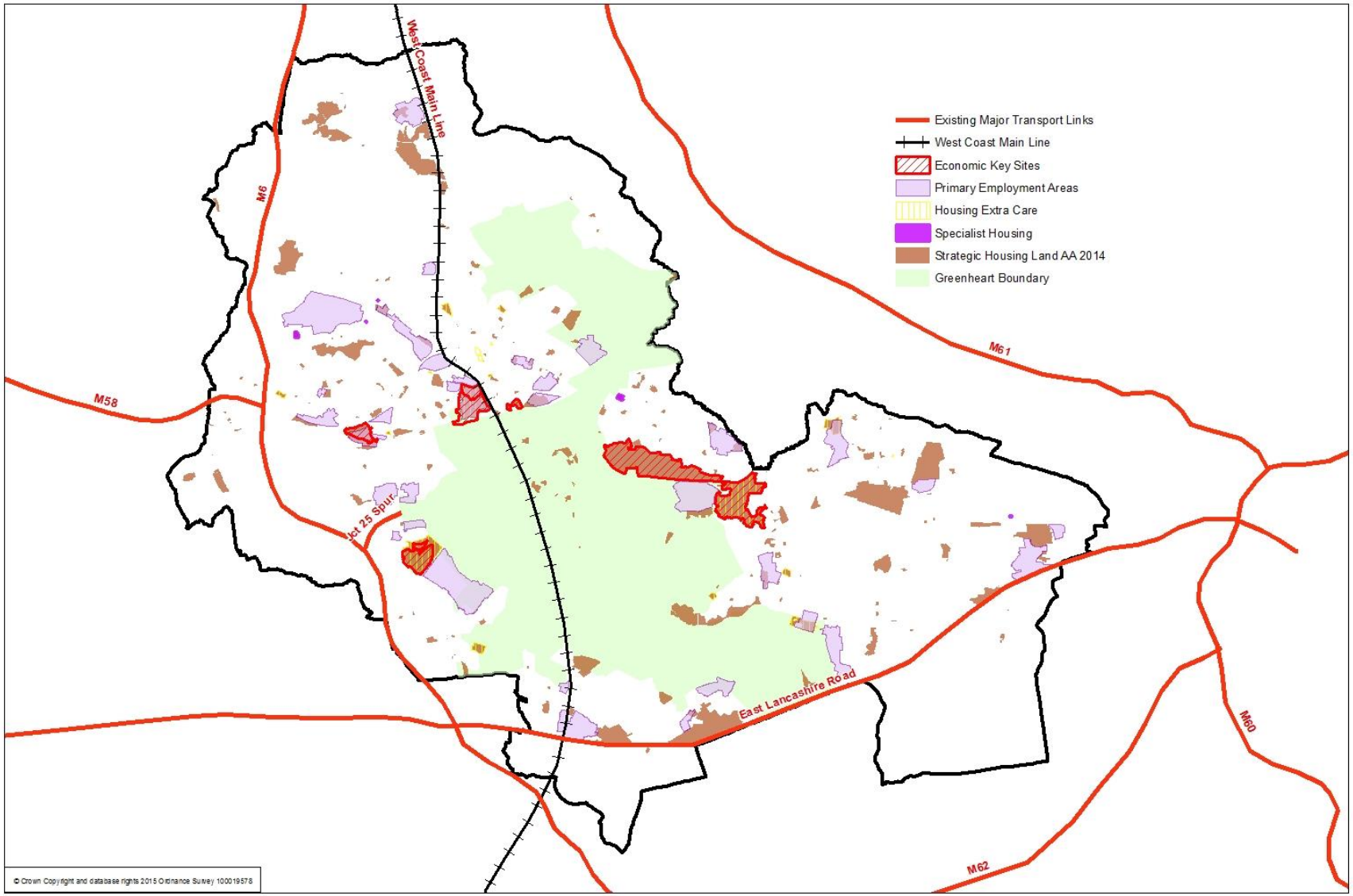
REQUEST		RESPONSE
Wigan to Standish Cycling and Walking Network We have asked for the documentation regarding the evidence that has been collated as to why this route has been proposed however we have not received anything. We would like to see the road safety audit which states that no major safety concerns were identified.		Transport for Greater Manchester led on a co-ordinated GM Local Cycling and Walking Infrastructure Plan (LCWIP) which uses the Propensity to Cycle Tool (PCT) and census data as a starting point to develop a GM-wide walking and cycling network plan. Alongside the LCWIP process, the GM Mayors Challenge Fund (MCF) Walking & Cycling team worked with districts to map local walking & cycling networks. This was done through a series of mapping workshops to identify the barriers and gaps and map a potential network of walking and cycling routes across GM. Although both were progressed separately, the two strands of work were coordinated at a later date. Documentation to show some of the work that has fed into the decision for the proposed route: • **Briefing LCWIP&Bee Network 10 05 2019** – Briefing to Council Leaders to explain the mapping process and the data sources used to highlight potential key routes in Wigan. • **GMCA Planning workshop Wigan Central map of indicative potential routes** – The map that was created at the first workshop on 12th April 2018; the paper maps were digitised by TfGM at a later date. • **GMCA Planning workshop Map Key** – key to lines on the map. • **Streets for All orbital corridors**: study involving extensive consultation with the council to capture local information, needs and priorities to develop corridor action plans and identify a list of potential strategic schemes. A small snapshot of other research and data collection that has fed into the network planning includes: • **Wigan Borough existing and future developments map.** • **Cycling_and_walking_for_individual_and_population_health_benefits** All of this evidence-based research has helped to shape and inform the council's framework within which the proposed walking and cycling schemes in Wigan have been developed, funded and delivered. Over the last 5 years work has progressed and a prioritised list of infrastructure schemes has been identified through the MCF programme entry process.

	A pipeline of schemes have then been developed further and brought forward through the Mayor's Challenge Fund for Cycling & Walking (MCF) to be consulted upon in more detail and delivered. Part of the governance process is the production of a full business case to support the decision to go ahead with a scheme. The business case includes evidence to support the strategic and economic cases. Excerpts from the business case are provided: • **Excerpts from W1 T3 001 Wigan to Standish Phase 1 FBC** • **Appendix 1.1_Logic Map Wigan to Standish Phase One 1.0** • **Appendix 2.1 220607-JJ-Wigan Crossings PEAT Summary_Core (with AST) (revised)** You also asked to "***see the road safety audit which states that no major safety concerns were identified".*** This is included: • **RSA1 Wigan to Standish Phase 1 Oct 21** The names of staff at the Council and with consultants are personal data. The Council does not disclose names of staff below Assistant Director as they would not reasonably expect that their personal data would be published to the world at large which is the effect of disclosure on the Freedom of Information Act 2000; similarly the Council cannot disclose the names of staff at third party organisations. As there would be no lawful basis to disclose this information (i.e. names of staff) under the Data Protection Act 2018, it is exempt from disclosure under section 40(2) of the Freedom of Information Act 2000 and the documents have been redacted accordingly.

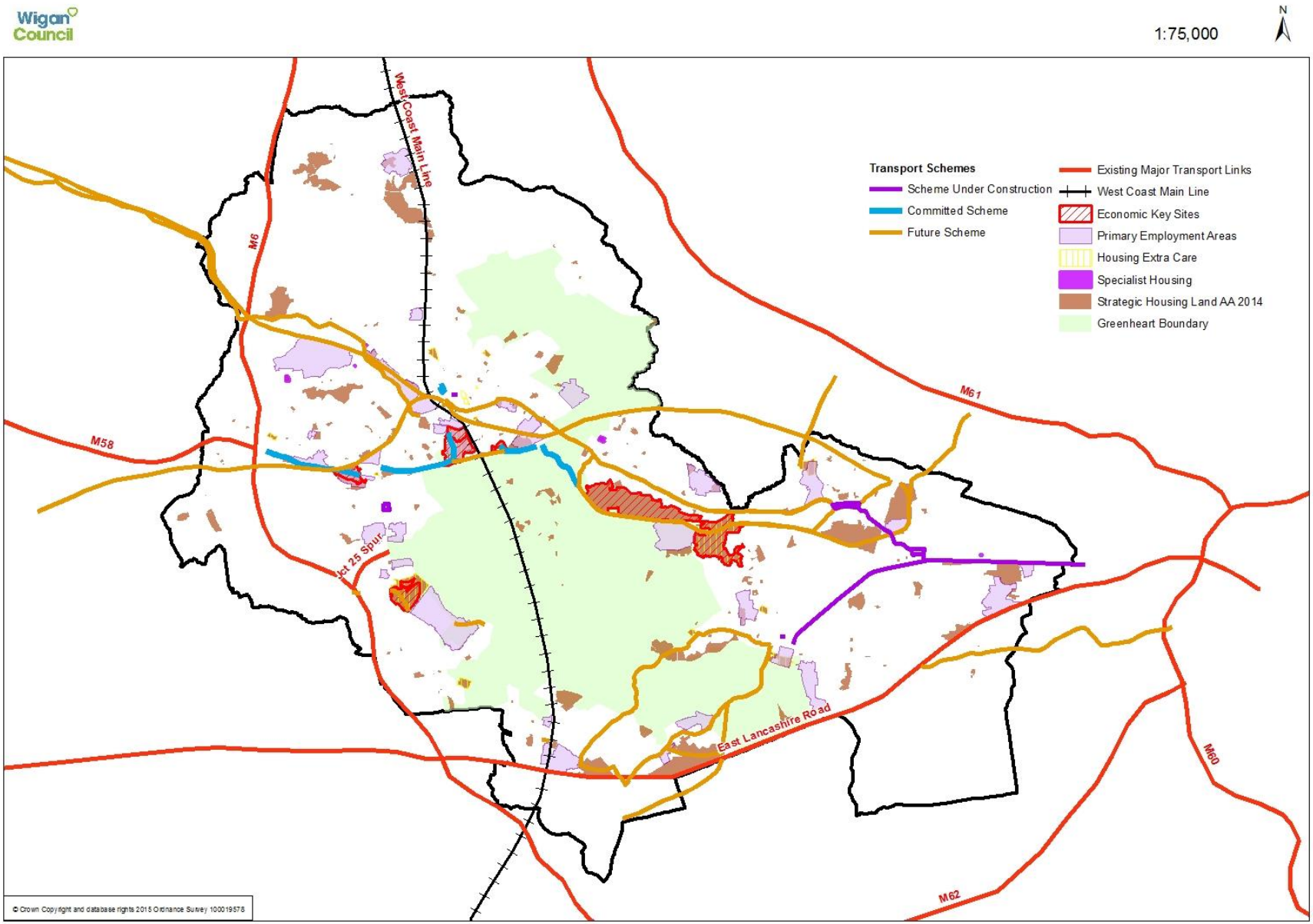
Development Sites



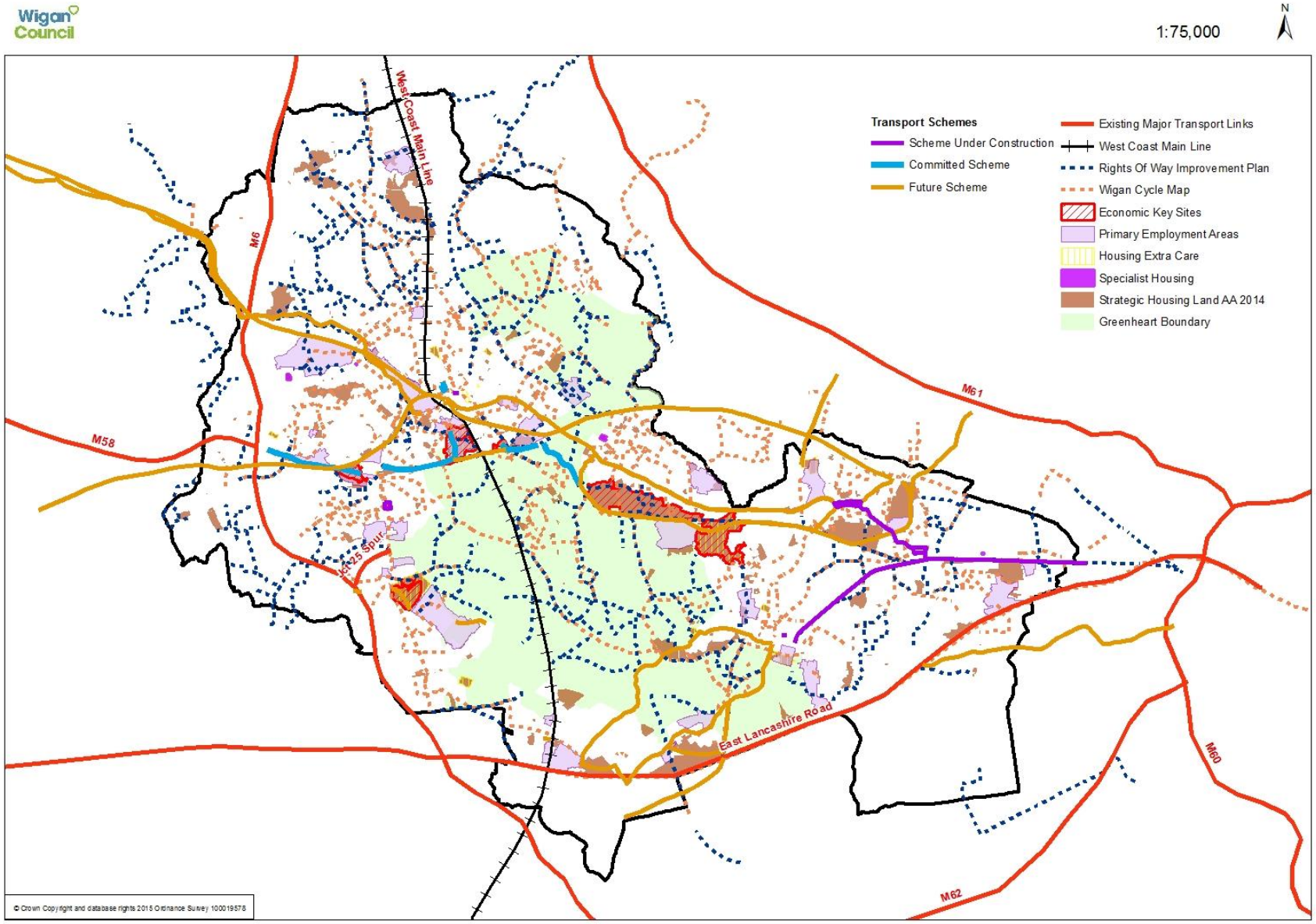
Development Sites with existing Transport Network



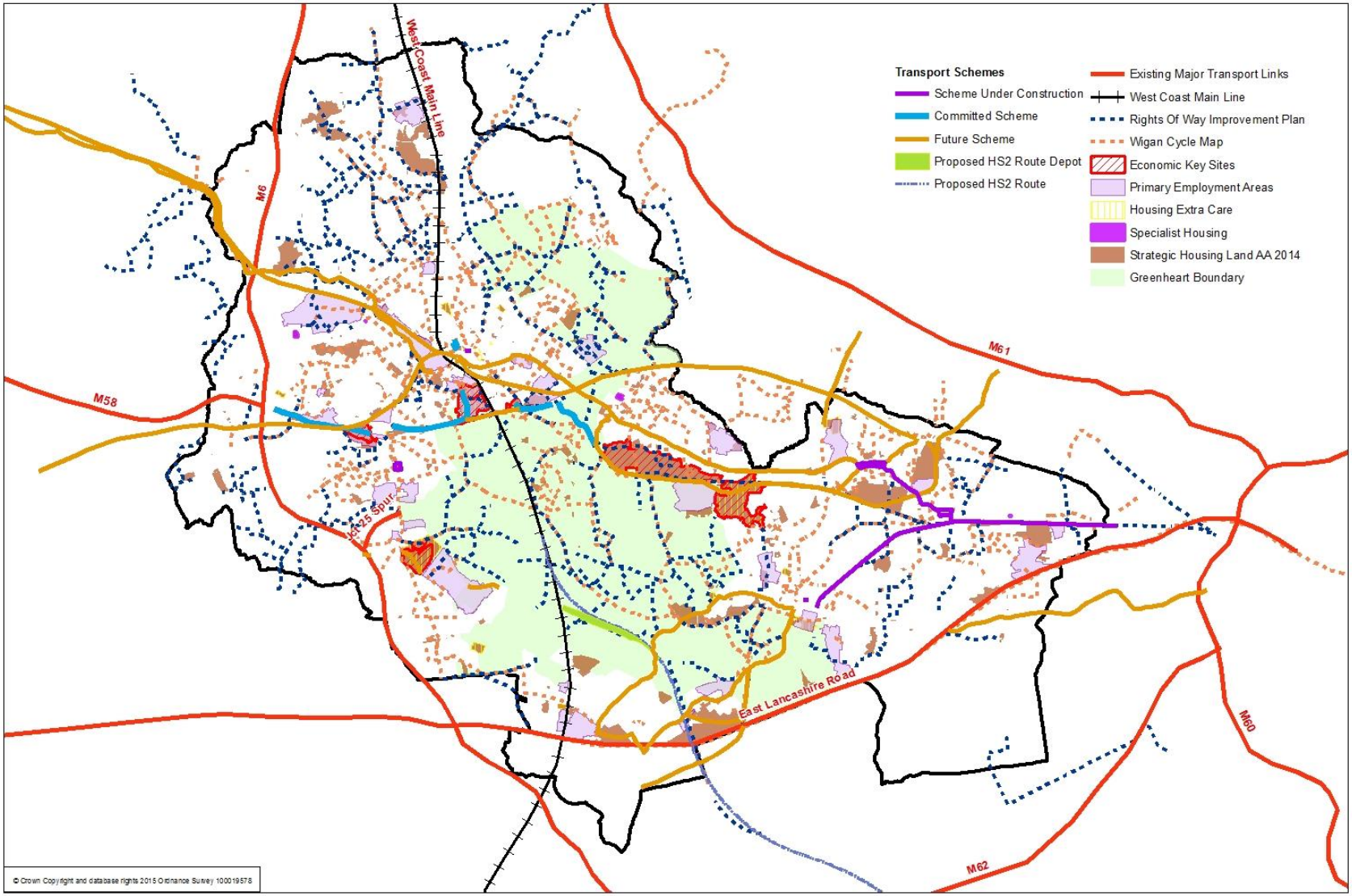
Development Sites, existing Transport Network and new road schemes



Development Sites, existing Transport Network, new road schemes and cycle network/ Rights of Way improvement works



Development Sites, existing Transport Network, new road schemes, cycle network/ Rights of Way improvement works and HS2 scheme



Streets for All.

STREETS FOR ALL ORBITAL CORRIDORS

Summary Document - Wigan

Revision	Date	Originator	Checker	Approver	Description
A	18/04/19	Various	[redacted]	[redacted]	50% DRAFT ISSUE
B	10/05/19	Various	[redacted]	[redacted]	2nd DRAFT ISSUE
C	15/05/2019	Various	[redacted]	[redacted]	DRAFT ISSUE FOR STEERING GROUP
D	10/07/2019	Various	[redacted]	[redacted]	FINAL ISSUE

Information class: Standard

Transport for Greater Manchester

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PJA

BroadwayMalyan BM

Contents

Preface

Streets for All presents a new approach to planning the streets of Greater Manchester. The initiative looks to create streets that better balance the movement of people and goods with the creation of more people-friendly places.

Streets for All takes clear inspiration from London's renewed focus on streets – approaching streets as places, not just traffic lanes. It takes account of both movement and place functions within streets.

As a holistic approach, Streets for All moves away from planning for transport modes, and towards putting people first to better shape and manage our streets. This will help us create more sustainable, healthy and resilient places across Greater Manchester; overall leading to an improved quality of life for those who live, work and visit our great city region.

Streets for All has been undertaken to establish a common approach to street design that can be used across Greater Manchester to help better plan our streets. This document explores key issues and potential interventions along a key 'Orbital' corridor that spans the districts of Wigan, Bolton, Bury, Rochdale, Oldham and Tameside.

A Manifesto for Equitable Streets

1) Streets are central to GMs growth and renewal.

More than 200,000 new homes and 65 million sq ft of employment space are required across the region by 2037[1] . To achieve this, we need 50% of all journeys in Greater Manchester to be made by walking, cycling and public transport[2]. .That's a million more sustainable journeys every day. In turn this will enable a healthier, greener and more productive city-region without increasing overall traffic levels. However, currently our streets can be hostile places for pedestrians, cyclists and public transport users. To make this ambition a reality, we need to radically change the way our streets are considered and designed.

We need to reconsider the role of our streets, looking beyond them as primarily for moving cars. We should also think of streets as places - places for playing, meeting, relaxing and simply enjoying. That's why Streets for All is also pivotal to supporting wider regeneration initiatives like the Mayor's Town Centre Challenge.

2) We're over-reliant on cars – and it is killing us.

Every day, 10 people die early in GM as a direct result of poor air quality – we think this is unacceptable[10]. In 2017, 399 people were killed or seriously injured in road traffic collisions, including 59 children, in the 6 districts this study spans[6] – we think this is unacceptable. Many of the poorest areas, with the lowest car use, have the highest exposure to both air quality and road safety issues - we think this is unacceptable.

We know that around 60% of car trips on the corridor are under 5km. This over reliance on cars is fuelling inactivity – which is known to be a central cause of cardiovascular disease, diabetes, cancer, depression and other serious illnesses. Tameside, for instance, inactivity is a factor in 30% of deaths[39] .

Streets for All delivers cleaner, safer and healthier streets that enable and encourage more people to travel by active modes.

3) We have a choice, and we understand the benefits.

Car-dominated streets don't happen by accident, they're the direct result of the choices we make. Many existing streets present a hostile or unattractive environment for any activity other than driving – perpetuating car dependency.

It's widely recognised that the most liveable places attract the best talent, investment and resources. The prize is enormous – from the health benefits of cycling, to the local spending boost delivered by high-quality placemaking. The social, economic and environmental case for change is clearer than ever.

4) We will need to make difficult decisions to make progress.

Change is never easy. Trade-offs need to be carefully considered and balanced between modes, with local solutions meeting strategic ambitions. Change won't happen overnight either, but we know that ultimately we cannot continue to build our way out of congestion by incrementally adding more space for cars. Many places this study considers were not designed to cope with the volumes of traffic they experience today and have been adapted to cope – often at the expense of quality of place and quality of life.

Streets for All allows us to grasp the opportunity to redefine the nature of a street creating resilient and fit for purpose places.

5) Walking and Cycling - Build the infrastructure and they will come.

Greater Manchester is at the forefront of an active travel revolution, with major investment (around £18 per person per year) planned in the BeeNetwork – that's more than anywhere else in the UK. High-quality segregated cycle routes completed to date have seen an increase in the number and diversity of people cycling. On Wilmslow Road, manual counts logged a 103% increase in cycle trips, two-years post-construction of the segregated cycle lane[16]. We also know that in places like Wigan, where cycling potential is high, rates are suppressed by limited infrastructure.

The GM Cycling Commissioner is clear that only high-quality infrastructure will be funded and Made to Move sets out the requirement to design for 'a 12-year-old on a bike' or parent with a double buggy. This change in mindset needs to be embraced by Local Highway Authorities, making excellence the default and not the exception.

6) Buses – Responding to the challenge.

Buses are a key weapon in the fight against congestion, moving up to 10 times more people than the same space a car would occupy. However, bus use into the six key town centres this study covers has fallen by a staggering 23% in just five years (2013-2017) . As bus use falls, prices increase – and this is a trend we need to address quickly.

To reignite bus use we need to learn from the successes of elsewhere – from cities that have implemented new approaches to bus transit, and also our own incredibly successful transit systems like Metrolink or Leigh Guided Busway. This means a fresh focus on transformational bus priority infrastructure delivering reliable journey times, safe and attractive bus stop/station environments, and reliable and accessible travel information.

7) Changing our approach to highway design.

Street design goes far beyond providing and protecting traffic capacity. The appearance and operation of the street plays a major part in the local economy, health and well-being of people and places.

Streets for All combines the professional skills of traffic engineering, placemaking, public transport, walking, cycling, and public health with the detailed knowledge of stakeholders who collaborate directly in the process to ensure that the designs meet local requirements and priorities.

But it is more than changing design cultures - the existing metrics and tools for measuring the 'success' of streets and junctions are too limited. They must consider more than just the capacity to move motor vehicles, looking too at how well a street delivers other functions as a safe and attractive place for people.

8) We need a stronger and more adaptable legal framework.

As with most cities outside London, GM is unable to enforce moving traffic contraventions. This means that local authorities don't have the powers to enforce things like HGV bans in small town centres, or create 'school streets' that protect children from harmful pollutants. Small changes to national design standards, like permitting informal side street zebra crossings, could have a transformational impact on the way streets function and people move. Streets for All can help make the case for change to Government.

9) This is not an 'anti-car' agenda.

By planning cities for car use, we have perpetuated car use and created reliance on them. If we plan cities and regions for only cars, they fail for everyone, including drivers. When we plan for all modes, it works better for everyone, including drivers

10) Change requires champions.

Throughout this process we've engaged with more than 120 local authority officers and local councillors all of whom have shown an incredible passion for the people and places they represent. They recognise that a fresh approach to street design is paramount. We need those people, and others, to unite and help push forward this agenda – to create a permanent legacy.

1. Executive Summary

Executive Summary

Introduction

Streets for All presents a new approach to planning and designing the streets of Greater Manchester. The initiative looks to create streets that better balance the movement of people and goods with the creation of more people-friendly places.

As a holistic approach, Streets for All moves away from planning for transport modes, and towards putting people first to better shape and manage our streets. This will help us create more sustainable, healthy and resilient places across Greater Manchester; overall leading to an improved quality of life for those who live, work and visit our great city region.

Streets for All has been undertaken to establish a common approach to street design that can be used across Greater Manchester (GM) to help better plan our streets. This document explores key issues and potential interventions along a key 'Orbital' corridor that spans the districts of Wigan, Bolton, Bury, Rochdale, Oldham and Tameside.

Why Streets for All?

Streets form a complex and important part of urban areas. They are home to many important and complex interactions. The make-up of a street is a fundamental deciding factor in how we choose to move around places. The quality of the street environment vastly influences our perception of an area, how we interact with people, how we feel, whether we consider an area to be attractive, and whether we want to spend time and money.

However, traditionally our streets have been designed primarily for vehicles. They consequently have often become environments that are dominated by traffic movements and ones which marginalise people and prevent important interactions. This is all embedding unhealthy practices, preventing the growth of local and regional economies, and damaging the natural environment.

We want to move away from an era of simply predicting and providing for traffic, and move towards providing for people and places. We want streets that are safer to use, places which are more welcoming and attractive to spend time, and environments which encourage healthier lifestyles. They should be safe and enjoyable for people of all ages, backgrounds and mobility, and at different times of day.

It must be made clear that SfA does not form an anti-car agenda. We recognise that the car is, for many, an essential part of our transport system. Instead, the initiative looks to better balance the playing field for all modes - helping reduce the number of trips that need to be made by car will benefit those trips that do.

Streets Today

Streets for All

"If we plan cities and regions for only cars, they fail for everyone, including car drivers. When we plan for all modes, it works better for everyone, including car drivers."

Growing GM

Greater Manchester Spatial Framework Revised Draft (GMSF) sets an ambitious plan for employment and housing growth for the next 25 years[1]. GM will subsequently see many more journeys taking place around the core, district centres and across the region. To ensure inclusive and sustainable growth, the region needs 50% of all journeys in GM to be made by sustainable modes - on foot, by bike and public transport. This will mean 1 million more sustainable journeys made every day[2]; key to this will be targeting shorter journeys which can more easily be made by active and sustainable modes.

SfA presents the opportunity to help improve the quality of transport links between neighbourhoods, town centres and key GMSF sites. Investment in walking and cycling infrastructure could help raise the economic vitality of northern GM towns and support the Mayor's Town Centre Challenge[3], whilst creating more vibrant streets, and boosting footfall, spend, values and quality of life.

Public Health

There is a prevalence of serious health issues across GM including: physical inactivity; shorter life expectancy; and long-term conditions such as cardiovascular and respiratory diseases[4]. GM's over-reliance on cars is fuelling inactivity. There is a great opportunity for SfA to deliver healthier streets that enable and encourage more people to travel by active modes. SfA looks to further define the Bee Network in north GM to help improve cycle and walking conditions across the Orbital corridor; creating streets that allow people of all ages and abilities to use them actively will help embed good physical and mental health.

Air Quality

Dirty air presents the single biggest environmental challenge to public health in GM; its effects are felt in all ten of the districts. Poor air quality has been noted to contribute to the equivalent of 1,200 deaths a year in GM[5]. Our streets need to be planned for people, not traffic. This will be important in moving away from a culture that sees short trips being frequently undertaken by the car, to people choosing to walk and cycle. SfA will help people to consider low-emission transit and embed more sustainable practices.

Road Safety

Ensuring that people are and feel safe, is crucial to delivering more liveable streets and places. Road casualties have reduced over the past 20 years in GM; however, there are still many killed or seriously injured (KSI) on our roads[6]. SfA forms a great opportunity to rethink how we plan our streets to make them safer for all. Creating environments which are easier for people to move within, easier to cross, and more enjoyable to use, can help increase the safety of our streets.

Transport and Congestion

Traffic congestion in GM is amongst the worst in the UK[7]. This means people and goods are affected on a daily basis – creating stress and reducing productivity. A revised approach is needed to solve the region's congestion problem. There is more to be gained by focusing on people and places, rather than vehicles and highway capacity. Ultimately we cannot continue to build our way out of congestion by incrementally adding more space for cars – an approach that has been the default response over many years, but only deals with the symptom and not the root cause.

Method

The Orbital corridor forms the largest of the SfA corridors and covers a diverse range of demographics, land uses, topographies and travel behaviours. The study has therefore involved extensive consultation with the six District Councils across the corridor (Wigan, Bolton, Bury, Rochdale, Oldham, Tameside) to capture key local information, needs and priorities.

This report has been created over a 9-month period, engaging more than 120 officers/ portfolio holders/ elected members, over four key stages of activities:

Analyse the Corridor

- Review of existing studies
- Multiple site visits covering the 83km Orbital corridor
- Baseline assessment: socio-economic, transport and travel, land use, environmental; and movement and place analysis.
- Stakeholder workshop

Corridor Visioning & Objectives

- Issues and opportunities mapping
- Stakeholder workshop
- Benchmarking and objective setting
- Production of Street Types

Corridor Action Plans

- District-by-District workshops (including elected members)
- Intervention long-listing
- Focus area mapping
- Production of concept designs

Next Steps & Refinement

- Stakeholder workshop
- Final reporting

Strategy and Action Plan

Street Types

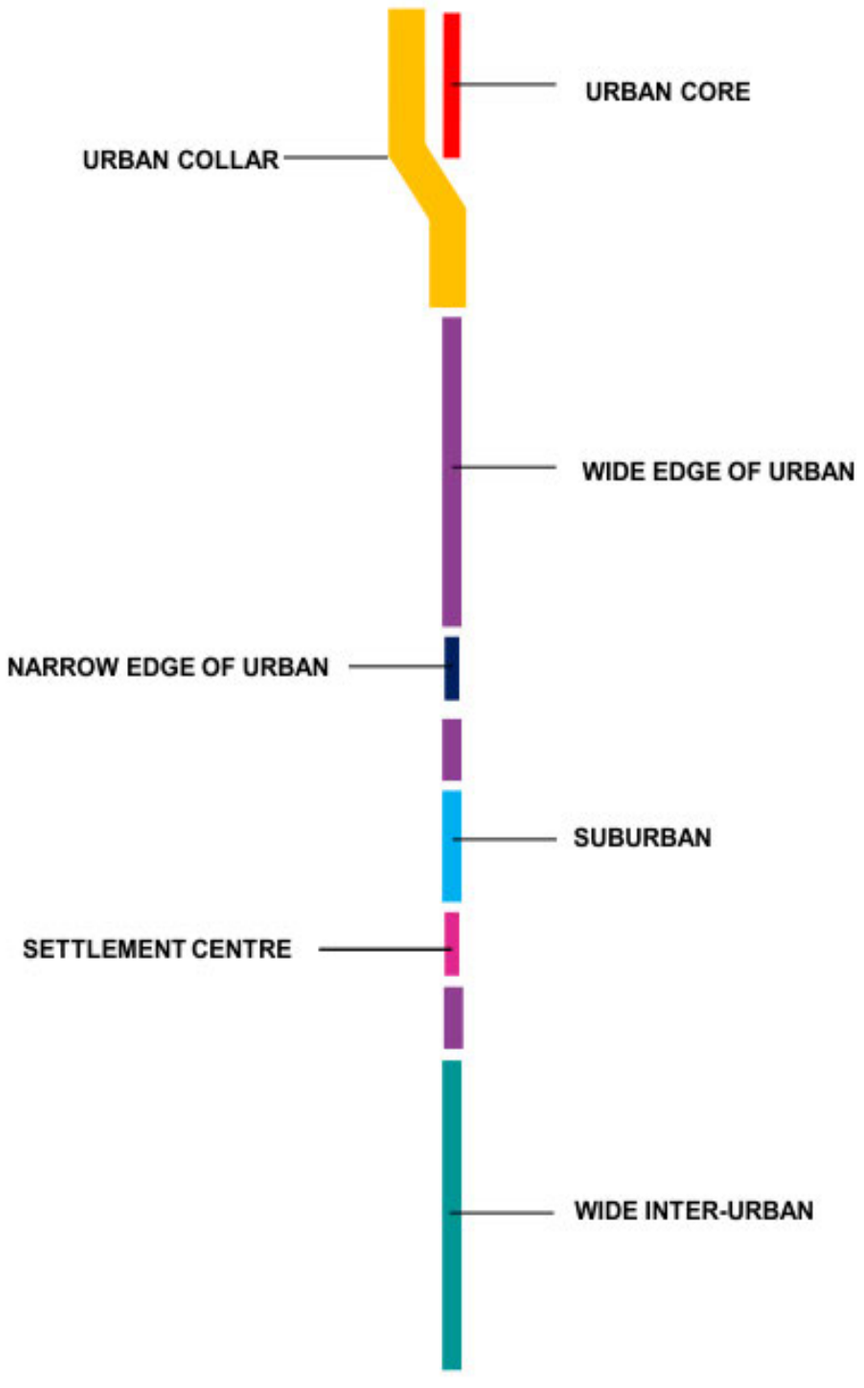
The development of street typologies is fundamental to the strategy and action plan. The seven typologies capture the different types of streets generally present across the Orbital corridor; based upon geometry, function, space allocation, and surrounding land uses.

The street types help identify issues and opportunities associated with different streets, as well as crucially identifying the type of relevant and suitable type of intervention.

- Urban Core – Large town centre, vehicle restricted areas, often traffic managed with one-way systems. Dominant retail function. Pedestrians often dominate movement demand. Open spaces and civic uses are common.
- Settlement Centre – Small/secondary town centre, traditional high street building front onto street. Likely to be kerbside loading/parking/bus stops. Traditional retail uses. Sometimes include historic building adding character and identity. Traffic dominated character and use.
- Urban Collar – Off the main town centre, includes ring roads and gyratory. No amenity space. No sense of arrival. Severe issues of severance and access. Highway/engineered character (signage/barriers). Vehicle focused with pedestrians/cyclists marginalised.
- Narrow Edge of Urban – Mixed land use but generally high density with frontages close to a 2-lane carriageway. Mix of terraced housing, traditional industrial buildings and larger old housing converted for commercial use. Busy roads with moderate pedestrian activity. Often cluttered environment. Often lacking in distinctiveness/identity. No green infrastructure.
- Wide Edge of Urban – Mixed land use, generally high density. Includes land hungry uses. Pockets of high density social housing. Vehicle movement has been prioritised, and often a severance issues and demand for ped/cycle movement. Highway/engineered character.
- Suburban – Medium to low density residential, intermittent open spaces, including some amenity spaces with grass verges. Lacking in character and identity, little opportunity for staying/stopping currently. Often approach to settlement centres. Larger carriageway width.
- Wide Inter Urban – 40mph plus roads with wider traffic lanes and verges. Usually shared ped/cycle path. Little demand for ped/cycle movement. Sometimes countryside setting with access through rights of way. Ped/cycle experience is of a unsafe/unappealing environment.

Street typologies were layered in a typical pattern across the Orbital corridor, as shown on the right.

Subsequently, a series of 'guiding principles' have been established for each street type – providing a basic framework to direct the redesign of all streets that make up the Orbital corridor.



Cycling Infrastructure Strategy

Better conditions for walking and cycling will enable these modes to replace many of the short car journeys that make up a significant proportion of travel. A 'Cycle Infrastructure Plan' has therefore been devised for the corridor. This follows five fundamental considerations:

- Coherent: Cycle networks that allow people to reach their day to day destinations easily, along routes that connect, are simple to navigate and are of a consistently high quality.
- Direct: Routes that provide the shortest and quickest way of travelling from place to place. This includes providing facilities at junctions that minimise delay and the need to stop.
- Safe: Cycle infrastructure that is safe (in terms of recorded collisions) and perceived to be safe by users, so that more people feel able to cycle.
- Comfortable: Conditions that provide: smooth surfaces; adequate width for the number of users; minimal stopping and starting; avoid steep gradients; excessive or uneven crossfall and adverse camber.
- Attractive: People cycling and walking are more directly exposed to the environment they are moving through, and value attractive routes through parks, waterfront locations other open spaces and well-designed streets and squares.

An infrastructure plan is developed and sets out feasible and future measures for cycling infrastructure across the Orbital corridor - there are 25 strategic schemes in total.

Quality Bus Transit

High-quality bus services are an essential form of transport and are key to providing sustainable urban and inter-urban transport40. They provide mobility for those who cannot travel actively or by car, as well as efficient means for travelling short to medium distances. Buses are also capable of moving up to 10 times as many people than the same space a car would – thereby serving as an excellent means to tackle congestion.

Quality Bus Transit (QBT) takes a fresh focus on transforming bus travel. The approach involves greater space allocation for buses, with stretches of highway dedicated for buses and priority over cars, as well as rethinking the way we design, and plan bus stops. A series of 'Overarching Principles' as well as an 'Infrastructure Plan' are devised for the Orbital corridor.

Corridor Action Plan

Corridor action plans are produced for each of the individual districts across the Orbital corridor. These followed a five stage process:

Issues and Opportunities

A range of issues and opportunities have been identified and mapped for each district through analysis of the corridor baseline study, street types identification, site visits, district-level data profiles (including items such as health), and feedback obtained from stakeholder consultation events.

District Action Plan

In response to the issues and opportunities work, an action plan has been produced for each district. The plans identify a list of strategic SfA schemes comprising: placemaking and public realm improvements; walking and cycle infrastructure; and QBT interventions.

Focus Areas

A number of 'focus areas' have been selected across the corridor for more in-depth analysis. More detailed issues and opportunities are explored in each area, and more localised SfA interventions identified. In total, there are 19 focus areas:

- Wigan - 6 focus areas
- Bolton - 3 focus areas
- Bury - 2 focus areas
- Rochdale - 4 focus areas
- Oldham – 2 focus areas
- Tameside – 2 focus areas

Concept Designs

Concept designs are presented produced for a select number of focus areas, in order to test the 'guiding principles' set out in the Street Types section across a range of geographies and scheme priorities. In total, this report contains 10 different concept designs:

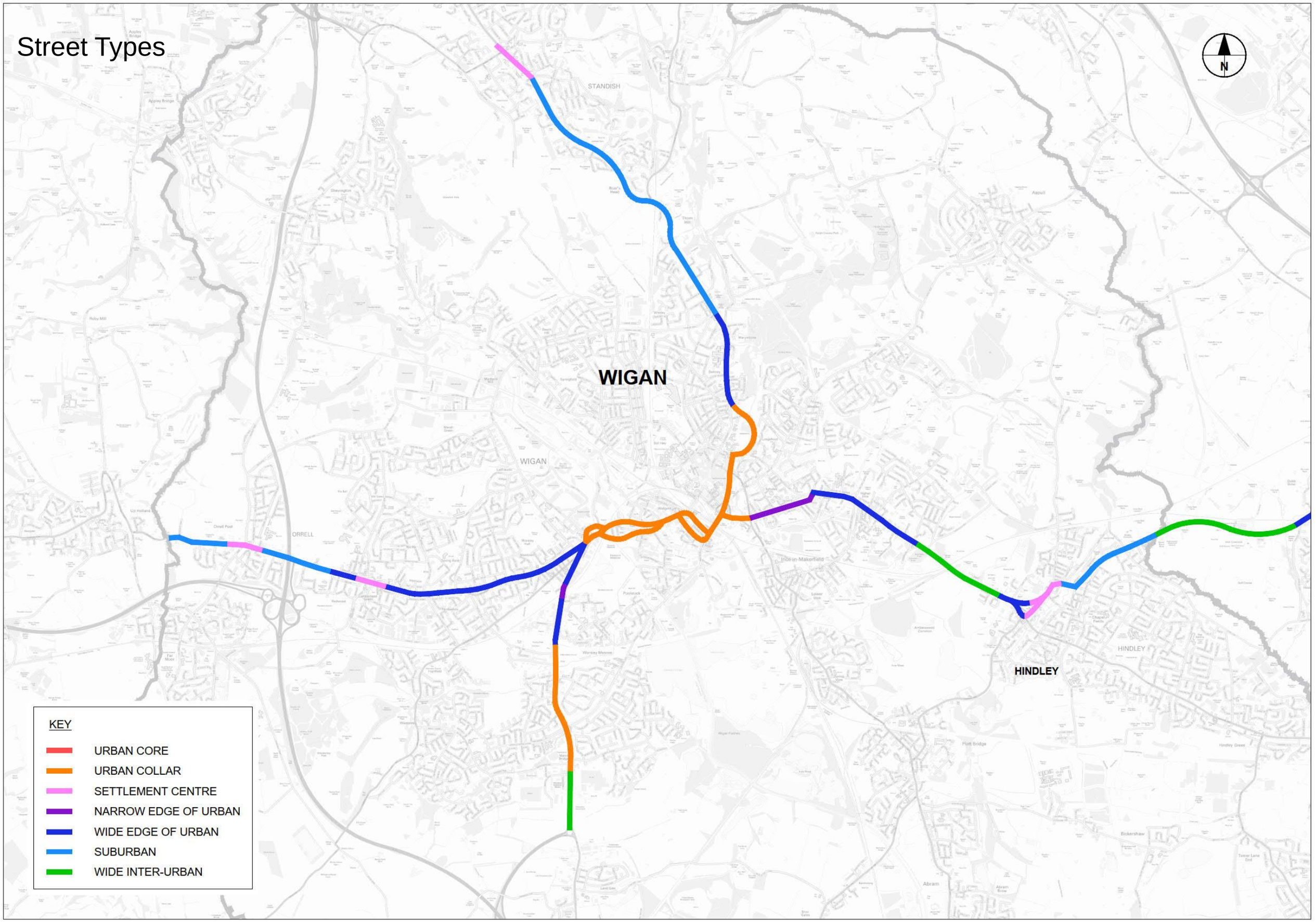
- Wigan – Wigan Central (Wallgate) & Warrington Road Cycleway
- Bolton – Deane Road Education Campus & Farnworth Local Centre
- Bury – Angouleme way
- Rochdale – Heywood Local Centre, Manchester Road (Sudden) & Middleton Collar
- Oldham – Royton Local Centre
- Tameside – Waterloo

Implementation Strategy

An SfA implementation strategy sets out the strategic-level SfA schemes identified, together with a cost range and indication of next steps. There are 45 strategic schemes in total.

2. Streets for All: Wigan

Street Types



Wigan Corridor Issues & Opportunities

Growing GM

- Housing allocations: 21,400 homes.
- Office floorspace supply: 20,225 sq.m.
- Industry & Warehousing: 641,717 sq.m.
- Key allocations along Corridor: M6, Junction 25 - 40,000 sq.m B2 and B8 uses.

Public Health

Significantly worse than the England average for:

- Life expectancy at birth (male and female);
- Under 75 mortality rate: all causes;
- Under 75 mortality rate: cardiovascular disease; and
- Under 75 mortality rate: cancer.

Air Quality

Over the legal limit for nitrogen dioxide pollution levels (µg/m3) at the following locations along the corridor:

- A577 Darlington Street; and
- A577 Manchester Road (Near Higher Ince).

Transport & Congestion

Along the Orbital Corridor in Wigan there are:

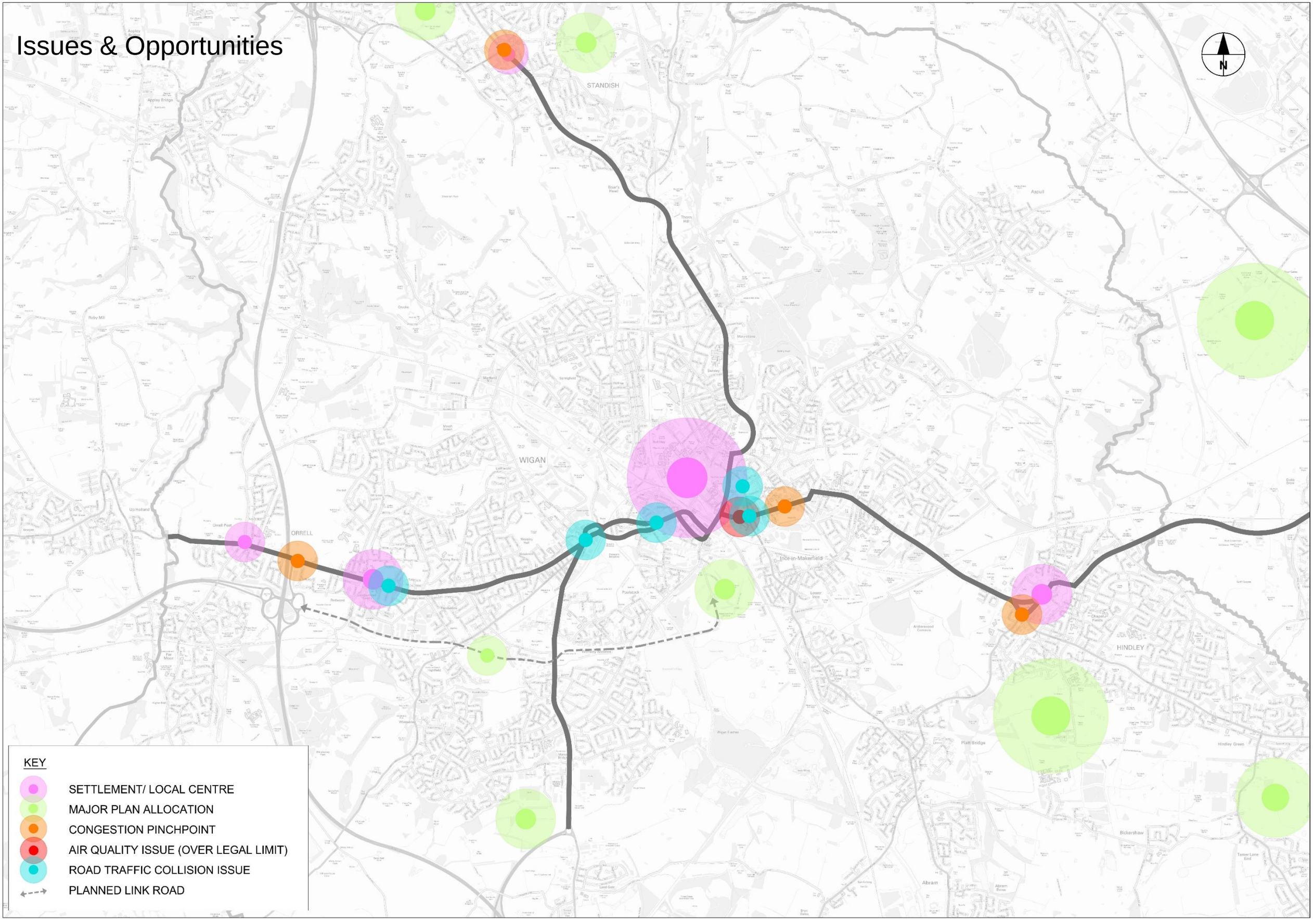
- There are low levels of cycling along the corridor (1-3% of travel to work trips in 2011); and
- the locations with the greatest potential for cycling to increase are Goose Green, central Wigan and Hindley.

Road Safety

The top five hotspots (all collisions) along the corridor for road safety issues are:

- Pemberton High Street;
- Warrington Rd/ Ormskirk Road junction;
- B5238/ A49 Warrington Road junction;
- A49 Harrogate St/A577 Darlington St junction; and
- A49 Wallgate/ A49 Pottery Rd junction.

Issues & Opportunities



Wigan District Action Plan

Selected as Focus Area
Selected for Concept Design

Key Strategic Schemes

W1 Wigan - Orrell Cycleway

Scheme: Segregated cycleway along A577 Ormskirk Road linking Wigan, Pemberton and Orrell.

Rationale: Use the opportunity afforded by the new M6/A49 link road to transfer strategic traffic away from this route and reallocate road space to create a new high-quality east-west cycleway.

W2 Orrell Local Centre

Scheme: Enhanced public realm at Orrell local centre, around the junction of A577 Orrell Road & B5206 Moor Road.

Rationale: Support local economy and create a stronger local centre by improving the look and feel of this area.

W3 Pemberton Local Centre

Scheme: Enhanced public realm at Orrell local centre, around the junction of A577 Orrell Road & B5206 Moor Road.

Rationale: Use the opportunity afforded by the new M6/A49 link road to comprehensively rethink public realm here – supporting the local economy through placemaking. More detail is provided in the 'Pemberton Focus Area' section of this report.

W4 Pemberton Neighbourhoods

Scheme: Explore the potential for implementing a filtered neighbourhood scheme here.

Rationale: Reducing rat-running and prioritising every day walking & cycling for local trips. Creation of safe play streets and neighbourhood pocket park greenspace.

W5 Wigan - Bryn Cycleway

Scheme: Segregated cycleway along A49 Warrington Road linking Wigan and Bryn.

Rationale: Formalise existing advisory cycle lanes to create a new high-quality north-south route. Tie-in to completed cycleops scheme at Saddle Junction.

W6 Poolstock Neighbourhoods

Scheme: Explore the potential for implementing a filtered neighbourhood scheme across south Wigan, alongside the implementation of a bus gate on Poolstock Lane.

Rationale: Reducing rat-running and prioritising every day walking & cycling for local trips. Creation of safe play streets and neighbourhood pocket park greenspace. Implement bus priority to improve journey times, and push strategic through-traffic on to the new A49 Link Road.

W7 Wigan Central

Scheme: Major transformation of the link between Wigan Pier and the town centre, to include walking, cycling and green infrastructure upgrades.

Rationale: Reconnect the town's strategic assets, using the opportunity afforded by the new M6/A49 link road to transfer strategic traffic away from this route. Support and spark the regeneration of the Pier area, and future HS2 gateway at Wigan North Western – in line with the Town Centre Strategic Regeneration Framework. More detail is provided in the 'Wigan Central Focus Area' section of this report.

W8 Standish Local Centre

Scheme: Enhanced public realm at Standish local centre, around the junction of A49 High Street & A5209 School Lane.

Rationale: Reprioritise and create space for pedestrians. Support local economy and create a stronger local centre by improving the look and feel of this area. More detail is provided in the 'Standish Focus Area' section of this report.

W9 Wigan - Standish Cycleway

Scheme: Segregated cycleway along A49 Wigan Road linking Wigan and Standish.

Rationale: Formalise existing advisory cycle lanes to create a new high-quality north-south route.

W10 Wigan - Hindley Cycleway

Scheme: Segregated cycleway along A577 Manchester Road linking Wigan and Hindley.

Rationale: Formalise existing advisory cycle lanes to create a new high-quality east-west route.

W11 Hindley Local Centre

Scheme: Enhanced public realm at Hindley local centre, along A58 Market Street. Potential eastbound bus gate on Cross Street, between Morris Street & Market Street.

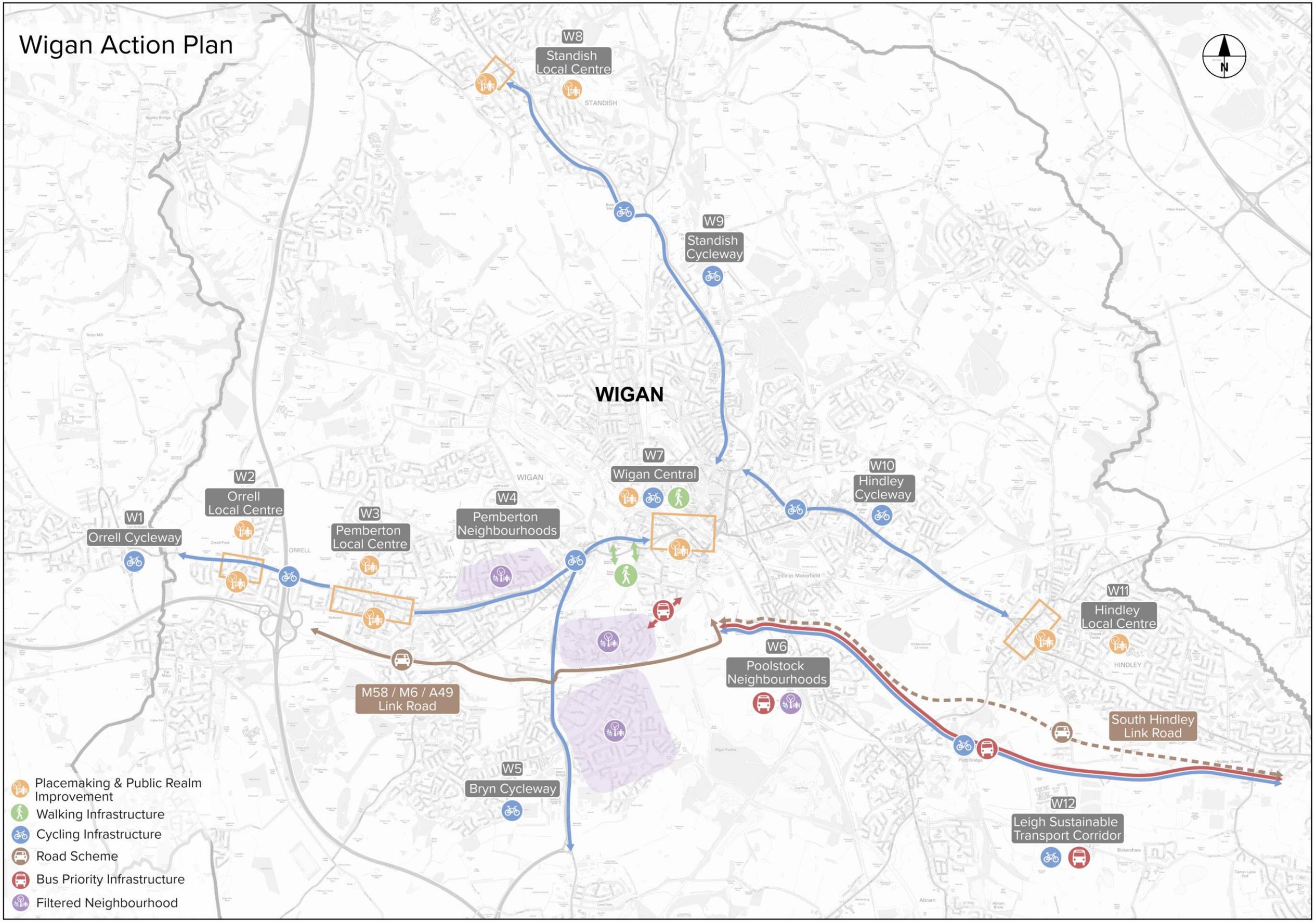
Rationale: Support local economy and create a stronger local centre by improving the look and feel of this area. Improve bus journey times. More detail is provided in the 'Hindley Focus Area' section of this report.

W12 Wigan – Leigh Sustainable Transport Corridor

Scheme: Extension of Leigh Guided Busway to link to Wigan, with a parallel high-quality segregated cyclway.

Rationale: Provide a transformational new public & sustainable transport link between Wigan & Leigh, and support new housing proposals south of Hindley.

Wigan Action Plan

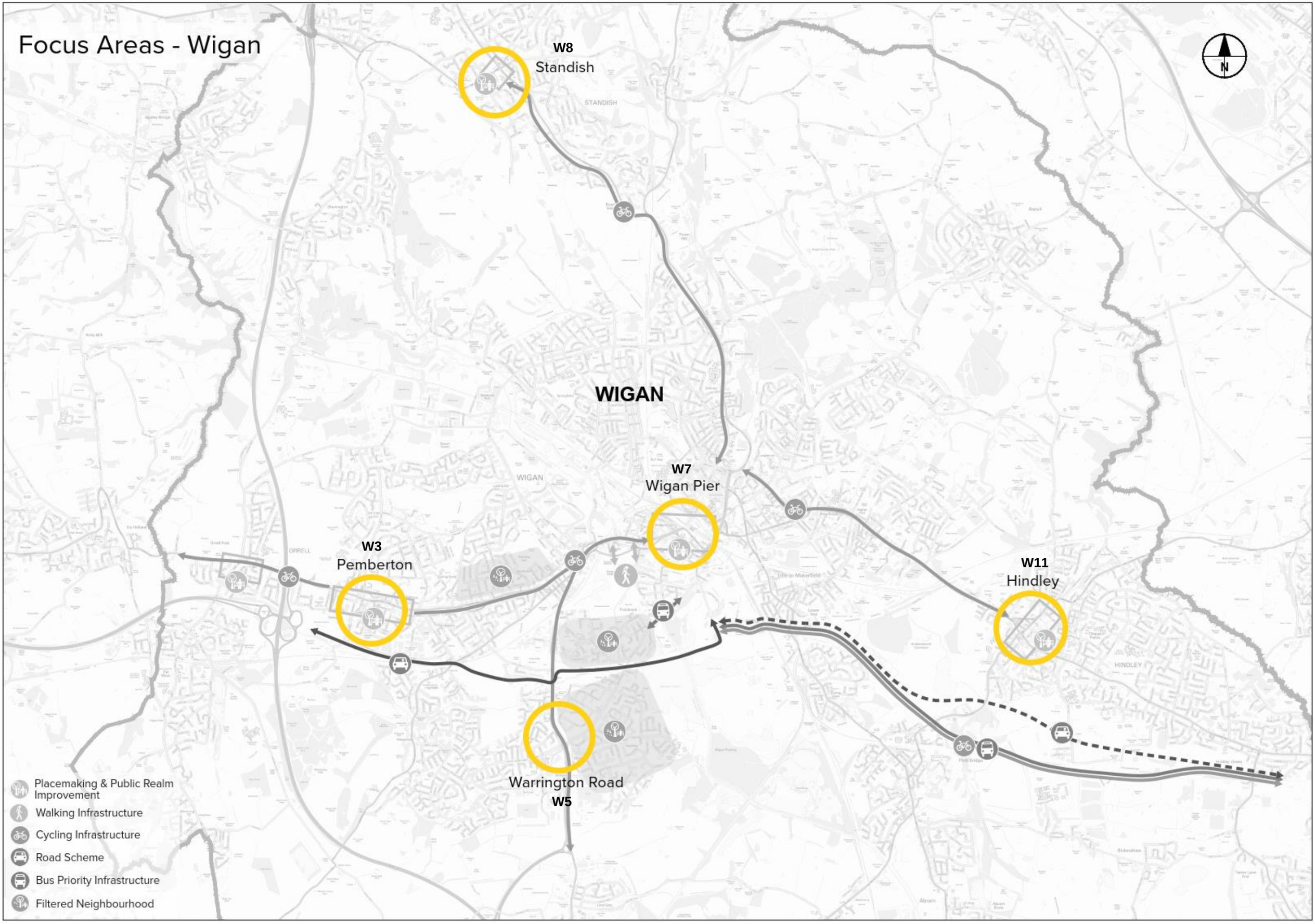


Wigan Focus Areas

Wigan

Ref	Focus Area	Primary Scheme Type	GM Thematic Alignment	Relevant Local Workstreams	Current Status	Taken to Concept Design?
Wigan						
W3	Pemberton Local Centre	High Street Public Realm			-	
W5	Wigan - Bryn Cycleway (Warrington Road)	Cycling	BeeNetwork		Saddle Junction Implemented	Yes
W7	Wigan Central/ Pier	Walking Cycling Town Centre Regeneration	BeeNetwork Mayor's Challenge Fund	HS2 Station Growth Strategy Wigan TC SRF	Optioneering	Yes
W8	Standish Local Centre	High Street Public Realm Cycling	BeeNetwork		-	
W11	Hindley Local Centre	High Street Public Realm Cycling	BeeNetwork		-	

Focus Areas - Wigan



W3 Pemberton Local Centre

Street Type: Settlement Centre

Pemberton local centre is the largest within the settlement of Wigan, outside of the main town centre. It serves a large residential catchment, with an offer primarily made up of food & drink, local convenience retail and a small number of specialist independents. Our work with stakeholders suggests that whilst Pemberton's offer is relatively good, it could be further strengthened through a refreshed focus on placemaking.

Key Issues & Opportunities Identified:

- Currently a key route to M6 J26, serving the west & centre of Wigan.
- Generally low quality public realm, with Ormskirk Road dominated by vehicular movement.
- New M58/A49 Southern Link Road offers major opportunity to transform this area.
- Local retail provides a strong base to build upon.

Primary Objectives:

Potential Schemes:

1) Public realm enhancement on Ormskirk Road, including comprehensive material palette change and arrowing.
2) New public space at the junction of Ormskirk Road & Chapel Street.
3) Busy Bee Network route linking Orrell to Saddle Junction.


TO M6 J26
A577
9
9
PRIMARY SCHOOL
NEED TO ENHANCE PUBLIC REALM AT LOCAL CENTRE.
CHURCH
PEMBERTON LOCAL CENTRE
GYRATORY
11,000 VPD
NEW M6/A49 LINK ROAD SHOULD BE USED TO PUSH STRATEGIC THROUGH-TRAFFIC AWAY FROM THIS AREA.
KEY
KEY LAND USES
BUSES PER HOUR
SIGNALISED PEDESTRIAN CROSSING

W5 Warrington Road

Street Type: Wide Edge of Urban

Warrington Road links central Wigan with Bryn & Ashton-in-Makerfield. It is a mixture of single and dual carriageway, with some existing (limited) cycle infrastructure in the form of shared footways, advisory on-carriageway cycle lanes and advanced stop lines. Surrounding land uses are predominantly residential, with some large industrial and big box retail located at the southern extent.

Key Issues & Opportunities Identified:

- A 'movement-focused' corridor, which creates major severance in places.
- Several major junctions create a poor experience for pedestrians and cyclists.
- Opportunity to tie-in with the new segregated cycle infrastructure at Saddle Junction.

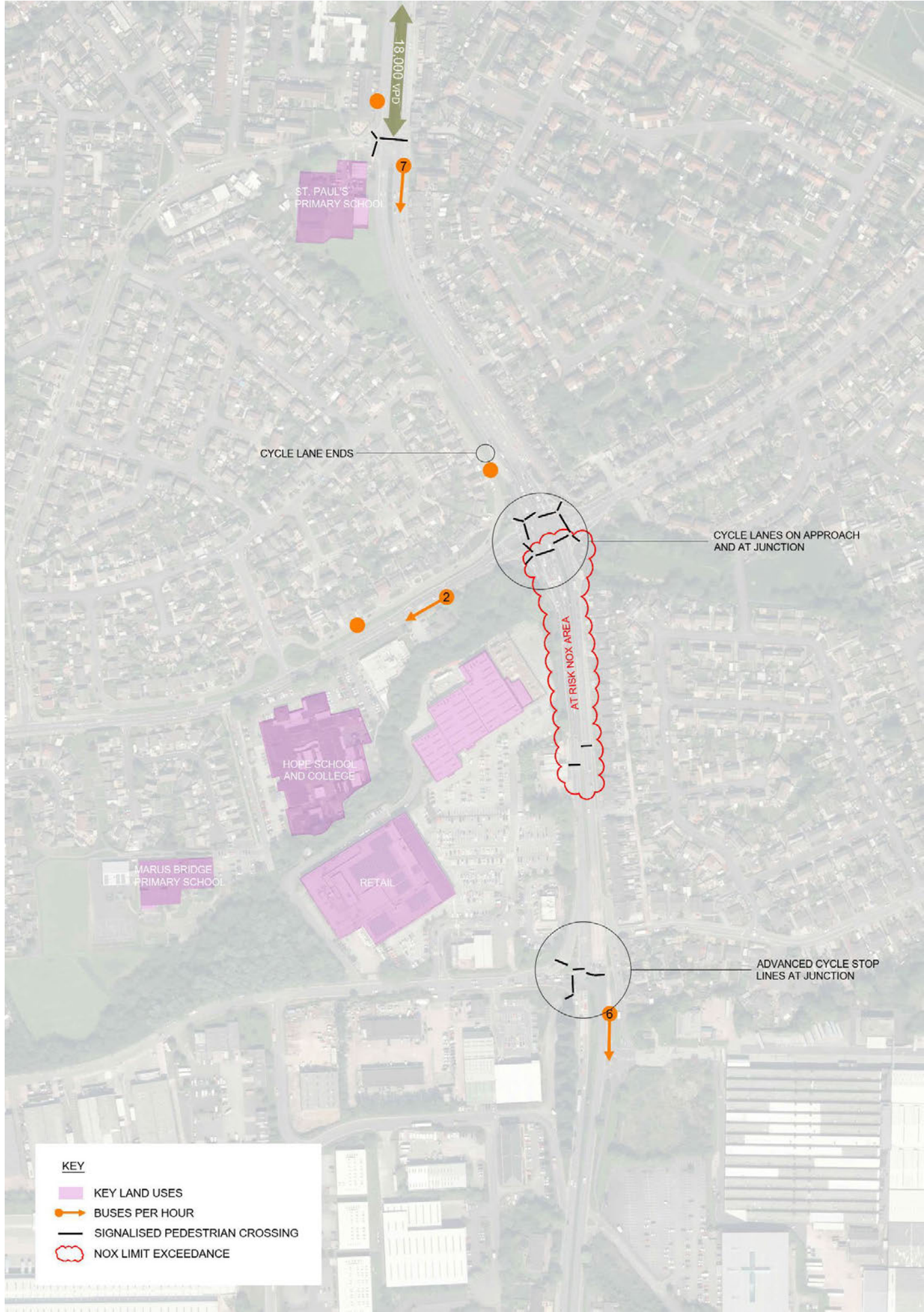
Primary Objectives:

Potential Schemes:

1) 'Busy Bee Network' segregated cycleway linking Wigan with Bryn.
2) Implementation of a 'cycleops' junction at the intersection of Warrington Road & Poolstock Lane.
3) Parallel quietway route on Poolstock Lane, with potential for a bus gate to filter general traffic (facilitated by the new M6/A49 Link Road).


BUS
STOP


END


18,000 vpd
7
ST. PAUL'S
PRIMARY SCHOOL
CYCLE LANE ENDS
CYCLE LANES ON APPROACH
AND AT JUNCTION
2
AT RISK NOX AREA
HOPE SCHOOL
AND COLLEGE
MARUS BRIDGE
PRIMARY SCHOOL
RETAIL
ADVANCED CYCLE STOP
LINES AT JUNCTION
6
KEY
KEY LAND USES
BUSES PER HOUR
SIGNALISED PEDESTRIAN CROSSING
NOX LIMIT EXCEEDANCE

Existing

Proposed

Guiding Principles Checklist

Street Type	Guiding Principles	Rating	Notes
Wide Edge of Urban	Declutter the footway;		
	Merge functions of street furniture such as relocating directional signage and litter bins to lamp posts;		
	Remove bus lay-bys to give more priority to buses and create space for bus stop bypasses;		
	Tighten junction turning radius' and introduce informal side street crossings;		
	Remove the central painted hatch median, including minor right-turn pockets;		
	Reduce the carriageway width to a maximum of 6.5m;		
	Extend footway width;		
	Relocate on-street parking away from the corridor;		
	Install segregated stepped cycleway (2m wide) either side of the carriageway; and		
	Speed limit consistent at max. 30mph – with a lower design speed than present.		

.

Design Precedents

Carlton Vale, London


Lawrence Hill, Bristol

Existing

Proposed

Guiding Principles Checklist

Street Type	Guiding Principles	Rating	Notes
Urban Collar	Declutter the footway including the removal of guardrailing and rationalisation of signage;		
	Removal of subways and introduction of signalised at-grade pedestrian crossings on key desire lines;		
	Tighten junction turning radius';		
	Removal of roundabouts and introduction of signalised junctions;		Roundabout retained. Cycle lane and crossing introduced.
	Reduce carriageway width to a maximum of 6m in each direction (3m per running lane);		
	Introduce segregated and stepped 2m cycleway;		Segregated cycle lane introduced along the central reservation.
	Define boulevard character through the introduction of new street trees and verge planting; and		
	Speed limit consistent at 30mph (or 20mph where possible) – with a lower design speed than present.		

Design Precedents

A38 Cycleway, Birmingham

W7 Wigan Central/Pier

Street Type: Urban Collar

Wigan Central/Pier refers to the area located south west of the town centre core, between Queen Street & Saddle Junction. It is predominantly an area of light industry, with some big box retail (such as car showrooms) and leisure uses. Residential uses have also begun to emerge over recent years, including at the historic Trencherfield Mill. Wallgate and Southgate are both two lane wide one-way highways, located either side of the Leeds-Liverpool Canal. The historic 'Pier' sits between these two routes.

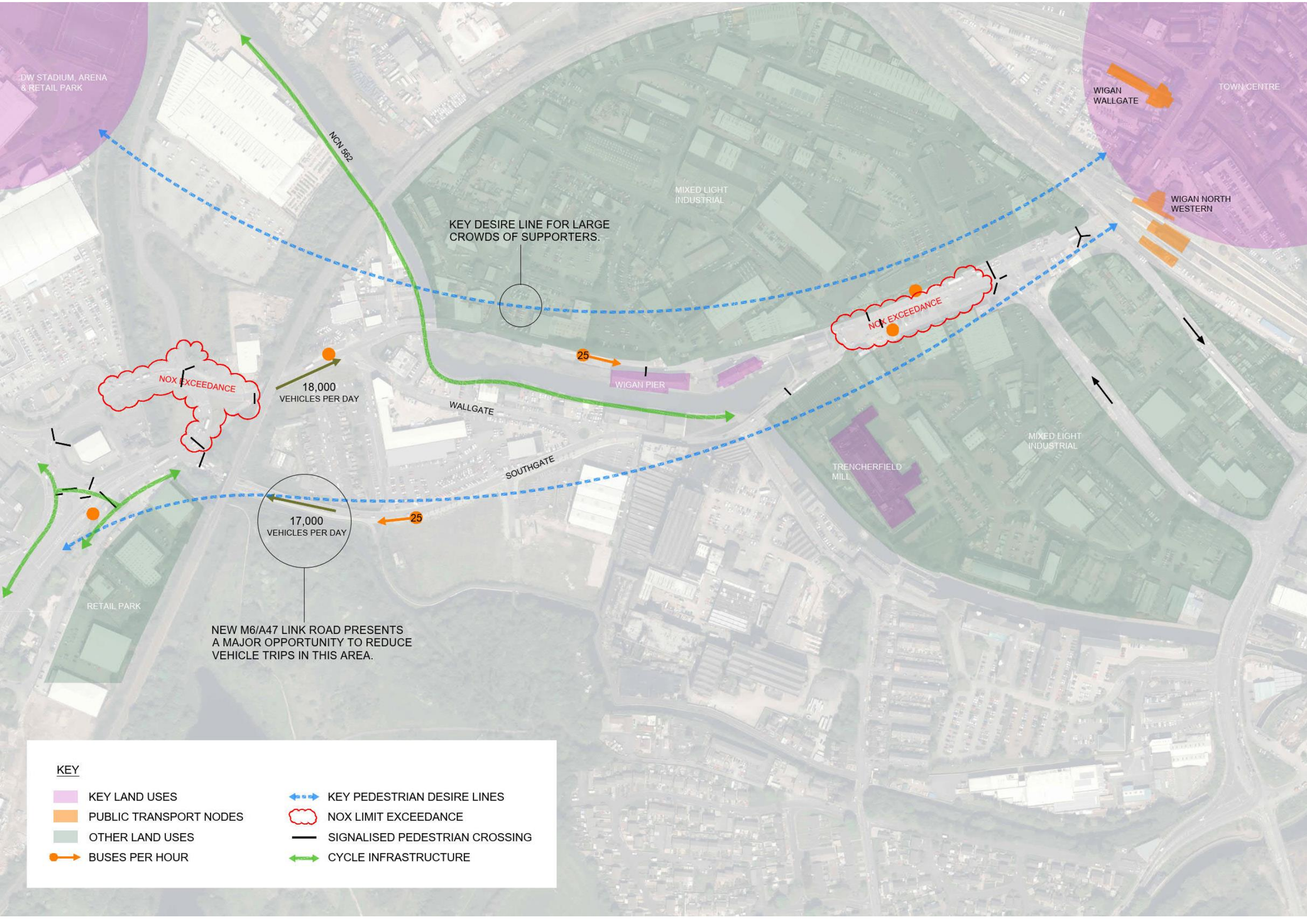
Key Issues & Opportunities Identified:

- Currently a key route serving the west & centre of Wigan – the area experiences high vehicular flows in peak hours. Their design creates the sense of a 'fast route' outside of peak hours.
- Wallgate & Southgate create an isolated pedestrian environment and a poor setting for development/regeneration.
- This is a key route between the Town Centre and DW Stadium – large crowds of pedestrians commonly use this route to walk between the two.
- Limited pedestrian crossings of both the highways and canal.
- New M6/A49 Southern Link Road offers major opportunity to transform this area.
- There is a clear need for the transformation of this street as part of a wider push for regeneration, particularly linking to a HS2 Growth Strategy for Wigan stations.

Primary Objectives:

Potential Schemes:

1) Closure of the junction with Great George Street and creation of a new pocket park, as an early win.
2) Reduction of the carriageway space, to encourage strategic traffic to transfer to the new M6/A49 Link Road.
3) Removal of the existing Queen Street gyratory and creation of a new pedestrian priority space on this street, serving a new southern entrance to Wigan North Western station.
4) Busy Bee Network bidirectional cycle route linking Wigan Town Centre to Saddle Junction.
5) Comprehensive public realm enhancement, including consistent side road treatments.
6) New pedestrian footbridges spanning the Canal, within the Wigan Pier area.


DW STADIUM, ARENA & RETAIL PARK
NCN 562
MIXED LIGHT INDUSTRIAL
KEY DESIRE LINE FOR LARGE CROWDS OF SUPPORTERS.
WIGAN WALLGATE
TOWN CENTRE
WIGAN NORTH WESTERN
NOX EXCEEDANCE
NOX EXCEEDANCE
25
WIGAN PIER
18,000
VEHICLES PER DAY
WALLGATE
SOUTHGATE
MIXED LIGHT INDUSTRIAL
TRENCHERFIELD MILL
17,000
VEHICLES PER DAY
25
RETAIL PARK
NEW M6/A47 LINK ROAD PRESENTS A MAJOR OPPORTUNITY TO REDUCE VEHICLE TRIPS IN THIS AREA.
KEY
KEY LAND USES
PUBLIC TRANSPORT NODES
OTHER LAND USES
BUSES PER HOUR
KEY PEDESTRIAN DESIRE LINES
NOX LIMIT EXCEEDANCE
SIGNALISED PEDESTRIAN CROSSING
CYCLE INFRASTRUCTURE

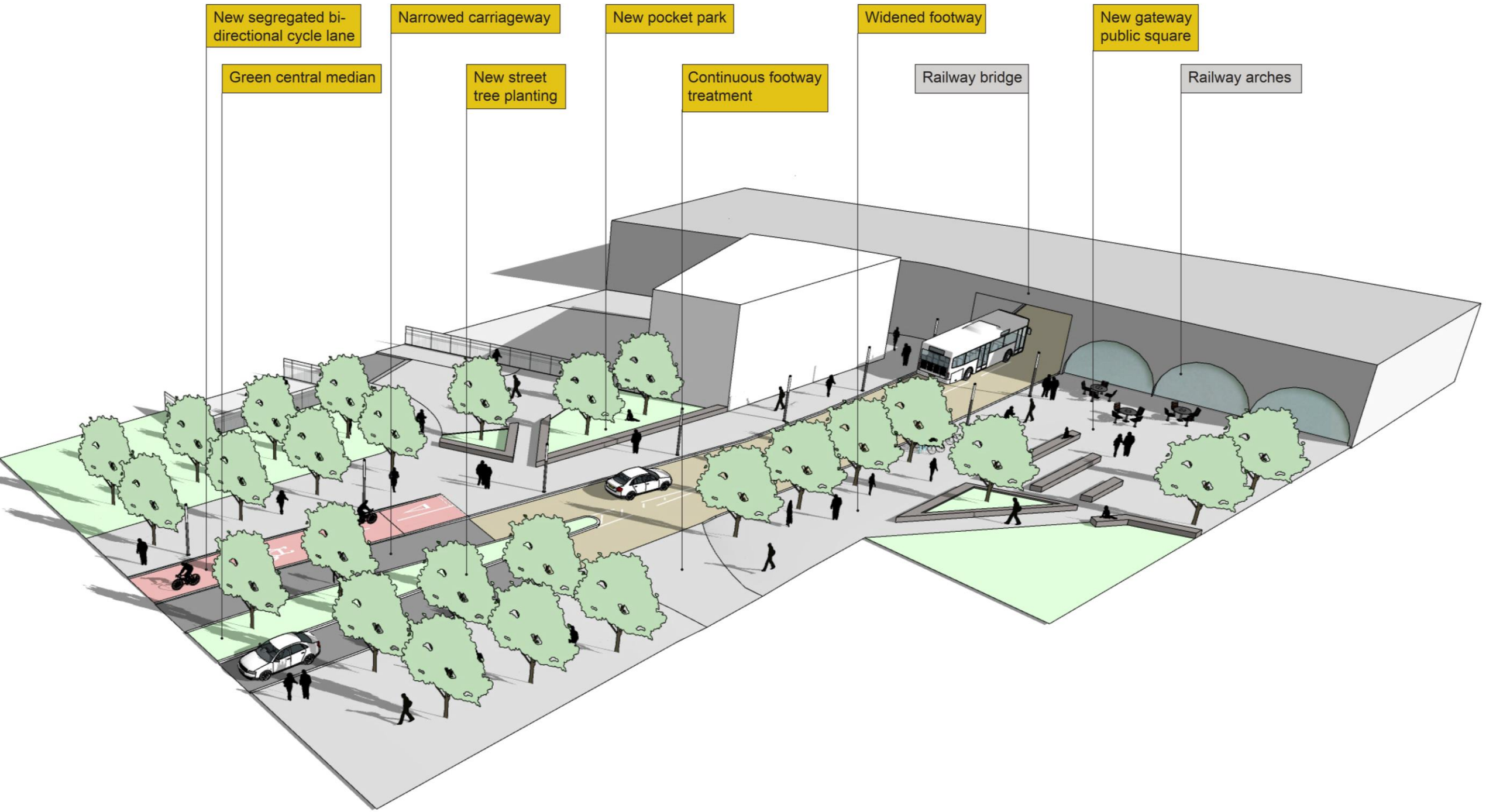
Existing


Great George Street
Pitt Street
Clayton Street
Wallgate
Caroline Street
Queen Street
Existing Plan Layout
KEY
Pedestrian realm
Carriageway
1 Access to stations and town centre (under bridge)
2 Railway arches
3 One way carriageway
4 Central median
5 Pedestrian crossing
6 Guardrails
7 Bus stop
8 Car show room
9 GoOutdoors
SCALE
0 1 3 5 10 15 25 35m
N

Proposed


Great George Street
Pitt Street
Clayton Street
Wallgate
Caroline Street
Queen Street
Proposed Plan Layout
KEY
Pedestrian realm
Carriageway
1 New gateway square
2 New pocket park
3 Widened pavement
4 Segregated bi-directional cycle lane
5 Optimised junction with pedestrian crossings
6 New green central median
7 New street tree planting
8 Continuous footway treatment
N
SCALE
0 1 3 5 10 15 25 35m

Proposed 3D


New segregated bi-directional cycle lane
Green central median
Narrowed carriageway
New street tree planting
New pocket park
Continuous footway treatment
Widened footway
Railway bridge
New gateway public square
Railway arches

Guiding Principles Checklist

Street Type	Guiding Principles	Rating	Notes
Urban Collar	Declutter the footway including the removal of guardrailing and rationalisation of signage;		
	Removal of subways and introduction of signalised at-grade pedestrian crossings on key desire lines;		
	Tighten junction turning radius';		
	Removal of roundabouts and introduction of signalised junctions;	N/A	No roundabouts originally present.
	Reduce carriageway width to a maximum of 6m in each direction (3m per running lane);		Lane width reduced to 3.3m, lane numbers reduced except at main junctions.
	Introduce segregated and stepped 2m cycleway;		Segregated stepped 3m bi-directional cycle lane on northern side of street.
	Define boulevard character through the introduction of new street trees and verge planting; and		
	Speed limit consistent at 30mph (or 20mph where possible) – with a lower design speed than present.		

Design Precedents

Deptford Market, London

West Bar, Sheffield

W8 Standish

Street Type: Settlement Centre

Standish is located to the north of Wigan. A relatively affluent village, the settlement centre features a compact mix of largely convenience retail and food & drink outlets. The centre sits on the junction of A49 Preston Rd and A5209 School Lane. The latter connects with M6 J27 around 2km to the west, which contributes to significant traffic flow through the village centre.

Key Issues & Opportunities Identified:

- Strategic traffic routing to/from M6 J27 travels through the centre of Standish.
- A combination of banned turns are in place at the A49/ A5209 junction. Stakeholder feedback was clear that these bans are regularly ignored. This conflicts with the pedestrian green time and creates a potential road safety hazard.
- The A49/ A5209 junction is a particularly poor pedestrian environment – very narrow footways, extensive guardrailing, and staggered crossings.
- There is a lack of places to stop and rest.

Primary Objectives:

Potential Schemes:

1) Transform A49/ A5209 junction – potentially to an 'Oxford Circus' style X-crossing with an all red phase.
2) A new public space at Market Place, fronting St Wilfrids C of E Church.


STANDISH
MINERAL LINE
6
CHURCH
OPPORTUNITY TO IMPROVE
THE SETTING OF HISTORIC
LANDMARK
CONSISTENT VIOLATION OF LEFT
TURN BAN - CONFLICTS WITH
PEDESTRIAN GREEN TIME
VERY NARROW FOOTWAY
STANDISH
LOCAL CENTRE
A5209
A49
ROUTE TO
M6 J27
6
KEY
KEY LAND USES
BUSES PER HOUR
SIGNALISED PEDESTRIAN CROSSING

W11 Hindley

Street Type: Settlement Centre

Hindley is a historic market town located in the east of the district of Wigan. It lies upon the intersection of A577 and A58, making it a pivotal point of movement between Wigan, Bolton and Leigh. The settlement centre spans along Market Street, and features a good mix of food & drink, convenience retail, and local independents. A Tesco Superstore is located just west of Market Street. Our work with stakeholders suggests the offer in Hindley is good, but Market Street is heavily dominated by vehicular traffic.

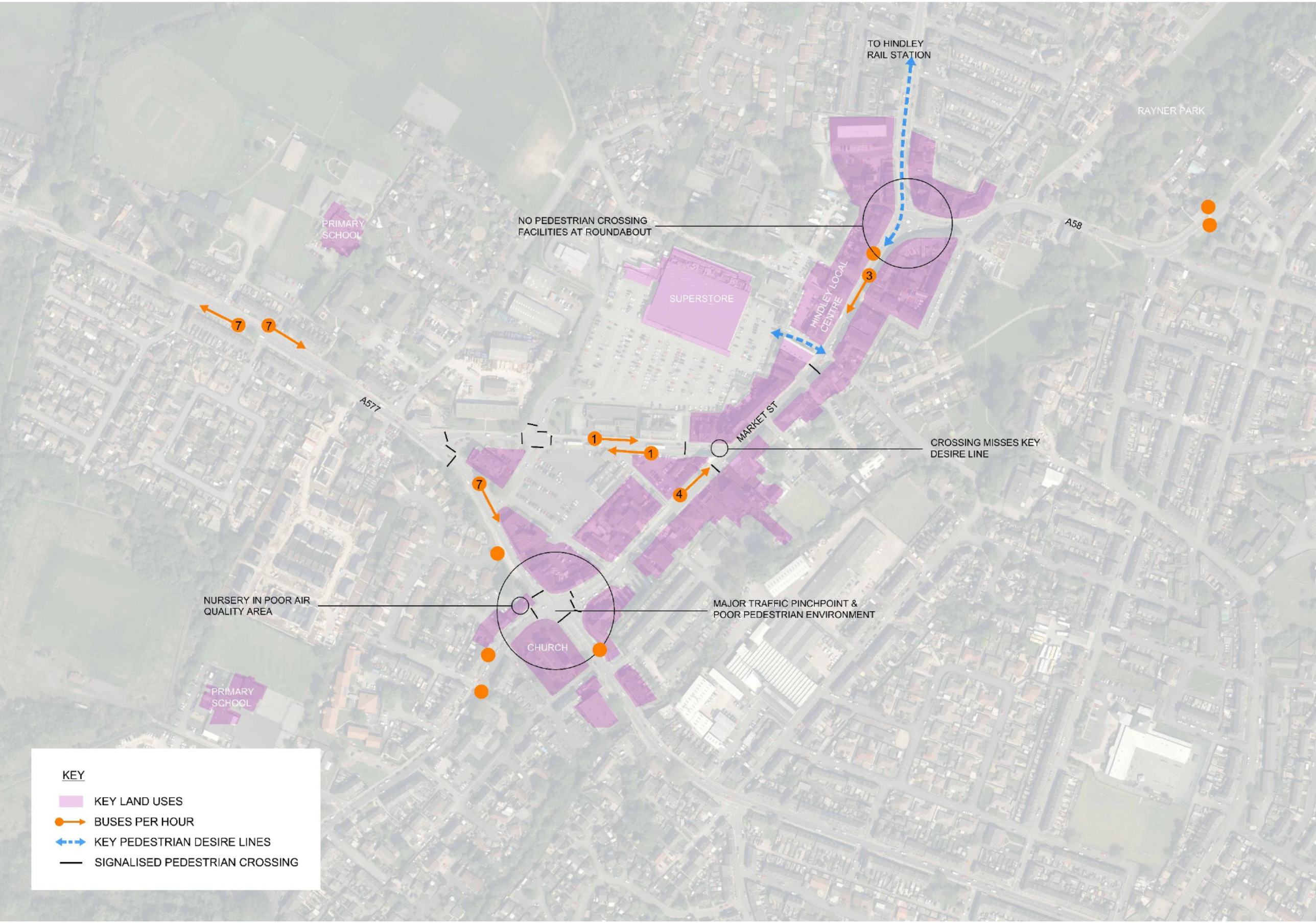
Key Issues & Opportunities Identified:

- Major traffic pinchpoint at the junction of A58 Market St/ A577 Wigan Rd. This area was flagged by bus operators as one of the worst junctions for journey time delay.
- High flows of vehicles along Market Street and a lack of pedestrian crossing points.
- Several historic landmarks are present along Market St, but the traffic engineered street character creates a poor setting.
- Market St/ Ladies Lane roundabout is a very poor pedestrian environment, where vehicles are able to turn at speed.
- There is a lack of places to stop and rest.
- Wigan-Bolton Strategic Route could help remove through traffic travelling through Hindley opening up more opportunities to create better environments for people.
- Providing enhanced public realm and an improved environment for pedestrians could be an asset in encouraging people from new housing allocations south of Hindley to visit the centre.

Primary Objectives:

Potential Schemes:

1) Transform Market St/ Ladies Lane junction. Reduce the design speed, improve pedestrian environment and crossing facilities, and create a stronger visual setting for St John's Church.
2) A new flexible town square space at Hindley Market Square.
3) Pocket park at the pedestrian link between Market St & Tesco.


TO HINDLEY
RAIL STATION
RAYNER PARK
A58
NO PEDESTRIAN CROSSING
FACILITIES AT ROUNDABOUT
PRIMARY
SCHOOL
SUPERSTORE
HINDLEY LOCAL
CENTRE
3
7
7
A577
MARKET ST
1
1
CROSSING MISSES KEY
DESIRE LINE
7
4
NURSERY IN POOR AIR
QUALITY AREA
MAJOR TRAFFIC PINCHPOINT &
POOR PEDESTRIAN ENVIRONMENT
CHURCH
PRIMARY
SCHOOL
KEY
KEY LAND USES
BUSES PER HOUR
KEY PEDESTRIAN DESIRE LINES
SIGNALISED PEDESTRIAN CROSSING

3. Implementation Strategy

Wigan

Ref	Scheme	Rationale	Cost	In the next 5 years we will…	
				Complete a business case for early delivery of.	Develop options for.
W1	Wigan - Orrell Cycleway	Use the opportunity afforded by the new M6/A49 link road to transfer strategic traffic away from this route and reallocate road space to create a new high-quality east-west cycleway.	High	✓	
W2	Orrell Local Centre	Support local economy and create a stronger local centre by improving the look and feel of this area.	Low	✓	
W3	Pemberton Local Centre	Use the opportunity afforded by the new M6/A49 link road to comprehensively rethink public realm here – supporting the local economy through placemaking.	Low	✓	
W4	Pemberton Neighbourhoods	Formalise existing advisory cycle lanes to create a new high-quality north-south route. Tie-in to completed cycleops scheme at Saddle Junction.	Low	✓	
W5	Wigan - Bryn Cycleway	Formalise existing advisory cycle lanes to create a new high-quality north-south route. Tie-in to completed cycleops scheme at Saddle Junction.	High	✓	
W6	Poolstock Neighbourhoods	Reducing rat-running and prioritising every day walking & cycling for local trips. Creation of safe play streets and neighbourhood pocket park greenspace. Implement bus priority to improve journey times, and push strategic through-traffic on to the new A49 Link Road.	Low	✓	
W7	Wigan Central	Reconnect the town's strategic assets, using the opportunity afforded by the new M6/A49 link road to transfer strategic traffic away from this route. Support and spark the regeneration of the Pier area, and future HS2 gateway at Wigan North Western – in line with the Town Centre Strategic Regeneration Framework.	High		✓
W8	Standish Local Centre	Reprioritise and create space for pedestrians. Support local economy and create a stronger local centre by improving the look and feel of this area.	Low	✓	
W9	Wigan - Standish Cycleway	Formalise existing advisory cycle lanes to create a new high-quality north-south route.	Medium	✓	
W10	Wigan - Hindley Cycleway	Formalise existing advisory cycle lanes to create a new high-quality east-west route.	Medium	✓	
W11	Hindley Local Centre	Support local economy and create a stronger local centre by improving the look and feel of this area.	Low	✓	
W12	Wigan – Leigh Sustainable Transport Corridor	Provide a transformational new public & sustainable transport link between Wigan & Leigh, and support new housing proposals south of Hindley.	High		✓

Low	Less than £5m
Medium	Between £5m - £10m
High	More than £10m

Streets for All.

STOCKPORT METROPOLITAN BOROUGH COUNCIL
SERVICES TO PLACE DIRECTORATE
STAGE 1 ROAD SAFETY AUDIT

For the attention of: [redacted] (Assistant Engineer – Wilde Consultants)

Scheme - Wigan Central Crossings

Date of Site Visit – 12th October 2021

Weather Conditions – Cloudy, overcast and light rain

Copies to: – [redacted] (Team Leader – Wilde Consultants)

The attached report is the Stage 1 Road Safety Audit for the above scheme based on the following information supplied to the Crash Investigation Team.

Item	Description	Supplied	Comments
A	Plans	Yes	See appendix A
B	Traffic Count Data	No	
C	Speed Count Data	No	
D	Accident Data	Yes	3 Years Collision data (supplied by SMBC)
E	Design Standards	Yes	TSRGD Highways Design Standard
F	Design Brief	Yes	785-011-WLD-DOC-004 (Rev B) Road Safety Audit Brief 28/09/2021
G	Other Data	No	

The Road Safety Audit has been conducted in accordance with the Highways England's Design Manual for Roads and Bridges document GG119 which supersedes the previous Standards HD19/15 and Advice Note HA42/94. It also has regard to the Institution of Highways and Transportation reference document, 'Guidelines for the Safety Audit of Highways'.

[redacted]
Corporate Director, Place
Highways and Transportation
Fred Perry House
C/o Stopford House
Piccadilly
Stockport
SK1 3XE

	Author	Feasibility & Road Safety Manager	
Signed	REDACTED	REDACTED	
Date	14th October 2021	9th November 2021	

Report title:	785-011 Wigan Central Crossings Highways Improvements
Date:	14th October 2021
Document reference and revision:	ES2/060 - 43855
Prepared by:	[redacted] – Feasibility & Road Safety Team (Stockport Council)
On behalf of:	Wigan Council ([redacted])

Scheme	785-011 Wigan Central Crossings Highways Improvements
Crash Investigation Team reference	ES2/060 - 43855
DOMS No.	ES2/18-19
Audit Brief Submitted by	[redacted] – Highways Engineer @ Wilde Consultants on behalf of Wigan Council
Contact	[redacted] [redacted]
Audit Team	[redacted] [redacted] [redacted] [redacted]

1.0 Introduction

1.1 This Road Safety Audit (RSA) Stage 1 report is for the project 785-011 Wigan Central Crossings Highways Improvements. The audit request was submitted by [redacted] on the 28th September 2021 on behalf of the Overseeing Organisation Wigan Council. The audit examines the road safety implications associated with the proposed improvements to cycling and pedestrian crossing facilities on Spencer Road West, Buckley Street and around the Kenyon Road / Mesnes Road junction.

1.2 The comments contained in this road safety audit are based on the information provided by Wilde Consulting Engineers Highways Team on the 28th September 2021 and site visits observations on the 12th October 2021. The audit report highlights any road safety issues observed at the time of the site inspection.

1.3 The report indicates each of the problems identified together with recommendations to solve or mitigate the problems, the Audit Team Statement and a schedule of documents reviewed.

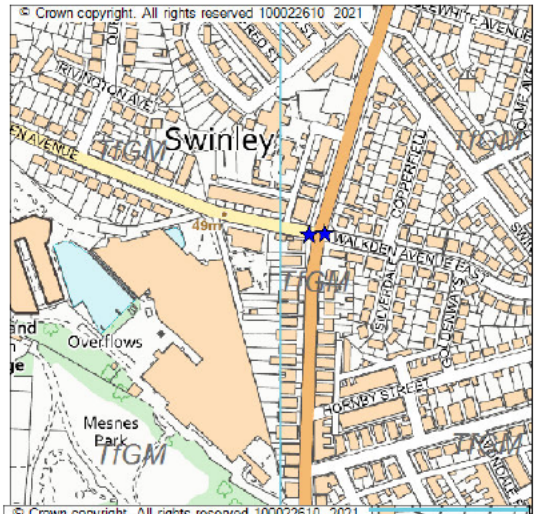
1.4 The comments and suggestions for road safety improvements made in this report are aimed to address matters that might have an adverse effect on road safety in the context of the chosen design. To clearly explain a safety problem or recommendation to resolve a problem, the Audit Team may, on occasion, refer to a Design Standard.

2.0 Road Traffic Incident Information

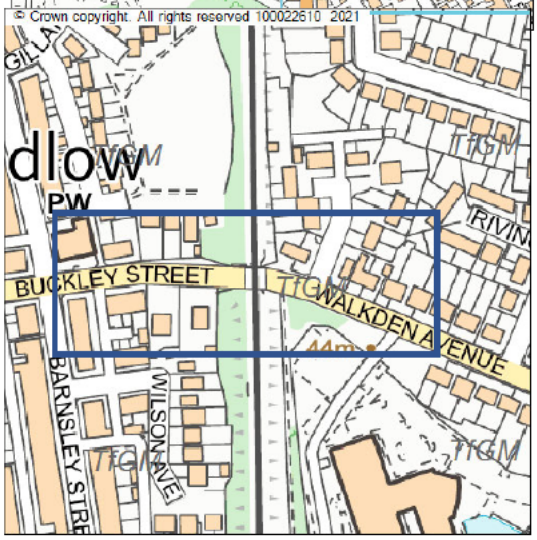
2.1 Road Traffic incident information relating to the most recent three years of data 01/04/2018 to 31/03/2021 was reviewed as part of the road safety audit. There were two recorded incidents within the vicinity of the schemes resulting in two serious injuries and two slight injuries casualties as detailed in the incident plots below.

2.2 **Kenyon Road / Walkden Avenue**
There were two recorded incidents at the junction; the first incident involved a taxi turning right from Mesnes Road onto Walkden Avenue colliding with a pedestrian crossing southbound and the collision resulted in serious injuries to the pedestrian.

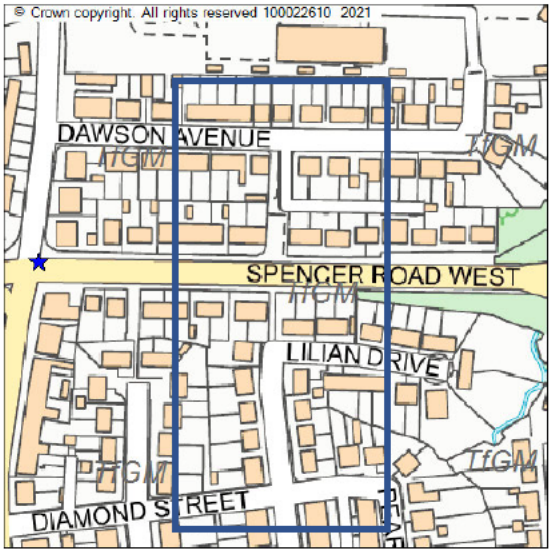
Incident two occurred when a car (V1) travelling east on Walkden Avenue disobeyed red traffic signal and collided with a car travelling south on Mesnes Road. The incident resulted in serious injuries to a passenger in v1 and slight injuries to the driver and passenger in v2.



2.3 **Buckley Street**
There were no recorded incidents within the bounds of the scheme



2.4 **Spencer Road West**
There were no recorded incidents within the bounds of the scheme



3.0 Audit Team

3.1 The members of the Audit Team were:

- **Team Leader:** [redacted] – Stockport Council
- **Team Member:** [redacted] – Stockport Council

3.2 RSA team have provided the Design Team with road safety specific curriculum vitae (CV) detailing training, continuing professional development (CPD) to demonstrate their competency for approval by the Overseeing Organisation. The competency of the audit team was approved by the Overseeing Organisation ([redacted] 21/09/2021) within the RSA brief.

3.3 [redacted] holds a certificate of competency in RSA in accordance with the requirements of the European Directive on Road Infrastructure Safety Management EC Directive 2008/96/EC [Ref 1.N.

3.4 The audit comprised an examination of the documents provided by the design team, which are listed in **Appendix A**. The documents consisted of three design proposals drawings and an audit brief supplied to give background information on the scope of the scheme.

3.5 The sites were examined by two members of the Road Safety Audit Team together on the 12th October 2021. The weather during the site inspection was cloudy and overcast with light rain showers and the road surface was wet. The site inspection was carried out between the hours of 11:00 and 13:00.

3.6 Photographs were taken, and notes were written in order to document impressions of the scheme prior to the writing of this report.

4.0 Terms of Reference

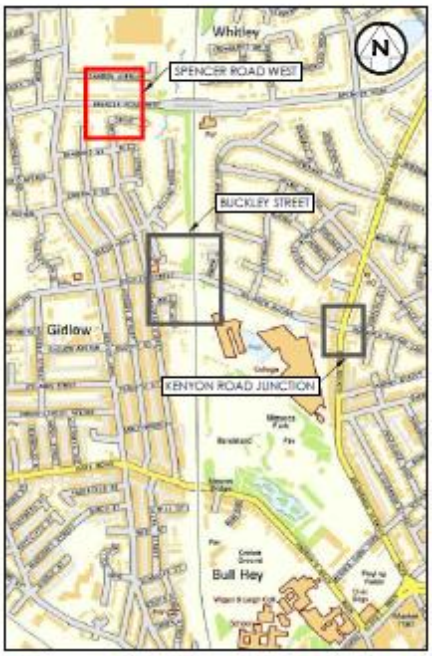
4.1 The audit is carried out in line with Highways England's Design Manual for Roads and Bridges document GG119 guidance / procedures for the Road Safety Audit. The safety audit is specifically an examination of the road safety aspects of the scheme design. It is not an appraisal of policy or strategic issues associated with the planning of the scheme. In the event of an accident and any resulting legal action, the Council, as Highway Authority, would have to defend its actions on the basis that it took such care, as in all circumstances was reasonably required, to ensure that the highway was not dangerous to road users. It is important, therefore that recommendations contained in the report are acted upon wherever possible.

4.2 All traffic sign and road marking diagram number references are made to The Traffic Signs Regulations and General Directions, 2016 (TSRGD).

5.0 Departures from Standards

5.1 The audit team were not informed of any departures or relaxations from Standards.

6.0 The Audit Brief & Scheme Description



6.1 The RSA brief was issued to the Audit Team on the 28th September 2021 by Wilde Consulting Engineers as the Design Team appointed by the Overseeing Organisation Wigan Council for the project: 785-011 Wigan Central Crossings Highways Improvements. The brief details requirements to carry out a Stage 1 Road Safety Audit in accordance with DMRB Standard GG119 to examine the road safety implications associated with the proposed Highways Improvements.

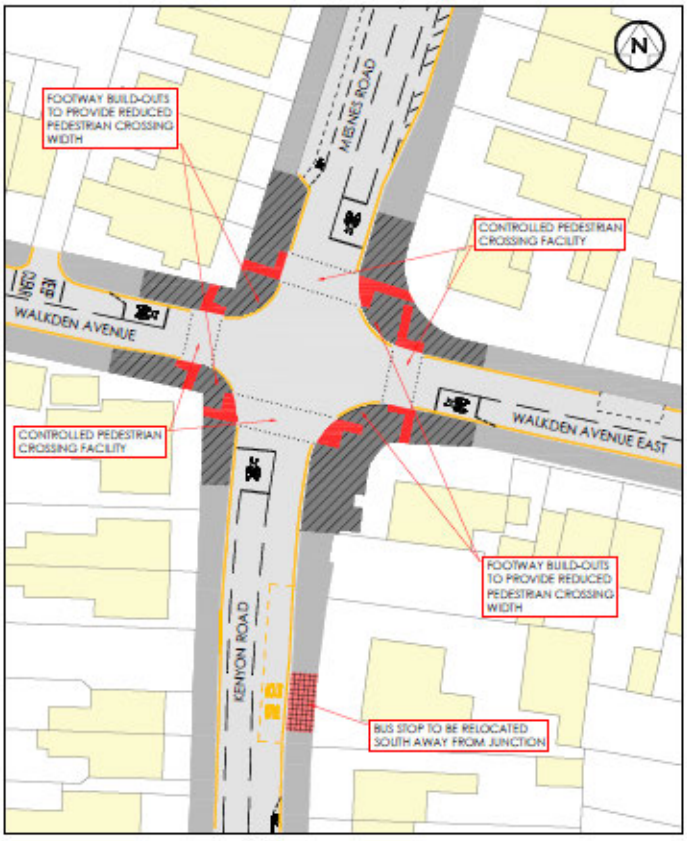
6.2 The three sites are located to the north of Wigan town centre, close to Mesnes Park. They are within the wards of Wigan Central and Wigan West and are contained within suburban residential areas.

6.3 The schemes consist of junction improvements, shuttle signal and toucan crossing installations with connecting cycle infrastructure.

6.3 The proposals for the individual elements are:

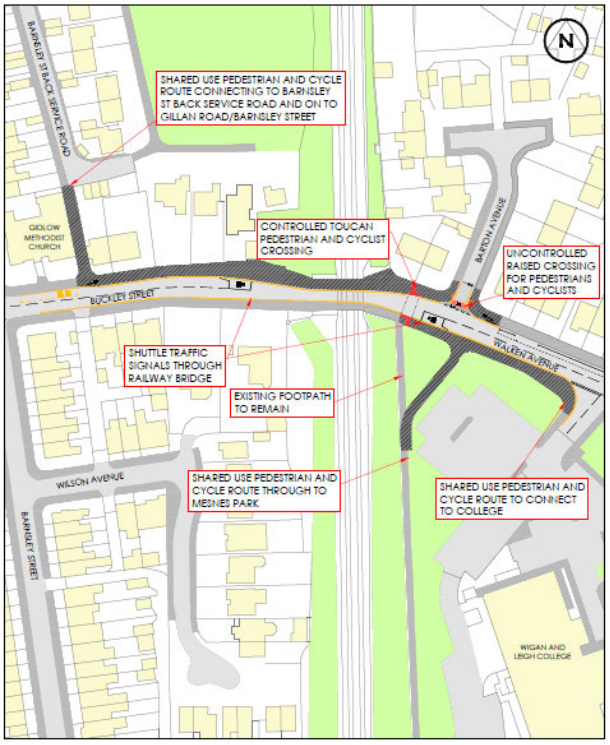
Kenyon Road Junction with Menes Road / Walkden Ave / Walkden Avenue East

- Introduce controlled pedestrian and cycle crossing facilities at the existing signals.
- Improved junction geometry and, if possible, operational capacity



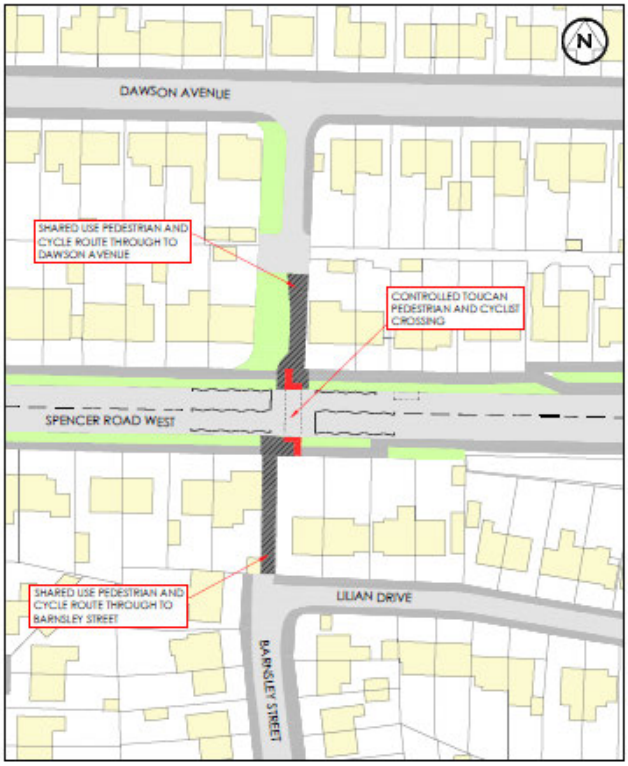
Walkden Avenue / Buckley St shuttle signals and pedestrian / cycle crossing

- Introduce two-way shuttle signals through the bridge on Buckley Street
- Introduce a controlled pedestrian and cycle Toucan crossing facility linking the proposed quiet street on Barnsley Street with Mesnes Park using shared use footways.



Spencer Road West pedestrian / cycle crossing

- Introduce controlled pedestrian and cycle Toucan crossing facility linking the proposed quiet street on Barnsley Street with Dawson Ave and the off-road network to the north.



7.0 Previous Road Safety Audits

7.1. This is a Road Safety Audit Stage 1 and therefor there have been no previous audits carried out on this scheme

8.0 ITEMS RAISED IN THE STAGE 1 ROAD SAFETY AUDIT

8.1 General

8.1.1 Problem 1

Location: Traffic signal positions and property 91 Buckley Street
Drawing: 785-011-WLD-DR-C-006
Summary: Increased risk of shunt type collisions as a result of inter-visibility between signals and egress from property 91

The audit team are concerned about the distance between the two stop lines, which is around 70 metres and the lines of visibility which are compromised by the tunnel wall. It is not clear how the secondary signal heads are going to be positioned but the audit team assume that they will be placed on the same side of the bridge as the primary signal head, as positioning of secondary signals should not be more than 50 m from their associated stop line. This would probably mean that vehicles exiting the property 91 would not have clear sight of signals when entering the junction and this may lead to conflict.

Recommendation 1

The audit team accept that this is a stage 1 RSA and signal positions will be finalised as part of the stage 2 detailed design. However, they feel that is prudent to identify the potential problems to the compromised visibility and potential lack of information to drivers entering on the wrong side of the signals (within the junction from property 91) at an early stage so the issues can be risk assessed and designed out. The audit team recommend that the stage 2 RSA includes information available to drivers egressing from 91 as to whether they will have a clear view to a signal head.

8.2 Alignment

There are no problems identified relating to alignment.

8.3 Junctions

There are no problems identified relating to Junctions.

8.4 Road Signs, Markings and Street Lighting

There are no problems identified relating to road signs and street lighting.

8.5 Vulnerable Road Users

8.5.1 Problem 2

Location: College Access Road and Gillan Road Passageway
Drawing: 785-011-WLD-DR-C-006
Summary: It is unclear where the segregated shared space starts and finishes which may lead to pedestrian/cyclist collisions.

There are two locations on the Buckley Street proposals (785-011-WLD-DR-C-006), at College Access Road and Gillan Road passageway where there are proposed sections of shared use cycleway and footway. However, there is no corduroy hazard paving to indicate where these sections start and end. This could lead to vulnerable road users, particularly blind or partially sighted pedestrians, unknowingly stepping into into the shared use section resulting in an increased risk of collisions between cyclists and pedestrians.

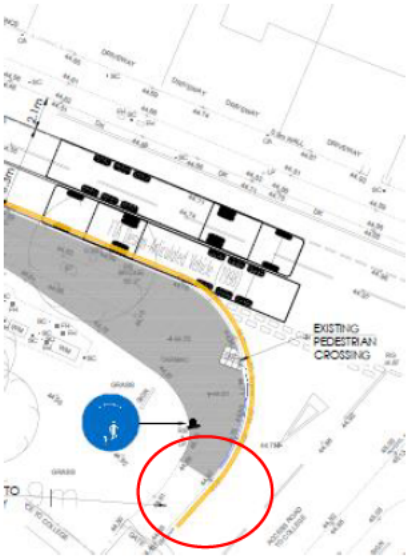


Image 1: *College Access Road*

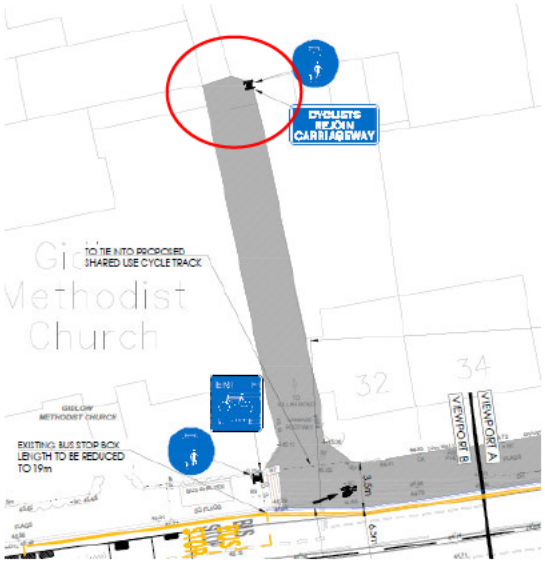


Image 2: *Gillan Road Passageway*

Recommendation 2
Provide corduroy paving to indicate the end/start of shared use space.

8.5.2 Problem 3

Location: Spencer Road West passageways leading to Dawson Avenue and Barnsley Street
Drawing: 785-011-WLD-DR-C-007
Summary: It is unclear where the segregated shared space starts and finishes which may lead to pedestrian/cyclist collisions.

There are two locations on the Spencer Road West proposals (785-011-WLD-DR-C-007), at the passageways leading to Dawson Avenue and Barnsley Street where there are proposed sections of shared use cycleway and footway. However, there is no corduroy hazard paving to indicate where these sections start and end. This could lead to vulnerable road users, particularly blind or partially sighted pedestrians, unknowingly stepping into the shared use section resulting in an increased risk of collisions between cyclists and pedestrians.

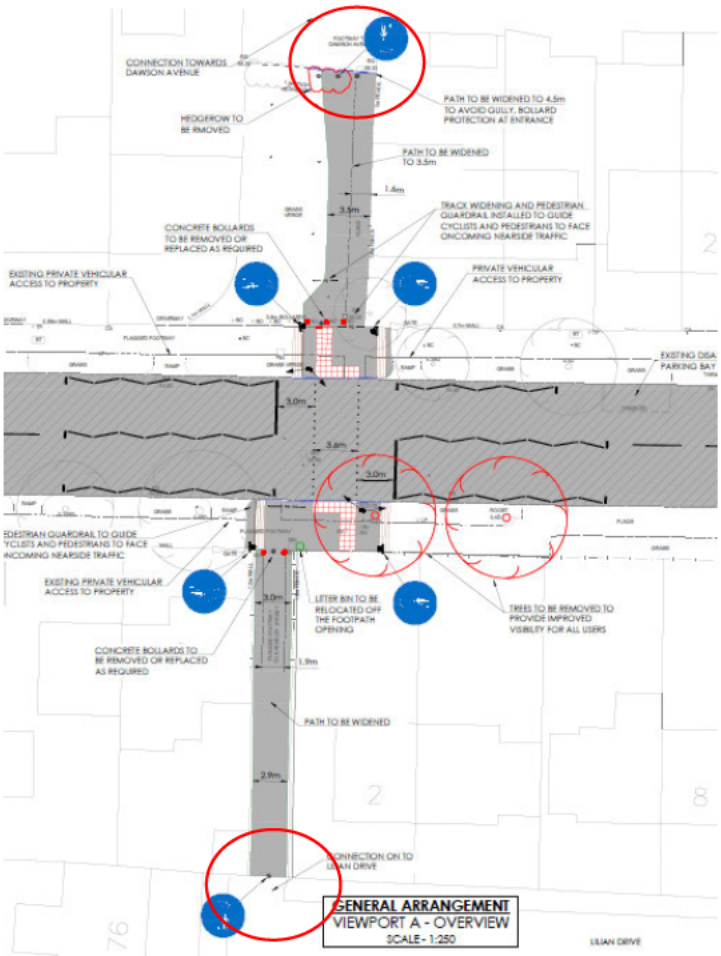


Image 3: *Spencer Road West passageways leading to Dawson Avenue (north) and Barnsley Street (south) – lack of hazard corduroy paving*

Recommendation 3

Provide corduroy paving to indicate the end/start of shared use space.

9.0 Further Safety Audits

9.1 The scheme should be subject to further Road Safety Audit Stage 2 (Detailed Design) and Stage 3 (Post Construction).

10.0 Conclusion

10.1 This Stage 1 Road Safety Audit recommends various actions, which should be addressed in the detailed design process. Where recommendations cannot be incorporated into the design, they should be documented in a road safety audit response report to record the road safety audit problems and recommendations, the Design Team and Overseeing Organisation responses and any subsequent actions. The response report should then be forwarded to the Road Safety Audit Team.

10.2 We certify that this road safety audit has been carried out in accordance with GG 119.

AUDIT TEAM LEADER:

Name: [redacted] Signed: [redacted]

Position: Senior Engineer / Transportation Officer Date: 14th October 2021

Organisation: Stockport Metropolitan Borough Council, Traffic Services, 2nd Floor, Fred Perry House c/o Stopford House, Stockport SK1 3XE

AUDIT TEAM MEMBER:

Name: [redacted] Signed: [redacted]

Position: Engineer / Transportation Officer Date: 15th October 2021

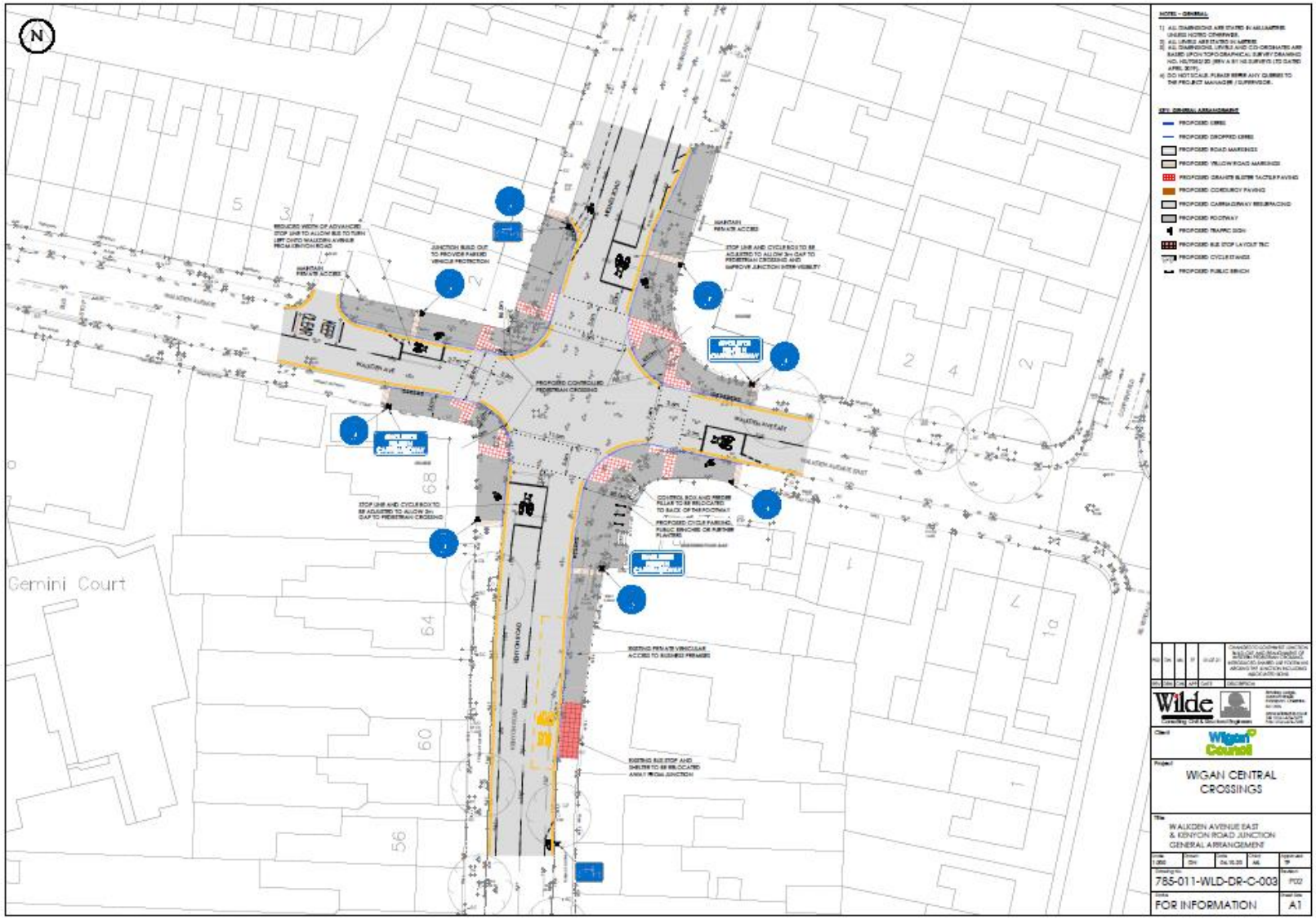
Organisation: Stockport Metropolitan Borough Council, Traffic Services, 2nd Floor, Fred Perry House c/o Stopford House, Stockport SK1 3XE

Appendix A: List of Documents supplied to the Audit Team

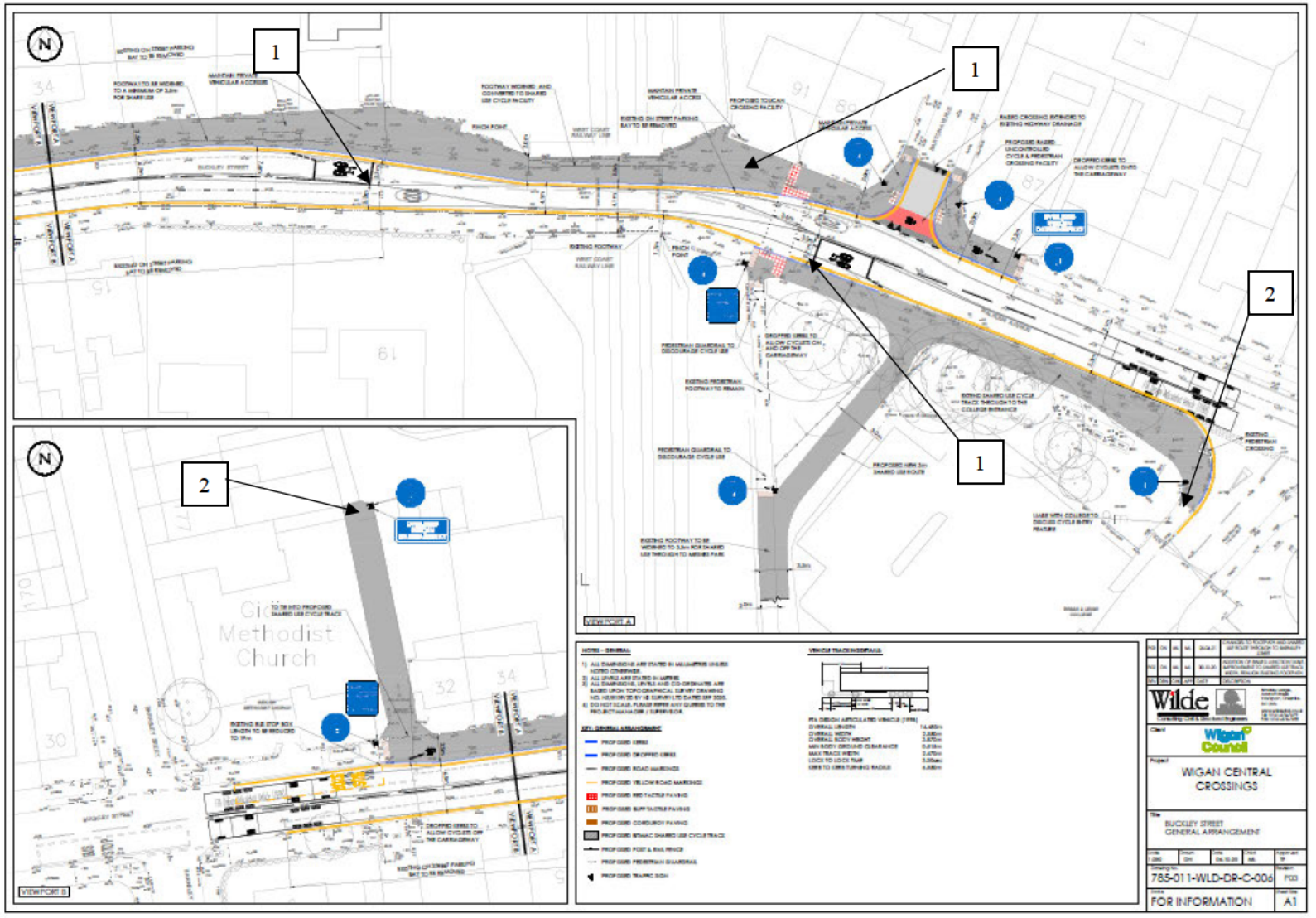
785-011 Wigan Central Crossings Proposed Highways Improvements Information Submitted 28th September 2021

Drawing Number	Drawing Title	**Size**	**Latest Revision**
785-011-WLD-DR-C-003	Walkden Avenue and Kenyon Road Junction Proposed General Arrangement	A1	01/07/2021 P02
785-011-WLD-DR-C-006	Buckley Street Proposed General Arrangement	A1	26/04/2021 P03
785-011-WLD-DR-C-007	Spencer Road West Proposed General Arrangement	A1	05/03/2021 P01
785-011-WLD-DOC-004 (Rev B)	Road Safety Audit Brief 28/09/2021		28/09/2021 Rev B

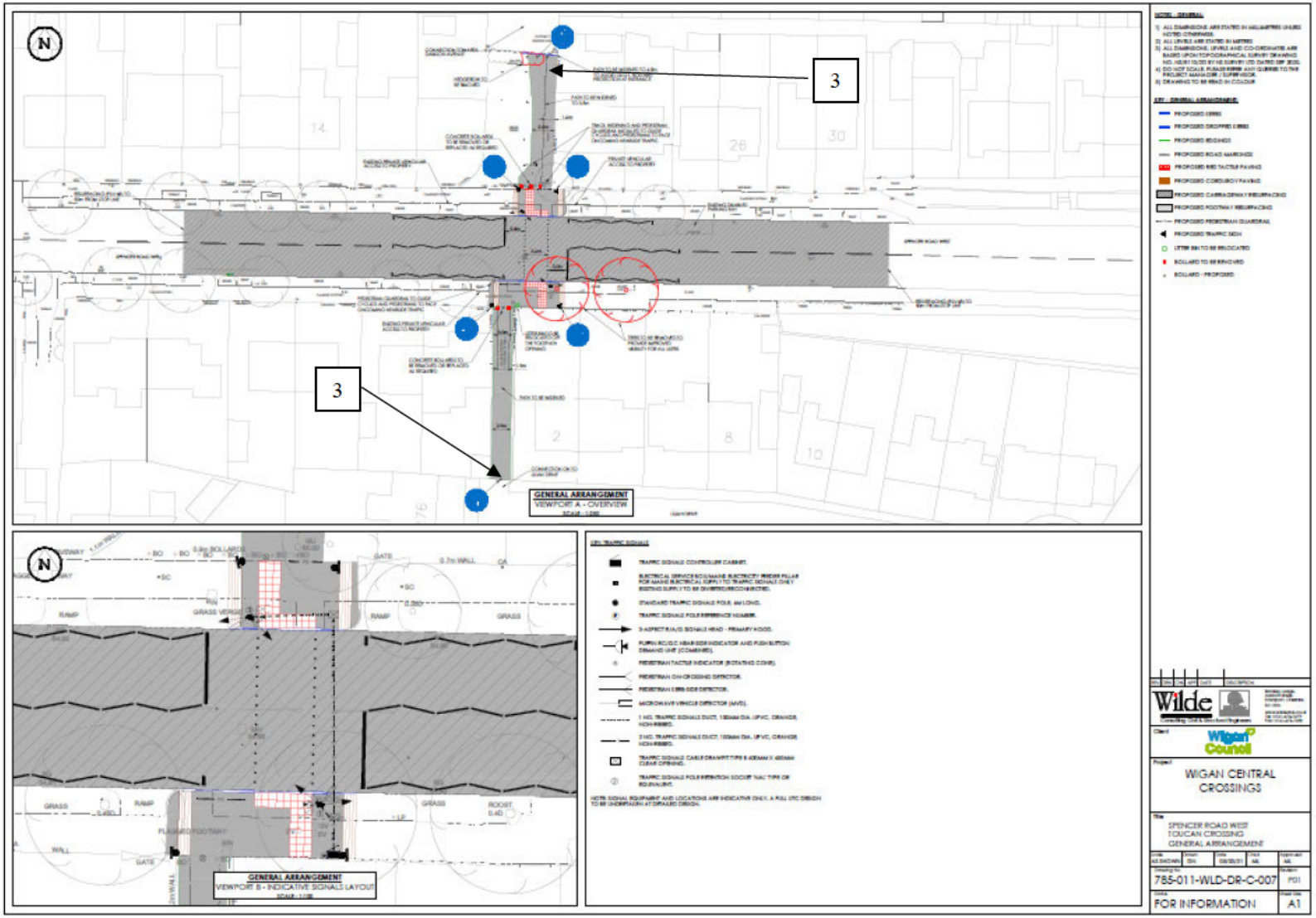
Appendix B –Problem Location Plan – 785-011-WLD-DR-C-003 Kenyon Rd Junction – No Problems Identified



Appendix B –Problem Location Plan – 785-011-WLD-DR-C-006 Kenyon Rd Buckley Street



Appendix B – Problem Location Plan – 785-011-WLD-DR-C-007 Spencer Road West



Section 1: Strategic Case

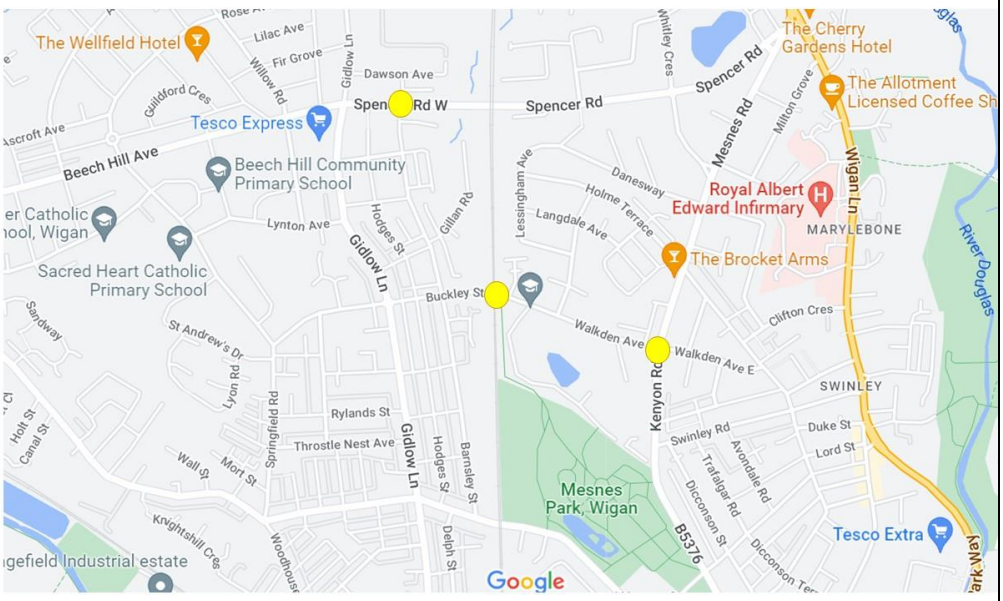
Priorities: **Description/Scope:** a) Set out the scheme context b) Outline the scope of the scheme c) Describe the main components and outputs expected	**Scheme context:** The scheme aims to address the gap in walking and cycling provision and to increase permeability on the network. The LCWIP development and Bee Network for Wigan has already identified this route as one of the key routes into Wigan Town Centre that are a priority for walking and cycling improvements. This scheme has close connections with Tranche 5 MCF Standish – Wigan – Aston network. The proposed crossing points will contribute to the **reduction in car dependency for short trips** by facilitating safe access to services and facilities within a mile of Wigan town centre. This will enable people to make a choice to travel more sustainably for shorter journeys to colleges, schools, health services and sustainable transport hubs that provide further connections across the borough and sub-region. Evidence from TfGM's Congestion Conversation (Autumn 2017) suggests that Wigan has the greatest proportion of frequent car drivers in GM, rarely using other modes such as walking/cycling[1]. 2011 Census data tells us that 64% of commuters travel by car through this area of Wigan, whilst only 2% travel by cycle (which is the UK average). However, according to the Propensity to Cycle tool (PCT), Wigan has the second highest propensity to travel by bike in Greater Manchester; the distances required to travel are quite short, and the borough as a whole is quite flat. The Walking and Cycling Index UK-wide survey reports that 73% of UK residents want to see "more frequent road crossings" to allow them to walk more; whilst 63% of UK residents support building "more tracks physically separated from traffic, even if this means less room for other road users". By developing safer infrastructure and making access to the town centre easier we will encourage more active travel; using the PCT we can see that the commuting cycling potentially could increase between 35% and 50% in this area of Wigan, depending on the 'zone' we are interrogating at route level. **Location**: Gidlow Lane and the surrounding areas are less than a mile away from Wigan Town Centre at its closest point. Proposed improvements will significantly improve access to Wigan Town centre, the education quarter, the bus station, and train stations. It will connect communities to the Northwest of the town, making walking and cycling easier and safer. The junctions proposed to benefit from improvements are: • **Kenyon Road** Google map places the junction here and the map co-ordinate is 53°33'19.7"N 2°38'06.1"W • **Buckley Street**

[1] TfGM R115 Congestion Conversation Wigan district appendix 2018: Mary-Jane Sturt

Google map places the junction here and the map co-ordinate is 53°33'23.8"N 2°38'26.0"W

- **Spencer Road West**
  Google map places the junction here and the map co-ordinate is 53°33'37.6"N 2°38'37.2"W

Figure 1: *Google map showing proposed crossing locations*



Improvements will enable easier and safer use by cyclists and walkers, so encouraging alternatives to the car. The local community would benefit from reduced traffic, and an improved flow of traffic which will improve air quality as well as improved cycling and walking facilities into Wigan town centre.

Background:
The need for improved crossing points at junctions in this area have been identified through the Bee Network and LCWIP development programme.

The area is immediately to the north of Wigan town centre, where there are established residential neighbourhoods who use Wigan as the main location for a range of services. However, access into the town is difficult from this location. All journeys involve crossing busy roads and junctions that currently have no pedestrian /cycle crossing facilities, and act as severance points and barriers to sustainable modes of transport. The result is that many residents use their car for short journeys into the town.

Gidlow Lane, Mesnes Road, Kenyon Road, Springfield Road, Frog Lane are all are busy roads connecting the residential areas to the north with the town centre. These roads also provide direct strategic walking and cycling routes, both to local neighbourhood facilities and Wigan town centre. There are a number of key crossing points which have been identified along these busy routes on Kenyon Road/Walkden Avenue, Buckley Street and Spencer Road West. The exact locations of the crossing points are noted above.

Gidlow Lane, Springfield Road, Kenyon Road and Mesnes Road are all busy radial roads connecting populations in the north of the borough to Wigan town centre and pose significant barriers and severance points to cyclists and pedestrians.

Proposals will **reduce severance impacts of major roads that pass through local communities;** the proposed Toucan or direct green man-controlled crossings will improve safety and efficient movement into Wigan.

The scheme will align with the following strategies:

TfGM 2040 Strategy	The scheme will help to deliver sustainable economic growth and access to opportunity for all by connecting people to employment and training opportunities, transport links and wider services. The scheme will help to create better places by reducing the dominance of cars and improving the environment.
Wigan Transport Strategy	The scheme will help to deliver sustainable economic growth and access to opportunity for all by connecting people to employment and training opportunities, transport links, and wider services. The scheme will help to create better places by reducing the dominance of cars and improving the environment.
The Deal 2030	Helps to deliver the Deal Principle of a Well-Connected Place through provision of safe crossing points and creating accessible routes for walking and cycling. There has been a recent refresh of the Wigan Deal and includes a focus on Sustainable Transport Planning
Made to Move Strategy	Helps to deliver the Goal of the Strategy by improving safety on busy roads and junctions to enable people to walk more. Also work with businesses to help achieve a culture shift on commuting and give people the choice to travel more actively. This will be done through a partnership approach to behaviour change and activation - working with our business team, public health, our Leisure & Wellbeing team, and our community cycling and walking champions.
Bee Network / Greater Manchester LCWIP	Development and delivery of identified routes and crossings, with high design standards to maximise accessibility, safety, and attractiveness.
Streets for All Strategy	Delivery of cycling and walking improvements, adopting, and applying the best practice advocated in the Streets for All Strategy.
GM Moving Strategy	Supports the Strategy's shared purpose through positive change to the lives of people who live close to Wigan town centre.
Wigan's Population (Adults) Health Strategy	Delivers the Strategy's aim by improving health outcomes for adult residents. Will support key themes of reducing carbon emissions, improving air quality, and making the healthy choice attractive and easy.

Wigan Outline Climate Change Strategy	The project delivers against the Strategy's theme of Air Quality and Transport by increasing the proportion of commuters walking, cycling, or using public transport.

B) Scope of the scheme

- Kenyon Road/Walkden Avenue
  - Existing traffic signals upgraded to include full pedestrian crossing facilities.
  - Widened footways around the junction to provide more space for pedestrians
  - Bus stop repositioned away from the junction (towards Wigan Town Centre on Kenyon Road)

- Spencer Road West
  - New Toucan crossing across Spencer Road West (between passageways from Dawson Avenue and Barnsley St)

- Buckley Street
  - New 'SHUTTLE' traffic signals under Buckley St railway bridge
  - Widening of footways for shared pedestrian / cycleway under bridge (linking passageway from Back Buckley Street / Gillan Road and the path to Mesnes park)
  - Toucan crossing on Walkden Avenue, connecting Mesnes Park path with shared use facility.

All crossing points are on roads which provide direct access into Wigan Town Centre, Wigan & Leigh College (and wider education quarter, including the Deanery High School), and the popular leisure venue of Mesnes Park. Providing these strategic safe crossing points will **improve walking and cycling access to key local facilities (jobs, education, health, and shops)** in Wigan Town Centre, all within a mile of the proposed crossing points. In addition, the side roads are difficult to negotiate for pedestrians and cyclists. Improvements will resolve these issues, enabling safer access for pedestrians and cyclists.

The proposed crossing points will **improve first and last mile access to public transport by walking and cycling.** This will be achieved through easier and safer access by residents living within a mile of Wigan town centre, which is the main hub for public transport, Wigan town centre has a new bus interchange and two train stations, both with excellent regional and national rail services.

This project provides a key link for the Council's Tranche 5 Standish/ Wigan/ Ashton project, which has secured gateway approval. It would link directly to these improvements from the north and provide additional links to the south connecting to a number of existing strategic networks that have recently been completed. These include new walking and cycling infrastructure at:

- Robin Park Road
- Saddle Junction
- Riverway at Darlington Street and King Street
- Victoria Street connecting to the Saddle
- Smithy Brook Road
- Poolstock Environmental Scheme

- The Road to Wigan Pier at Wallgate

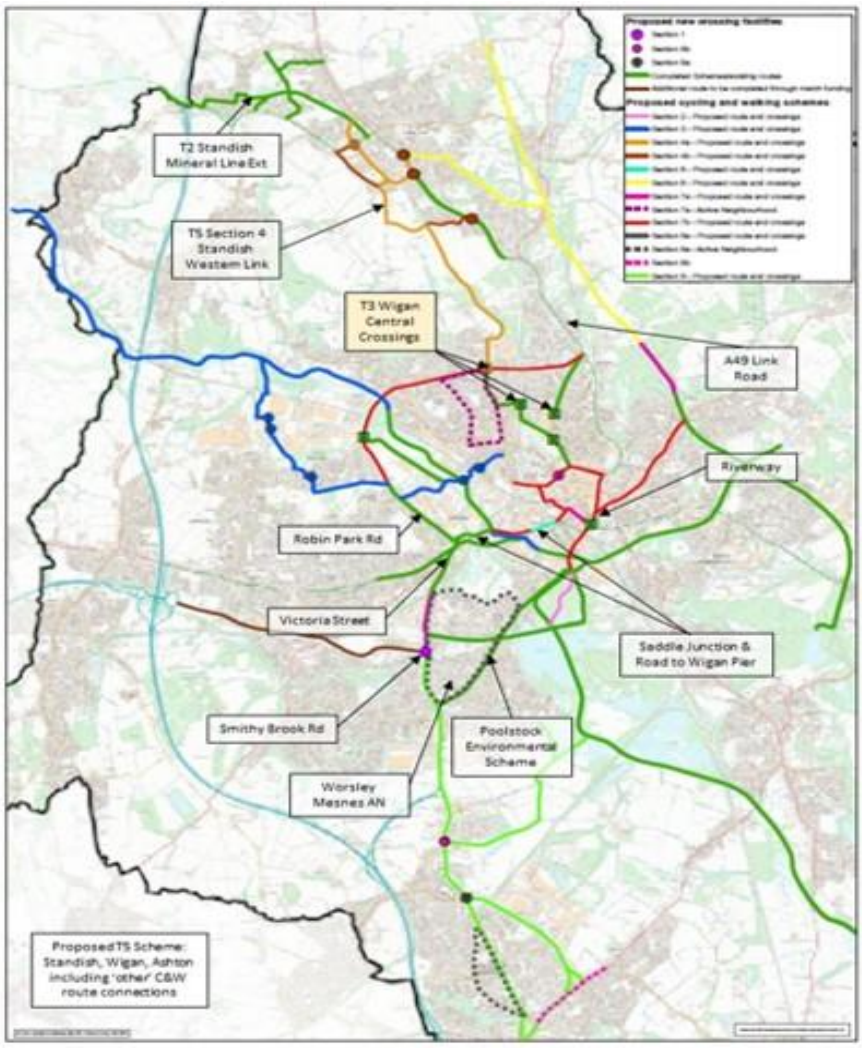


Figure 2: *Map showing proposed MCF T5 Standish, Wigan to Ashton scheme and the connections to existing, completed and other MCF schemes.*

For context on the wider Bee network plans for Wigan Borough, please refer to this interactive map:
Schemes near me | TfGM Bee Active

Image 1*: Robin Park Road cycle scheme*

Image 2: *Saddle Junction*

Image 3: *Riverway at Darlington Street and King Street*

Image 4: *Victoria Street connecting to the Saddle*

Image 5: *Smithy Brook Road*

Image 6: *Road to Wigan Pier*

C) Components and outputs

Main components and expected outputs

The scheme addresses a current gap in walking and cycling provision and will increase permeability on the Bee Network whilst providing benefits for the road network in Wigan.

Expected outputs

- New pedestrianised walking and cycling crossing facilities at Kenyon Road/Walkden Avenue enabling safer crossing.
- Install new toucan crossings in two locations
- Widen footways and introduce tactile paving to make it safer for pedestrians and cyclists.
- Footway level shared use path and new 'SHUTTLE' traffic signals under the railway bridge on Buckley Street to create a safer and more accessible environment for pedestrians and cyclists.

Priorities: a) Outline the scheme objectives and outcomes b) Provide a Logic Map and explain the causal logic of how the chosen intervention(s) lead to the identified outcomes c) State how the scheme relates to the MCF funding priorities d) Set out what will constitute successful delivery of the scheme objectives and the criteria which will be used to measure success	a). The scheme objectives (using the SMART model) are: • To reduce the risk and improve actual and perceived safety for pedestrians and cyclists at key junctions close to the town centre. • Reduce car use. • To increase walking and cycling along the route through the higher quality provision which the scheme will offer. • Increase the number of people accessing education, employment, and retail by active travel modes. • To see an improvement in traffic flows with new traffic signals in place. Expected outcomes of the scheme are as follows: **Immediate** • Reduced car dominance. • More efficient movement of vehicles through the junction. • Increased safety for walkers and cyclists crossing junctions. • Improved route continuity for people walking and cycling. **Intermediate** • Reduction in road traffic incidents at specific locations • Increased number of walkers and cyclists • Increased access to local and regional centres, retail, employment, and community services • Increased awareness of the Bee Network and other strategic walking and cycling routes. This awareness will be further improved through activation activities, including engaging with Wigan's Walking & Cycling forum. This will involve partners such as Leisure & Wellbeing, Public Health, and other interest groups as appropriate and will focus on behaviour change. **Long term** • Improved safety perceptions of walking and cycling. • Increased footfall on local high streets. • Reduced car use for short local trips. • Increased active travel modes for short local trips. Expected long term impacts of the scheme are as follows:

- Improved health outcomes for people with an increase in the number of Wigan residents reaching physical activity targets through active travel. Health data and access to health services can be made available from our public health colleagues.

- Improvement in air quality in proximity to the junctions due to a reduction in car use for short local trips and in idling vehicles stuck in congestion. We have a number of quality monitors in the area and can monitor levels of carbon dioxide from the NOX tubes.

- Reductions in KSI incidents due to separation of modal types, increased access to crossing points and reduced vehicle conflict. We will monitor safety by looking at the RTA data on a regular basis.

- Improve the active travel environment and provide people with a choice to leave the car at home for short trips; residents and students commuting and those attending events and activities in Wigan town centre, such as Pride, Christmas lights switch on and Wigan 10K.

- Logic Map

See logic map in appendix 1.1

- **MCF Funding Priorities**

The project meets the MCF funding priorities for Active Centres and Corridors as follows:

Develop walking and cycling improvements on major routes

The three junction improvements will provide key links to the town centre. Proposals will make the junctions, together with associated crossings, safe and attractive for pedestrians and cyclists.

Improved access to local centres by cycling and walking

This route links population clusters to:
- Wigan town centre, which is the local centre for goods, services, and employment,
- Transport hubs, (bus and train stations,)
- Other schemes forming a strategic network for cycling and walking:
- Tranche 5 Wigan to Standish Phase 2; Standish Western Route which is proposed to be completed by December 2023.
- Tranche 5 Leeds Liverpool Canal and Links scheme; proposed to be completed by May 2023.

The existing crossing points are currently inadequate or have none in place at all along these routes and will be improved. Providing these safe crossing points will help us to promote and enable people to choose walking and cycling to access the services and facilities in Wigan town centre.

Improve efficient movement of people across towns

The routes that meet at this junction are busy radial roads connecting populations to local facilities. By removing the physical and implied barriers, and addressing the severance points at these junctions, movement of people by vehicle and through active travel options will be improved.

The barriers include but are not limited to:

- A lack of a pedestrian crossing from Walkden Avenue across Kenyon Road
- A lack of facilities under the railway bridge
- A lack of crossing points along Spencer Road

Once implemented it is expected that local community centres such as churches, nurseries and schools will experience a drop in vehicle journeys for short distances (under 1.5 miles) due to the improvements in safe crossing points.

Reduce negative impacts of traffic on communities

The improved crossing points will:

- Support easier and safer sustainable travel by residents to destinations as supported by producing a holistic corridor
- Offer sustainable alternatives to the commutes by car along this route into Wigan,
- Improve air quality,
- Address, remove or reduce barriers to accessing local services and businesses,
- Support healthier lifestyles. This is notable due to the inverse relationship between the majority of deprived areas of Wigan suffering from higher negative impacts of motor traffic.

Further development and onward connections

Furthermore, connections can be made with the following:

- Tranche 5 Wigan–Standish–Ashton programme of works; the prioritised schemes are all due for completion before March 2024.
- Completed town centre schemes: Riverway crossing; Road to Wigan Pier and Saddle Junction segregated walking and cycling facilities; and Victoria Street junction improvements.

Plans for the future will make a connection via the college and through Mesnes Park towards the town centre. This central crossings scheme is the first phase of the route that connects Wigan to Standish. The second phase of works, the Standish Western Route scheme, will provide an improved off-road route that will connect people from the town centre at Gidlow Lane, through to Standish town centre. This proposed scheme is under development and currently programmed to be complete by March 2024.

D) Success indicators

Successful delivery of the scheme will be demonstrated by:

- Programme completed on time or at least with minimal delays.
- Budget is managed.
- Cycling and walking take up is improved.

	• Less road traffic accidents **Monitoring and Evaluation** Monitoring and Evaluation for this scheme will consist of: • Comparison of ATC data commissioned in March 2022. • Comparison of pedestrian and cycle data commissioned in March 2022. • Comparisons and analysis of RTA information. • Intercept surveys will be commissioned a year after the scheme is complete. • Activation activities, participation numbers and feedback. • Feedback from the walking & cycling forum. • Observing and engaging with Local Media.
Issues being addressed: a) Summarise the issue(s) the scheme seeks to resolve b) Describe how the scheme will address the issue(s), referring to the causal logic outlined in the Logic Map as necessary c) What is the impact of not delivering the scheme?	a) The scheme area is immediately to the north of Wigan town centre, where there are established residential neighbourhoods who use Wigan as the main location for a range of services. Access into the town is difficult from this area. All journeys involve crossing busy roads via junctions that currently have no controlled pedestrian/cycle crossing facilities. These roads and junctions act as severance points and barriers to sustainable modes of transport. Pedestrians and cyclists currently struggle to cross these busy junctions with the result that many residents use their car for short journeys into the town. Improved crossing points at junctions in this area have been identified through the Bee Network and LCWIP development programme as follows. Gidlow Lane is an advisory/quiet on-road cycle route; there are local shops located on Gidlow Lane to the south of the junction. There is a housing estate to the north of the junction and there are existing cycle paths north off Gidlow Lane which provide links to Standish. The Mesnes Road route is well used by pedestrians/cyclists travelling to and from the Swinley residential area into Wigan town centre and they currently struggle to cross the busy junction with Walkden Avenue. There is existing advanced cycle stop markings in places on all arms of the junction. At Springfield Road/Park Road there are local shops located on Woodhouse Lane to the south of the junction. There are residential properties surrounding the junction and St Andrew's Primary School is located close by. The MP, Local Councillors and residents have complained to the Council over several years about the danger for pedestrians crossing these junctions and have requested controlled crossing facilities. Issues the scheme seeks to resolve include: • Safety for pedestrians • An alternative route by foot and bike rather than car • Better access under the railways bridge for all travellers • Connecting people with communities by allowing safer crossing points to get to key destinations The scheme is aiming to resolve all of the above issues, with more information included in the below table:

Issue being addressed	How	Impact
Safety of pedestrians crossing busy junction points	Additional crossing points installed	Less RTA and safer movement crossing these busy roads and junctions
Cyclist conflict with traffic	Segregated cycle facility	Safer cycling and more uptake of cycling and walking
Air quality	New cycling and walking infrastructure	Allows more people to walk and cycle and less use of vehicles
Health and wellbeing	New cycling and walking infrastructure conneting to other town centre routes	Residents should be more inclined to walk or ride a bike if the safe infrastructure is in place.

b) There is currently a gap in the network in Wigan in this part of the town. This creates a severance in the Bee Network as there are a number of cycle routes in and around the rest of the town. The Wigan Bee Network Plan, included as Appendix 1.3 shows the existing cycle schemes that have been implemented and the proposed schemes for the whole borough. Completing this scheme will start to bridge the gap in the network. This scheme completes part of the Tranche 5 MCF strategic network. The impacts of not delivering this scheme will mean safety of both pedestrians and motorists will remain a concern and the priority for the area would remain for transport users not for walkers and cyclists.

Tranche 5 connections:

- The scheme will connect to Section 4: Wigan to Standish Phase 2 (also known as Standish Western Route); an improved off-road route running north to south from Standish, near Beech Walk, to Gidlow Lane.
- This scheme is currently in development, and we expect to complete this scheme by March 2024.

- From Gidlow Lane the proposed network will link into the town centre via Frog Lane/New Market Street. This is Section 7 (of Tranche 5) which proposes to provide additional links to complete the network around the town centre through the introduction of additional crossing points.
- These will ensure that all other previous funded cycle facilities (CCAG2/GDMW) are fully connected. We currently do not have funding for this section and will be looking to future funding pots to enable us to complete the network in the town centre.

These connections can be viewed in Figure 2: Map showing proposed MCF T5 Standish, Wigan to Ashton scheme and the connections to existing, completed and other MCF schemes.

<table>
<tr><td></td><td>c)
By not delivering the scheme, the barriers that currently severely limit walking and cycling into Wigan town centre from established residential neighbourhoods around the area will remain in place. Therefore, residents from these neighbourhoods will continue to use their car for short journeys (less than 1 mile) into Wigan town centre to access all the facilities and services located there.

As part of the MCF Tranche 5 programme, we have a wider aspiration to create a coherent and connected north to south cycling and walking network from Standish, through to Wigan and Ashton. We have received programme entry for our Tranche 5 bid to create this network. If this scheme were not delivered, we could not provide a fully connected route from north to south.</td></tr>
<tr><td>Strategic Benefits:
a) Describe each of the benefits (including any disbenefits) of the project, including the new capability, beneficiary, timescale, and measurement.</td><td>
<table>
<tr><th>Benefit</th><th>New capability</th><th>Beneficiary</th><th>Timescale</th><th>Measurement</th></tr>
<tr><td>Improved health and increased physical activity</td><td>Segregated cycle way and better crossing facilities</td><td>Residents</td><td>Within 12 months of completion</td><td>Monitor through cycle counts (manual and digital)</td></tr>
<tr><td>Reduced congestion</td><td>Better efficiency at junctions</td><td>Motorists and pedestrians as well as business users</td><td>Within 12 months</td><td>Scoot data, more people accessing the retail parks and less people ‘stuck in traffic’. Traffic queuing data to be assessed regularly.</td></tr>
<tr><td>Improved access and connectivity to job opportunities and services</td><td>Easier movement by all modes through junction</td><td>Businesses, job seekers and service users</td><td>Within 12 – 24 months</td><td>User surveys and activation activities</td></tr>
</table>
</td></tr>
</table>

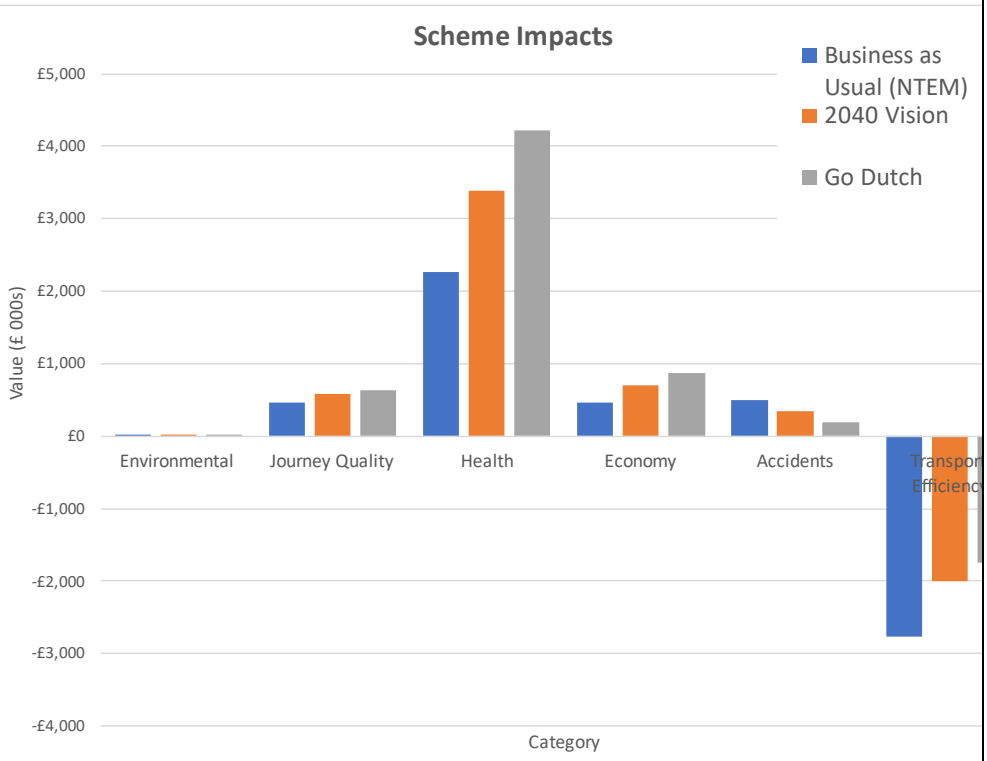
Section 2: Economic Case

NOTE: Amount of information provided should be proportionate to the value and complexity of the scheme

Value for Money statement: a) Utilise the TfGM PEAT tool to produce a Value for Money (VfM) statement, ranking the scheme as low, medium	**Value for Money Statement** This FBC is for the provision of improved and new crossings for pedestrian and cyclists in North Wigan focused around the Gidlow area. The scheme aims to address the gaps in walking and cycling provision and to increase permeability of the network, including by providing improved paths, wider footways, and new crossings at busy main roads. The appraisal anticipates that installing new signalised crossings will lead to more local walking and cycling trips to access local amenities, such as the Wigan & Leigh College site on Walkden Avenue. Extra demand will include some new journeys and some journeys which shift to being made on foot or by bicycle rather than other modes of travel such as car. The anticipated benefits align with the Council’s policy aims and the aims of Made to Move, with positive outcomes sought in relation to health, journey experience and the economic benefits.

or high according to the BCR b) Consider providing an Appraisal Summary Table c) Provide any additional supporting material which outlines the anticipated net benefits to users. For example, evidence from similar schemes.	The importance of localised upgrades which focus on reducing severance for active modes is a core Active Bee Network principle. This only increased as a result of the COVID-19 pandemic with people now placing even greater focus on opportunities to walk and cycle within local neighbourhoods and to access local destinations for leisure and exercise purposes. The FBC appraisal has made a proportionate, reasonable estimate of the levels of existing and future demand based on available data sources. - Existing demand is taken from observed count data collected during mid-March 2022. - Safety impacts have been assessed using recent collisions data. Highway impacts have been assessed based on a mix of traffic modelling analysis undertaken by TfGM UTC and delay calculations based on the March 2022 observed count data. The appraisal uses v1.7 of the TfGM Programme Entry Appraisal Tool (PEAT). This monetises most of the benefits the Scheme will achieve, although PEAT cannot monetise the significant benefits to people walking and cycling from reduced severance and better connectivity. In addition, the proposed uplift in cycling numbers is modest, especially at the shuttle working under the railway bridge, where the proposals significantly improve the cycling environment. The results of the analysis are summarised below and demonstrates that, under the core scenario, the scheme is forecast to achieve **a Benefit-to-Cost Ratio (BCR) of 1.08 in a Business-as-Usual scenario, and 3.45 in a 2040 Vision scenario**. The Go Dutch scenario offers the highest value for money but is considered unlikely to be the outturn. The table below is copied from PEAT and presents the appraisal results. The graph from PEAT is also copied below the table, summarising the benefits by scheme impact category. The PEAT Tools and all appraisal calculations are provided in Appendix 2.1.

Wigan Crossings, Core				Impacts	
		Analysis of Monetised Costs and Benefits (in £000s)		Business as Usual (NTEM)	2040 Vision
Environmental	Noise			£1.4	£1.9
Environmental	Local Air Quality			£4.0	£5.5
Environmental	Greenhouse Gases			£5.1	£7.2
Journey Quality	Journey Quality	Walking		£462.6	£571.2
Journey Quality		Cycling		£1.7	£6.9
Health	Physical Activity	Reduced risk of premature death		£2,193.7	£3,293.1
Health		Reduced morbidity		£68.0	£97.0
Economy		Absenteeism		£484.0	£721.9
Accidents	Accidents	From Active Mode Change		£20.9	£29.1
Accidents		From infrastructure changes		£703.0	£703.0
Accidents		From increase in cycling		-£53.5	-£195.0
Accidents		Change in walk, bus and rail casualties due to Cycle Trips		£2.9	£11.8
Accidents		From increase in walk trips		-£169.6	-£210.8
Transport Efficiency	Severance impacts			TBC	TBC
Economy	Wider Public Finances (Ind. Tax Rev)	Indirect Taxation Revenues		-£12.1	-£15.9
Economy		Health sector cost savings		£0.0	£0.0
Transport Efficiency	Transport Efficiency	Active mode	Congestion benefit	£248.3	£350.4
Transport Efficiency			Infrastructure	£0.7	£1.0
Transport Efficiency		Highway Impacts	Car	-£2,962.0	-£2,301.4
Transport Efficiency			Bus	-£54.1	-£53.2
	Present Value of Benefits (PVB)			£945.03	£3,023.79
	Present Value of Costs (PVC)			£877.10	£877.10
	OVERALL IMPACTS				
	Net Present Value (NPV)			£67.93	£2,146.68
	Benefit to Cost Ratio (BCR)			1.08	3.45



As is shown in the PEAT outputs, the main benefits of the scheme are likely to originate from improved health and wellbeing for the new pedestrians and cyclists. Broadly, additional exercise leads to healthier lifestyles which makes people less likely to suffer from illness and health issues. This predominantly shows itself in the appraisal as a reduced risk of premature death for an individual, and the economic benefits of a healthier workforce taking less time off work for sickness. The strategic case and logic map refers to the expected improvements of health and obesity issues in the local area, which can be positively impacted by the increases in active travel and movement.

The FBC appraisal also captures the improvements to the quality of a journey for new and existing pedestrians and cyclists, where the new infrastructure provides a significant enhancement in travel experience. In particular, users will benefit from the provision of signalised crossings with priority for active mode users which will reduce severance and enhance perceived and actual safety. However, the full benefit of the reduced severance is not captured by this appraisal so the actual benefits will be greater than that which can be monetised through PEAT.

The negative 'benefit' from Transport Efficiency arises due to a delay to motorised traffic introduced as a result of the traffic signals.

For the introduction of pedestrian signals at the Kenyon Road/Walkden Avenue junction and the new shuttle working for the rail bridge on Buckley Street, the appraisal inputs have taken modelled delays using analysis provided by the TfGM UTC team. For Spencer Road, an estimate has been made as to delays for traffic based upon the potential usage of the pedestrian crossing and the traffic levels observed.

It must also be noted that for WBC to achieve the uplifts in activity assumed in the appraisal, it is assumed that an engaging Activation Plan will be delivered, that will

	maximise the potential success of the scheme. Activation plans for the scheme are set out in the management case of the FBC. Interpretation of value for money must note the variance in value for money results between the 2040 Vision and Business as Usual NTEM scenarios. These scenarios are variants built into TfGM's PEAT tool to reflect alternative futures in terms of demand growth trends, e-bike usage, and accident rates. In terms of growth, NTEM is based on a continuation of existing trends whereas the 2040 Vision scenario advised by TfGM aligns to Made to Move policy and the Right Mix vision for GM where 50% of journeys are to be made by non-car modes in 2040. The 2040 Vision scenario also reflects an acceleration in the reduction of casualty rates towards the GM 2050 Vision Zero whereas the NTEM scenario extrapolates historical casualty rates. In addition, to the standard PEAT scenarios, the uplift assumptions have been altered to provide a low and high growth forecast of uplift in active travel, utilising the relationships between low, middle, and high outputs of the DfT's Emergency Active Travel uplift tool, applied to the core uplift which has been taken from comparative local schemes. Only the low growth scenario (under business as usual) presents a BCR that is lower than 1, where the highway disbenefits significantly counter the walking and cycling benefits. The value for money conclusions could differ depending on how the outturn situation occurs, however the analysis does suggest that the investment will be very robust based on the PEAT scenarios tested. These present possible alternative futures rather than a certain result but these outputs demonstrate that the scheme is a sound investment in all situations barring a very pessimistic scheme, combined with a lack of progress in terms of the Council and TfGM strategy for uptake of active travel. The quantified assessment should be considered alongside the wider impacts which are not monetised in the appraisal. An Appraisal Summary Table for the core NTEM scenario is included with this FBC (Appendix 2.1) which summarises the overall results of the scheme appraisal and value for money assessment.
Description of (dis)benefits: **a) Describe each of the benefits (including any disbenefits) of the project, including the new capability, beneficiary, timescale and**	**Description of (dis)benefits** **a) Describe each of the benefits (including any disbenefits) of the project, including the new capability, beneficiary, timescale, and measurement &** **b) Prioritise the benefits in terms of most significant impact** **The key predicted impacts which are quantified in the appraisal are:** • Health benefits, in terms of reduced risk of premature death, reduced morbidity and reduced absenteeism, as can be expected due to an increase in walking and cycling trips. • Improvements to journey quality as a result of the improved walking and cycling facilities for new and existing users. • Collision rate reductions from the decrease in car use, due to mode shift towards walking and cycling.

measurement **b) Prioritise the benefits in terms of most significant impact** **c) Consider using a Benefits Map or Benefits Realisation plan** **d) Describe the approach taken to quantify the scheme's benefits and (where applicable) disbenefits** **e) Provide evidence which describes each of the qualitative and quantified benefits to users and how they represent value for money**	• Environmental benefits in terms of noise, local air quality and greenhouse gases which can result from fewer car trips being made (as a result of modal shift towards walking and cycling). • There is a disbenefit arising from highway impacts on road users (cars and buses), due to additional delay created by the new (signal-controlled) crossings and the signalisation of the Kenyon Road / Walkden Avenue junction. • Wider changes in collision rates which could result from the forecast rises in walking and cycling – albeit safety issues are mitigated through the design and safety audit process as much as possible. • Reduction in Wider Public Finances, as a result of reduced fuel consumption due to mode shift towards walking and cycling. • Collision rate reductions due to the infrastructure changes, as a result of the introduction of signalised crossings for cyclists and pedestrians. **The key predicted impacts which are not quantified in the appraisal are:** • The reduction in severance due to the creation of safe crossing points (over and above the journey quality benefits for pedestrians, which is valued). • Benefits to cyclists from the new crossings (PEAT is only able to value crossing benefits to pedestrians). • Any public health or obesity benefits, resulting from increased active travel. • Improved perception of walking or cycling within the local community due to the scheme and the overall enhancement network cohesion and travel opportunity. • Changes in highway reliability which can result from mode shift from motorised modes in favour of walking and cycling. • Changes in severance, townscape, or biodiversity. • Changes in social cohesion, due to the improved network integration. • Changes in access to public transport services. • Highway impacts on road users (cars and buses), due to additional delay created by any increase in demand for existing crossings within the immediate area or surrounding areas. • Any adverse impacts for users during the construction period. **Some of the main direct benefits of the scheme are predicted to be:** • More active population. • Fewer short journeys made by car resulting in less road traffic. • Reduced air pollution and adverse noise impacts. • More people accessing local services. • Wider accessibility by no-cost transport options, and more opportunity for people who do not have access to a car. **Beneficiaries will include local residents and businesses.** **Dis-benefits have been identified as:** • There is the potential that collision rates involving pedestrians and cyclists could increase and highway disbenefits on surrounding roads could increase in locations away from the immediate scheme works, if

the number of people walking and cycling in the neighbourhood increases.

- Highway journey times will be made slightly slower, due to the additional delay incurred when vehicles have to stop to allow people to cross the road at the new controlled crossing points and at the shuttle working arrangement.
- The scheme will increase future maintenance requirements for the Council given the new crossing infrastructure provided.

Please refer to the logic map in Appendix 1.1 and the Monitoring and Evaluation Plan at Appendix 3.2 for further details of benefits, timescales, and measurement.

The table below shows the scheme benefits in priority order.

Benefit	Impact
More active population	Less pressure on the health service as residents who walk, and cycle regularly are healthier and live longer. If people are more active, they will use their car less which will also impact on congestion
Reduced air pollution	Less pressure on the health service as residents are healthier. Healthier population will have higher levels of employment
Fewer short journeys made by car resulting in less road traffic	Reduced congestion, and NOx emissions with the resultant positive impacts on health.
Wider accessibility by no-cost transport options, and more opportunity for people who do not have access to a car	Assists low-income families to access local amenities, services, and employment opportunities.

c) Consider using a Benefits Map or Benefits Realisation plan

Please refer to the Logic Map at Appendix 1.1.

d) Describe the approach taken to quantify the scheme's benefits and (where applicable) disbenefits

Appraisal Structure

Scheme impacts are appraised using 6 separate PEAT tools. These set out a range of scheme impacts for different sections of the overall scheme. A further PEAT contains the scheme costs. The results from the 7 PEAT tools are aggregated together in a macro-enabled 'Summary' workbook. All files are included in structured folders in Appendix 2.1 to the business case submission for review.

Baseline Walking and Cycling Demand

Baseline walking and cycling demand has been estimated, based on counts observed at four sites across the scheme area, as shown in the map below. Data was collected 8th-14th March 2022. This data was interpreted to identify an average daily use which is applied in the PEAT tool as existing demand. The count sites were selected to provide a good overview of the different routes **and links**

which the scheme will upgrade and enable. Data is analysed for the 0700-1900 period only and so will be somewhat of an underestimate of existing use as we can reasonably expect some use outside of these hours (in particular in summer when daylight continues later into the evening). However it was considered to be suitable for the purposes of this analysis and provides additional robustness to our conclusions.

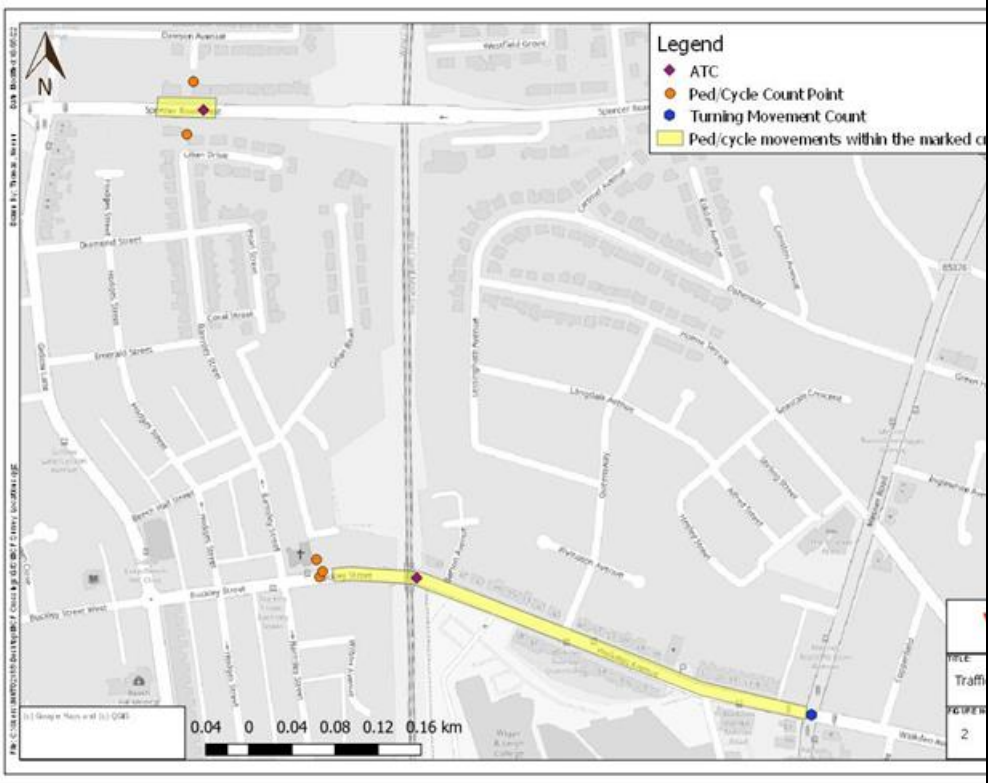


Figure 3: Count data sites

Flow diagrams were prepared from the count data for each of the locations to help build up estimates of the existing number of trips, and potentially, additional trips reassigned from other routes, if any.

For each of the site locations, trips were analysed for Weekdays (Monday to Friday) and Weekend days (Saturday and Sunday). A weighted average of this data was calculated to derive the existing number of trips that has been input to the PEAT.

The table below summarises the daily average existing trips at each location. Average weekday trips have been growthed to total weekday trips and the average Sunday trip is growthed to total weekend trips to form the overall total weekly trips estimate (7-days). This was then averaged to derive an Average Daily Existing Trips.

	Existing number of Trips				Average Daily Existi Trips	
	Cyclists		Pedestrians		Cyclists	Pedest
	Weekday	Weekend	Weekday	Weekend		
Spencer Road West	7	5	216	249	7	22
Buckley Street	4	4	466	343	4	43
Walkden Avenue	2	2	228	168	2	21

Kenyon Road	58	42	1,081	823	54	1,007

*** All values above are for the 12-hour 0700-1900 period only and so are likely to under-represent the full demand.**

As the Kenyon Road junction crossings upgrades would not be used by all users passing through the junction (only those crossing on relevant arms with new signalised crossings), only 50% of the turning movements were included in the appraisal demand inputs within PEAT.

Future Walking and Cycling Demand

Future walking and cycling demand reflect an uplift in existing use for both modes.

Forecasts for a core scenario are based on uplift percentages from similar studies conducted in Manchester and other parts of UK with similar proposals and populations impacted. Based on DfT's "Analysis and synthesis of evidence on the effects of investment in six Cycling Demonstration Towns" document published in November 2009, a 25% uplift has been considered for cycling. The walking uplift of 25% has been used based on the document "The Pedestrian Pound" published by Living Streets, which accounts for the Public Realm improvements in Greater Manchester.

Additional trips have been identified that are existing and likely to switch to the new infrastructure. These assumptions are shown below.

Location	Additional Trips Reassigned		Comments
	Cycling	Walking	
Spencer Road	0	0	No additional reassigned trips are considered to use this intervention
Buckley Street	7	268	Assuming 50% of the total users from the southern footway will use the proposed interventions
Walkden Avenue	1	140	Assuming 25% of those people crossing nearby will use the intervention
Kenyon Road	2	113	Assuming 25% of those people crossing Walkden Avenue (away from the junction) will use the intervention

Journey Quality / Ambience Impacts

Journey quality uplifts have been selected within the PEAT tool which are considered to be applicable. These primarily relate to improvements in the provision of a green man crossing, pavement widths, surface quality, and signage.

Safety

Collision data has been analysed for the Dec 2015 – Dec 2020 period as the before scheme period.

Except at Kenyon Road, no other locations showed collisions have occurred which could reasonably have been avoided if the proposed infrastructure improvements had been in place.

One slight collision and two serious collisions were recorded along Kenyon Road in the past 5 years. One serious collision involving a pedestrian could have **been**

preventable if the proposed signalised crossings had been in place to assist crossing movements.

Highway impacts

For this scheme, the highway impacts for road users (cars and buses) which have been quantified are any additional delays which may be created on link sections because of the following:

- Provision of a new signalised crossing and shuttle working for vehicles for Walkden Ave/Buckley St.
- Addition of pedestrian signal stages at the Kenyon Rd/Walkden Ave crossroads junction (already signalised for traffic).
- Installation of a new signalised crossing at Spencer Rd.

The main highway impacts of the scheme are due to the introduction of the new shuttle working arrangement on Buckley St, and the inclusion of new pedestrian stages at the Kenyon Road crossroads. These have been modelled by TfGM. The Spencer Road West crossing is not modelled due to it being a stand-alone crossing.

The modelled journey time changes and disbenefits which may be generated by both scheme elements have been included as highway impacts in the PEATs, in all scenarios, including the core assessment. The total additional delay is entered in pcu hours, as well as the delay per bus user. Frequency and occupancies provided by data from the TfGM appraisal team.

The junctions have been modelled in LINSIG using a combination of survey data from 2019 at the Kenyon Road junction, and survey data from 2022 at the shuttle-run (supplied by WSP). Please see Appendix 2.2 for the base data.

The modelling indicates there will be additional delay for all vehicles and a build-up of queuing due to both measures is expected.

- The shuttle running under the rail bridge is introducing a new 'red stop' signal with traffic constrained to a single lane rather than flowing unopposed.
- The crossroads will have a new 'all red' phase added to the signal ops.

The modelled outputs received from TfGM is provided below:

Total Delay (pcu hrs)	Time period	Existing 104s cycle	Proposed (ped stage alternate cycles) 104s cycle
Kenyon Rd / Walkden Ave crossroads	**AM Peak**	8.3	17.8
	PM Peak	8.3	13.6
Buckley St shuttle run	**AM Peak**	0.0	2.5
	PM Peak	0.0	2.3

Link Description AM PEAK	Existing 104s cycle	Proposed (ped stage alternate cycles) 104s cycle	Difference in Delay (s/pcu)

	Deg of sat (%)	Delay (s/pcu)	Qu len (m)	Deg of sat (%)	Delay (s/pcu)	Qu len (m)	*Used in bus impact appraisal*
Mesnes Rd (all mvmnts)	66	24	43	67	32	76	20.5
Kenyon Rd (all mvmnts)	48	19	27	79	52	70	
Walkden Ave (all mvmnts)	69	25	41	79	41	67	-
Walkden Ave E (all mvmnts)	12	14	6	13	25	12	-
Buckley St EB (at shuttle)	-	-	-	57	23	34	21.0
Buckley St WB (at shuttle)	-	-	-	55	19	56	

Link Description PM PEAK	**Existing 104s cycle**			**Proposed (ped stage alternate cycles) 104s cycle**			**Difference in Delay (s/pcu)**
	Deg of sat (%)	**Delay (s/pcu)**	**Queue len (m)**	**Deg of sat (%)**	**Delay (s/pcu)**	**Queue len (m)**	***Used in bus impact appraisal***
Mesnes Rd (all mvmnts)	50	22	20	69	52	55	19.5
Kenyon Rd (all mvmnts)	69	20	51	70	29	89	
Walkden Ave (all mvmnts)	68	30	35	70	42	67	-
Walkden Ave E (all mvmnts)	19	18	9	20	30	19	-
Buckley St EB (at shuttle)	-	-	-	38	19	20	17.5
Buckley St WB (at shuttle)	-	-	-	33	16	25	

The PEATSs use the model results for when the ped stage is called every other cycle, which feels like a reasonable worst-case assumption based on existing and forecast demand. Should the signals be activated more frequently this would obviously mean a greater level of highway delay impact which would have to be

proactively managed by the Council and UTC to ensure network conditions are maintained at an acceptable level.

A version of the Crossing Delay Tool (v3) developed with TfGM has been used to estimate additional delay created by the new Spencer Rd crossing; using Bus Frequency, Bus Occupancy, Total Modelled Journey time and Travel Time per Public Transport vehicle for the Spencer Road and Walkden Avenue crossings inputs.

The crossing delay tool is used for both Weekday and Weekend traffic counts to estimate the separate journey times during each time. Total traffic across each peak is obtained from the 7-day ATC data received.

The results of the crossing delay tool are entered into the relevant PEAT assessment, with separate calculations produced for the AM Peak, Interpeak and PM Peak periods and then annualised in line with the default PEAT parameters. Future year traffic within the appraisal period is accounted for using default PEAT parameters that include NTEM and TfGM's Spatial Theme. This assumes a decline in car use and an increase in bus use, in line with the Greater Manchester Transport Strategy 2040.

Other PEAT Assumptions

- Costs exclude development costs already "sunk" (which total £126,387).
- The QRA [redacted] is removed and replaced with optimism bias of 20% as per TAG A1.2
- Maintenance is allowed for as 5% of capital costs every 10 years for the scheme life.
- The analysis applies 364 days per annum, other than where weekend only (253 days) or weekend days only (102 days) is indicated.

e) Provide evidence which describes each of the qualitative and quantified benefits to users and how they represent value for money

Benefit	How it represents value for money
Fewer short journeys made by car	Reduced congestion, and NOx emissions with the resultant positive impacts on health.
More active population	Less pressure on the health service as residents who walk, and cycle regularly are healthier and live longer.
More people accessing local jobs	Reduced unemployment and additional spend in the local economy. People in work are healthier
Increased spend in retail centres	Improved sustainability of retail businesses
Reduced air pollution	Less pressure on the health service as residents are healthier
No-cost transport options	Reduced unemployment and additional spend in the local economy.

	Journey Quality / Ambience Impacts Journey quality uplifts have been selected within the PEAT tool which are considered to be applicable. These primarily relate to improvements in the provision of a green man crossing, pavement widths, surface quality, and signage. **Safety** Collision data has been analysed for the Dec 2015 – Dec 2020 period as the before scheme period. Except at Kenyon Road, no other locations showed collisions have occurred which could reasonably have been avoided if the proposed infrastructure improvements had been in place.

To assess the robustness of the conclusions drawn from the core scenario it is appropriate to undertake sensitivity tests which demonstrate how the value for money would differ if the outturn were not as captured in the core scenario.

Sensitivity analysis has covered:

#	Sensitivity Test	Pedestrian Demand	Cycle Demand	Highway Impacts	Collisions	Costs
ST1	Higher Cycling and Walking Growth	Higher uplifts than core		Same as core		
ST2	Lower Cycling and Walking Growth	Lower uplifts than core		Same as core		
ST3	Increased Costs	Same as core				Additional 20% costs over same delivery period

Tests 1 and 2 examine how VfM would change if the post-scheme number of pedestrians or cyclists is higher or lower than the core assumptions. The core uplifts of 25% for cycling and walking have been adjusted to create high and low scenarios using values calculated using the Uplifts Tool, released by DfT in 2020. This was originally produced for use in support of the Emergency Active Travel programme. It is founded on evidence which provides a reasonable assumption in lieu of any more robust analysis being available for this stage. The tool produces a low, medium, and high estimate of growth, based on the scheme costs and this relationship has been used to derive low and high estimates around the 25% core scenario assumption.

The DfT Tool uplifts are a product of scheme costs. As the scheme costs are not presented in a way which differentiates between walking and cycling investment, a simple 50% split has been chosen between the modes. Area-wide cycling network is chosen for the cycling intervention type, while town centre walking infrastructure has been chosen for the walking intervention given the urban setting.

The resulting uplift percentages used for the low and high sensitivity tests are presented in the table below:

Location	Cycling % Uplift			Walking % Uplift		
	Low	Core	High	Low	Core	High
Buckley Street	15%	25%	52%	16%	25%	41%
Kenyon Road	15%	25%	52%	16%	25%	41%
Spencer Road	15%	25%	52%	16%	25%	41%
Walkden Avenue	15%	25%	52%	16%	25%	41%

Test 3 examines how the VfM would change should the scheme costs increase beyond the existing estimates. An increase of 20% is tested.

All assumptions remain the same, including input parameters and the OB of 20%.

Sensitivity Test Output Summary

The PEAT tools have been re-run for these sensitivity tests. The results are summarised in the table below.

Scenario	2040 Vision BCR	VfM Category	NTEM BCR	VfM Category
Core	3.45	High	1.08	Low
ST1 (high)	6.82	Very High	3.21	High
ST2 (low)	2.53	High	-0.05	Very Poor
ST3 (20% cost increase)	2.87	High	0.90	Poor

These results demonstrate that the scheme is very likely to offer a strong value for money case with at worst a 'High' categorisation in each test for the 2040 Vision scenario, and for the high growth test using the NTEM scenario. The BCR is above 1 in the core scenario and near 1 in the increased cost scenario, which represents a 20% cost increase over and above the 20% optimism bias already included. The low growth scenario returns a 'Very Poor' VfM category; however this scenario is the most pessimistic combination of low active mode uplift and business as usual conditions which is considered highly unlikely. More reasonable would be for uplifts to at least match the core assessment (given the low base a 25% uplift is more than achievable), and the outturn scenario to be comfortably within the range set between the NTEM and 2040 Vision PEAT scenarios. As noted previously, these results also exclude any monetisation of the significant benefits that reduced severance will bring to the area.

Our confidence in this comes from local and regional policies being progressed by the Council and TfGM, and the impact of a wider network of active travel routes that are being delivered by the Active Bee Network, which will enable greater usage than could be predicted by a single scheme in isolation. In particular this scheme will integrate with the planned Tranche 5 scheme network, including measures along Beech Hill Lane. It should also be noted that the baseline data only captures the 0700-1900 period which again means the benefits are likely to be under represented to some extent.

When considered alongside the strong case for intervention set out in the strategic case, we believe the core appraisal and sensitivity test analysis provides sound evidence that this scheme should be funded.

a)
Options appraised:

1. Do nothing.

2. Limited improvements – new crossing on Spencer Road West, upgraded pedestrian facilities at Kenyon Road Junction and improved cycling and walking at Buckley Street, with added shuttle signals under the bridge and improved path way / route for cyclists and walkers via Mesnes Park from Pagefield College

3. Comprehensive improvements – all of the above listed under limited improvements plus additional cycling facilities at Kenyon Road. There would also be a cyclops junction at Gidlow Lane.

b)

Option 1: Do nothing

Strengths	**Weaknesses**
• Avoids disruption to existing traffic	• Congestion • Poor air quality • Potential for more traffic accidents, including pedestrian/vehicle accidents • Inactivity/poor health • Reputation - continued complaints from residents/members
Opportunities	**Threats**
• None	• None

Option 2: Limited scheme

Strengths	**Weaknesses**
• On existing Highway • Benefits some residents - pedestrians (and cyclists in some places) • Partially addresses local safety concerns	• Short term traffic disruption • Limited number of beneficiaries • Loss of some on street parking
Opportunities	**Threats**
• Improved safety for walkers and cyclists crossing major junctions • Less traffic/pedestrian accidents • Some air quality improvement • Some reduced congestion • Improved health	• programme working prior to and during election period (May 2023)

Option 3: Comprehensive scheme

Strengths	**Weaknesses**
• On existing Highway • Benefits residents and those from further afield - pedestrians and cyclists • Connects with other route improvements to maximise opportunities for cycling and walking • Fully addresses local safety concerns • Widens safe access to surrounding residential areas • Better access through the park • Comprehensive provision for cyclists through the Kenyon Road junction	• Significant traffic disruption during construction • Route via the college would be inaccessible during improvement works
Opportunities	**Threats**
• Improved safety for walkers and cyclists crossing major junctions • Less traffic/pedestrian accidents • Significant air quality improvement • Significantly reduced congestion • Improved health outcomes	• Programme working prior to and during election period (May 2023)Programme length would be longer • Cost increase to deliver full scheme

The chosen option (2) was selected because the scheme users will benefit from several direct routes into the town centre. This option will also provide a direct link to other Tranche 5 works (Standish Western Link). The works are affordable within the programme budget and not too disruptive during construction phases.

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For any queries relating to this document, please contact Nick Clarke or Michael Brannan at Public Health England.

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Executive summary

Regular physical activity benefits long-term health, including mental health, and helps to prevent over 20 common health conditions. The UK Chief Medical Officers' guidance for adults includes 150 minutes of moderate intensity activity a week, and that the easiest way to achieve this is through daily activity such as walking and cycling.

Over 4 in 10 women (42%) and 1 in 3 men (34%) in England are not active enough for good health, with human and economic costs for the individual, communities and the health and social care system. The most recent estimates are that physical inactivity costs the NHS more than £450 million a year at Clinical Commissioning Group level, equating to £817,274 per 100,000 individuals or £8.17 per person.

This rapid evidence review is intended for health and social care policy makers, decision makers and commissioners and attempts to address the following question:

"What is the impact of walking and/or cycling on different health outcomes?"

This review found that walking and cycling benefit health in a number of ways:

- people who walk or cycle have improved metabolic health and a reduced risk of premature mortality
- walking and cycling reduce the risk factors for a number of diseases, including cardiovascular disease, respiratory disease, some cancers, and Type II diabetes
- walking and cycling also have positive effects on mental health and general well-being. The mental health and neurological benefits include reduced risk of dementia, improved sleep quality, and a greater sense of wellbeing
- in environmental terms, health benefits accrue for the general population from a reduction in pollution due to car use and a decrease in road congestion
- the evidence is that the health benefits of walking and cycling outweigh any potential health risks and harms – for example from injury or pollution

The weight of evidence suggests that if walking and cycling can be increased, they have potential to lead to important health gains at the population level, and thus benefit the NHS and the wider health and care system.

The evidence is stronger and more consistent for certain health outcomes, and evidence gaps remain in some areas. There is little direct evidence about whether walking or cycling to work might have different health effects to walking or cycling for leisure.

There is little specific evidence available on the benefits of walking and cycling for people with disabilities and those living with long-term conditions. Similarly, there is little about the effects on groups living with different levels of deprivation. It would be helpful if these gaps were addressed, particularly regarding practical methods to improve access to physical activity for these groups.

1. Introduction

The population health benefits of physical activity are well established in the scientific literature [1, 2]. Population recommendations for physical activity are set by the Chief Medical Officer. The Chief Medical Officer's guidance for adults is for 150 minutes of moderate activity a week (2 ½ hours), or for 75 minutes of vigorous activity. The guidance also recommends activities that strengthen muscles, and says that sitting time should be minimised (see Appendix 1 for more details) [2].

The most recent estimates are that lack of physical activity (physical inactivity) costs the NHS more than £450 million a year at Clinical Commissioning Group level. One in 4 women and 1 in 5 men in England are are damaging their health through a lack of physical activity. They are classed as physically inactive – that is, having less than 30 minutes a day of moderate activity.

Walking and cycling have attracted attention as options for increasing population activity levels because they can be fitted around daily life. Walking is one of the main contributors to total physical activity across all age groups in the population and is already the most common activity for older people as shown by data from the Health Survey for England [3, 4]. Cycling for transport can be a time-efficient option for physical activity, as it can be integrated into daily routines.

The World Health Organisation (WHO) includes walking and cycling as key actions in its *Global Action Plan on Physical Activity 2018-2030* [5]. It stated that "investing in policies to promote walking and cycling…can contribute directly to achieving many of the 2030 Sustainable Development Goals (SDGs)".

Promoting walking and cycling has been identified as one of the "Seven Best Investments" to increase population levels of physical activity [6] in the *Toronto Charter for Physical Activity: A Global Call to Action*. This report stated that if walking and cycling promotion was applied at sufficient scale it would "make a significant contribution to reducing the burden of non-communicable diseases and promote population health" and contribute to "improving the quality of life and the environments in which we live".

The Government has set an aim to double cycling activity to 1.6 billion trips per year. This is to aid population health and wellbeing as well as to improve road congestion, air quality, and economic and local development. This ambition is to be realised through the statutory Cycling and Walking Investment Strategy (CWIS). A fuller understanding of the health impacts of increasing walking and cycling will help underpin this investment.

In 2018, Government ministers asked for a clearer summary of the population health benefits and impacts that are specific to walking and cycling. This was to strengthen the national narrative on the benefits of walking and cycling, and to make the health impact case more accessible to local and national system partners. This review has been produced in response.

2. Aims and objectives

This evidence review aims to identify, summarise, and report relevant evidence to support engagement in the Cycling and Walking Investment Strategy (CWIS) [7]. The review attempts to address the following question:

“What is the impact of walking and/or cycling on different health outcomes?”

The objective was to examine the benefits of walking and cycling to individual and population health, and therefore the benefits for local health and social care systems. The intention was to summarise the evidence in one place, in order to support CWIS implementation by the health sector.

3. Methods

The approach for preparing this evidence review is summarised below.

Design

Rapid evidence review

Search strategy

Targeted searching of relevant databases (Medline, Google Scholar, etc.) was conducted. Selected search terms for walking and cycling were used (see Appendix 2), and identified records were screened for relevance to the primary research question/aim.

Scope

Walking and cycling are behaviours that are performed in more than one domain. The scope for this report was walking or cycling for:

- transport, active travel and commuting
- leisure and recreation
- sport, exercise and fitness
- occupation

Table 1 Definitions of walking and cycling

Walking	Walking refers to all forms of purposeful or incidental bipedal locomotion within reasonable speed ranges (ie not running or jogging) [8].
Cycling	Cycling includes bike rides of any length or intensity and covers cycling for different purposes (ie both transport and leisure) [9].

Walking and cycling as part of elite performance and high-level competition were not included.

Evidence from any country was considered for inclusion. Studies were included if there were good epidemiological reasons to assume the evidence would be applicable to the English population. Evidence for all ages was considered for inclusion.

Study selection and reporting the evidence

A hierarchical strategy was used for study selection, first selecting systematic reviews and meta-analyses. When these were not available, scoping and narrative reviews were selected. Finally, high quality individual studies were included. Prospective and experimental study designs were included. Cross-sectional evidence was not reported for aetiological associations, due to known limitations and possible reverse causation (a person with low cardiorespiratory fitness may walk or cycle less due to their health status, rather than low levels of walking or cycling leading to their health status). If included reviews had reported cross-sectional evidence as part of their findings, this evidence would be eligible for reporting here. Cross-sectional evidence has been reported on questions of prevalence. The flow of studies for the primary aim (as reported in section 5) is shown in Appendix 3: Study Flow Chart.

Where available, data were extracted on volume, type or intensity of walking and cycling, and magnitude of effect on health outcomes. For reviews, number and nature/design of studies were extracted, along with any reporting of study quality or bias. For individual studies details including design, population and sample size were extracted.

The analytical framework for the primary research objective was to report:

- the physical health benefits of walking
- the mental health benefits of walking
- the physical health benefits of cycling
- the mental health benefits of cycling

The evidence on these areas is reported in Section 5. The selection of health outcomes was informed by the existing reviews for physical activity and health. The nature of the evidence for each health outcome was assessed according to the following hierarchy:

1. Systematic review and meta-analysis level evidence
2. Scoping and narrative review level evidence
3. Consistent study level evidence
4. Inconsistent study level evidence
5. Fragmented or incomplete level evidence
6. No evidence

Once these sections were reported, emergent and relevant sub-questions were highlighted and discussed, though independent search strategies were not employed in these areas. The evidence for these sections is reported in Sections 6-13. In Section 14, the limitations of the current evidence base are presented. Finally, in Section 15 recommendations for policy and practice are made.

4. Benefits of physical activity overall

Walking and cycling as examples of physical activity

The evidence base for walking and cycling and their impacts on health is increasingly clear and convincing. However, the evidence is not complete and is restricted to what researchers have evaluated. This **direct evidence** specifically on walking and cycling sits within an even wider, more comprehensive, and stronger evidence base for the health impacts of physical activity in general (**indirect evidence**). The strongest physical activity evidence – and that with the greatest mass – exists for moderate to vigorous physical activity (MVPA), of which walking and cycling are excellent (perhaps the best) examples.

> The eminent epidemiologist Professor Jeremy Morris famously described walking as the "…nearest activity to perfect exercise" [10]

Figure 1 below shows the place of walking and cycling on the spectrum of sedentary to vigorous activities, as assessed in multiples of resting metabolic rate (Metabolic Equivalent of Task or MET). It is important to note that these are just indications of likely intensity ranges; walking is not always moderate intensity and cycling is not always vigorous. For example, brisk walking up a hill carrying a load would be intense activity. Likewise, slow cycling on a good flat surface would likely be moderate for most people [11].

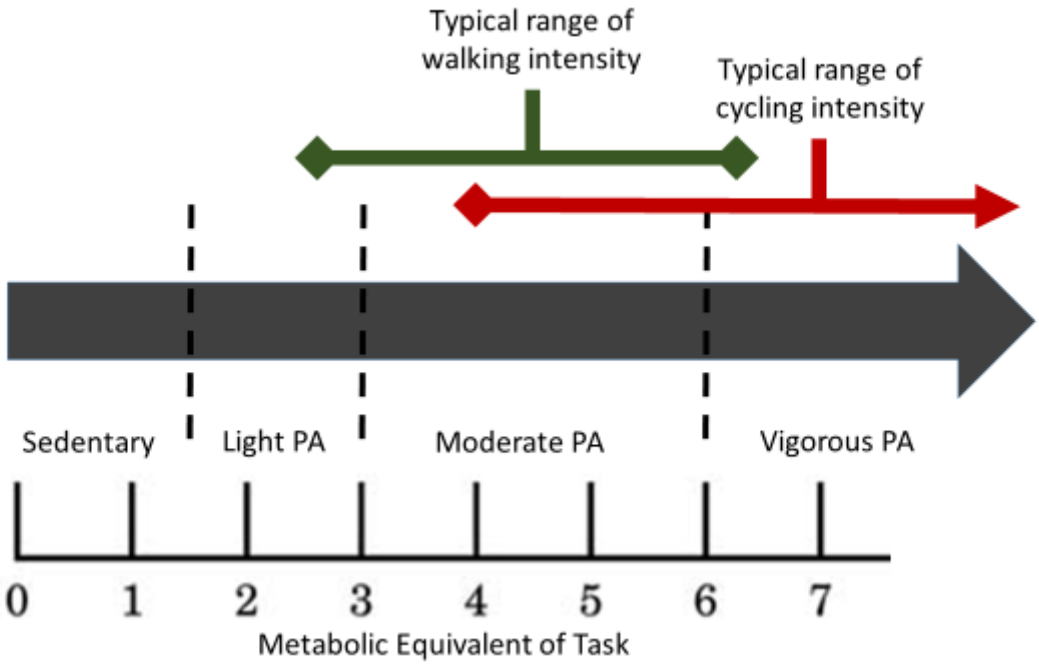


Figure 1. Illustration of walking and cycling as moderate to vigorous physical activities. Note ranges given are indicative and intensity will vary by pace, terrain, fitness, and many other factors. Ranges are estimates, based on the 2011 Compendium of Physical Activities. [11]

The health benefits of physical activity

The Chief Medical Officers have stated that there is strong, consistent and convincing evidence that regular physical activity is beneficial for a wide range of health outcomes and risk factors [2]. This increasingly comes from systematic reviews and meta-analyses of high quality population cohort studies [1]. The health benefits include hard health outcomes such as all-cause mortality, cardiovascular disease, coronary heart disease, and stroke. Regular physical activity reduces the risk for developing many cancers, including those of the breast, colon, bladder, endometrium, oesophagus, kidney, lung, and stomach. It also improves metabolic health reducing the risk of developing Type 2 diabetes, and can help maintain a healthy weight and support weight loss [2]. There are neurological benefits including reduced risk of dementia and mental health outcomes such as reduced depressive symptoms. Moderate-to-vigorous physical activity has been shown to improve the quality of sleep and also quality of life [1].

In summary “regular physical activity can reduce the risk of developing a new chronic condition, reduce the risk of progression of a condition already present, and improve quality of life and physical function” [1]. As exemplars of physical activity, there is therefore very strong **indirect evidence** that walking and cycling can realise these benefits.

How much do walking and cycling contribute to physical activity?

Walking is one of the main contributors to total physical activity across all age groups, contributing between 26-42% of total physical activity [3], and has been demonstrated to be accessible to large proportions of society in terms of age and gender [9]. Cycling is less prevalent, with just 5.7% of people in England cycling 3 or more times per week [11], and 1% of children cycling to school [11]. In comparison, in the Netherlands, men and women achieve an average 24 and 28 minutes respectively of daily physical activity through walking and cycling [12]. Despite the current low prevalence of cycling compared to walking, both have potential to be built into daily routines and may therefore be more likely to be sustained and yield significant increases in weekly physical activity (eg cycling or walking to and from work). The Propensity to Cycle Tool study (2016) estimated that if people in England had the same readiness to cycle a given distance as those in the Netherlands then 18% of people would cycle to work - even allowing for England’s greater hilliness in certain regions [13].

Walking and cycling for travel are likely to have similar health benefits for an individual as other types of physical activity. Due to the higher possibility they can be built into daily life and routine compared to many other physical activities, they have particularly high sustainable population health potential across the life-course.

Dose response relationships between physical activity and health benefits

Physical activities, including walking and cycling can be considered in terms of dose – usually consisting of duration, intensity, and frequency. Dose response meta-analyses and pooled analyses have generally found a non-linear relationship between total dose (volume) of activity and risk of disease, with the greatest benefit in moving from being inactive to doing some level of activity [1]. Magnitude of benefits at higher doses (beyond the WHO higher recommendation of 5 hours per week of moderate activity) are less well established and likely vary by disease outcome.

Duration, intensity, and frequency can be combined to produce total physical activity energy expenditure metrics. This allows us to compare and combine activities of a different kind. A common method for doing this is the Marginal Metabolically Equivalent Task (MMET) rate that represents the body mass adjusted energy expenditure of an activity above the metabolic rate of sedentary behaviour. Typically, walking is moderate and cycling vigorous intensity. However, intensity varies by speed, terrain and hilliness, load carrying, and personal characteristics such as age and fitness (see Figure 1).

Walking and cycling are commonly cited examples of moderate and vigorous activities and are thus likely to have similar benefits to other regular physical activity behaviours of similar intensity conducted for similar durations [1]. Due to the non-linear relationship between volume of activity and disease risk, the marginal benefits of doing more walking and cycling are very likely to depend on the total amount of activity an individual is doing and not just their walking and cycling level. Thus, as with all physical activity, the benefits of increasing walking and cycling are likely to be much higher for those who are inactive.

5. What are the health benefits of walking and cycling specifically?

The following section is a summary of the **direct evidence** for walking and cycling organised in terms of the physical and mental health benefits.

The physical health benefits of walking

In summary, walking is associated with a wide range of physical health benefits for children, adults and older adults [1, 2]. These benefits include reduced risk of all-cause mortality, cardiovascular disease incidence and mortality, coronary heart disease incidence and mortality, certain cancer mortality[1] and type II diabetes incidence. Walking also has beneficial impacts on disease risk markers and musculoskeletal health [1]. The evidence for the physical health benefits of walking is summarised in Table 2 and Table 3 below.

[1] The 2018 US Physical Activity Guidelines Advisory Committee Scientific Report found strong evidence that physical activity reduced risk of a number of cancers including bladder, colon, esophageal adenocarcinoma, renal and gastric and limited evidence for a number more. However, they stated that few data were available on walking specifically and cancer risk, and that this was an important need for future research 1. 2018 Physical Activity Guidelines Advisory Committee, *2018 Physical Activity Guidelines Advisory Committee Scientific Report*. 2018, U.S. Department of Health and Human Services: Washington DC.

Table 2 Review level evidence for effect of walking on disease incidence, disease incidence and mortality, and all-cause mortality

Potential benefits of walking	Findings	Type of evidence for benefits	Quality assessment[2]
All-cause mortality	A systematic review and meta-analysis (search date 2013) of cohort studies (14 studies; 280,000 people) reported an 11% (95% confidence intervals (CI) 4 to 17%) reduced risk of all-cause mortality in those who meet physical activity guidelines through walking (11.25 MET.hours/week) compared to those with no walking [14]. These findings are supported by another systematic review and meta-analysis (search date 2009) of cohort studies (five studies; 217,042 people) which also reported an 11% (95% CI 4 to 18%) reduced risk of all-cause mortality in those who meet physical activity guidelines through walking (11.25 MET.hours/week) compared to those with no walking [15].	Systematic review level (cohort)	From 14 studies, 10 scored 8 or 9/9 (none less than 7) [14]; mean 6/9 [15]
Cardiovascular disease	One systematic review and meta-analysis (search date 2007) of 18 cohort studies (459,833 people) found that high levels of walking reduced cardiovascular disease risk by 31% (95% CI 23 to 39%) compared with low levels of walking [16].	Systematic review level (cohort)	Mean score of 5.3/7
Coronary heart disease	One systematic review (search date 2007) of 11 cohort studies and one RCT (295,177 people) found a dose response relationship for walking and coronary heart disease risk. Walking for 30 minutes/day five days per week was associated with a 19% (95% CI 14 to 23%) reduced risk of coronary heart disease compared with no walking [17].	Systematic review level (cohort and RCT)	No quality assessment reported
Cancer	One systematic review and meta-analysis (search date 2012) of cohort studies (five studies; 304,123 people) reported a 3% (95% CI 2 to 5%) reduction in breast cancer risk for every 10 MET.hours/week of walking [18]. Another systematic review and meta-analysis (search date 2014) of ten studies (four cohort, one case-cohort and three case control studies; 251,693 people) reported an 18% (95% CI 3 to 31%) reduction in risk of endometrial cancer in high versus low levels of walking [19].	Systematic review level (cohort and case-control)	No quality assessment [18]; 20/33 studies scored >6/9 [19]
Type II diabetes	One systematic review (search date 2006) of cohort studies (five studies; 240,605 people) found that walking for 2.5 hours/week at a brisk pace is associated with a 17% (95% CI 9 to 25%) lower risk of developing type II diabetes compared with no walking [20]. Experimental design evidence also reports that walking is protective against progressing to diabetes [21] and improving glucose tolerance [22, 23].	Systematic review level (cohort, crossover and RCTs)	No quality assessment reported

[2] As reported by the review authors in included reviews. Higher scores mean better quality rating eg 0/9 lowest quality; 9/9 highest quality.

Table 3 Review level evidence for the physical health benefits of walking on intermediate risk factors

Potential benefits of walking	Findings	Type of evidence for benefits	Quality assessment (systematic reviews only)
Cardiorespiratory fitness	Review evidence found that walking can improve cardiorespiratory fitness in adults, but the evidence for children is inconclusive. One systematic review and meta-analysis (search date 2012) of RCTs (18 studies; 894 people) found that walking interventions at a moderate intensity had a 3.04mL/kg/min (95% CI 2.48 to 3.60) improvement in cardiorespiratory fitness (approximately 10%) in inactive participants with modest levels of aerobic fitness [24]. Intensity and duration of interventions for each outcome were not separately reported (as the review reported other outcomes) but for the review as a whole interventions were on average 18.7 weeks long (for 20-60 minutes, 2-7 days per week). Another systematic review (search date 2012) of ten studies (eight cross sectional and two prospective; 26,948 children) reported inconclusive evidence that walking to school was associated with improved cardiorespiratory fitness in young people compared with those who travelled to school passively [25]. The average distance travelled/activity time and intensity was not reported.	Systematic review level for adults Inconclusive evidence for children	Only 2/18 studies rated as low risk of bias [24] Predominantly moderate quality, [25]
Blood pressure	Two systematic reviews found that walking can improve blood pressure. One systematic review (search date 2012) of RCTs (16 studies; 816 people) found that walking interventions significantly reduced systolic (-3.58 mm Hg, 95% CI -5.19 to -1.97) and diastolic (-1.54 mm Hg, 95% CI -2.83 to -0.26) resting blood pressure [24]. Intensity and duration of interventions for each outcome were not separately reported (as the review reported other outcomes) but for the review as a whole interventions were on average 18.7 weeks long (for 20-60 minutes, 2-7 days per week). Another systematic review (search date 2007) of RCTs and non-randomised interventions (12 studies; 468 people; number of RCTs and non-randomised interventions in each analysis not reported) found a -3.8 mm Hg reduction (95% CI -1.7 to -5.9) in systolic blood pressure and a -0.3 mm Hg (95% CI 0.02 to -0.46) reduction in diastolic blood pressure as a result of increased walking (average increase of 2491 and 2183 steps/day in the RCTs and the non-randomised interventions respectively) [26].	Systematic review level (RCTs & non-randomised interventions)	Only 2/18 studies rated as low risk of bias [24] No quality assessment [26]
Vascular function	Review evidence has found that studies predominantly focus on the role of general exercise training on vascular function, with exercise training leading to improvements [27], however preliminary evidence from a RCT (77 people) suggests that walking for 30 minutes at a brisk intensity five days per week can beneficially improve arterial stiffness [28].	Fragmented or incomplete level evidence (RCT)	N/A
Blood lipids	Mixed evidence for the role of walking on blood lipids was identified. One meta-analysis (search date 2012) of RCTs (16 studies; 758 people) found no significant effects of walking on cholesterol [24]. Intensity and duration of interventions for each outcome were not separately reported (as the review reported other outcomes) but for the review as a whole interventions were on average 18.7 weeks long (for 20-60 minutes, 2-7 days per week).	Inconclusive systematic review level (RCTs and observational studies)	Only 2/18 studies rated as low risk of bias [24] No quality assessment [26]

	Another review (search date 2007) of RCTs and observational studies (seven studies; 192 people) also found no significant effects (-0.09 95% CI -0.32 to 0.15) of walking interventions on blood lipids (average increase of 2491 steps/day in the RCTs; observation data not reported) [26]. A third review found that physical activity can reduce postprandial lipemia [29]. Whilst the latter review was not specific to walking, Gill and Hardman [30] suggest that energy expenditure during the activity rather than either the intensity or mode of activity is the most important determinant of lowering lipids.		
Haemostatic, inflammatory and immune function markers	One review (search date 2015, number of participants not reported) included three cross-sectional studies and one crossover trial and found preliminary evidence for improved haemostatic, inflammatory and immune function markers with regular walking [31]. Intervention descriptions/physical activity duration and intensity were not reported.	Narrative review level (cross-sectional & crossover trial)	No quality assessment
Body composition	Three systematic reviews found evidence to suggest that walking can lead to improvements in body composition. One systematic review and meta-analysis (search date 2012) of RCTs (25 studies; 1275 people) found that walking interventions were associated with an average weight loss of -1.37kg (95% CI -1.75 to -1.00) [24]. The same review also found that walking interventions (23 RCTs; 1201 people) led to reductions in BMI of -0.5 kg.m-2 (95% CI -0.72 to -0.35), and -1.51cm (95% CI -2.34 to -0.68) reductions in waist circumference (11 RCTs; 574 participants) [24]. Intensity and duration of interventions for each outcome were not separately reported (as the review reported other outcomes) but the average walking intervention duration for the review as a whole was 18.7 weeks long (for 20-60 minutes, 2-7 days per week). Another systematic review (search date 2007) of RCTs and non-randomised interventions (18 studies; 562 people; number of RCTs and non-randomised interventions in each analysis not reported) found that walking (average increase of 2491 and 2183 steps/day in the RCTs and non-randomised interventions respectively) led to a -0.38 kg.m-2 (95% CI -0.05 to -0.72) reduction in BMI [26]. Finally, a systematic review (search date 2015) of RCTs (22 studies; 1524 people) found that walking (average 46 minutes, moderate intensity for four sessions/week for 12 to 16 weeks) was associated with a -2.13kg (95% CI -3.20 to -1.06) average weight loss, a -0.96 kg.m-2 (95% CI -1.44 to -0.48) reduction in BMI and -2.83 (95% CI -4.13 to -1.53) reduction in waist circumference [32].	Systematic review level (RCTS, interventions & observational)	Only 2/18 studies rated as low risk of bias [24] No quality assessment [26] Predominantly moderate quality [32]
Musculoskeletal health	One non-systematic review (search date 2015) noted there is inconclusive evidence for walking to improve musculoskeletal health in healthy individuals, however the review did not report details of this evidence [31]. The same review identified two further systematic reviews that found evidence that walking interventions can benefit musculoskeletal health in postmenopausal women [33] and adults with chronic back pain [34], suggesting that walking may benefit individuals with impaired musculoskeletal health. A systematic review and meta-analysis (search date 2006) found that walking interventions had significant positive effects at the femoral neck of 0.014g/cm^2 (95% CI 0.000 to 0.028) (four RCTs, one non-randomised trial; 302 people) but not the lumbar spine 0.007g/cm^2 (95% CI -0.001 to 0.016) (four	Systematic review level (for individuals with impaired musculoskeletal health) (RCTs and non-randomised	Average quality score 2/5 [33] 3 low risk, 1 unclear, 3 high risk [34]

	RCTs, one non-randomised trial; 427 people) in postmenopausal women [33]. Interventions were predominantly three sessions/week, ranging from 20-50 minutes per session and 7-24 months duration. Intensity of walking was not reported. The second systematic review (search date 2015) of RCTs (seven studies; 869 people) found that walking is as effective as usual care in people with chronic back pain [34]. Interventions ranged from 4 weeks to 12 months and the volume ranged from 40 minutes twice/week to walking programs that were individually tailored and increased in volume each week. Intensity of walking was not reported.	trials)	

The mental and neurological health benefits of walking

The Physical Activity Guidelines Advisory Committee Scientific Report in the USA in 2018 reviewed multiple health outcomes. It concluded that walking is associated with improved mental and neurological health [1]. Benefits include fewer symptoms of depression and lower incidence of depression (including in post-partum women), reduced risk of dementia, improved cognitive function, improved quality of life (and sleep quality), and reduced feelings of anxiety [1].

The most up to date and comprehensive account of the benefits of walking for mental health is a scoping review published by Kelly et al., in 2018 [8]. The authors pre-specified which mental health outcomes to investigate; depression, anxiety, self-esteem, psychological stress, psychological well-being, subjective well-being, resilience, social isolation and loneliness (see Appendix 4 for definitions). Five systematic reviews and 50 papers were included.

The authors concluded that the evidence base for walking and mental health has grown considerably over the past 2 decades. For depression and anxiety, the evidence shows consistent beneficial effects. For other outcomes, evidence is still “emerging” and at times mixed, often characterised by cross-sectional study designs. The evidence for the benefits of walking on these outcomes is summarised in Table 4 below.

The scoping review by Kelly et al., [8] also found “emerging evidence” that the environmental context of walking plays a role in the mental health benefit. There was consistent evidence to suggest that outdoor and green environments confer mental health benefits beyond those from walking indoors or in the built environment. However, the studies were generally short term or single bout designs with small sample sizes, and so further research is needed in this area. There was limited evidence on the social context of walking (walking alone versus walking with others) as well as the type of walking (commuter, dog walking, leisure walking) and therefore no clear conclusions can be drawn [8].

Table 4 Mental and neurological health outcomes of walking* (adapted from Kelly et al., 2018 [8])[+]

Mental health benefits of walking	Evidence	Strength of evidence for benefits
Depression	Five systematic reviews found evidence to suggest that walking may be beneficial in both the prevention and treatment of depression. For example, one included systematic review and meta-analysis of RCTs (eight studies; 341 people) found that walking can treat clinical depression (effect size -0.86, large effect size) [35].	Systematic review level (interventions & observational)
Anxiety	Based on 14 studies (five cross-sectional, one prospective, five interventions, four acute studies), the authors found evidence that walking is beneficial for preventing and treating anxiety.	Consistent study level (interventions & observational)
Self-esteem	Evidence from 11 studies (two cross-sectional, seven interventions, four acute studies) suggests that walking interventions can have a positive effect on self-esteem but observational findings were limited.	Inconsistent study level (interventions & observational)
Psychological stress	The authors found emerging but limited evidence from six studies (two cross-sectional, three acute studies, one intervention) that walking is associated with lower psychological stress in observational studies, and that walking could be used as a potentially promising intervention to decrease psychological stress.	Study level (interventions & observational)
Psychological well-being	The evidence base is limited but promising, with three cross-sectional studies and one prospective study identifying positive relationships between walking and psychological well-being. The findings from the intervention studies are mixed with only two of seven studies demonstrating positive effects on psychological well-being compared with control groups.	Inconsistent study level (interventions & observational)
Subjective well-being	11 studies (four cross-sectional, two prospective cohort, five acute studies) indicated an association between walking and subjective well-being. The only long-term intervention study was inconclusive and further studies are clearly needed.	Inconsistent study level (interventions & observational)
Resilience	No published journal articles were identified addressing the association between walking and resilience. However, there is emerging evidence suggesting a relationship between physical activity and resilience.	-
Social isolation and loneliness	The evidence base for walking on social isolation and loneliness is limited. One cross-sectional study found a significant positive association between frequency of contact with neighbours, neighbours social support and neighbourhood involvement and participation in walking behaviour, whilst four intervention studies showed mixed evidence.	Fragmented (interventions & observational)
Neurological conditions [1]	Reduced risk of dementia, improved cognitive function, reduced feelings of anxiety and depression in healthy people and in people with medical conditions, reduced incidence of depression, and improved cognition in people with dementia.	Systematic review level (observational)

*Total number of people included for each outcome and study quality not reported in review.

[+]As a scoping review, there was no quality assessment of the included studies.

The physical health benefits of cycling

The **direct evidence** base for the physical health benefits of cycling is not as large as for walking. In large part this is because in most countries there is less cycling than walking at a population level, and therefore fewer opportunities to study and observe the benefits (or harms). However, cycling is a good example of moderate to vigorous

physical activity, and the evidence on moderate to vigorous activity as a whole is very strong. Thus there is strong **indirect evidence** indicating a range of health benefits (see section 4). The following section will outline the available **direct evidence** on the physical health benefits of cycling.

Our search strategy identified 4 systematic reviews, 1 meta-analysis of cohort studies, 1 non-systematic review, and 5 individual studies (3 cohort studies, 1 prospective study, and 1 RCT), which found evidence that cycling can reduce the risk of all-cause mortality, cardiovascular disease and type II diabetes. There was also evidence to suggest that cycling can improve disease risk factors, including cardiorespiratory fitness and body composition.

Only 2 studies were identified for blood pressure and 1 for blood lipids, making it difficult to form strong conclusions. The review did not identify any evidence on the effect of cycling on haemostatic, inflammatory and immune function markers, or for coronary heart disease. The evidence for the benefits of cycling on these outcomes is summarised below in Table 5 and Table 6.

Table 5 Effect of cycling on disease incidence, disease mortality, and all-cause mortality

Potential benefits of cycling	Findings	Strength of evidence for benefits	Quality assessment (systematic reviews only)
All-cause mortality	Two cohort studies found that cycling was associated with a 21% reduced risk of all-cause mortality in 67,143 women [36] and a 28% reduce risk of all-cause mortality in 30,640 adults [37]. A meta-analysis (search date 2013) of seven cohort studies (187,000 people) found that a cycling level corresponding to WHO guidelines of 150 minutes of moderate physical activity per week was associated with a 10% (95% CI 4 to 17%) reduced risk of all-cause mortality, compared with no cycling. A dose-response relationship of cycling was also estimated, which suggested that physical activity benefits per unit of cycling are about twice as high for the first 1-2 hours of cycling per week, compared with significantly more time spent cycling [14].	Systematic review level (cohort)	From 7 studies, mean score was 7.7/9 [14]
Cardiovascular disease	A review (search date 2018) identified cohort studies (12 studies; 722,407 people) and found that seven out of 12 studies reported a statistically significant reduced risk of cardiovascular disease incidence and/or mortality with cycling compared to low or no cycling, and five studies found no significant associations [38].	Review level (cohort)	No quality assessment
Cancer	A review (search date 2018) identified cohort studies (nine studies; 1,074,480 people) and found that six out of nine studies found no statistically significant association between cycling and cancer incidence, while three out of nine studies found that cycling was significantly associated with cancer incidence and mortality compared with no cycling [38].	Review level (cohort)	No quality assessment
Type II diabetes	A review (search date 2018) identified cohort studies (four studies; 193,273 people) and found that two out of four studies found a statistically significant association between cycling and reduced risk of type II diabetes compared with no cycling [38].	Review level (cohort)	No quality assessment

Table 6 Physical health benefits of cycling

Potential benefits of cycling	Findings	Strength of evidence for benefits	Quality assessment (systematic reviews only)
Cardiorespiratory fitness	Three reviews were identified that reported associations between cycling and cardiorespiratory fitness. The first review (published 2011) identified two RCTs and one controlled clinical trial and found evidence to suggest that cycling benefits cardiorespiratory fitness in adults. The same review found inconclusive evidence for benefits in adolescents (two cross-sectional studies, one prospective study) [39]. Another review (search date 2018) found four RCTs (281 people) of cycling to school/work interventions and reported that three out of the four studies found that the intervention groups significantly increased cardiorespiratory fitness [38]. The final review (search date 2012) identified four cross-sectional and one prospective study (10,918 children) and found that cycling benefits cardiorespiratory fitness in young people [25].	Systematic review level for adults; inconclusive for children (RCTs, controlled clinical trial, cross-sectional and prospective)	Adults – predominantly strong; children – moderate [39] Predominantly moderate quality [25] No quality assessment [38]
Blood pressure	A cohort study (23,732 people) found that cycling to work at baseline was associated with lower odds of hypertension compared with passive travel after adjusting for confounding factors [40]. A review (search date 2018) also identified one RCT (48 adults) which found no change in blood pressure following a cycling intervention [38].	Inconclusive (cohort and RCT)	No quality assessment
Blood lipids	A cohort study (23,732 people) found that cycling to work at baseline was associated with lower odds of hypertriglyceridemia (OR=0.85, 95% CI 0.76 to 0.94) compared with passive travel after adjusting for confounding factors [40].	Fragmented (cohort)	-
Body composition	A systematic review (search date 2010) identified three studies (15,062 people) reporting an association between cycling and lower body weight in adults [41]. A further review (search date 2018) identified cohort studies (four studies; 61,272) and one RCT (48 people) and found that three out of the four cohort studies showed that cycling is significantly associated with reduced risk of developing obesity and the RCT significantly decreased body fat compared with no cycling [38]. In children, a prospective study of 890 children found that cycling to school was associated with lower body weight [42]. A randomised cycling intervention targeting young people with Down Syndrome (46 young people) found that the intervention led to reductions in BMI and percentage body fat amongst those who successfully learned how to ride a bicycle, however 44% of the intervention group did not learn how to ride a bicycle during the training period [43].	Review level (interventions & observational)	Mean score 3.7/10 [41] No quality assessment [38]
Musculoskeletal health	A systematic review (search date 2012) of observational and intervention studies (31 studies; 2922 people) examined the evidence on cycling and bone health. The authors concluded that "from our	Systematic review level	Mean score 4/7

	comprehensive survey of the current available literature...road cycling does not appear to confer any significant osteogenic benefit." [44]	(interventions & observational)	

The mental and neurological health benefits of cycling

No review-level evidence for the mental or neurological health benefits of cycling was found. Thus there are insufficient data to generate an evidence table as has been compiled here for walking, and for the physical health benefits of cycling.

Of the studies that were identified there was 1 prospective study, 4 cross-sectional studies, 1 non-randomised intervention and a qualitative study. They provided indications that cycling could benefit mental wellbeing and sickness absence from work [45], psychological stress [46, 47], subjective well-being [48], and social isolation and loneliness [49]. There was mixed evidence for cycling and health-related quality of life [50, 51]. Only 1 of the 7 studies were considered to have met the inclusion criteria, so conclusions about the specific mental health benefits of cycling have not been made.

While there remains insufficient **direct evidence** specifically pertaining to cycling, there is strong **indirect evidence** for the benefits of leisure time physical activity and MVPA on mental health. Cycling can be considered a good example of these behaviours.

Active travel and active commuting: the health benefits

There is a body of evidence investigating the health benefits of active travel and active commuting, where walking and cycling (and other forms of active transport eg scooting) are combined in studies and assessed as a single behaviour. This is summarised below.

Physical health benefits of active travel and commuting

A meta-analysis (search date 2007) of cohort studies (8 studies; 173,146 people) demonstrated an 11% (95% CI 2 to 19%) reduced risk of adverse cardiovascular outcomes with active commuting compared with passive commuting [52]. The protective effects of active commuting were more robust among women than in men. A nested case-control study (204 heart attack cases and 327 matched controls) found that car commuting was significantly associated with increased risk of heart attack (OR 1.77, 95% CI 1.05 to 2.99).

Inflammatory and haemostatic markers explained a substantial proportion of the reduction in heart attack risk related to active commuting in this population [53]. Similarly, a large cohort study (28,334 people) found that active commuting was significantly related to reduced risk of heart failure in women but not in men [54].

A cohort study (219 women) analysed travel behaviour in pregnant women and found that those who kept travelling actively during pregnancy gained less weight than those

who became less active [55]. An RCT (130 inactive obese women) found that the active commuting group decreased their C-reative protein (high levels are a marker of inflammation) by approximately 30% from baseline to 6 months. No effects of the activity were observed on the haemostatic compounds of fibrinogen, vWF, t-PA, PAI-1 or the t-PA/PAI-1 ratio within or between groups [56].

Health benefits of active travel have also been identified in young people. A systematic review by Lubans *et al* (search date 2009) identified 27 studies and found positive associations between active travel to school and cardiorespiratory fitness (4 cross-sectional, 1 prospective study; 13,459 children), with mixed evidence for active travel on body composition (24 cross-sectional, 1 prospective; 79,545 children) [57].

A systematic review (search date 2007) of 18 studies (16 cross-sectional, 2 prospective; 42,977 children) found no association between active travel and body weight in children [58]. This was supported by a further systematic review (search date 2008) of 10 studies (9 cross-sectional, 1 prospective; 6044 children), which also found no association between active travel and body weight in children [59].

Mental health benefits of active travel and commuting

A meta-analysis by White *et al* [60] (search date 2015) of cross-sectional and prospective studies (14 cross-sectional, 1 prospective; 29,774 people) found a positive association between transport physical activity and mental health in 7 studies, with stronger associations found for active travel to and from work compared with travel for an unidentified reason or where all trips were measured together. There was no association with mental ill-health.

Of note, a number of studies do not meet the criteria for inclusion in the evidence summary. This includes cross-sectional evidence suggesting that active travel can have a positive effect on psychological well-being [61, 62], subjective well-being [62, 63], depressive symptoms [64], and physical well-being [65], and 1 cross-sectional study that found no association between transport physical activity and happiness [66].

6. Do health impacts differ by domain and type of walking and cycling?

Walking and cycling can be classified as occuring in 1 of the 4 main domains of physical activity [67]. Walking and cycling usually occur in transport, leisure and exercise, or as part of work and occupation (see Figure 2). In terms of transport, walking can be part of multimodal trips, and while this is less common with cycling, the train-bicycle combination has substantial potential. In which category different people do most of their walking and cycling varies by context and by demographic factors, including age and gender.

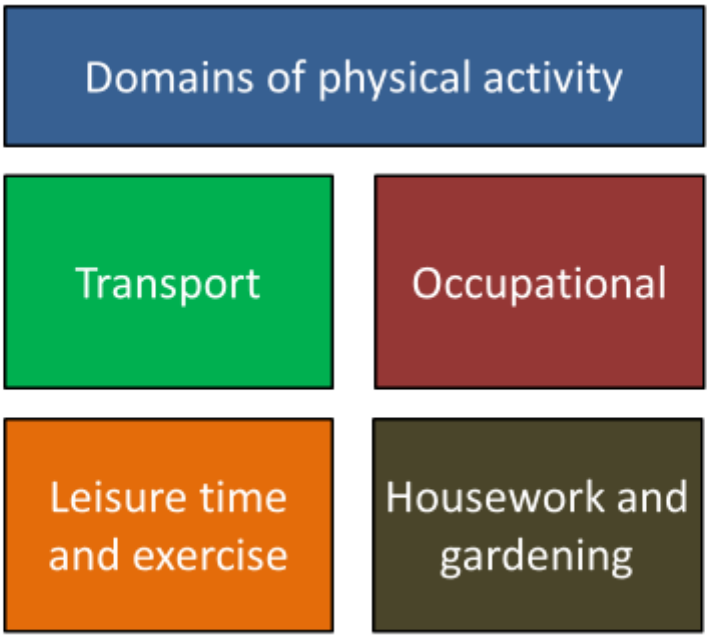


Figure 2. The 4 main domains of physical activity. Walking and cycling are usually classified in 3 of the 4 (Transport, Occupational, or Leisure time and exercise). Where walking is part of housework and gardening, this would normally be incidental or of very short duration.

Domains of walking and cycling

Do different domains of walking and cycling have differing impacts on health? Separating out the studies by both modality (walking and cycling) and domain dilutes the evidence. This risks either reporting random variation in study results as real differences, or treating absence of evidence on a specific behaviour domain as indicating a genuine lack of knowledge. In this way we may risk unnecessary doubt.

Thus instead of separating out the evidence it might be better to consider why, for example, walking or cycling to work might have different health effects to walking or cycling for leisure? Considerations may include (i) the pace, (ii) the exposure to pollution, (iii) injury risk, (iv) the proximity to green or forest space, or (v) the presence of social company. Personal preference and prior experiences may also play a part. The frequency and likelihood of the behaviour being habitually sustained are perhaps most likely to impact the long term health outcomes. Added to that, walking, cycling, and car ownership can be influenced by socio-economic status (SES) which could confound any detected relationships. Considering all these factors, the current epidemiological evidence base is simply not large enough to address any domain differences in a meaningful way yet.

There are 2 main points to emphasise. Firstly, in section 5 the **direct evidence** showed numerous positive health effects of walking and cycling. These studies came from a spectrum of types and domains, so the interpretation of the evidence is that any type of walking or cycling at a sufficient intensity, duration, and frequency is likely to benefit health. Secondly, there are a number of research gaps that, if addressed, will deepen our understanding of how different types of walking or cycling may have differential effects, and how effects may change across the lifecourse[3].

In summary, there is not (yet) sufficient evidence to make strong conclusions that one domain of walking or cycling is more beneficial than another. This is a priority area for greater understanding, in order to inform policy and strategy for greatest societal benefit.

Do benefits vary by pace and intensity?

In short, yes, but the implications for policy and health promotion are not simple.

The physiology of walking and cycling means that there are greater potential physical health benefits if conducted at greater speed/pace as the intensity will be higher [68, 69]. While the observational evidence can be confounded by fitter, healthier people being able to walk/cycle faster, the experimental evidence supports these findings [70].

Pace and intensity are relative rather than absolute concepts. One person's 3mph walk may be a greater relative effort than another person's 4.2 mph, and the 3mph walker may therefore derive greater relative health effects. This is because there is a spectrum

[3] For example Kelly et al., (2018) reported preliminary evidence that type, context, and environment of walking seem to impact magnitude of mental health benefits.

of fitness across the population that varies by factors such as leg length, age, weight status, or history of activity.

The complexity comes in considering how best to use this information. The people who stand to benefit the most from eg walking are those who are most unfit, likely with pre-existing medical conditions and/or a history of inactivity and other unhealthy lifestyle behaviour [70]. It may be that a “public health message” emphasising greater pace and intensity would be less motivating and more unattainable than one that said “any walking will improve health”.

Finally while the physiology on the physical health benefits is supportive of greater pace [70], it is less clear whether greater pace is better for mental health [8]. If mental health is impacted by social contact or enjoying the environment, pace may have no role, or even a negative role if it makes the activity less enjoyable.

The evidence base does not answer these questions at present, and so how to most effectively utilise pace in walking and cycling promotion is not known. Therefore, while physiologically correct, it is not known if pace should be included or emphasised in walking and cycling promotion.

7. What is known about walking-cycling health benefits by age (across the life-course)?

As children, adults, and older adults often experience different health outcomes and conditions, it may be expected that the health benefits of walking and cycling would vary by age.

As is the case for physical activity in general, there are fewer associations between walking and cycling and disease end points in children. This is because many of the chronic diseases associated with low activity do not manifest in childhood, but rather in adulthood. As a result, risk factors (eg cardiometabolic fitness) may be more informative to study, and for young people, cycling has been shown to benefit cardiorespiratory fitness [25, 71]. Both walking and cycling are beneficial for cardiorespiratory fitness in adults [24, 39].

For adults, age was not found to significantly moderate associations between walking and cardiorespiratory fitness, blood lipids or body composition [24]. However, it is likely that walking and cycling may be of particular benefit for some health outcomes in older adults. It should be noted that for most diseases risk increases with age, so the same relative risk reduction in disease risk has a much greater absolute risk reduction at older ages. The big exception here is mental health outcomes, with burden greater at younger ages.

A systematic review of 30 modelling studies estimated that middle-aged and older adults (>45 years) would benefit more by shifting to active travel than younger people [72]. However, the review was not able to determine if those who were active at younger ages were more likely to be active at older ages. There is some evidence that physical activity behaviour tracks from childhood to adulthood [73]. It is therefore plausible that children and adolescents who walk and cycle are more likely to become adults who are normalised to walk and cycle, increasing the rationale for starting at young ages.

For musculoskeletal health, there is some indication from systematic reviews that walking could be particularly beneficial for older adults or adults with impaired musculoskeletal health, with evidence for improvements in postmenopausal women and adults with chronic back pain, but not in healthy adults (see Table 3).

Overall, there are benefits of walking and cycling across the lifecourse. Better understanding of this may be of particular interest to those delivering and planning for health and social care.

8. What is known about the benefits by socioeconomic status?

For adults in England, a nationally representative survey found no substantive difference in walking levels between the most and least deprived areas in men. For women, there were no significant differences by deprivation for walking levels in insufficiently active women, however active women in the most deprived areas walked significantly more than active women in least deprived areas [74]. In older adults, data from the English Longitudinal Study of Aging found that walking speed was significantly faster in the least deprived areas compared with the most deprived (0.91 m/s compared with 0.75 m/s at age 70 years). This declined faster with age in adults in the least deprived areas. However the gaps in walking speed between the most and least deprived areas did not close [75].

In children, girls in the most deprived areas cycled significantly less than girls in less deprived areas. There were no significant differences in cycling levels for boys, or for walking levels in boys or girls [76]. Another study based in England found that children who walked to school were more likely to live in a deprived area compared with children who did not walk or cycle to school [77].These findings may have implications for cycling policy actions and priorities.

The benefits of increasing walking and cycling have also been estimated by SES. Tainio and colleagues modelled mortality impacts of replacing short car trips with cycling by age, gender and SES. They found that benefits are greater for less deprived SES groups, largely because these groups were conducting more car trips at the outset. These findings suggest that to get full benefits across the population and SES spectrum, there is a need to consider more than just car trips [78], although the harms of car use (eg pollution, injury risk) were not considered. Conversely, a systematic review (search date 2014) identified 2 relevant modelling studies and these estimated that disadvantaged ethnic groups would benefit more from active travel than the general population [72]. This conclusion was related to higher incidence of chronic disease in disadvantaged ethnic groups.

The Impacts of Cycling Tool (ICT) (www.pct.bike/ict) provide both a data visualisation of the National Travel Survey and models the potential impacts of non-cyclists having the same likelihood to cycle a trip of a given distance as existing cyclists. Results are available for each English region and by socioeconomic group, age group, gender and ethnic minority status. Of note it can be seen that the proportion of trips that are made by walking is higher for those in lower SES groups. It identified that for people of low SES and for ethnic minority women, cycling could lead to notable travel time savings. In the population as a whole, around 57% of the trips switched would be slower by bike.

Among women just over 50% of trips would be faster by bike. Among non-white women and the never worked and long-term unemployed over two-thirds of trips would be faster by bike.

Based on the available evidence, there is a need to consider the potential for walking and cycling policy actions, and interventions to address health and wider social inequalities.

9. What is known about the benefits by disability and long-term health conditions?

In England, people with a physical disability were found to be approximately 50% less likely to have cycled in the past 4 weeks than people without a physical disability [79]. However, the variation between local authorities is greater still and disabled people in higher cycling areas are more likely to cycle than non-disabled people in low cycling areas [80]. A qualitative study found that cycling infrastructure is not adequately inclusive for disabled populations and significant barriers to disabled cycling remain in the UK, predominantly relating to cost and infrastructure. The authors noted a lack of research on disability cycling, with further research needed to better understand how to support people with disabilities to cycle for different purposes (eg travel, recreation) [81]. Further evidence also highlights the exclusion of people with disabilities in transport and cycling strategies in London [80].

Few studies have investigated if the benefits of walking and cycling are different for disabled people. There is cycle ergometer (stationary bike) evidence for positive impacts on affect, anxiety, gait, pain (in osteoarthritis), pain-related disability, and health-related quality of life in adults with intellectual disabilities, but this cannot necessarily be extrapolated to cycling for leisure or transportation [1].

This limited evidence base on walking and cycling [82] suggests an urgent need for further research to understand potential benefits of, or inequalities in access to, walking and cycling for disabled people.

There are an additional set of questions about what walking and cycling participation might look like across a range of disabilities, mobilities, and conditions. There may be particular differences between physical and mental disabilities. The bodily movements and muscle groups involved have the potential to impact the health effects experienced. Greater understanding is required.

Whilst there is not yet specific **direct evidence** for walking and cycling, there is considerable **indirect evidence** in that physical activity is beneficial for people living with long-term conditions [1]. Given that walking and cycling contribute to total physical activity, it is likely that walking and cycling would be beneficial for people with long-term conditions, especially as they are on average less physically active overall.

10. Benefits for the wider population

In addition to the physical and mental health benefits of walking and cycling to the individual, there is evidence that walking and cycling can have wider population benefits including reductions in air pollution, noise and economic benefits. In other words, it is not just the individuals doing the walking and cycling that stand to benefit. A 2016 report by PHE, *Working Together to Promote Active Travel,* detailed a number of wider benefits including improvements in local air quality and in social cohesion, along with reductions in traffic congestion, carbon emissions, and road casualties [83]. Further details are discussed below.

Air pollution

A systematic review (search date 2014) of modelling studies (primarily from Europe) identified 14 studies that estimated health benefits to the general population from increased active travel and reduced car use. The included studies identified reductions in a range of outcomes including all-cause mortality, respiratory disease, cardiovascular disease, cancer, adverse birth outcomes, activity-restriction days, and productivity loss from increased active travel and reduced car use in the general population [72]. A report by Sustrans estimated that meeting the targets to double cycling and increase walking set out in the Government's CWIS in England would lead to savings of £567 million annually from air quality alone and prevent 8300 premature deaths each year [84].

Noise

A systematic review identified 3 studies investigating potential health impacts of noise exposure to the general population with a shift to active travel. The included studies estimated reductions in noise costs. However, the potential health impacts that contribute to this were not explicitly quantified [72].

Economic costs to the NHS

Previous work for Public Health England has estimated the cost to local commissioning groups of physical inactivity. The most recent estimates are that physical inactivity costs the NHS more than £450 million a year [85]. This is likely to be an underestimate, because it only considered those not meeting minimum recommended physical activity levels and only some of the diseases likely to be affected by physical inactivity were covered. Notably, dementia was not included. Costs were largest for diabetes followed by coronary heart disease, then cerebrovascular disease, then breast cancer and

colorectal cancer [85]. As described in previous sections, promoting walking and cycling address inactivity and contribute to reducing these economic costs.

11. What about adverse effects?

Injury risks while walking or cycling

Trade-offs between injury risk and physical activity benefits have generally been found to be positive at the population level [72]. That is to say, the health benefits of walking and cycling in a given population are greater than the health risks and harms. Modelling studies suggest that the benefit-to-harm ratio is generally better at older ages, as disease risks increase with age [86] faster than injury risks increase. For example, a study of the London cycle hire scheme estimated much bigger benefits from cycling in central London for older people.

Road traffic fatality rates can be measured per population but are better represented as occurring per distance travelled as time spent travelling or per trip. Because walking is slower than cycling and cycling is often slower than driving, a per time based measure makes walking appear relatively safer than a distance based one. In England fatality rates per km travelled are higher for pedestrians (36.7 fatalities per billion km in 2010-2012) and cyclists (20.8 fatalities per billion km) than driving (2.8 fatalities per billion km) [87]. Rates vary substantially by age and gender. For young men (17-20 years), rates are particularly high when driving and similar to the risk whilst cycling. For walking generally, fatality rates are higher for men than for women. By age, risks appear to be J shaped for cycling; that is falling toward middle age and increasing faster at older ages. The risks of walking increase exponentially with age.

Statistics on hospital admission rates per billion km show a slightly different picture. Generally rates are higher for cyclists than for pedestrians at younger ages (under 40) and higher for pedestrians at older ages [88]. However, the data are likely to be less robust than for fatalities.

Driving poses a greater risk to others than walking or cycling. However, even when accounting for all the people involved in road traffic collisions the rates per million hours were still lower for drivers (in 2011-2013 0.257 for men and 0.127 for women) than for cyclists (0.425 for men and 0.216 for women) [89] . One limitation of this analysis is that the distance driven by car includes relatively safe miles on the motorway and this makes comparison between risks while driving on other roads and risks whilst walking and cycling more difficult. Generally, risks are higher for all modes in rural areas.

There is systematic review evidence from 2017, with 15 studies to suggest that when the number of pedestrians and cyclists increases, there is a less than proportional increase in the number of collisions and injuries involving them [90]. This suggests a safety-in-numbers effect. Although mechanisms are still debated, the effect findings are relatively consistent. Safety in numbers probably occurs in addition to the effects of

other road safety factors. One study in England found that for cyclists overall injury risk increased between 2001 and 2011 despite a small increase in cycling and a safety in numbers effect being identified [91]. A safety in numbers effect by itself would still mean that total cyclist and pedestrian injuries increase with increases in use. However, as risk is also affected by motor vehicle volume, a mode shift to walking and cycling can lead to a fall in total injuries. A systematic review identified 21 studies investigating the effect of active travel and injury and fatality risk, specifically in relation to traffic related injuries and fatalities. Fourteen out of the 21 studies estimated an increase in risk of road traffic injuries or fatalities. Six studies estimated a decreased risk, and 1 estimated no change in traffic fatalities with increased active travel [72]. However, comparing injury/fatality data between cycling and car journeys is notably challenging [92].

According to recent figures from the UK Department for Transport, 69% of women and 56% of men in England feel it is too dangerous to cycle on the roads [93]. Fear relates both to experience or awareness of actual collisions and also to the far more common ‘near misses’ [94]. There is likely to be a smaller effect on discouraging walking, but this is less well studied.

Exposure to air pollution

Air pollution causes a substantial population health burden. Physical activity can increase exposure to air pollution through changes in inhalation rate and changes in air pollution concentrations in the location of activity. Being physically active increases the inhalation rate, which can lead to a higher dose of air pollution penetrating lungs [95]. While this is true for all forms of activity, the impacts will be greater for those in more polluted environments. Air pollution whilst travelling is an important factor, particularly in urban environments as air pollution concentrations are higher in traffic. A review of European studies found that pedestrians are on average less exposed than car and bus users and cyclists, and car users are more exposed than cyclists on average. Cyclist and bus rider exposure contrasts depend on the type of pollutant, but are similar [17].

Several studies have assessed the short term impacts of air pollution and physical activity [96-98]. Short-term studies suggest that air pollution can reduce the benefits of physical activity, but that the benefits are still greater than the risks. For example, in a recent study in London volunteers walked in a polluted environment. Reduced cardiorespiratory benefits were observed among those aged 60 years and older. [99]. Long-term cohort studies suggest that physical activity could protect from the harmful effects of air pollution, and that air pollution, at the levels seen in England, will not significantly modify the benefits of physical activity amongst adults [100-103].

Several modelling studies have compared the risks and benefits of walking and cycling in the urban environment and all of them have concluded that the benefits of physical activity outweigh the risks of air pollution [72]. More recently, a study looked specifically at the long-term risk-benefit trade-offs of walking and cycling-related physical activity and air pollution in multiple locations of the world, and concluded that in England the benefits clearly outweigh the risks [104].

There is also a small, but growing, literature on the impact of air pollution on people's willingness to do physical activity [105].

12. Models and tools

Various tools exist to estimate the health impacts of increasing population levels of walking and cycling. The WHO Europe Heath Economic Assessment Tool (HEAT) heatwalkingcycling.org/#homepage estimates health gains from changes in walking or cycling, and new modules allow estimation of how much of this gain might be offset by higher injury risks and increased inhalation of air pollutants. The health gains are expressed as premature deaths prevented and the results monetised using the statistical value of a life.

In England, the Department for Transport (DfT) has produced guidance on modelling health impacts of changes in walking and cycling. These include an approach related to HEAT, but that estimates health impacts as changes in the 'reduction of years of life lost due to physical inactivity' trid.trb.org/view/1485096. The DfT also includes recommended values for changes in sickness absence from increased walking and cycling. trid.trb.org/view/1485096.

The DfT has also funded the open source Propensity to Cycle Tool (PCT) that estimates the cycling commuting potential and corresponding physical activity gains at an area and route level in England [13]. The PCT is available at www.pct.bike. The PCT uses a modified version of the HEAT approach accounting for local authority mortality rates and the age distribution of the population.

Results from local authority level analysis show that if English people were as likely to cycle a trip, allowing for trip distance and hilliness, as people in the Netherlands, then there would be high cycling potential in all local authorities. While England is hillier than the Netherlands, English commutes tend to be shorter. This scenario showed that if English people became as likely to cycle a trip of a given distance as Dutch people, nearly 1 in 5 (18%) would cycle to work - an almost 6-fold increase. Across England, every local authority would see at least 1 in 15 commuters cycling to work, with a third seeing cycle commuting rates of 20% or more. The PCT also includes an *Ebikes* scenario that builds on the *Go Dutch* scenario and looks at the additional cycling potential if people had Dutch propensity plus widespread access to electric bikes ('ebikes'). Ebikes enable people to cycle that bit further and tackle hills more easily. Under the *Ebikes* scenario, more than 1 in 4 commuters (26%) would cycle all the way to work. Even in the most hilly areas, like West Devon, at least 1 in 7 commuters might cycle [106]. The PCT is recommended for use in the CWIS [7] and meets a need identified in the recent NICE guidance to identify areas where there is high potential to increase active travel. [www.nice.org.uk/guidance/ng90/chapter/Recommendations]

Another tool funded by the UK Department for Transport is the Impacts of Cycling Tool (www.pct.bike/ict) [107]. This estimates multiple outcomes if non-cyclists became as

likely to cycle a trip of a given distance as existing cyclists. Outcomes include premature deaths prevented, years of life gained, changes in physical activity levels, greenhouse gas emissions, and time savings or losses.

The interface allows users to look at the impacts on population subgroups by age, gender, ethnicity and socio-economic group. The modelling study finds that if the proportion of the English population who cycle regularly increased from 4.8% to 100%, then there would be a nearly 10% reductions in car miles and passenger related CO_2 emissions, along with reductions in premature mortality of 7.5% to 10.8% (varying by age and gender). If the new cyclists had access to ebikes, then mortality reductions would be a bit smaller (7.0% to 10.3%), while the reduction in car miles and CO_2 emissions would be greater (13%). Generally health benefits were slightly greater among men than among women in relative terms, and notably greater in absolute terms. This is due to a combination of the different risk profiles of men and women, differences in trip patterns, and that men are more likely to cycle a longer trip distance than women on average. Absolute benefits increased rapidly with age, as disease risks are higher at older ages and - to a lesser extent - because other types of physical activity are less common at older ages.

While the PCT focuses on scenarios of behaviour change, a common need in transport planning is to simulate impacts of interventions change. With the aim of meeting this need, the Cycling Infrastructure Prioritisation Toolkit (CyIPT) was funded by the DfT's Innovation Challenge Fund. The estimated costs and potential benefits of each scheme is estimated and visualised in a web application hosted at www.cyipt.bike/ (password protected) to inform the decision-making process. Uptake is modelled based on an analysis of change in cycling rates and infrastructure between 2001 and 2011 in areas that saw investment in cycling.The CyIPT is being used by Local Authorities and others to prioritise schemes within overall cycling strategies developed using tools such as the PCT and local knowledge.

The NICE physical activity return on investment tool (www.nice.org.uk/about/what-we-do/into-practice/return-on-investment-tools/physical-activity-return-on-investment-tool) is an Excel model developed to help decision making in physical activity programme planning for local authorities. Unlike the PCT or ICT, it aims to model the impact of interventions using default or user-provided values on the cost and effectiveness of the intervention. Interventions can be combined together to compare the relative cost effectiveness. Unlike HEAT, the PCT, or ICT it does not model the effect of physical activity directly on mortality, but through 3 diseases: coronary heart disease, stroke, and type 2 diabetes. Also, unlike the other tools, it does not use a continuous dose response function but represents physical activity as 3 levels (inactive, low activity, and sufficiently active) [108].

13. Lessons for promoting walking and cycling

This section briefly considers lessons, opportunities and suggestions for actions for the health and social care sector in terms of promoting walking and cycling. Public health should be about helping to build a health-promoting environment and society. This includes building a society where walking and cycling are the norm. The UK Government has a stated ambition for "cycling and walking to become the norm by 2040" [109] and will target funding at innovative ways to encourage people onto a bike or to use their own 2 feet for shorter journeys. This includes specific objectives to double cycling, reduce cycling accidents, and increase the proportion of 5-to-10 year-olds walking to school to 55% by 2025" [101]. The plan for how to achieve this is laid out in the CWIS [7].

A 2017 Report by PHE, *Spatial planning for health: An evidence resource for planning and designing healthier places* illustrated the linkages, and strength of evidence, between spatial planning and health based on the findings from an umbrella literature review of the impacts of the built environment on health [110].

This report identified 4 key principles for promoting healthy transport:

1. Provision of active travel infrastructure;
2. Provision of public transport;
3. Prioritising active travel and road safety;
4. Enabling mobility for all ages and activities.

In 2012 the National Institute for Health and Clinical Excellence (NICE) published public health guidance on promoting walking and cycling [111]. This covered policy and planning, local programmes schools, workplaces and the NHS. In relation to the health sector, this guidance stated that the NHS as a large employer should encourage walking and cycling to access its sites among staff, visitors, and patients. It emphasised the importance of providing for inclusive walking and cycling, including disabled people. The relevant information is presented in Table 7.

Table 7 2012 NICE guidance recommendations for promoting walking and cycling [111]

Recommendation 1 High-level support from the health sector

Who should take action?

- directors of public health
- public health portfolio holders in local authorities
- clinical commissioning groups

What action should they take?

- ensure a senior member of the public health team is responsible for promoting walking and cycling. They should support coordinated, cross-sector working, for example, by ensuring programmes offered by different sectors complement rather than duplicate one another. The senior member should also ensure NICE's recommendations on physical activity and the environment are implemented
- ensure the joint strategic needs assessment, the joint health and wellbeing strategy and other local needs assessments and strategies take into account opportunities to increase walking and cycling. They should also consider how impediments to walking and cycling can be addressed
- ensure walking and cycling are considered, alongside other interventions, when working to achieve specific health outcomes in relation to the local population (such as a reduction in the risk of cardiovascular disease, cancer, obesity and diabetes, or the promotion of mental wellbeing [1]). These include outcomes identified through the joint strategic needs assessment process
- ensure walking and cycling are included in chronic disease pathways
- ensure all relevant sectors contribute resources and funding to encourage and support people to walk and cycle
- where appropriate, ensure walking and cycling are treated as separate activities which may require different approaches
- ensure walking and cycling projects are rigorously evaluated. This includes evaluating their impact on health inequalities

Recommendation 10 NHS

Who should take action?

- clinical commissioning groups
- national commissioning board
- primary and secondary healthcare professionals

What action should they take?

- incorporate information on walking and cycling into all physical activity advice

given by health professionals. (See also NICE's recommendations on 4 commonly used methods to increase physical activity.)

- ensure walking and cycling are among the options provided by the ‘Let's Get Moving’ physical activity care pathway
- ensure people who express an interest in walking or cycling as a way of being more physically active are given information about appropriate national and local initiatives. Also provide individual support and follow-up (see recommendation 7)
- direct people with limited mobility to specialist centres where adapted equipment, assessment and training are available for walking and cycling
- ensure walking and cycling programmes link to existing national and local initiatives

14. Limitations

There are a number of limitations that should be acknowledged.

In relation to the evidence base, far more studies have focused on leisure activity or total activity than on walking or cycling specifically. This is because of the interests of researchers, the measurement tools or data available, and also because cycling is a less common regular activity in most countries where studies have been conducted. The studies of walking and cycling provide more evidence on broad outcomes such as all-cause mortality than on individual disease mortality. This is partly because there are more total deaths in the studies than from any 1 cause, so the statistical power is greater. In large population cohorts it is also generally easier to assess hard disease outcomes from eg death registers than it is to assess risk factors such as high blood pressure. This also biases the available evidence.

There is generally more observational prospective evidence than long-term trial evidence, as trial designs are far more expensive and harder to control, especially over a number of years. As a result, it is difficult to find evidence of the 10- or even 5-year effects of increased walking from a randomised trial.

These considerations need to be held in mind when reading the specific evidence. Lack of, or incomplete evidence on walking and cycling for a specific outcome will often be because no-one has sufficient data to study it well. However, where there is good evidence that physical activity impacts this outcome, then there is general scientific consensus that will most likely apply to walking and cycling as exemplar types of physical activity. At present this **indirect evidence** is more abundant, and of higher quality, than the **direct evidence** for walking and cycling.

In relation to the methods, this was a rapid scoping review conducted in a limited time frame. This restricted the ablity to assess all aspects of study design and quality. For example, the report was not in a position to say which of the relationships or associations described were independent from engagement in other physical activity (independent associations allow stronger inference of the modal specificity of walking and cycling). There was also only time to search a limited number of databases. Further, there was not scope to conduct meta-analysis on each outcome to find the pooled effect.

It can be considered a strength that the report has focused on systematic reviews and meta-analyses, followed by other review designs and high quality studies. This has allowed summarising of the evidence base for a high number of outcomes and questions. It has also been possible to highlight areas where the evidence base has gaps, and future research could be prioritised.

15. Conclusions and recommendations

There is strong evidence that physical activity improves physical and mental health, and that walking and cycling make important contributions to overall physical activity levels. A growing body of **direct evidence** supports specific physical and mental health benefits for both walking and cycling.

Increasing walking and cycling therefore has the potential to substantially improve individual and population health, and thus benefit health and care systems.

The evidence set out in this rapid evidence review will help make the case for appropriate levels of funding for further active travel interventions. To increase population walking and cycling, and to realise the associated benefits for population health and health and care systems, there is a need to provide environments and opportunities that support walking and cycling. Such environments should be accessible to all, with particular attention to ages, socioeconomic status, and people with disabilities and long-term conditions.

References

1. 2018 Physical Activity Guidelines Advisory Committee, *2018 Physical Activity Guidelines Advisory Committee Scientific Report*. 2018, U.S. Department of Health and Human Services: Washington DC.
2. Start Active Stay Active, *A report on physical activity for health from the four home countries' Chief Medical Officers*, T.D.o. Health, Editor. 2011.
3. Bélanger, M., N. Townsend, and C. Foster, *Age-related differences in physical activity profiles of English adults.* Preventive Medicine, 2011. **52**(3): p. 247-249.
4. Craig, R., J. Mindell, and V. Hirani, *Health Survey for England 2008: physical activity and fitness.* 2009.
5. World Health Organization, *Global action plan on physical activity 2018–2030: more active people for a healthier world*. 2018.
6. *Investments that Work for Physical Activity.* British Journal of Sports Medicine, 2012. **46**(10): p. 709-712.
7. Department for Transport, *Cycling and Walking Investment Strategy,*. 2017: London.
8. Kelly, P., et al., *Walking on sunshine: scoping review of the evidence for walking and mental health.* British Journal of Sports Medicine, 2018. **52**(12): p. 800.
9. Department for Transport, *Walking and Cycling Statistics 2017: Notes and Definitions*. 2018: England, UK.
10. Morris, J.N. and A.E. Hardman, *Walking to health.* Sports Medicine, 1997. **23**(5): p. 306-32.
11. Ainsworth, B.E., et al., *2011 Compendium of Physical Activities: a second update of codes and MET values.* Medicine & science in sports & exercise, 2011. **43**(8): p. 1575-1581.
12. Fishman, E., L. Böcker, and M. Helbich, *Adult Active Transport in the Netherlands: An Analysis of Its Contribution to Physical Activity Requirements.* PLOS ONE, 2015. **10**(4): p. e0121871.
13. Lovelace, R., et al., *The Propensity to Cycle Tool: An open source online system for sustainable transport planning.* 2017, 2017. **10**(1).
14. Kelly, P., et al., *Systematic review and meta-analysis of reduction in all-cause mortality from walking and cycling and shape of dose response relationship.* International Journal of Behavioral Nutrition and Physical Activity, 2014. **11**(1): p. 132.
15. Woodcock, J., et al., *Non-vigorous physical activity and all-cause mortality: systematic review and meta-analysis of cohort studies.* Int J Epidemiol, 2011. **40**(1): p. 121-38.
16. Hamer, M. and Y. Chida, *Walking and primary prevention: a meta-analysis of prospective cohort studies.* Br J Sports Med, 2008. **42**(4): p. 238-43.
17. Zheng, H., et al., *Quantifying the dose-response of walking in reducing coronary heart disease risk: meta-analysis.* European Journal of Epidemiology, 2009. **24**(4): p. 181-192.
18. Wu, Y., D. Zhang, and S. Kang, *Physical activity and risk of breast cancer: a meta-analysis of prospective studies.* Breast Cancer Res Treat, 2013. **137**(3): p. 869-82.
19. Schmid, D., et al., *A systematic review and meta-analysis of physical activity and endometrial cancer risk.* Eur J Epidemiol, 2015. **30**(5): p. 397-412.
20. Jeon, C.Y., et al., *Physical activity of moderate intensity and risk of type 2 diabetes: a systematic review.* Diabetes Care, 2007. **30**(3): p. 744-52.
21. Laaksonen, D.E., et al., *Physical activity in the prevention of type 2 diabetes: the Finnish diabetes prevention study.* Diabetes, 2005. **54**(1): p. 158-65.

22. Swartz, A.M., et al., *Increasing daily walking improves glucose tolerance in overweight women.* Prev Med, 2003. **37**(4): p. 356-62.
23. Yates, T., et al., *Effectiveness of a Pragmatic Education Program Designed to Promote Walking Activity in Individuals With Impaired Glucose Tolerance.* A randomized controlled trial, 2009. **32**(8): p. 1404-1410.
24. Murtagh, E.M., et al., *The effect of walking on risk factors for cardiovascular disease: An updated systematic review and meta-analysis of randomised control trials.* Preventive Medicine, 2015. **72**: p. 34-43.
25. Larouche, R., et al., *Associations Between Active School Transport and Physical Activity, Body Composition, and Cardiovascular Fitness: A Systematic Review of 68 Studies.* Journal of Physical Activity and Health, 2014. **11**(1): p. 206-227.
26. Bravata, D.M., et al., *Using pedometers to increase physical activity and improve health: A systematic review.* JAMA, 2007. **298**(19): p. 2296-2304.
27. Moyna, N.M. and P.D. Thompson, *The effect of physical activity on endothelial function in man.* Acta Physiologica Scandinavica, 2004. **180**(2): p. 113-123.
28. Kearney, T.M., et al., *Accumulated brisk walking reduces arterial stiffness in overweight adults: evidence from a randomized control trial.* J Am Soc Hypertens, 2014. **8**(2): p. 117-26.
29. Petitt, D.S. and K.J. Cureton, *Effects of prior exercise on postprandial lipemia: a quantitative review.* Metabolism, 2003. **52**(4): p. 418-24.
30. Gill, J.M. and A.E. Hardman, *Exercise and postprandial lipid metabolism: an update on potential mechanisms and interactions with high-carbohydrate diets (review).* J Nutr Biochem, 2003. **14**(3): p. 122-32.
31. Kelly, P., M. Murphy, and N. Mutrie, *The Health Benefits of Walking*, in *Walking*. 2017, Emerald Publishing Limited. p. 61-79.
32. Mabire, L., et al., *The Influence of Age, Sex and Body Mass Index on the Effectiveness of Brisk Walking for Obesity Management in Adults: A Systematic Review and Meta-Analysis.* Journal of Physical Activity & Health, 2017. **14**(5): p. 389-407.
33. Martyn-St James, M. and S. Carroll, *Meta-analysis of walking for preservation of bone mineral density in postmenopausal women.* Bone, 2008. **43**(3): p. 521-531.
34. Lawford, B.J., J. Walters, and K. Ferrar, *Does walking improve disability status, function, or quality of life in adults with chronic low back pain? A systematic review.* Clinical Rehabilitation, 2015. **30**(6): p. 523-536.
35. Robertson, R., et al., *Walking for depression or depressive symptoms: A systematic review and meta-analysis.* Mental Health and Physical Activity, 2012. **5**(1): p. 66-75.
36. Matthews, C.E., et al., *Influence of Exercise, Walking, Cycling, and Overall Nonexercise Physical Activity on Mortality in Chinese Women.* American Journal of Epidemiology, 2007. **165**(12): p. 1343-1350.
37. Andersen, L.B., et al., *All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work.* Arch Intern Med, 2000. **160**(11): p. 1621-8.
38. Gill, J., et al., *Benefits and risks of cycling, and how to increase cycling participation: Evidence and evidence gaps. A report for British Cycling & HSBC UK.* 2018 (In Press).
39. Oja, P., et al., *Health benefits of cycling: a systematic review.* Scandinavian Journal of Medicine & Science in Sports, 2011. **21**(4): p. 496-509.
40. Grontved, A., et al., *Bicycling to Work and Primordial Prevention of Cardiovascular Risk: A Cohort Study Among Swedish Men and Women.* J Am Heart Assoc, 2016. **5**(11).
41. Wanner, M., et al., *Active Transport, Physical Activity, and Body Weight in Adults: A Systematic Review.* American Journal of Preventive Medicine, 2012. **42**(5): p. 493-502.
42. Bere, E., et al., *Longitudinal associations between cycling to school and weight status.* Int J Pediatr Obes, 2011. **6**(3-4): p. 182-7.

43. Ulrich, D.A., et al., *Physical Activity Benefits of Learning to Ride a Two-Wheel Bicycle for Children With Down Syndrome: A Randomized Trial.* Physical Therapy, 2011. **91**(10): p. 1463-1477.
44. Olmedillas, H., et al., *Cycling and bone health: a systematic review.* BMC Medicine, 2012. **10**: p. 168-168.
45. Mytton, O.T., J. Panter, and D. Ogilvie, *Longitudinal associations of active commuting with wellbeing and sickness absence.* Preventive Medicine, 2016. **84**: p. 19-26.
46. Avila-Palencia, I., et al., *The relationship between bicycle commuting and perceived stress: a cross-sectional study.* BMJ Open, 2017. **7**(6).
47. Brutus, S., R. Javadian, and A.J. Panaccio, *Cycling, car, or public transit: a study of stress and mood upon arrival at work.* International Journal of Workplace Health Management, 2017. **10**(1): p. 13-24.
48. Ward, A.L., et al., *Is the 'happy wanderer' really happy? Transport and life satisfaction among older teenagers in rural New Zealand.* Journal of Transport & Health, 2018.
49. Whitaker, E.D., *The Bicycle Makes the Eyes Smile: Exercise, Aging, and Psychophysical Well-Being in Older Italian Cyclists.* Medical Anthropology, 2005. **24**(1): p. 1-43.
50. Koolhaas, C.M., et al., *Physical activity types and health-related quality of life among middle-aged and elderly adults: The Rotterdam Study.* The journal of nutrition, health & aging, 2018. **22**(2): p. 246-253.
51. De Geus, B., et al., *Cycling to work: influence on indexes of health in untrained men and women in Flanders. Coronary heart disease and quality of life.* Scandinavian Journal of Medicine & Science in Sports, 2008. **18**(4): p. 498-510.
52. Hamer, M. and Y. Chida, *Active commuting and cardiovascular risk: A meta-analytic review.* Preventive Medicine, 2008. **46**(1): p. 9-13.
53. Wennberg, P., et al., *Reduced risk of myocardial infarction related to active commuting: inflammatory and haemostatic effects are potential major mediating mechanisms.* European Journal of Cardiovascular Prevention & Rehabilitation, 2010. **17**(1): p. 56-62.
54. Wang, Y., et al., *Occupational, Commuting, and Leisure-Time Physical Activity in Relation to Heart Failure Among Finnish Men and Women.* Journal of the American College of Cardiology, 2010. **56**(14): p. 1140-1148.
55. Skreden, M., et al., *Change in active transportation and weight gain in pregnancy.* International Journal of Behavioral Nutrition and Physical Activity, 2016. **13**(1): p. 10.
56. Gram, A.S., et al., *Anti-inflammatory effects of active commuting and leisure time exercise in overweight and obese women and men: A randomized controlled trial.* Atherosclerosis, 2017. **265**: p. 318-324.
57. Lubans, D.R., et al., *The relationship between active travel to school and health-related fitness in children and adolescents: a systematic review.* Int J Behav Nutr Phys Act, 2011. **8**: p. 5.
58. Lee, M.C., M.R. Orenstein, and M.J. Richardson, *Systematic review of active commuting to school and childrens physical activity and weight.* Journal of Physical Activity & Health, 2008. **5**(6): p. 930-49.
59. Faulkner, G.E., et al., *Active school transport, physical activity levels and body weight of children and youth: a systematic review.* Preventive Medicine, 2009. **48**(1): p. 3-8.
60. White, R.L., et al., *Domain-Specific Physical Activity and Mental Health: A Meta-analysis.* American Journal of Preventive Medicine, 2017. **52**(5): p. 653-666.
61. Martin, A., Y. Goryakin, and M. Suhrcke, *Does active commuting improve psychological wellbeing? Longitudinal evidence from eighteen waves of the British Household Panel Survey.* Preventive Medicine, 2014. **69**: p. 296-303.

62. Singleton, P.A., *Walking (and cycling) to well-being: Modal and other determinants of subjective well-being during the commute.* Travel Behaviour and Society, 2018.
63. Morris, E.A. and E. Guerra, *Mood and mode: does how we travel affect how we feel?* Transportation, 2015. **42**(1): p. 25-43.
64. Sun, Y., Y. Liu, and F.-B. Tao, *Associations Between Active Commuting to School, Body Fat, and Mental Well-being: Population-Based, Cross-Sectional Study in China.* Journal of Adolescent Health, 2015. **57**(6): p. 679-685.
65. Humphreys, D.K., A. Goodman, and D. Ogilvie, *Associations between active commuting and physical and mental wellbeing.* Preventive Medicine, 2013. **57**(2): p. 135-139.
66. Richards, J., et al., *Don't worry, be happy: cross-sectional associations between physical activity and happiness in 15 European countries.* BMC Public Health, 2015. **15**(1): p. 53.
67. Kelly, P., C. Fitzsimons, and G. Baker, *Should we reframe how we think about physical activity and sedentary behaviour measurement? Validity and reliability reconsidered.* Int J Behav Nutr Phys Act, 2016. **13**: p. 32.
68. Stamatakis, E., et al., *Self-rated walking pace and all-cause, cardiovascular disease and cancer mortality: individual participant pooled analysis of 50 225 walkers from 11 population British cohorts.* British Journal of Sports Medicine, 2018. **52**(12): p. 761-768.
69. Schnohr, P., et al., *Intensity versus duration of cycling, impact on all-cause and coronary heart disease mortality: the Copenhagen City Heart Study.* Eur J Prev Cardiol, 2012. **19**(1): p. 73-80.
70. Oja, P., et al., *Effects of frequency, intensity, duration and volume of walking interventions on CVD risk factors: a systematic review and meta-regression analysis of randomised controlled trials among inactive healthy adults.* British Journal of Sports Medicine, 2018. **52**(12): p. 769-775.
71. Cooper, A.R., et al., *Longitudinal associations of cycling to school with adolescent fitness.* Preventive Medicine, 2008. **47**(3): p. 324-328.
72. Mueller, N., et al., *Health impact assessment of active transportation: A systematic review.* Preventive Medicine, 2015. **76**: p. 103-114.
73. Telama, R., et al., *Tracking of physical activity from early childhood through youth into adulthood.* Medicine and science in sports and exercise, 2014. **46**(5): p. 955-962.
74. Roberts, D., N. Townsend, and C. Foster, *Use of new guidance to profile 'equivalent minutes' of aerobic physical activity for adults in England reveals gender, geographical, and socio-economic inequalities in meeting public health guidance: A cross-sectional study.* Preventive Medicine Reports, 2016. **4**: p. 50-60.
75. Zaninotto, P., A. Sacker, and J. Head, *Relationship Between Wealth and Age Trajectories of Walking Speed Among Older Adults: Evidence From the English Longitudinal Study of Ageing.* The Journals of Gerontology: Series A, 2013. **68**(12): p. 1525-1531.
76. Payne, S., N. Townsend, and C. Foster, *The physical activity profile of active children in England.* International Journal of Behavioral Nutrition and Physical Activity, 2013. **10**(1): p. 136.
77. Roth, M.A., C.J. Millett, and J.S. Mindell, *The contribution of active travel (walking and cycling) in children to overall physical activity levels: a national cross sectional study.* Preventive Medicine, 2012. **54**(2): p. 134-139.
78. Tainio, M., et al., *Mortality, greenhouse gas emissions and consumer cost impacts of combined diet and physical activity scenarios: a health impact assessment study.* BMJ Open, 2017. **7**(2).

79. Goodman, A. and R. Aldred, *Inequalities in utility and leisure cycling in England, and variation by local cycling prevalence.* Transportation Research Part F: Traffic Psychology and Behaviour, 2018. **56**: p. 381-391.
80. Andrews, N., I. Clement, and R. Aldred, *Invisible cyclists? Disabled people and cycle planning – A case study of London.* Journal of Transport & Health, 2018. **8**: p. 146-156.
81. Clayton, W., J. Parkin, and C. Billington, *Cycling and disability: A call for further research.* Journal of Transport & Health, 2017. **6**: p. 452-462.
82. Smith, B., et al., *Evidence Review on Physical Activity and Disability: Scientific report on physical activity for health benefits among disabled adults* Public Health England, Editor. 2018 (In press): London.
83. Petrokofsky, C. and A. Davis, *Working Together to Promote Active Travel; A Briefing Document for Local Authorities,*, Public Health England, Editor. 2016: London.
84. Sustrans, *The role of walking and cycling in solving the UK's air quality crisis* 2017, Sustrans: England, UK.
85. Public Health England, *Physical inactivity: economic costs to NHS clinical commissioning groups*. 2016: England, UK.
86. Woodcock, J., et al., *Health effects of the London bicycle sharing system: health impact modelling study.* BMJ : British Medical Journal, 2014. **348**.
87. Feleke, R., et al., *Comparative fatality risk for different travel modes by age, sex, and deprivation.* Journal of Transport & Health, 2018. **8**: p. 307-320.
88. Mindell, J.S., D. Leslie, and M. Wardlaw, *Exposure-Based, 'Like-for-Like' Assessment of Road Safety by Travel Mode Using Routine Health Data.* PLOS ONE, 2012. **7**(12): p. e50606.
89. Scholes, S., et al., *Fatality rates associated with driving and cycling for all road users in Great Britain 2005–2013.* Journal of Transport & Health, 2018. **8**: p. 321-333.
90. Elvik, R. and T. Bjørnskau, *Safety-in-numbers: A systematic review and meta-analysis of evidence.* Safety Science, 2017. **92**: p. 274-282.
91. Aldred, R., et al., *Cycling injury risk in London: A case-control study exploring the impact of cycle volumes, motor vehicle volumes, and road characteristics including speed limits.* Accident Analysis & Prevention, 2018. **117**: p. 75-84.
92. Götschi, T., J. Garrard, and B. Giles-Corti, *Cycling as a Part of Daily Life: A Review of Health Perspectives.* Transport Reviews, 2016. **36**(1): p. 45-71.
93. Department for Transport, *Walking and cycling statistics*. 2018: England: 2017.
94. Aldred, R. and S. Crosweller, *Investigating the rates and impacts of near misses and related incidents among UK cyclists.* Journal of Transport & Health, 2015. **2**(3): p. 379-393.
95. Bigazzi, A.Y. and M.A. Figliozzi, *Review of Urban Bicyclists' Intake and Uptake of Traffic-Related Air Pollution.* Transport Reviews, 2014. **34**(2): p. 221-245.
96. Cutrufello, P.T., J.M. Smoliga, and K.W. Rundell, *Small things make a big difference: particulate matter and exercise.* Sports Med, 2012. **42**(12): p. 1041-58.
97. Giorgini, P., et al., *Air Pollution and Exercise: A REVIEW OF THE CARDIOVASCULAR IMPLICATIONS FOR HEALTH CARE PROFESSIONALS.* J Cardiopulm Rehabil Prev, 2016. **36**(2): p. 84-95.
98. Giles, L.V. and M.S. Koehle, *The health effects of exercising in air pollution.* Sports Med, 2014. **44**(2): p. 223-49.
99. Sinharay, R., et al., *Respiratory and cardiovascular responses to walking down a traffic-polluted road compared with walking in a traffic-free area in participants aged 60 years and older with chronic lung or heart disease and age-matched healthy controls: a randomised, crossover study.* The Lancet, 2018. **391**(10118): p. 339-349.

100. Andersen, Z.J., et al., *A study of the combined effects of physical activity and air pollution on mortality in elderly urban residents: the Danish Diet, Cancer, and Health Cohort.* Environ Health Perspect, 2015. **123**(6): p. 557-63.
101. Endes, S., et al., *Is physical activity a modifier of the association between air pollution and arterial stiffness in older adults: The SAPALDIA cohort study.* Int J Hyg Environ Health, 2017. **220**(6): p. 1030-1038.
102. Andersen, Z.J., et al., *Diabetes incidence and long-term exposure to air pollution: a cohort study.* Diabetes Care, 2012. **35**(1): p. 92-8.
103. Fisher, J.E., et al., *Physical Activity, Air Pollution, and the Risk of Asthma and Chronic Obstructive Pulmonary Disease.* American Journal of Respiratory and Critical Care Medicine, 2016. **194**(7): p. 855-865.
104. Tainio, M., et al., *Can air pollution negate the health benefits of cycling and walking?* Preventive Medicine, 2016. **87**: p. 233-236.
105. An, R., et al., *Impact of ambient air pollution on physical activity among adults: a systematic review and meta-analysis.* Perspectives in Public Health, 2018. **138**(2): p. 111-121.
106. www.cedar.iph.cam.ac.uk/resources/evidence/eb-14-englands-cycling-potential/. *Evidence Brief special – England's Cycling Potential: Results from the Department for Transport-funded Propensity to Cycle Tool project*. Accessed 2018.
107. Woodcock, J., et al., *Development of the Impacts of Cycling Tool (ICT): A modelling study and web tool for evaluating health and environmental impacts of cycling uptake.* PLoS Med, 2018. **15**(7): p. e1002622.
108. National Institute for Health and Clinical Excellence, *Estimating return on investment for interventions and strategies to increase physical activity: Technical report*. 2014, Matrix Knowledge: England, UK.
109. *www.gov.uk/government/news/government-publishes-12-billion-plan-to-increase-cycling-and-walking*. 2017.
110. Pinto, A., et al., *Spatial planning for health: An evidence resource for planning and designing healthy places,*, Public Health England, Editor. 2017: London.
111. National Institute for Health and Clinical Excellence, *Physical activity: walking and cycling (PH41)*. 2012: London.

Appendix 1: The Chief Medical Officers' Physical Activity Guidelines

Individual physical and mental capabilities should be considered when interpreting the guidelines.

Adults Aged 19-64 years

Adults should aim to be active daily. Over a week, activity should add up to at least 150 minutes (2 ½ hours) a week of moderate intensity activity. Comparable benefits can be achieved through 75 minutes of vigorous intensity activity spread across the week, or combinations of moderate and vigorous intensity activity.

This volume of activity can be accumulated in different ways. Higher intensity activity for shorter amounts of time or a mixture of moderate, vigorous and high intensity activities will provide similar health benefits. While meeting the guidelines is likely to yield optimal health benefits, there is value and health gain in physical activity, even when below the moderate intensity and 150 minute thresholds.

Adults should also undertake physical activity to improve muscle strength on at least 2 days a week.

Long periods of sitting should be broken up with some light activity.

Children Aged 5-18 years

Ensuring that all children are as active as possible throughout childhood is important for population health.

- engage in moderate to vigorous intensity physical activity for at least 60 minutes and up to several hours every day
- incorporate vigorous intensity activity, including those that strengthen muscle and bone strength on at least 3 days a week
- minimise the amount of time spent being sedentary (sitting) for extended periods.

This activity can include all forms of active play such as physical education, active travel, activity after-school, play and sports. There are separate guidelines for the under 5s, including those capable of walking.

Older adults aged 65+ years

In terms of volume and duration, the guidance is similar to that of adults aged 19-64 years. Activity should add up to at least 150 minutes (2 ½ hours) a week of moderate intensity activity.

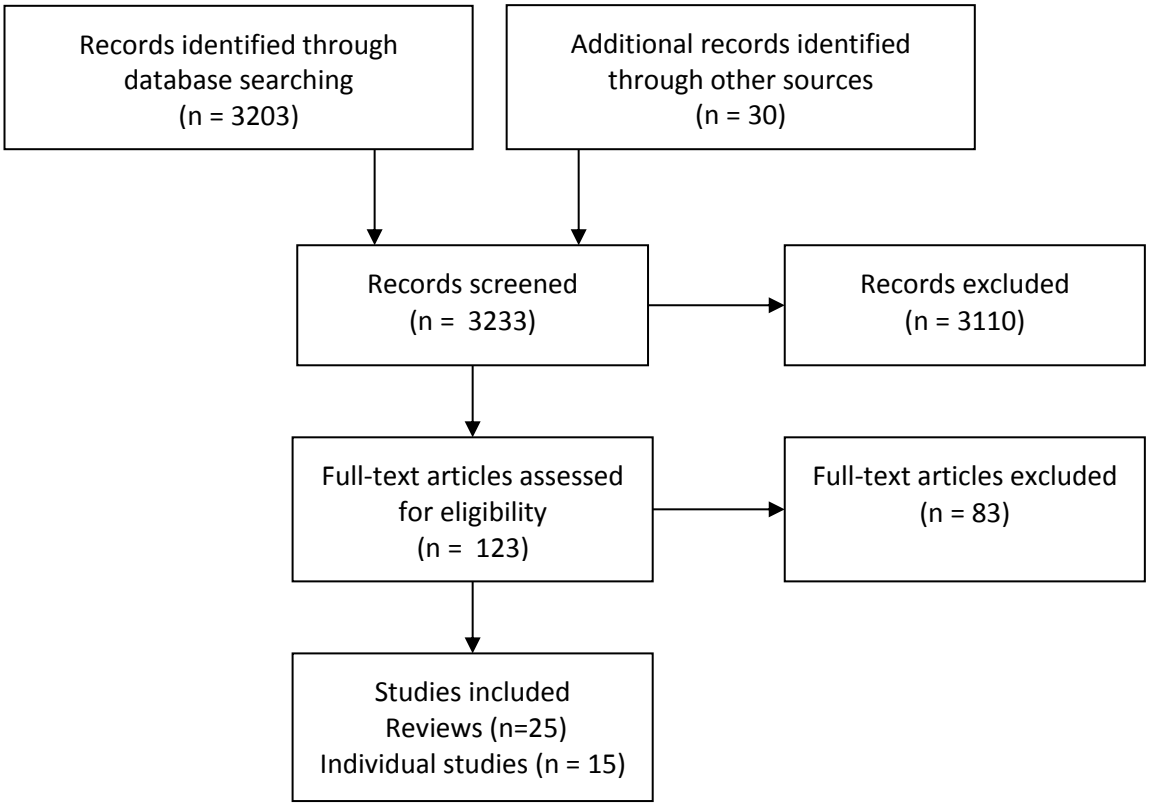
Resistance training for major muscle groups is recommended on at least 2 days per week. Balance and flexibility training is also relevant in this group, aiding independence and functional outcomes.

Increasing volume and frequency of light activities and reducing sedentary behaviour are a place to start for the frailer or disabled older adult. Both strategies contribute towards improving health.

Appendix 2: Search Terms

Outcomes	Search terms
Walking, cycling and active travel terms	bicylc*, active commut*, active travel*, walk*
Physical health outcomes	All-cause mortality, morality, cardiovascular disease, coronary heart disease, cancer*, type II diabetes, glucose metabolism, diabet*, cardiorespiratory fitness , aerobic capacity, blood pressure, hyperten*, vascular function, endothelial function, arterial stiffness, blood lipids, cholesterol, haemostat*, inflammatory markers, body composition, body weight, obes*, musculoskeletal.
Mental health outcomes	Depress*, anxiety, panic disorder*, self-concept, , psychological stress, psychological discomfort, psychological distress, psychological well-being, subjective well-being, psychological resilience, resilien*, social isolation, loneliness, social support.

Appendix 3: Study flow diagram



Appendix 4: Mental health outcome definitions, see Kelly et al 2018 [8]

Table 1 Mental health outcomes included in this review

Outcome	Description
Depression	Depression is a mood disorder categorised by prolonged periods of low mood, or lack of interest and/or pleasure in normal activities most of the time. Depression includes dysthymia and major depressive disorder.[88]
Anxiety	Anxiety is characterised by uncomfortable or upsetting thoughts, and is usually accompanied by agitation, feelings of tension and activation of the autonomic nervous system. It is important to note the distinction between transient anxiety symptoms (state anxiety), persistent symptoms (trait anxiety) and anxiety disorders: a collection of disabling conditions characterised by excessive, chronic anxiety. Examples of anxiety disorders are specific phobias, social phobia, generalised anxiety disorder, panic disorder, obsessive-compulsive disorder and post-traumatic stress disorder.[4]
Self-esteem	Self-esteem is the feelings of value and worth that a person has for oneself. It contributes to overall self-concept as a construct of mental health.[89]
Psychological stress	Psychological stress or distress can be defined as the unique discomforting, emotional state experienced by an individual in response to a specific stressor or demand that results in harm, either temporary or permanent, to that person.[90]
Psychological well-being	Psychological well-being links with autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance. This is often referred to as eudemonic well-being.[10]
Subjective well-being	Subjective well-being is defined as a person's cognitive and affective evaluations of his or her life. Often referred to as hedonic well-being (and closely aligned with the construct of happiness).[11]
Resilience	Resilience refers to a steady trajectory of healthy functioning after a highly adverse event or a conscious effort to continue in an insightful and integrated positive manner as a result of lessons learnt from an adverse experience.[91]
Social isolation and loneliness	Social isolation is described as lack of a social network while loneliness is described as an unfulfilled social need.[92]

Briefing: GM Local Cycling & Walking Infrastructure Plan and Bee Network Plan

What is the "Bee Network" Plan?
The Bee Network Plan is Greater Manchester's (GM) proposed new cycling and walking (C&W) network which will connect every neighbourhood in GM across all ten local authority areas.

The Plan was derived from a series of consultation and network planning workshops held in Spring 2018 involving those people with the greatest knowledge of the local network, including local members, residents, members of local cycling and walking groups and council officers. The workshop in Wigan was held on 12 April 2018.

The GM Bee Network Plan shows the ambition for cycling and walking (C&W) and will guide GM's development and delivery of C&W infrastructure over the coming years.

The Plan will also shape and inform the council's own Local Cycling & Walking Infrastructure Plan (LCWIP) and provides an important framework within which future cycling and walking schemes in Wigan can be developed, funded and delivered.

By way of example, one of the Wigan sections of the Bee Network Plan is appended showing:

• **'Beeways' (yellow lines)**. These are generally on quiet roads or traffic free routes. The majority of these have been derived from the Neighbourhood Network Planning method.

• **'Busy Beeways' (black lines)**. These are on busier roads have been derived through a combination of the Neighbourhood Network Planning method and the LCWIP method. These include (as heavier black lines) the routes which are the subject of the current Streets for All Corridor Studies.

Is the Bee Network the same as GM's Local Cycling and Walking Infrastructure Plan (LCWIP)?
LCWIPs are a DfT-endorsed, evidence-based approach to planning for C&W infrastructure. As a strategic plan for Greater Manchester, the development of the GM LCWIP is being led by TfGM in close partnership with the 10 local authorities.

A primary source of data for the GM LCWIP is the Department for Transport's (DfT) Propensity to Cycle Tool, which can demonstrate where cycling infrastructure is most needed.

The Greater Manchester LCWIP will consist of three outputs, in line with DfT guidance:

• A future network plan for C&W - *this will be the latest version of the Bee Network Plan*;

• A prioritised list of infrastructure schemes required to deliver the plan. *This will include schemes identified through the MCF programme entry process*;

• A report setting out the methodology and evidence behind the plan.

Current Progress and Timeline
Further work is required to audit the emerging LCWIP network and to produce a prioritised list of schemes to deliver it, thus completing the LCWIP.

The Bee Network Plan is a live document and will continue to evolve and change as projects are brought forward through the Mayor's Challenge Fund for Cycling & Walking (MCF), and other funding streams, to deliver the network.

Financial information
The Bee Network Plan provides the framework for bids into the MCF, which is currently a 3-year programme to March 2022, with a budget of £160 million.

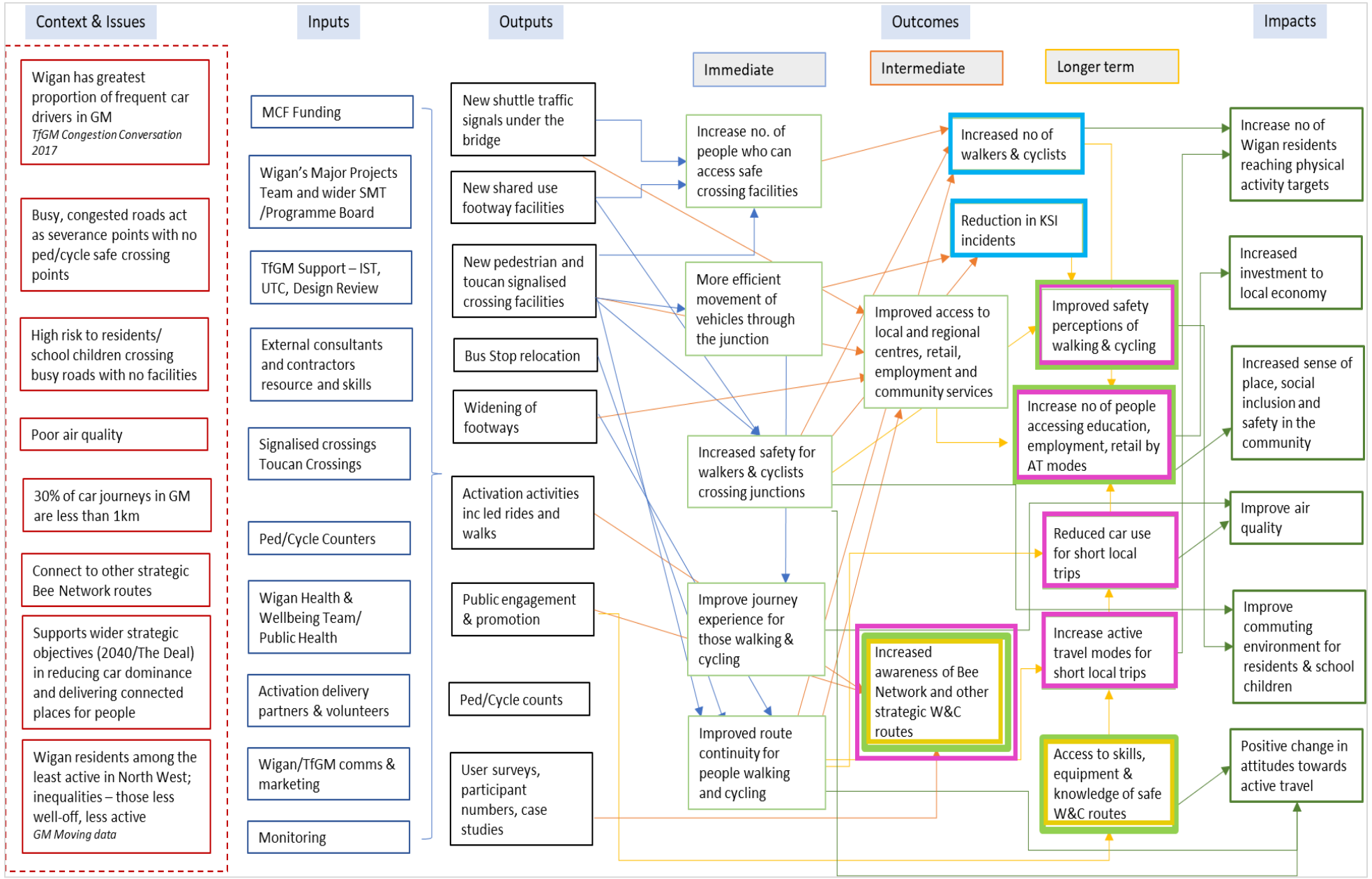
Next Steps
Over the period to June 2019, each district is being asked to approve v2.1 of the Bee Network Plan for publication – planned for end of June. This is on the Cabinet agenda for 6 June 2019.

Following the publication of v2.1 of the Bee Network Plan, the concluding stages of the LCWIP work will be progressed to inform future prioritisation of the delivery of the network.

Wards affected:
All

For more information contact:

LOGIC MAP: Wigan to Standish Cycling and Walking Network – Phase One



What outcomes will be measured and how

- Route user intercept surveys
- Activation, participation counts/surveys
- Data Collection (W&C/ATC/Accident)
- Promotion/social media engagement

Assumptions & Warnings

- Scheme is maintained and kept in good condition.
- Activation plan will be developed and delivered.
- Wigan town centre businesses, and leisure and community facilities remain attractive and offer a diverse choice for users.
- The propensity to walk and cycle is influenced by the quality of the experience, not just distance.
- People who walk and cycle to local centres spend more time in the streets, thus increasing activity such as going into shops or stopping at a café.
- Established relationship between active travel and an increase in physical activity and health
- Wider changes in collision rates could result from the increased number of people walking and cycling in the area **(WARNING)**
- Shuttle signals could contribute to congestion due to slight delays for motorists **(WARNING)**