Appendix B

Economic Appraisal Summary

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Derby City Council

Nottingham City Council

1. Introduction and context

1.1 This technical note outlines the appraisal methodology used when assembling the Economic Case for Derby and Nottingham City Councils' Transforming Cities Fund Tranche 2 Strategic Outline Business Case. Building on the Draft SOBC submitted to DfT in June 2019, and through subsequent co-development discussions with DfT colleagues, we adopted the following economic appraisal techniques in order to forecast and quantify the anticipated benefits associated with the Low, Medium and High investment packages defined in our final SOBC:

- Using the **Derby and Nottingham Strategic Transport Model** to test the potential:
  - Impact of physical public transport improvements to the existing network – notably bus priority improvements achieved through new/extended bus lanes, traffic signal priority for buses and linked traffic signals to benefit all traffic.
  - Disbenefits to car travellers and other highway users in the few locations where roadspace is proposed to be reallocated in order to afford greater priority to public and sustainable transport routes.
  - Impact of new and extended public transport services, which will be supported through the provision of infrastructure under the TCF2 programme – notably new and extended Park & Ride sites, a new rapid transit link in the centre of Derby, and the facilitation of new Demand Responsive Transport Services in locations where it is hard to provide conventional public transport services at the times of day that people need them.
  - Diversionary impacts associated with forecast growth in cycling trips (as estimated using DfT's Active Mode Appraisal Toolkit, and based on local and national precedents) and mode-shift away from private cars, public transport and taxi options.
- Applying the **Valuing Urban Realm Toolkit (VURT)** to forecast the impact on pedestrian flows, dwell times in key city locations, and changes in amenity benefits

associated with significantly improved public realm in both Derby and Nottingham.

- Using the **Active Mode Appraisal Toolkit (AMAT)**, based on assumed changes in cycling activity levels derived from national/international evidence of behavioural responses and local cycle count data, to forecast the impact of urban and inter-urban cycle route improvements focused on key growth locations in the Derby and Nottingham area.
- Applying TAG guidance to develop **bespoke spreadsheet models** to forecast and appraise the impact of groups of measures for which no dedicated modelling tools are available. These include:
  - Passenger amenity benefits associated with enhanced and extended Real Time Information services and improved bus stops.
  - Opportunity cost values for the expansion of existing Park & Ride sites at Hucknall and Phoenix Park - which cannot easily be tested in the Strategic Model given there is no mechanism for constraining parking capacity at the Park & Ride sites.
  - Forecasting the number of additional cycle trips that a public bikeshare system could deliver, with the resulting trip growth fed into the Active Mode Appraisal Toolkit.
  - Forecasting the CO_{2e} reductions associated with extensions to the Derby and Nottingham Go Ultra Low EV chargepoint network.

1.2 The remainder of this Technical Note covers each of these points in turn, signposting to further appendices (as relevant); following a brief summary of core assumptions, appraisal periods applied and overall rationale for the appraisal approach.

2. Core assumptions and input data

Appraisal of scheme benefits

2.1 In line with WebTAG guidance, and based on feedback received from DfT in respect of our successful TCF Tranche 1 submission, we applied the following conventions to our spreadsheet economic appraisal models and TUBA outputs from the strategic model:

- Base price and value year: 2010.
- Appraisal periods:
  - 5 years for public cycle/e-bike hire system.
  - 15 years for real-time information and bus interchange/shelter upgrades.
  - 20 years for public realm improvements in Derby and Nottingham city centres.
  - 20 years for bus-based public transport priority / traffic signal improvements / Park & Ride improvements tested in the strategic model (2043 was the nearest year to the proposed end of appraisal period)
  - 30 years for walk/cycle infrastructure improvements.
  - 30 years for tram-based Park & Ride extensions appraised using spreadsheet forecasting tools – reflecting that these are significant upgrades to NET tram network infrastructure at an early stage (15 years) into the original design life of these facilities.
- Discount rate to convert future benefits to Net Present Value: 3.5%.

2.2 For all bespoke spreadsheet models we have clearly documented our assumptions in-line, with source data and assumptions recorded both in the spreadsheet models themselves and narrated in the Economic Appraisal Summary report for each investment package.

Appraisal of scheme costs

2.3 We treated scheme costs as follows for the purpose of the Cost:Benefit Analysis and Value for Money Assessment:

- Construction-related inflation is forecast to run ahead of both Consumer and Retail Price Index measures. We allowed for this by applying the latest RICS Building Cost Information Service (BCIS) all-in tender price inflation forecasts for

2019/20-2022/23 to our initial cost estimates[1]. This allowance for inflation is included in the total capital value presented in Table 6 1.

- Risks were considered at both Programme and Theme levels. These were quantified based on the programme's Risk Register, found in Table 8-3 of the SOBC, with cost and delivery impacts priced based on the estimated likelihood and impact of each risk. Allowance for these risks is costed within the total capital cost of the programme, and recognises that our Councils will bear the risk for any cost over-runs associated with our delivery of the TCF Tranche 2 programme. As larger schemes are developed through the local Assurance Framework, individual scheme risk registers, and risk allowances will be developed - particularly for individual theme components exceeding £5m in value.
- Optimism Bias was applied at 44% for all schemes, reflecting that most are at Stage 1 of the scheme development process defined in Table 7 of TAG Unit A1.2.

[1] Gleeds (2019) Inflation Report 2019 Q2, page 14. Available at: https://gb.gleeds.com/contentassets/b94d2a7269fb4b76b4573bce4079374c/inflation-report-2019-q2.pdf

3. Strategic Model Testing

3.1 Based on co-development dialogue with DfT colleagues we concurred that it would be proportionate to use the strategic transport model for Derby and Nottingham to test as many Theme components of each of the Low, Medium and High investment packages as possible. To this end, we worked with colleagues at SYSTRA (who maintain the Derby and Nottingham area model on behalf of the local Councils), and DfT's Transport Assessment and Modelling team, to compile a breakdown of the scheme components contained within each TCF Theme and investment package.

3.2 The division of Theme and Package components across the strategic model, valuing urban realm toolkit appraisal, active mode appraisal and bespoke spreadsheet tools is documented in Annex Bi to this Technical Appendix.

About the strategic transport model

3.3 The most recently-developed, and appropriate, strategic model is the East Midlands Gateway Transport Model, which has been developed to focus upon the proposed Toton HS2 station and its interaction with local road and rail networks. The model development and validation reports were shared with colleagues at DfT through the co-development process and are included in Appendix D to the SOBC.

3.4 In summary, the strategic model comprises the following components:

- A SATURN Highway Model.
- A CUBE Voyager Public Transport Model.
- A Cube Variable Demand Model including destination, mode choice, trip frequency and time of day responses.
- A TRICs-based Trip End Model.

3.5 The model is validated against local-collected traffic data (2015-17) and boarding, alighting and on-board survey counts across a range of agreed public transport cordons (2017) and has a base year of 2016. Its focus upon public transport and highway flows means that the impact of any measures aimed at increasing the widespread uptake of walking and cycling needed to be calculated separately and fed into the model through a revised set of O-D matrices.

3.6 On this basis, we used the strategic model:

- As a source of recently collected data on traffic flow (along key select links and junctions) and passenger movement (bus and rail passenger trips) along key corridors.

- To inform the economic appraisal and value for money assessment of all public transport improvements (as documented in Annex Bi), which was undertaken as a pair of model runs (2023 opening year and 2043 final year) for each of the Low, Medium and High investment packages.

3.7 Further detail on what has been encoded into the strategic transport model (Model development and validation reports), and the outputs from the resulting model tests (TUBA benefits summary and Forecasting report), can be found in Annex Bi to this Technical Note, and in Appendix D to the SOBC.

3.8 The Transport User Benefits Assessment derived from the Low, Medium and High package model tests was combined with the outputs from the other tests documented in this Technical Note in order to prepare the Value for Money assessment and Cost:Benefit Analysis that are presented in the Economic Case section of the SOBC.

4. Valuing urban realm improvements

4.1 This section summarises the methodology and main assumptions applied with respect to the measurement of the economic case for public realm cases under the Transforming Cities Fund Strategic Outline Business Case (SOBC). Summary economic values are not presented in this appendix, since they have been provided in the Economic Case section of the SOBC.

Context

4.2 The methodology applies the Valuing Urban Realm Toolkit (VURT) 2016 (Transport for London, 2016). A bespoke spreadsheet model was developed, consistent with the recommended TfL methodology, but also taking into account the unique features of the Nottingham and Derby public realm proposals.

4.3 In particular the following schemes have been appraised using the VURT methodology:

- Broadmarsh Public Realm Stages 1 & 2 (part of Package Aii – Nottingham Rail / Bus Station Public Realm)
- City Centre to Derby Rail Station Access Improvement Scheme (part of Package Aiii – Derby City Centre Hubs)
- Public Realm work within key areas of the city Centre (part pf package Aiv – Derby Rail Bus Station Public Ream)

4.4 VURT considers the user benefits over the lifetime of a scheme. In particular, 11 'link' attributes are taken into consideration whereby, economic utility, measured in pence per minute (ppm), of time spent moving through the street or road is summed for the number of pedestrians over the lifetime of the project. The list of link attributes is presented below:

- Effective width
- Dropped kerbs
- Obstructions
- Permeability
- Legibility
- Lighting
- Personal security
- Surface quality
- User conflict
- Quality of the environment
- Maintenance

4.5 In addition, for certain sections, six 'space' attributes have been assessed, taking into account the user benefits of staying in the space, also measured in pence per minute (ppm), summed for the total number of pedestrians over the lifetime of the project. The complete list of space attributes is presented below.

- Moving in the space
- Interpreting the space
- Personal safety
- Feeling comfortable
- Sense of place
- Opportunity for activity

4.6 Sections of urban realm have been disaggregated into homogenised groups, so as to allow for 'baseline' and 'scenario' characteristics to be subjected to an audit.

4.7 It is important to note that not all section attributes have been scored. Sections that are, and are expected to remain, dominated by through movements, have not been assessed by their space attributes. Excluding space attributes for certain sections has the impact of producing conservative economic benefits.

4.8 All user benefit values have been converted into base prices consistent with WebTAG Databook May 2019 Version 1.12. This includes converting into Base Price year 2010, using VoT Multiplier values to obtain year of benefits realisation, and applying the recommended discount factor (3.5%).

4.9 VURT also has the functionality of measuring the expected property value benefits. This facility has not been employed and therefore the economic benefits derived from the public realm schemes are wholly derived from user benefits of pedestrians spending time walking through, and staying within the street space. Excluding property values has the impact of producing conservative economic benefits.

Main assumptions and base data

4.10 The appraisal period is 20 years, consistent with VURT guidelines (15 to 20 years). Schemes are expected to open in 2023 and this is the First Year of Benefits Realisation (FYoBR).

4.11 Count data (from July 2015) was available for relevant streets in the centre of Nottingham for two 3-hour periods (one in AM and one in PM peak periods). These counts provide base pedestrian data for Carrington Street, Canal Street, Middle Hill and Trent Street. For links whereby counts are not available, pedestrian counts are based on nearby observed count sites. Conversion to 24-hour periods has been derived by comparing the Google station popularity profile over a full typical day. This produced an estimated factor of 38% (i.e. 3-hour peak is estimated to be 38% of a typical 24-hour period). The observed counts appear low partially because the second phase of the tramline was not operational until November 2015 (after the observed counts) and therefore a 20% uplift was applied. Even then, the observed counts for Nottingham

appear low on some links. For example, the 24-hour estimate for Canal Street is only approximately 1,150 pedestrians (2015) – this is very low for such a central street. For Carrington Street, the estimates are at a more realistic 11,100 per day (these values include the 20% uplift described above).

4.12 Historic (2015 – 2018) observed pedestrian counts were available at five central Derby city locations (Cornmarket, East Street, Irongate, Sadler Gate, and St. Peters Street). For links whereby counts were not available, pedestrian counts are based on nearby observed count sites. The observed counts are for full 24-hour periods. The historic counts were used to derive an annual growth rate of 2.8% within the central locations.

4.13 For sections close to Derby rail station, estimates of station usage are available from the Office of Road and Rail[2]. In the year 2017, it is estimated that 4.1 million used the station as either an origin or destination station. In addition, 21.1% of Derby station users are reported to be pedestrians (Station Travel Plans, Data Analysis report, 2009), producing an average of approximately 2,360 pedestrian users per day walking through Railway Terrace. For links nearby, percentage allocations were applied Siddals Rd (50%), Calvert Street (5%) and Liversgate Street (5%). The ORR data between 2010/11 and 2017/18 produced an annual growth rate of 2.75%. Dwellers (people staying in the space) were estimated for Railway terrace based on the number of bus users travelling to the station (15.1% (Station Travel Plans, Data Analysis report, 2009), producing an estimated 850 bus interchangers per day. Estimates for Morledge were based on the average across the five count sites within Derby city centre (see above)

4.14 (Normal) pedestrian growth rates over the appraisal period are assumed to vary between the location sites and are based on a combination of data sources. As a background NTS data provides per annum walking growth of 6% over the past three years – however this is not necessarily reflective of city centre usage. Nottingham specific data shows 6.6% (2010), 4.8% (2011) and 9.9% (2012)[3]. Nevertheless, an average growth rate of 4.0% is assumed for Nottingham. Derby historic data shows an average 2.8% growth between 2015 – 2018 at Cornmarket, East Street and St Peters Street. Because it is expected that the public realm enhancements will reverse the constrained historic growth rates, it is assumed that Derby centre will experience a 3.5% annual growth rate over the appraisal period. Pedestrian growth rates applied near the station are wholly dependent on Derby station usage and these have been estimated to be 2.75% (ORR) over the past 8 years.

4.15 (Generated) pedestrian growth rates over the appraisal period are assumed to vary between the location sites. According to Living Streets, generated increase in footfall

[2] https://dataportal.orr.gov.uk/statistics/usage/estimates-of-station-usage/
[3] Link to report

after public realm schemes are very scheme specific and typically varies from between 20% to 100% in London, but more typically between 25% (Manchester and Coventry) to 35% (Sheffield)[4]

4.16 Because of the potentially transformative impact in Nottingham (the scheme is part of a wider project to attract 2,900 jobs in the centre), the higher estimate of 35% is applied for the Broadmarsh project and the more conservative 25% for the Derby centre and station public realm projects. Generated pedestrians are expected to materialise over a three-year period after scheme opening.

4.17 Concept visuals have been assessed to score the streets for the do-something scenario. They are available for most Broadmarsh area schemes and, in general, the level of service is expected to be of extremely high quality. With respect to the Derby stations public realm schemes, visuals have been provided for Railway Terrace, Siddals Rd and Morledge which show an improved level of service over the current pedestrian and public space environments. For the links in Derby centre, there are graphics available for Becketwell Square and the Spot. Other links in Derby centre are assumed to be developed to a similar standard to the Morledge proposals.

4.18 VURT default values of walking speeds are 1.33 meters per second. However, because the targeted pedestrians are city centre walkers, it is expected that they are more likely to carry shopping or walk at a more leisurely pace. Research conducted by Mastercard found that in similar circumstances, average walking speeds are 1.27 metres per second and this slightly slower speed is applied in the model[5].

4.19 Not all links are designed for people to stay in the space and in some links the baseline number of dwellers is zero. In cases where the baseline case does include some dwellers (for example people sitting on benches, leaning on lamp posts, waiting at bus stops), the average dwelling time is assumed to be 5 minutes. In the do-something scenario, for links which will be designed for people to spend time in, the average time spent is assumed to increase to an average of 30 minutes. The exceptions to this are dwellers who are assumed to be waiting at bus stops (e.g. Derby Station interchangers) and is expected to remain at 5 minutes (i.e. no change in dwelling time between the bassline and do-something case).

4.20 (Normal) dwelling growth is assumed at the same rate as normal walking growth: 4% per annum for Nottingham, 3.5% p.a. for Derby centre and 2.75% p.a. for Derby station. (Generated) dwelling growth is usually assumed to be at 5% of current pedestrians. The exception to this is the expected development at Becketwell which is currently a vacant plot (and therefore has no current footfall) and expected benefits are wholly derived

[4] https://www.livingstreets.org.uk/media/3890/pedestrian-pound-2018.pdf
[5] https://www.independent.co.uk/life-style/lakeside-shopping-centre-fast-lane-shoppers-christmas-hurry-speed-essex-mall-a8084191.html

from generated dwellers, assumed to be 5% of baseline pedestrians currently using St Peters Street. In all cases, generated dwellers are expected to materialise over a three year period after scheme opening.

Methodology notes by site

4.21 Using the identified methodology above and the selected base data, the following sections give a broad overview of the specific assumptions made in the process of evaluating each VURT appraisal within the different investment packages (Low / Med / High) associated with Theme A.

Broadmarsh public realm stages 1 & 2

Carrington Street North

4.22 At this site, space to walk is theoretically sufficient; however effective width is significantly restricted because of the existence of road furniture (street lights, utility boxes etc.), some of which are misaligned, particularly the metal fencing near Collin Street, which dissects pedestrian desire lines.



Figure 4-1: Carrington Street North *(source: google street view)*



Figure 4-2: Carrington Street North *(source: google street view)*

4.23 There are dropped kerbs at junctions with Canal St and Collin St, however, the tactile material requires reinstatement. Some obstructions (signs, utilities) and metal fencing (near Collin Street). Permeability is facilitated at the pedestrian crossings; however, more efficient crossing facilities would provide additional benefits to such a highly trafficked street.

4.24 Legibility is poor as there is a lack of signage and a feeling of visual distractions. Plenty of street lights to provide night time visibility, however tall building(s) restricts day time light. Despite the central location, the buildings on the West side of the street do not provide adequate active frontage as many walls are blank on the first floor. In addition, the east side of the street is overlooked by a car park. As a consequence, the street offers very little informal surveillance.



Figure 4-3: Carrington Street North

4.25 Visual distractions, object obstructions, lack of open space and generally drab feeling leads to low perceived levels of personal security (although there is sufficient night time lighting and it is a busy walking area).The surface is generally even but is inclined in certain areas, there are multiple surfacing types and is visually not appealing and, in some areas, filled with different materials. There is the presence of utilities on the pavement.

4.26 User conflict is present here because the current alignment of the street is separated with access to vehicular traffic and natural pedestrian desire lines are disturbed. Materials currently used are of high quality though dated and there are no natural or beautification features. The street is not neglected but requires some maintenance. The East side of the street is overlooked by drab structures but the street has some green trees near Canal St. Currently the space is not designed for staying in.

Carrington Street (South)



Figure 4-4: Carrington Street South

4.27 Sufficient space to walk especially near Queens St (at railway station) but effective width is currently restricted because of the existence of road furniture. There are only two areas with dropped kerbs, one of which is a zebra crossing. Some obstructions (signs, utilities, bus stops) but less near the station at Queens Street and mostly tidy. The zebra crossing provides some permeability however this can be considered inadequate for such a high-volume street and high vehicular traffic reduces permeability further. Legibility is relatively poor as there is a lack of signage towards the station on this link as well as lack of signage for users exiting from the station. Less street lighting near station limiting night time visibility and building(s) somewhat restrict day time light. Neutral concerning personal security though more open feel near the station feels slightly more secure. The surface quality can be considered positive. Some user conflict expected especially at busy times with frontages to shops. Materials currently used are of high quality though slightly dated. The station area and canal bridge enhance the feel of the area however promoting a feel of the place. The street is not neglected but not in optimal condition. Apart from waiting at buses, the road is not designed for staying in.

Collin Street (East)

4.28 The road is not currently in a suitable condition for walking, however, even in the absence of construction activities, the street is likely to have constrained effective width (pavement path removed along sections) and there are no dropped kerbs.



Figure 4-5: Collin Street East

4.29 There are few obstructions. Little to no permeability as there are no crossings and dropped kerbs - this is exacerbated by high vehicular traffic speeds. There are no signs to assist pedestrians (legibility). Sufficient lighting and business of road likely to reduce the feeling of personal vulnerability (but the presence of fast cars could make people less secure). Blank walls on Northside provide no opportunity for surveillance (formal or informal). Very poor quality of the environment with high noise pollution and few beautification features. The street requires maintenance. The street is not currently suitable for staying in and users are likely to rush through as fast as possible.

Collin Street (West)

4.30 Effective width unconstrained but narrow on Southside of the street (and also limited for sharing with cyclist) and presence of obstructions on the northside of the street with bus stops, metal railing, and street furniture. Only one area of dropped kerbing. Minimal obstructions on the south side of the street. Very little permeability due to high vehicle speeds, no opportunities to cross and also road and bus shelters create a barrier for crossing. No signage for walkers, however, there is tactile paving bordering the pavement (note tactile features do not affect the legibility scoring). Plenty of street



Figure 4-6: Collin Street West *(source: google street view)*

lights to provide night time visibility, however tall building(s) restricts day time light. Bus stops and open pavement (on the southside) promotes a sense of security, however high featureless (blank) walls on the Northside could engender a feeling of danger at night time. Some formal surveillance. Surface quality is reasonable, flat and even. User conflict is existent because of shared space with cyclists. Quality of environment generally not positive however some trees and bus shelters do promote the area. The street is in a reasonable level of maintenance with shelters and furniture appearing in adequate condition. Apart from waiting at buses, the road is not designed for staying in.

Middle Hill

4.31 The road is passable by pedestrians but is not a pleasant link and only used for essential walking or selected to save (walking) journey time. Effective width is reasonable with little clutter at the top of the hill but significantly reduced to the lower side of the hill with little (and almost no) space for pedestrians. No dropped kerbs. Permeability is minimal with no opportunity to move other than one direction.



Figure 4-7: Middle Hill

4.32 No signage to aid direction for pedestrians. An acute sense of poor personal safety especially at the lower end of the hill - though public transport does provide a level of informal surveillance. Presence of utilities is a source of obstructions. Surface quality is in reasonable condition at the top of the hill but reduces significantly lower down including the presence of drainage issues. Very low quality of the environment with no beautification features and high noise pollution. Currently, the space is not designed for staying in.

Sussex Street

4.33 The street is narrow street but little limited obstructions. No signage, therefore, limited legibility. Evenly spaced street lighting though the street is shaded which limits daytime lighting. Relative seclusion (no frontage) and no (formal or informal security informal) engenders a feeling of insecurity. The space feels enclosed. No evidence of user conflict. Sense of environment is poor though little noise pollution. Surface quality is not appealing and poor quality in places. Currently, the space is not designed for staying in.



Figure 4-8: Sussex Street

Canal Street

4.34 Effective width is high but constrained at certain sections where there are obstructions. There is signage that is dedicated for road users and takes up the width of the pavement. There are no dropped kerbs or appropriate gradients that are designed for pedestrians. The constrained width and lack of dropped kerbs do not promote permeability.



Figure 4-9: Canal Street

Legibility is very poor as there is no signage for pedestrians. Some street lighting but less on the east side of the street. There is a car park on one side of the street which can engender a feeling of insecurity during night time and dereliction during day time. However, vehicle traffic provides some informal surveillance. The surface is generally even but is not visually appealing, and the street is patch repaired so the surface colour displays varying shades of grey. Materials currently used are of moderate quality though very dated and there are no natural or beautification features - the boundary

of the pavement is not consistent, steel fencing in some places and poor-quality low brick boundary elsewhere. The street is not neglected but requires some maintenance. Currently, the space is only likely to be stayed in by those waiting at bus stops.

Trent Street

4.35 Effective width reasonable along sections where there is no street furniture and dropped kerbs, however presence of street furniture and parked cars create a narrow perception along most of the length of the street. There is dropped kerbing along one section (nr. Station Street), however, there are no dropped kerbs along over 90% of the length of the road.



Figure 4-10: Trent Street

Obstructions (street furniture, utilities and signs). Parked cars along the length the road significantly inhibit permeability. Legibility is relatively poor as there is a lack of signage and a feeling of visual distractions. Plenty of street lights provide night time visibility, even though the viaduct along the west side of the street restricts day time light. Good street lighting, the Nottingham City Council offices and rail tracks (above the street) offers a reasonable perception of personal security. The surface quality of the pavement is adequate especially the areas with block paving, however, some sections have been patch-repaired and the colour of the pavement is not consistent. Limited user conflict. The viaduct and City Council housing offices (which have a modern and clean design) enhance the feel of the area however there is an opportunity for improvement. The street is not neglected but not in optimal condition. Currently, the space is not designed for staying in.

Castle Road

4.36 The effective width is limited in certain areas inhibiting the efficient movement of pedestrians. There are no dropped kerbs serving pedestrians. There are some obstructions (bollards, street lighting etc) along the route.



Figure 4-11: Castle Road

Permeability is very low due to lack of crossings, parked cars and high vehicular traffic speeds. No signs to aid navigation for pedestrians. Very good provision of street lighting and open space provides day time light. Personal security is promoted by night time light and plenty of informal surveillance provided by the historic 'Ye Olde Trip to Jerusalem'. Surface quality is good along most sections but very cracked and uneven along Southside of Castle Rd). User conflict existent because of low effective width, parked cars multi-directional pedestrian traffic and multi-speeded pedestrians (travelling vs tourist pedestrians). Quality of environment generally positive due to natural greenery and historic buildings. The street is well maintained. Although there is potential the street is not designed for staying in (apart from customers at the historic inn).

Broadmarsh Do-Something Scenario

4.37 Artist impressions exist for Sussex Street, Collin Street, Middle Hill Carrington Street. The drawings show that the streets are to be pedestrianised to an extremely high standard, and in generally the highest scores have been allocated in the scenario case. Street furniture is removed and there is significantly de-cluttering. The streets are (mostly) pedestrianised and effective width and permeability is enhanced dramatically. It is assumed that legibility will be provided with posting and signage designed for pedestrians. In some cases (for example Sussex Street, pictured above, incorporating existing tram overpass) the physical width itself is increased by demolishing the existing brick and metal side barriers. For certain section whereby they are not exclusiveley pedestrianised (for example, Middle Hill), less then maximum scores have been proovided for relevent scores such as permeability.



Figure 4-12: Sussex Street proposed developments *(Source: NCC)*

4.38 Sussex street will provide pedestrian linkages to existing and proposed development. The space will provide recreational facilities such as areas for street performances and skate boarding etc. which will provide much improved opportunity for activity and create a new north-south pedestrian route.

4.39 Middle Hill (visualised right) will not be pedestrianised, however dropped kerbs will provide the street a pedestrianised feel. There are new cinemas providing opportunity for activity. Permeability will remain an issue because of traffic, however much improved with dropped kerbs throughout.



Figure 4-13: Middle Hill proposed developments *(source: NCC)*

4.40 Along Carrington Street there will be improved frontages and block paving will restrict traffic to pedestrians, cyclists and buses thereby minimising user conflict and promoting permeability. There will be dropped kerbing that will promote accessibility. The block paving will dramatically improve the surface quality.

4.41 Collin Street will have shops, cafes, landscaping, water features and public art. The place will be a significantly improved area for staying in including shaded and covered areas and landscaped green areas that complement and enhance the urban space.



Figure 4-14: Carrington Street (L) and Collin Street (R) proposed urban realm improvements *(source: NCC)*

Derby City Centre to Derby Rail Station Access Improvement

Victoria Street

4.42 Wide pavement area but effective width is currently restricted because of the existence of obstructions e.g. road furniture - including bicycle loops, postal boxes, bollards, litter bins, shop advertisements bus stops. A few sections are providing dropped kerbs. There are obstructions across the entire length of the link (see above). Permeability is

significantly restricted due to high numbers of buses (vehicle traffic and offloading passengers). Legibility is relatively poor as there is a lack of signage and a feeling of visual distractions. Plenty of street lights to provide night time visibility, however, (mainly) two- and three-story building(s) can potentially restrict natural light. Perceived levels of personal security are reasonably positive due to the business of the route with lots of active frontage and informal surveillance derived from bus passengers.

4.43 The surface is generally even and the surfacing materials used are consistent, however, there are some marks and stains across the entire length due to continual wear and tear. User conflict exists because of frontage with shops and the current alignment of the street is separated with access to vehicular traffic, especially with high bus traffic. Materials currently used are of above-average quality though dated and there are no natural or beautification features. The street is reasonably well maintained. Apart from waiting at buses, the road is not designed for staying in.

Albert Street

4.44 Sufficient space to walk and minimal road furniture, however, the space allocated to pedestrians is low. There are some dropped kerbs at pedestrian crossings with block paving. There are significant obstructions along the alignment. Permeability is promoted by crossing facilities and dropped kerbs but negated by taxi ranks. Legibility levels are relatively low as there is a lack of signage. Street lights provide night time visibility, however, (mainly) two- and three-story buildings can potentially restrict natural light.

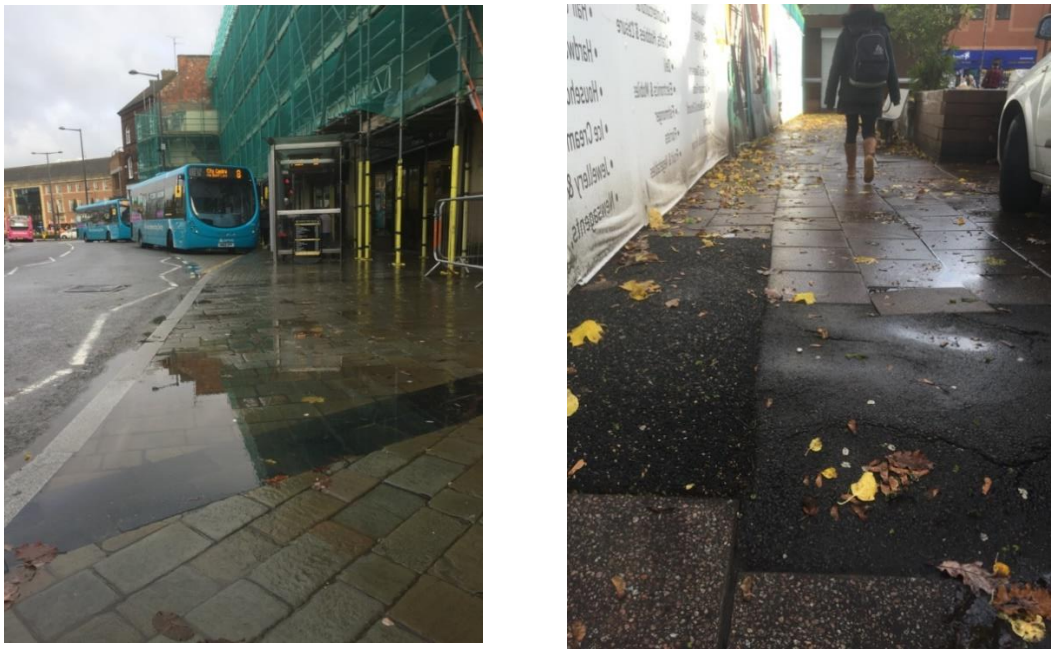


Figure 4-15: Albert Street, without scheme *(source: Derby City Council)*

4.45 Personal security is positive during the day as operating shops provide active frontage. The surface is generally even but there are cracked sections and the surfacing materials are not consistent - however, there are utilities on the pavement and marks and stains across the entire length due to continual wear and tear. In addition, there are drainage issues. User conflict is neutral. Materials currently used are of above-average quality though dated and there are no natural or beautification features. Apart from waiting at buses, the road is not designed for staying in.

Figure 4-16: Improved Albert Street & St Peter's Street intersection 'Do-Something' scenario *(source: DCC)*



The Spot

4.46 Sufficient space to walk but effective width is currently restricted because of the existence of road furniture. There are no dropped kerbs apart from areas serving bus stops or allowing vehicles access for deliveries. There are obstructions (signs, utilities and bus stops) across the entire length of the link. The high throughput of vehicular traffic and lack of dropped kerbs significantly limit permeability. Legibility is relatively poor as there is a lack of signage and a feeling of visual distractions. Plenty of street lights provide night time visibility, however, buildings restrict day time light. Personal security provided by active frontage and high traffic. There is also evidence of some formal surveillance (video surveillance cameras). The surface is in extremely poor condition with the main carriageway cracked and the pavement areas are constructed and maintained using inconsistent materials, providing an extremely unappealing appearance. Presence of utilities on the pavement. User conflict is existent because of the cluttered feel of the street. Quality of the environment is poor. The street is very dated and there are no natural or beautification features. The street appears neglected in certain sections and is in need of rehabilitation. Although there are seating provisions, currently the road does not manage to attract a significant number of people to use it as space to stay in.

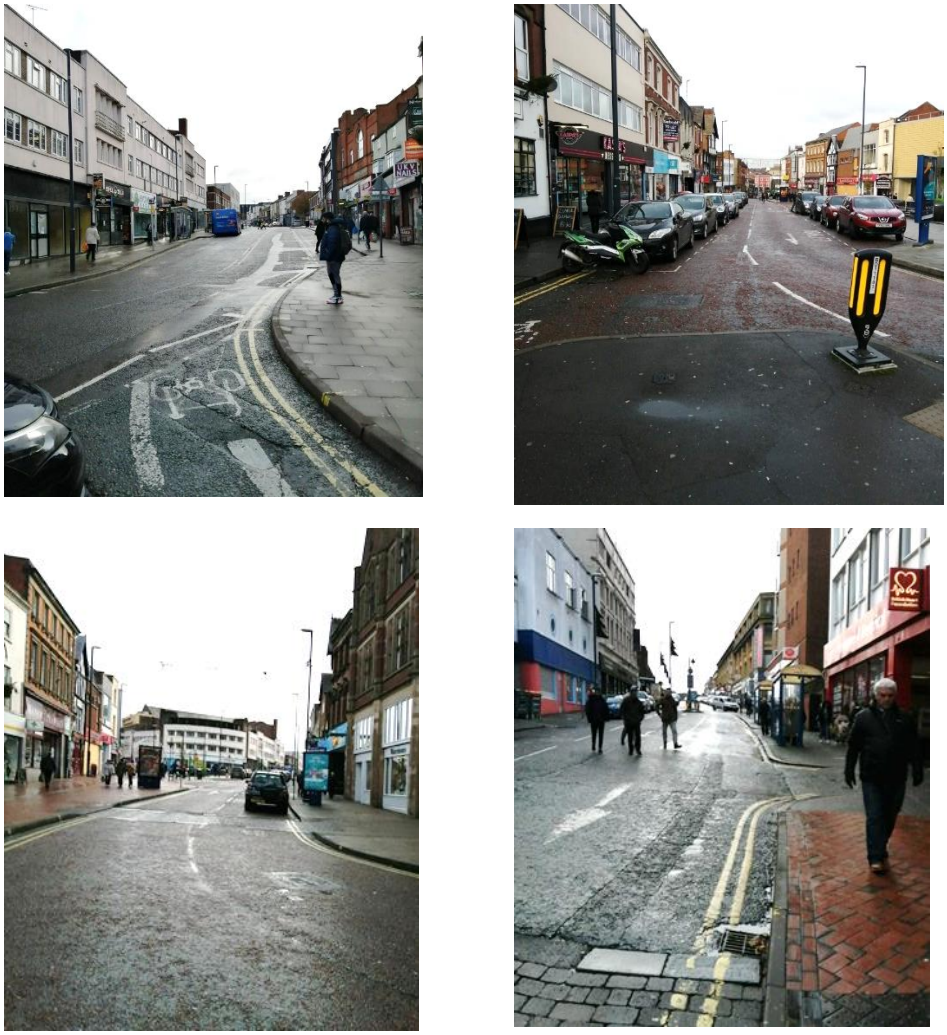


Figure 4-17: The spot *(source: DCC)*



Figure 4-18: The spot proposed developments 'Do-something' scenario *(source: DCC)*

4.47 The pictures show the Spot in the do-something scenario, whereby the area is significantly improved as a 'space to stay in'. The area is organised so that traffic (vehicular and pedestrian) are able to stay and pass safely – therefore permeability will be improved (but will not receive maximum scores). There are recreational areas for people to enjoy and beautification features to enhance the feel of the place. Lighting is optimally spaced. The surface quality will be provided at the highest level of surface.

Becketwell

4.48 For Becketwell Square, note that link attributes have been assessed for Coylear Street and Becker Well Lane, however, the economic estimates have been neutralised because it is anticipated the newly developed square will serve as a space to stay in (rather than a link to move through). Therefore, Becketwell is assessed for its 'space' characteristics.

4.49 The streets and roads surround a derelict and vacant plot of approx. 0.675 hectares. Coylear Street and Becket Well Lane have extremely narrow pavement areas. There are no dropped kerbs. Some but very limited obstructions. Absent street lighting which, along with the relative seclusion of the area, leads to very low perceived levels of personal security. The pavement surface is cracked and covered in moss in vegetated areas. Due to dereliction, the quality of the built environment is very low. The space is in need of major maintenance.

4.50 Regarding space characters, Becketwell is a vacant space, therefore, minimum scores were provided for all space characteristics, including: moving in the space, interpreting the space, personal safety, sense of place and opportunity for activity.

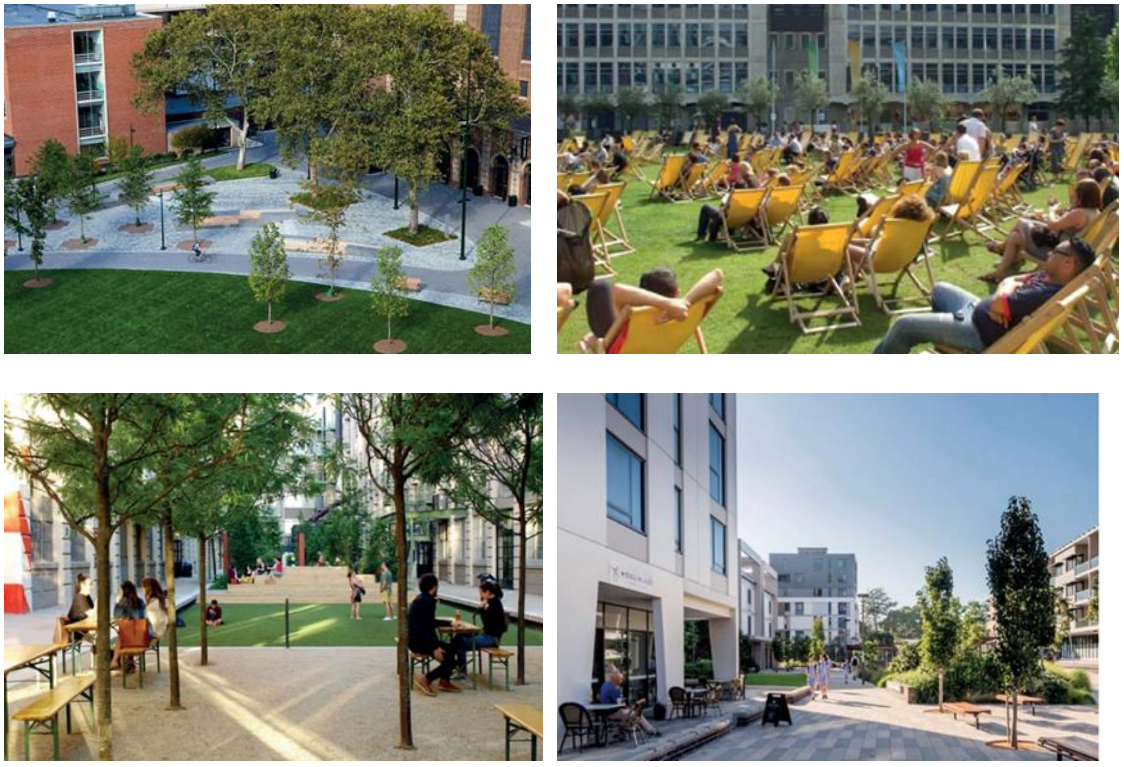


Figure 4-19: Becketwell proposed development 'Do-something' scenario *(source: DCC)*

4.51 In the Do-Something scenario, the square at Becketwell will be a high-quality space for people to engage in a variety of activities throughout the day. There will be a plaza in the North West quadrant of the square, for people to arrive, meet and greet. At the South West side of Becketwell there will be lawn and open green space for informal recreation and events. On the East side there will be garden terraces, providing

sheltered and landscaped space. Materials used will be of the highest quality. Overall the square has received very high scores for 'staying the in the space' characteristics.

Macklin Street



Figure 4-20: Mackin Street *(source: Google street view)*

4.52 Pavement width is limited in certain sections (less than 1 metre). No dropped curbs to serve pedestrians (some for vehicular access). Many obstructions, including utilities but also residential bins and parked cars. The constrained width and lack of dropped kerbs, cluttered organisation and segregated usage do not promote permeability. Reasonably spaced street lighting. A dilapidated and cluttered environment, and the vacant plot at Becketwell, promote a sense of insecurity, though the residential housing with frontage off-pavement does provide some counterbalance. The surface is generally even but there are multiple surfacing types and colourings due to periodic pavement patching. In addition, there is a presence of utilities on the pavement. Due to dereliction, the quality of the built environment is very low. The area requires some maintenance. Currently, the space is not designed for staying in.

Corn Market



Figure 4-21: Corn Market *(source: Google street view)*

4.53 Effective width high because the street is pedestrianised however there are some street furniture. Generally few, but there are a limited number of obstructions (shop signs, advertising, litter bins, telephone boxes street lights etc.). Permeability can be improved by organising street furniture more efficiently. No signs to guide direction for pedestrians. Street lights provide night time visibility, however, (mainly) two- and three-story buildings can potentially restrict natural light. Perceived levels of personal security are reasonably positive due to the business of the route. The surface is generally even and the surfacing materials used are consistent. However, the block paving is showing signs of distress. Low levels of user conflict. Materials currently used are of average quality but

dated and there are no natural or beautification features. The street is reasonably well maintained. Although there are plenty of seating provisions along Corn Market, currently the street does not manage to attract a significant number of people to use it as space to stay in.

Becket Well Lane

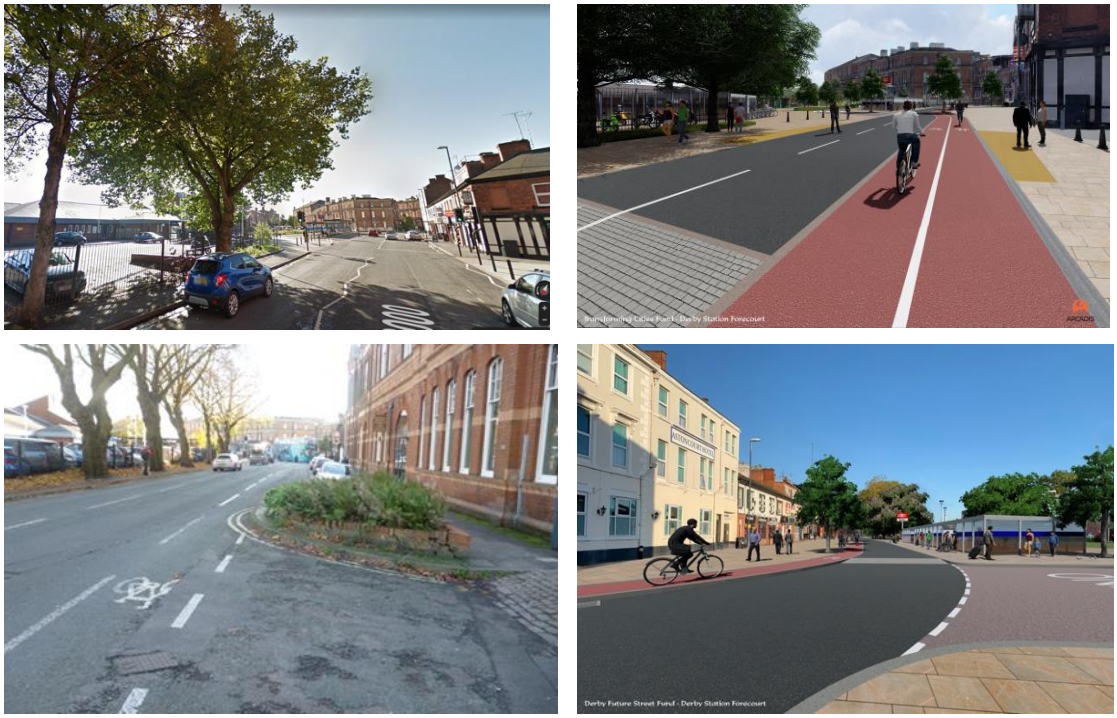
4.54 The street has reasonable effective width, especially wide in some sections. There are no dropped kerbs. Very limited obstructions. Lack of dropped kerbs inhibits permeability. No signs to guide direction for pedestrians. Some but limited street lighting. Limited street lighting does promote sense of insecurity though proximity to Victoria Street does counterweigh this. Surface is flat and of reasonable state of repair however there is moss between the paving slabs. Limited user conflict. There are no natural or beautification features. The street is reasonably well maintained.

Public Realm work within key areas of the City Centre

Railway Terrace

4.55 Effective width varies along Railway Terrace however very sufficient North of the station. A dropped kerb outside the station but few along length of the link. Trees forming major obstructions. Pedestrianised signalised bossing provides some permeability however buses and vehicular traffic inhibit the permeability of the street. Legibility is poor as there is a lack of signage towards the station on this link as well as lack of signage for users exiting from the station. Street lighting is reasonably well spaced providing night time light. There is plenty of formal and informal surveillance around the station, however north of the station has a more enclosed feel. The surface is generally even though trees have caused major cracking and there are sections with drainage issues. Significant user conflict at the station area between vehicles and pedestrians. Quality of the environment is average. The street is relatively well maintained. There is currently no provision for people to stay in the space.

4.56 In the do-something scenario, the street will receive a significant improvement with effective width noticeably improved and dropped kerbs provided. Permeability is also improved with better organisation of the street (optimal segregation between pedestrians, cyclists and vehicular traffic) and traffic calming features slowing down traffic. Surface quality is renewed. In addition, the space will receive better space scores. (However, the improvement is significant, it is not envisaged to be of the same standard as Broadmarsh).



Baseline scenario Do-something scenario

Figure 4-22: Railway Terrace baseline scenario vs 'Do-something' scenario *(source: DCC)*

Morledge

4.57 The effective width of the street is high with certain sections greater than 3 metres. There is one dropped kerb at the signalised crossing and the kerb height is low along the link. Permeability is very low due to carriageway width and high vehicle traffic. No signs to assist pedestrians. Plenty of lights to provide night time visibility and the open area provides daytime light. Presence of formal surveillance (video cameras) and the high number of pedestrians along the link offers informal surveillance. Surface quality in good condition. User conflict is present due to high multi-directional and varying walking speeds of pedestrian travel. Quality of the environment is average. The street has a positive level of maintenance.

4.58 In the do-something scenario, there will be a general improvement in most scores (however, the level of enhancement is not as significant as the Nottingham Broadmarsh improvements). Effective width and permeability will be improved marginally, and in addition, surface quality and maintenance will receive maximum PERS score. Most other attributes will receive similar scores.





Figure 4-23: Morledge proposed development 'Do-something' scenario *(source: Google/DCC)*

Siddals Rd. (North)



Figure 4-24: Siddals Road *(source: Google street view)*

4.59 Reasonable effective width considering the pedestrian flow; however, there are sections where the width is 1.5 metres. Some dropped kerbs. High vehicle traffic constructs permeability. No signs to assist pedestrians. Plenty of lights to provide night time visibility and open area provides daytime light. Presence of formal surveillance (video cameras). However, commercial properties do not provide any informal surveillance at night. The surface is in poor condition in sections and possible drainage issues during wet periods. Minimal user conflict. Quality of the environment is below average and the street does not have a positive aesthetic appearance. The street is in an average level of maintenance.

4.60 In the do-something scenario, the street will receive a moderate enhancement, with PERS scores most improved being surface quality, quality of the environment and maintenance. Effective width will be improved marginally by trimming back trees and increasing the width slightly. The street will remain a space to move through rather than to stay in.





Figure 4-25: Siddals Street proposed development 'Do-something' scenario *(Source: DCC)*

Siddals Rd. (South)

4.61 Reasonable effective width considering the pedestrian flow along some sections but pavement ending suddenly. Some dropped kerbs. High vehicle traffic constructs permeability. No signs to assist pedestrians. Plenty of lights to provide night time visibility and open area provides daytime light. Presence of formal surveillance (video cameras). Apartments provide active frontage. The surface is generally even but there is presence of utilities on the pavement. Minimal user conflict. Quality of environment promoted by greenery. The street is in average level of maintenance. It is envisaged that in the do-something scenario, Siddals Rd South will be of similar level of service to Siddals Rd North.



Figure 4-26: Siddals Road *(source: Google street view)*

Calvert Street

4.62 Pavement width is narrow but sufficient for current levels of pedestrian travel. Transverse crossing of the street is not a major pedestrian desire line, therefore, permeability and dropped kerbs not major issues. No obstructions across the length of the street. (Two) street lights providing sufficient lighting at night time. Residential street provides active frontage and informal surveillance. Surface quality average but, but, in some places, possible drainage issues in wet conditions. Positive environment due to aesthetically pleasing appearance, low noise levels and green features. Above average level of maintenance.



Figure 4-27: Calvert Street *(Source: DCC)*

Livergate

4.63 Pavement width is narrow but sufficient for current levels of pedestrian travel. No dropped kerbs serving pedestrians. Lack of dropped kerbs limit permeability but low traffic volume not a major impediment. No obstructions across the length of the street. Street lights providing sufficient lighting at night time. Commercial nature of street provides little active frontage and informal surveillance during night time. Surface quality average. Low noise levels and some green features but the street is not aesthetically pleasing. Above average level of maintenance.

5. Cycling infrastructure proposals

5.1 The cycling infrastructure proposed by the four themes of the bid have been evaluated using the DfT's Active Mode Appraisal Toolkit (AMAT). This was supported by use of GIS to define route and cycle forecast data, and preliminary spreadsheet modelling to collate and check assumptions.

5.2 Individual schemes were divided into 'components'; sections of infrastructure which would be delivered under different levels of funding proposal. At this stage, the SOBC Themes (A-D) into which each scheme component related were not considered, and for simplicity these scheme components were grouped into three funding proposal levels:

- Low
- Mid (i.e. low scheme components + mid scheme components)
- High (i.e. low scheme components + mid + high scheme components)

5.3 Mapping of the proposed cycling scheme components in GIS allowed checking of infrastructure against the existing cycling network, and measuring of important statistics such as scheme length and estimated usage (all documented in the AMAT Summary Spreadsheet found in Appendix F to the SOBC). Note that the majority of these schemes consisted of new cycling *links;* in some schemes, junction improvements formed all or part of component proposals but these were considered not possible to appraise due to lack of data (or were appraised as part of significantly improved links).

Local cycle route usage data

5.4 Mapping these scheme components allowed retrieval of usage data from the existing network, in particular using the Propensity to Cycle Tool (PCT)[6] to query the 2011 Census for cycle infrastructure in Derby and Nottingham. This provided an estimate of the numbers of cyclists using each link and where multiple links would be affected by a scheme component, a weighted average (weighted by the proportion of a link's length of the total length) was used.

5.5 This link-based usage data was retrieved for each of the 37 scheme components proposed. In order to calculate an estimate for the 2019 level of cycling on each of the target links in Nottingham, a growth rate was calculated from Nottingham City Council cycle count data. Importantly, these counts covered both areas of the city that had had cycle investment in this period, and a number of 'control' areas which capture overall growth in cycling in the city. This growth rate (representing a 52% increase in cyclists

[6] http://pct.bike/

since 2011) was then applied to links in the vicinity of Nottingham City Council-proposed schemes.

5.6 For Derby, which has received slightly less investment in cycling over the years since the Census, a more conservative growth factor of 16% was used, based upon reported increases in DfT table CW0302 for Derby 2015-2017 (the longest period for which data is available). It is possible that Derby's level of cycling growth could be closer to that of Nottingham's, but evidence for this was not available.

Estimating future increases in cycling activity

5.7 The estimated current cycling trip numbers for each scheme location are then used as a basis for an evidenced increase in cycling as a result of each component, according to the best evidence available for several types of existing scheme. This is based upon the summaries in the report shared by DfT colleagues through the co-development process *'CWIS Active travel investment models: Model structure and evidence base'*. A thorough review of this document led us to group the scheme components proposed in Derby and Nottingham into three possible 'types': short-distance; long-distance, and 'flagship' (highest quality).

5.8 As there are several different pieces of evidence available reporting behaviour change due to investment in cycling infrastructure, we propose low- and high- bounds for the level of cycling uplift that might be expected. This is based on the following evidence:

- **Short distance schemes**
  - Low: Manchester Oxford Road, 2017 to 2018 change of 11% of cyclists[7]
  - High: TfL Cycle Superhighways, 65% increase in cycling, 2017[8]
- **Longer distance schemes**
  - Low: Assorted evidence (Hopkinson *et al* 2019), 6% increase for cycle networks[9]
  - High: CCA programme/Hopkinson *et al* 2019, 18% increase[10].

For the majority of schemes, we took the average of low and high values to estimate increases in cycling (see Table 5-1). For 'flagship' schemes, we used the local evidence of change in cycling counts on Nottingham's Western Cycle Corridor, where a 140% increase was observed, i.e. 2.4x the original level of cycling, after installation of a major cycle superhighway (see

[7] The Guardian (2019). https://www.theguardian.com/environment/bike-blog/2019/apr/26/if-you-build-them-they-will-come-record-year-for-cycle-counters

[8] Haojie *et al* (2017) "Safety effects of the Cycle Superhighways"

[9] Hopkinson *et al* (2019). "CWIS Active travel investment models: Model structure and evidence base: Technical Appendix 4."
[10] Cycle City Ambition Programme (2019). "Baseline and interim report."

5.9 Table 5-2). Whilst this is a high level of expected uplift, it is broadly consistent with government targets to double cycling, and other evidence of significant 'transformative' schemes nationally[11] and internationally[12].

5.10 In some circumstances, specific further assumptions were required: for example, the Trent river crossing proposed at Lady Bay under scheme Cv did not exist as a link in the PCT and so 'base' cycle commuter numbers could not be derived. Instead the number of commuter cyclists using the closest crossing of the Trent was used. These assumptions are fully listed in the AMAT Summary Spreadsheet.

Table 5-1: Uplift values applied to baseline cycling activity

Scheme type	Low estimate (% of existing)	High estimate (% of existing)	Average uplift (% of existing)
Short distance (city centre schemes less than 1.5km)	11	65	38
Long distance (more significant suburban and inter-town cycle paths and tracks)	6	18	12
Flagship infrastructure (Most significant schemes or those in areas of considerable development)			140
All assumptions and references listed in Cycle Infrastructure spreadsheet			

Table 5-2: Nottingham cycle superhighway (western corridor) counts used for flagship schemes

Year	Abbey Street counts
2011	183,017
2013	372,573
2015	364,742
2017	418,897
2018	439,621
Cycle counts for Abbey St., Nottingham, 2011-18.	

[11] The Diglis Bridge, Worcestershire, experienced a very significant increase in local cycling and walking trips in the first five years after opening. https://www.gov.uk/government/case-studies/new-cyclist-and-pedestrian-bridge-diglis-bridge-worcester

[12] In Vancouver, the building of a network of protected cycle routes was associated with cycling increasing from 4% to 10% mode share of the general population (i.e. approx. a 2.5x increase): Boldry *et al* (2017) "Defining connected bike networks".

Allowing for diversionary impacts in strategic modelling

5.11 Using these estimated future numbers of cyclists, we calculated an estimated new number of cycling trips attributable to installation of each component of proposed cycling infrastructure. These values are used in conjunction with WebTAG cycle diversion factors (table A5.4.7) to remove daily trip counts from specific travel modes that will be tested within the strategic public transport model.

5.12 This process involved identifying the numbers of car, taxi and public transport trips to be removed from the base matrices of the model (pre dynamic travel mode assignment) and comparing the GIS of scheme components to which the trip reductions applied and the strategic model's O-D zones.

5.13 This approach was discussed and agreed with DfT colleagues through the TCF co-development process and sought to mitigate double-counting of mode shift benefits that would otherwise be counted within an AMAT appraisal when conducted alongside a strategic public transport model appraisal in the same geographic area.

AMAT appraisal and aggregation

5.14 Upon compilation of the statistics above for each scheme component, the Active Mode Appraisal Toolkit (AMAT) was used to appraise the value of each section of scheme and estimate present value benefits (PVB) of improved health and journey quality from current and estimated future trip numbers. This was completed for each of 37 scheme components, and benefits aggregated in the attached spreadsheet. Note that a number of specific assumptions were made in the production of AMAT worksheets:

- The appraisal period would run for 30 years, from the final year of funding in 2023.
- Nottingham and Derby were assumed to be best considered 'Inner and Outer Conurbations'
- Current and proposed levels of cycle infrastructure were set from a combination of proposal documentation, discussion with officers, and local knowledge.
- Additional facilities are not currently expected to be provided as part of these scheme components (lockers, showers etc.)
- 100% of a trip is expected to use the 'scheme component' being appraised in each AMAT, as we have tried to avoid combining multiple areas of many pieces of infrastructure and applied weighted average trip estimates across each one.
- Journey length is set to equal the national average cycle trip length (5.6km) according to the latest National Travel Survey, with the average proportion of a trip which uses the scheme infrastructure set to reflect the proportion of the

average 5.6km cycle trip length that the scheme component being appraised reflects (e.g. a 1km improved link would equate to 17.8%)

- Optimism bias is applied at package level rather than within the AMAT worksheet, reflecting the fact that this has already been accounted for at package-level within cycling scheme costs using a value of 44%. (The AMAT worksheets have been used to calculate Present Value Benefits but not BCRs for individual components, due to the complexity of avoiding double-counting benefits within the strategic model.)

5.15 Each AMAT worksheet for individual scheme components is provided separately, for reference in Appendix F. Journey quality and health benefits, in 2010 prices, were copied to the summary spreadsheet. This removes the element of mode-shift benefit calculated in an AMAT, which would otherwise be double-counted when running the strategic transport model for public transport.

6. Bespoke spreadsheet modelling

6.1 Separate, bespoke spreadsheet models were created in order to appraise the Present Value Benefits (PVBs) of the proposed:

- Tram Park and Ride expansion
- Real-Time Information (RTI) upgrades
- Public cycle + e-Bike / e-bike hire system
- Electric Vehicle (EV) chargepoint network extension

6.2 Each of these apply WebTAG factors and guidance to local and national evidence in order to forecast changes in specific travel behaviours resulting from the TCF2 programme interventions.

6.3 For the following scheme appraisals, all costings and prices were adjusted to 2010 prices by inflating prices according to RPI and then deflating them using the GDP deflator. This follows guidance from DfT's WebTAG Annual Parameters (October 2019 edition).

Tram Park and Ride expansion

6.4 The quantifiable benefits identified for the expansion of the Hucknall and Phoenix Park tram-based Park and Ride (P&R) car parks were expressed as reductions in congestion, infrastructure, maintenance, accident, local air quality, noise and greenhouse gas costs (all of which are associated with reductions in car KM travelled, achieved through the interception of more vehicle trips), in addition to the increased revenue resulting from tram ticket sales.

6.5 It was not possible to directly calculate the 'with scheme' and 'without scheme' P&R impacts using the strategic transport model, since parking capacity at the Park & Ride 'receptor' zones cannot be constrained. As such the Reference Case runs of the model prepared earlier in the appraisal process already assume that higher numbers of Park & Ride trips would be completed by tram than the available numbers of parking spaces at each site could accommodate. This is corroborated by count data provided by Nottingham Trams Ltd, which demonstrated that the car parks at both Phoenix Park and Hucknall are effectively full before 8am on a high proportion of weekdays.

6.6 As such, in order to quantify the potential future benefits of the Park & Ride car park expansions, the opportunity cost of *not* increasing their capacity was calculated. This drew on weekday counts of the number of car parking spaces available at 7am, 9am and 11am in 2019, which were compared with strategic model estimates of the

numbers of vehicles that would arrive at each Park & Ride site in the 2023 reference case, 2023 (with scheme opening year) and 2043 (with scheme final modelled year).

6.7 Hourly counts between 5am and 11am were estimated for 2019 by assuming zero empty spaces at 5am and interpolating a uniform filling rate between the two-hour count intervals. These hourly counts were projected to 2023 and 2043 by adjusting each hour's count by the ratio of number of spaces predicted to be available at 9am in 2023 and 2043 to the number of spaces available at 9am in 2019. From these projected counts, the number of cars predicted to be parked in each hour were calculated by subtracting the number of spare spaces from the total capacity of each car park, which were compiled into a total number of cars parked for the morning peak. These calculations can be found in the 'TCF2_Tram-PR-extension-Model' spreadsheet that has been included in Appendix H to the SOBC.

6.8 The spreadsheet model was not limited by the number of spaces available at the car park in 2019, but was limited by the capacity after 2023. The number of vehicles that were projected to park at each car park grew at a constant rate, calculated by dividing the difference between the expected number of vehicles in 2023 and 2043 by 20. This growth continued until 2053 or until the expanded capacity was reached, whichever came first.

6.9 Having calculated the number of cars predicted to park at the expanded tram Park and Ride car parks that would *in reality* not be able to park without the expansion, the opportunity cost from these potential users was then calculated using the following assumptions:

- Appraisal period of 30 years, reflecting the likely design-life of the extended car parks, assuming continued maintenance in-line with the existing facilities.
- All tram trips would have been made by car had they not been made by tram, and the length of the car journey would have equalled the length of the average tram journey in Nottingham, which was assumed to be 6.6km based on DfT's LRT0107 spreadsheet – and which coincides with the approximate length of a tram journey into the centre of Nottingham from Phoenix Park.
- Vehicle occupancy rate of 1.57 people per car (according to WebTAG all-week average car occupancy per trip).
- All people parking in the Park and Ride car parks would be using the tram.
- Benefits calculated for working days only, which were assumed to be 253 days per year, as used in DfT's Active Mode Appraisal Toolkit.
- No account was taken of inter-peak tram-based Park & Ride trips, which are more likely to be accommodated in future – owing to capacity being available after the weekday AM peak period (which is not currently the case).

- Tram ticket prices were based on a simple average of all 2019 fares, adjusted for future inflation (applied using the GDP deflator as a simple proxy for future fare inflation) and converted to 2010 prices. This means the estimate of the increased revenue to tram operators was most likely a reasonably conservative one, as all tickets were weighted equally, although the more expensive tickets are likely to be purchased more frequently.
- The marginal external cost rates (in pence/km) for the above quantifiable benefits of tram rides over car trips and the loss of indirect taxation from fuel duty and road tax were taken from WebTAG. It was assumed that the replaced journeys would have been made on 'inner and outer conurbation' A-roads and the congestion band of each car was assumed to be an average of the five bands.

6.10 The PVB calculated through opportunity cost of tram trips is reported in the Economic Case section, and further detail on the calculations and assumptions used is included in the attached spreadsheet. These forecasts are considered to be conservative on the basis that no estimate has been made of the off-peak trips accommodated at the expanded Park & Ride sites.

Real-time information/bus shelter/interchange upgrades

6.11 The value of public transport Real-Time Information (RTI), bus shelter and interchange upgrades across Nottingham and Derby was calculated by applying value of time factors from the TAG data book to the number of 'generalised minutes' of benefit that bus and tram passengers would be expected to benefit from as a result of enhanced information and waiting facilities (expressed as a percentage of total bus and tram passengers in Derby and Nottingham).

6.12 The 'generalised minutes' value reflects a proxy for the amenity benefit that passengers derive from the enhanced information, and the time saved by passengers as a result of productively using their waiting time at a bus stop. This drew from WebTAG guidance about the value of 'soft' bus interventions[13] and used numbers of these types of measures planned for each package to estimate a value of the proposals in future years under different funding packages (low, medium, and high).

6.13 These values were applied based on the number of RTI / bus shelter / interchange improvements being delivered in each of the Low / Med / High TCF investment packages. The scale of improvement in each package was related to an estimated proportion of total annual bus and tram passengers who are expected to benefit from the network upgrades. The following assumptions were applied to the appraisal:

[13] TAG data book (May 2019) table M3.2.1: Segmented values of soft bus interventions.

- Appraisal Period of 20 years.
- Total passenger journeys by bus in Nottingham and Derby assumed to remain at a constant level of 64.9 million (derived from the latest DfT BUS0109 local authority bus patronage figure, relating to 2017/18), with 18.8 million tram journeys (derived from DfT's LRT statistics released in 2019) also assumed as a future constant.
- Estimated proportion of trips improved by RTI upgrades, which will remain constant for the duration of the appraisal period:
  - Low Package – 7%
  - Medium Package – 15%
  - High Package – 20%.
- These estimates reflected both the relative amounts of funding allocated to these measures in the Low/Med/High investment packages, and their locations in central areas of Derby and Nottingham and along high-priority bus corridors/at key tram and bus interchange locations.

6.14 Value of time per bus passenger for every year from 2023 to 2043 was taken from WebTAG, adjusted for inflation and converted to 2010 prices to derive Present Value Benefits.

Public cycle + e-bike / e-bike hire system

6.15 The cycle/e-bike hire schemes proposed in the Medium and High investment packages were appraised over a five-year period, reflecting the risk of failure associated with these schemes and the fact they are dependent on private sector suppliers to sustain the operational revenues – which are often cross-subsidised through advertising revenues.

6.16 Our estimation of Present Value Benefits (PVBs) included:

- Public Health Benefits, combining reduced risk of premature deaths and reduced absenteeism.
- Marginal External Benefits from reduced car travel, which encompass congestion, infrastructure, accident, local air quality, noise and greenhouse gas reductions, off-set by indirect taxation.

6.17 No journey quality impacts were assumed, in order to ensure a conservative appraisal, whereas in reality some of the journeys people make by cycle/e-bike hire are likely to be on the improved cycle networks that our TCF programme SOBC is seeking to deliver.

6.18 Both sets of Net Present were calculated using DfT's AMAT toolkit, although some assumptions were made using the Shared Electric Bike Programme Report 2016 from DfT and CoMoUK. It was not possible to incorporate diverted trips from cars in the strategic model tests, due to the different appraisal period being considered in the wider modelling work. As such the mode-shift values were extracted from the AMAT form.

6.19 In order to calculate the PVBs and Benefit Cost Ratios (BCRs), the following process and assumptions were used:

- Appraisal period of 5 years.
- Total number of e-bikes proposed for the medium and high packages will be 625 and 1250 respectively.
- Total number of hires predicted per day calculated assuming 2 rides/bike/day for the Medium package and 3 rides/bike/day for the High package, based on initial engagement by NCC and DCC with potential operators.
- 309 days a year that e-bikes would be used, which assumes that they would be utilised on 100% of the 253 working days per annum and 50% of weekend days and public holidays.
- Total hires (trips) per day were calculated by multiplying the number of bikes in the scheme by the number of hires predicted per bike per day.
- Total hires (trips) per year were calculated by multiplying the daily hires by 309 days.
- Total hires over the five-year scheme calculated by multiplying the annual hires by five.
- The proportion of e-bike trips that would have been made by a normal bike per day was assumed to be 19%, as stated in the CoMo Report.
- Therefore, the net change in e-bike trips for each package used was the total predicted e-bike hires over the five-year period reduced by 19%.

6.20 The benefits derived from reduced risk of premature deaths were calculated using AMAT, by entering the following values and then reducing the value by 25%, assuming that e-bikes generate 75% of the preventative health benefits of regular bikes (Newson & Sloman 2019):

- Number of cycling journeys per day without the proposed scheme, which was assumed to be 19% of the number of journeys per day with the scheme, with the latter also being entered into the AMAT.
- The average e-bike hire trip length, which was assumed to be:

- **Medium package:** A simple average of the 5.6km average cycle trip length (NTS 2018, NTS0303) and the average length of an e-bike journey (8.0km based on CoMoUK's Shared Electric Bike Programme research report, 2016), reflecting that the cycle hire scheme's fleet at this level of investment will be a mix of pedal cycles and e-bikes.
- **High package**: 8km, reflecting that the scheme would be a full public e-bike hire system.

- 28% assumed would be using the scheme to commute to work and 46% assumed to otherwise be using a car, both derived from the CoMo Report.
- 0.75% background rate in trips, derived from National Travel Survey Data 2006-2016, over a five-year appraisal period.
- 309 days per year that the scheme data would be applicable for.

6.21 The value of reduced absenteeism was calculated using the above AMAT inputs, but without any reductions, and combined with the preventative health benefits to create a total Public Health Benefits figure. In order to calculate the Marginal External Benefits from reduced car travel, the same figures as above were entered into AMAT and no reductions were applied to the outputs.

6.22 An appraisal summary table has been provided to summarise the valuation of scheme costs and benefits in the spreadsheet titled 'TCF2_ebike-system-appraisal', which can be found in Appendix H to the SOBC.

Electric vehicle charging network extension

6.23 The PVBs of an extended electric vehicle (EV) charging network across the Nottingham-Derby metropolitan area were calculated using assumptions about improvement of air quality and reduction of greenhouse gas emissions related-costs of EVs relative to internal combustion engine cars. These are priced in DfT's Marginal External Cost values, which are expressed on a per-vehicle-km basis.

6.24 In order to calculate these marginal external costs, the following assumptions were applied:

- All trips made by EVs would otherwise have been made by internal combustion engine cars.
- Both EVs and combustion cars would be driving on inner and outer conurbation A-roads, and combustion engine cars assumed to be in the average of the five congestion bands.
- Appraisal period of 10 years, reflecting the anticipated replacement life-cycle of the EV charge points.

- 253 working days per annum, as used in DfT's Active Mode Appraisal Toolkit (AMAT), and 112 weekend/bank holiday days per annum.
- Assumed both the D2N2 and Broadmarsh schemes will be made up of two thirds 7kWh dual posts and one third 50 kWh rapid chargers.
- Journey length of both EVs and cars used was 13.2km, the average car journey length given in the 2018 NTS 0303.
- Three charge cycles assumed per charging socket per weekday and two cycles per weekend day for the duration of the appraisal period, based on Nottingham GUL programme monitoring.
- Only Greenhouse Gases and Local Air Quality were priced using the marginal external cost values from WebTAG, with an assumption that all other costs would remain constant whether the distance travelled was completed by an EV or a conventionally fuelled vehicle.
- We specifically did not include the indirect taxation disbenefit, on the assumption that VAT on the price of electricity consumed / EV charging fee incurred would offset it.

6.25 The number of EV charge points proposed under each scheme was applied to these assumptions to calculate PVBs and other benefits under each scale of investment. Out-turn data from our forecasts was presented in the Greenhouse Gas (GHG) worksheets for Low/Med/High investment packages to reflect the estimated environmental benefit for improved facilities for electric vehicles. These can be viewed in the spreadsheet titled 'TCF2_EV-charge-points', which can be found in Appendix H to the SOBC.

Annex Bi

Technical Note on modelling approach

Title	TCF2 economic appraisal approach by package and scheme
Date	14/10/2019
Author(s)	Neil Taylor
Version	1-4

1. Background

1.1 This note proposes an approach to forecasting impacts, and quantifying benefits for each of the Transforming Cities Fund (TCF) packages that form the Low, Medium and High funding bids that Derby and Nottingham City Councils are preparing for DfT submission at the end of November 2019. It is intended to inform discussion with:

- SYSTRA colleagues, who maintain the Derby and Nottingham strategic transport model on the Councils' behalf, and who will use it to forecast the impact of proposed public transport priority, Park & Ride, and road space re-prioritisation interventions.
- DfT Transport Appraisal and Strategic Modelling colleagues, with whom ITP's team is liaising to ensure the approach to modelling and appraisal aligns with the latest guidance and thinking regarding Transforming Cities Fund interventions.

Overview of TCF programme packages

1.2 Four thematic TCF packages have been developed by Derby and Nottingham City Councils based on insight and guidance from colleagues at DfT. They are:

a) **City Centre connectivity and integration**: focused on rail/bus station, city centre public realm, and interchange facilities at key transport nodes in the centre of Derby and Nottingham.

b) **Strategic Derby – Nottingham – East Mids Airport (EMA) connectivity**: focused on enhancing strategic public transport and cycling links between key employment and growth locations along key movement corridors, alongside integrated public transport information and ticketing investments.

c) **Nottingham urban growth corridors:** Strategic Park & Ride, public transport priority, and safer cycle route improvements focused along intra-urban movement corridors in Nottingham.

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d) **Derby urban growth corridors:** Strategic Park & Ride, public transport priority, and safer cycle route improvements focused along intra-urban movement corridors in Derby.

Relationship to Low/Medium/High bid values

1.3 Each of these four packages contain schemes that relate to their overarching theme. Across most scheme proposals funding can be scaled to suit different levels of investment, with the extent of each type of intervention varying accordingly - e.g. smaller Park & Ride site extensions, fewer junctions upgraded to prioritise public transport movements, shorter lengths of cycle route upgraded/delivered. In some cases, schemes are to be removed if funding values are reduced, since they become undeliverable below a certain budget level.

1.4 Following co-development feedback from DfT officers, a set of refined Low, Medium and High value packages of schemes are currently being finalised by Derby and Nottingham City Council colleagues. Understanding that the total cost of the full list of schemes proposed in the Draft SOBC was slightly too high, and recognising the size of the joint workday population of Derby and Nottingham (as well as the portion of this that would benefit from TCF interventions), these refined packages are expected to roughly fit the following scope and approximate total bid values – expressed in terms of the funding commitment being sought from DfT:

- Low / ~£100m: Highest priority interventions and scaled-down desirable schemes.
- Med / ~£130m: Highest and Medium priority interventions (some scaled-down).
- High / ~£160m: All High and Medium priority interventions.

Implications for proposed appraisal approach

1.5 In view of timescales, and to ensure a proportional amount of effort is invested in the appraisal of the TCF proposals, we propose a streamlined approach to the use of the Derby and Nottingham Strategic Model and the use of ancillary spreadsheet modelling techniques is focused upon the three Low/Med/High bid values. Doing so should limit the transport modelling and appraisal process to:

- **Three different sets of Active Mode and Valuing Urban Realm appraisals, one for each of the Low/Med/High bid values**. These will use Reference Case data from the Derby and Nottingham Strategic model, local count data, and national ex-post impact data as a basis for estimating behavioural responses to investments in cycle networks (including diversion from public transport trips by cycle corridor) and enhanced public realm across the Derby and Nottingham areas.

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- **Three distinct model runs, one for each of the Low / Med / High bid values**, with the primary focus being to forecast the behavioural responses of travellers to public transport and highway network interventions proposed at each funding level. These model runs will seek to incorporate the estimated diversionary impact of behavioural responses to cycle network investments (in particular) by:
  - Applying DfT's published diversion factors to the increased numbers of cycle trips so as to estimate the number of trips that will be abstracted from public transport and car trips.
  - Manually netting them from base O-D matrices that underpin the model, following which it will assign them to car and public transport modes based on generalised cost conventions, and in response to forecast changes in local highway network conditions linked to the delivery of strategic housing and employment growth.
- **Three sets of ancillary spreadsheet-based appraisals**. These will be applied only where necessary, and seek to calculate wider benefits that cannot be tested using the transport model. These could include benefits that are expected to accrue to transport operators and passengers (e.g. as a result of wider availability of contactless ticketing and cashless fare payment), as well as impacts associated with EV charging. We anticipate these spreadsheets will also compile benefit estimates from the different stages of each Low/Med/High bid appraisal process (as described above) to set out the Benefit:Cost Analysis for each of the three funding bids.

Contents of the remainder of this note

1.6 The remainder of this note documents the specific schemes that are included in each of the Low, Medium and High bids being prepared (being finalised at the time of writing). Each table sets out the proposed appraisal method, which is to be refined based on discussion with SYSTRA and DfT colleagues.

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2. 'Low' investment proposal – schemes and modelling approach

Package	Scheme	Details for appraisal	Appraisal method / key assumptions
A: City Centre Integration	i) Nottingham city centre hubs and interchange	• 500m off-road cycleway Canal St East • 350m off-road cycleway Station St East • 140m off-road cycleway Trent St • Enhanced station pax facilities + cycle hub • City centre signage improvements • Broadmarsh EV charging	• Active Mode Appraisal Toolkit (AMAT) assessment of cycling uplift based on local count/model/PCT data & sample out-turn evidence from Sustrans • MODEL calculated trip reductions applied to base O-D trip matrices (excluding walking and non-trip diversions) in Derby & Nottingham Strategic Model for 1km buffer around routes
	ii) Nottingham city centre public realm	• 370m Carrington St public realm upgrade (1,550sqm) • 250m Colin St public realm upgrade (3,000sqm) • 450m Middle Hill (2,100sqm) • Sussex St public realm (5,650sqm)	• Apply TfL Valuing Urban Realm Toolkit (VURT) to footfall numbers and claim amenity benefit for ~80% of local footfall data (and/or ORR rail entry/exit data in absence of local counts).
	iii) Derby city centre hubs and interchange	• Derby bus station vehicle exit upgrade • Morledge/Bus Station junction improvement	• MODEL specific scheme details (based on proposals) to determine bus system impacts on patronage and congestion
	iv) Derby city centre public realm	• 1000m St Peter's St (The Spot) public realm • 1000m St Peter's St off-road cycleway	• VURT appraisal of footfall • AMAT appraisal of cycling uplift

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Package	Scheme	Details for appraisal	Appraisal method / key assumptions
B: Strategic Derby – Nottingham – East Mids Airport (EMA) connectivity	i) Derby – EMA - Nottingham cycle expressway	• 10km A6005 corridor cycle expressway Beeston to Draycott • 3km Derby Riverside Path extension to Borrowash (to form cycle expressway) • 3km Derby Canal Path extension to Swarkestone (EMA route)	• AMAT appraisal (per other schemes) • MODEL calculated trip reductions applied to base O-D trip matrices (excluding walking and non-trip diversions) in Derby & Nottingham Strategic Model for 1km buffer around routes
	ii) Bikeshare programme	• 10 Cycle Hub secure bike parking / e-bike charging sites along inter-urban routes	• AMAT appraisal of cycle expressway
	iii) Inter-urban bus priority improvements	• Future-proofing of RTI + HOPS systems • New Robin Hood products (Student PAYG) • Robin Hood top-up at tram TVM's • EMV card validators at locations/buses • Bus lane/signal priority (A52, A6, A609) • Derby contactless EMV upgrades	• ITP spreadsheet (TCF1) to estimate RTI amenity value • MODEL impact of reduced inter-green periods on A52/A6/A609) • MODEL reduced delay penalty across the network
	iv) EM Airport / Gateway DRT	• New DRT service EMA – Gateway – Kegworth Parkway Station through brokerage	• MODEL traditional fixed line PT route with bus every 20 mins from 5am – 12am • ITP spreadsheet (TCF1) to calc wider benefits of EV bus operating distances
	v) D2N2 EV charge point network	• 60 additional EV chargers • 50% at PT interchanges	• ITP spreadsheet (TCF1) to calc environmental impacts of more EV trips

Package	Scheme	Details for appraisal	Appraisal method / key assumptions
C: Nottingham urban growth corridors	i) Southern growth corridor (E-W) extension	• 0.85km Thane Rd bus & ULEV lane + Clifton Bridge junction improvement • 0.85km Colwick Loop Rd bus & ULEV lane (Private Rd No. 1 to Victoria Park Way) • Colwick Level X-ing signal & camera upgrade • RTI information extension (50 TFT screens) • 0.85km cycle lane along Thane Rd	• MODEL 40 sec PM Peak JT saving for W-E buses on Thane Rd/Queens Drive • MODEL 20 sec AM and PM Peak JT saving in both directions • MODEL 10 sec JT saving in both dirs • ITP spreadsheet to calc pax amenity bens • AMAT appraisal per other schemes
	ii) Central and Western bus priority corridors	• Traffic light priority A609 Ilkeston Rd (Canning Circus to Wollaton Vale – 13 junctions • Traffic light priority A610 Canning Circus to Nuthall Rd – 10 junctions • Traffic light priority A60 Lower Parliament St to Queens Drive A453 – 17 junctions • A60 corridor SCOOT treatment (Canal St – Mansfield Rd/Forest Rd junction)	• MODEL encoded bus lane improvements impact on patronage and congestion
	iii) Northern bus priority corridors	• 2 x SCOOT junction installations (Hucknall Rd / Bestwood Rd & Bestwood Park Dr) • 1 x MOVA install (Arnold Rd / Edwards Ln) • Bus lane enforcement cameras • NUH Campus Road Improvements to support larger bus capacity on the Medilink service • Carey Rd/Stockhill/David's Lane level crossing cameras and traffic signals • 0.23km B6004 bus lane nr Burford Primary School (Bestwood / Arnold)	• MODEL reduced inter-green period of signals being upgraded

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Package	Scheme	Details for appraisal	Appraisal method / key assumptions
	iv) Park & Ride upgrades	• Expand Phoenix P&R 657 to 1,000 spaces • Expand Hucknall P&R 439 to 550 spaces • Deliver Leapool P&R (0 to 200 spaces)	• Existing Park & Rides included in model (which does not offer capacity constraint) • MODEL new P&R service from A60/A614 junction
	v) LCWIP priority cycle corridors	• Improved River Trent ped/cycle crossing – 0.25km bridge • Ring Road improvement – 4.0km • LCWIP South: Queens Drive to Thane Rd – 1.8km • LCWIP North: Hucknall Rd Greenway – 3.4km • LCWIP North East: St Anns Well Rd – 3.5km	• AMAT appraisal for each cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)
	vi) Workplace capital travel grants	• Change in travel behaviour at Nottingham-based business	• No appraisal possible
D: Derby urban growth corridors	i) Smart Park & Ride Hubs	• 0.25km bus lane • 2 x improved junctions • +200 P&R spaces • +20 EV charge points	• MODEL impact of encoded bus lane / pinch point removal schemes on journey times and PT patronage/decongestion • MODEL 1 new Park & Ride sites and PCU trip reduction impact • AMAT appraisal for cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)

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Package	Scheme	Details for appraisal	Appraisal method / key assumptions
	ii) Bus + rapid transit improvements	• Infinity Park – City Centre DRT service (details?) • 1.5km eRT route: Cathedral Qtr – Pride Park • 10 junctions improved (where?) • 100 bus shelters upgraded • 40 RTI displays upgraded to TFT screens	• MODEL new PT service between Infinity Park & City centre (~20 min headway) • MODEL new eRT route between Pride Park and Cathedral Quarter (10 min headway) • ITP spreadsheet to calc pax amenity bens of RTI and bus shelter improvements
	iii) LCWIP priority cycling routes	• 2.5km City centre – Mickleover cycleway • 3km Pentagon Island – Spondon cycleway (50% off-road and 50% on-road) • 2.87km City Centre – Raynesway (A52) cycleway	• AMAT appraisal for cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)
	iv) Workplace capital travel grants	• Change in travel behaviour at Derby-based business	• No appraisal possible

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3. 'Medium' investment proposal – schemes and modelling approach

Package	Scheme	Details for appraisal	Appraisal method
A: City Centre Integration	i) Nottingham city centre hubs and interchange	• 500m off-road cycleway Canal St East • 350m off-road cycleway Station St East • 140m off-road cycleway Trent St • Enhanced station pax facilities + cycle hub • City centre signage improvements • Broadmarsh EV charging • 200m Queens Bridge Rd + Junction • 1.3km London Rd + Station St Junction	• AMAT appraisal of cycling uplift based on local count/model/PCT data & sample out-turn evidence from Sustrans • MODEL calculated trip reductions applied to base O-D trip matrices (excluding walking and non-trip diversions) in Derby & Nottingham Strategic Model for 1km buffer around routes
	ii) Nottingham city centre public realm	• 370m Carrington St public realm upgrade (1,550sqm) • 250m Colin St public realm upgrade (3,000sqm) • 450m Middle Hill (2,100sqm) • Sussex St public realm (5,650sqm) • 300m Broadmarsh W/Castle Rd public realm	• VURT appraisal of footfall numbers, claiming amenity benefit for 90% of local footfall data (and/or ORR rail entry/exit data in absence of local counts).
	iii) Derby city centre hubs and interchange	• Derby bus station vehicle exit upgrade • Morledge/Bus Station junction improvement • Derby Cockpitt bus gate • Derby Derwent Bridge bus gate • 1.31km Morledge/Siddals Rd public realm • 1.31km Morledge/Siddals Rd cycleway	• MODEL specific scheme details (based on proposals) to determine bus system impacts on patronage and congestion • VURT appraisal of footfall • AMAT appraisal of cycling uplift

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Package	Scheme	Details for appraisal	Appraisal method
	iv) Derby city centre public realm	• 1000m St Peter's St (The Spot) public realm • 1000m Becketwell public realm upgrade • 1000m St Peter's St off-road cycleway	• VURT appraisal of footfall • AMAT appraisal of cycling uplift
B: Strategic Derby – Nottingham – East Mids Airport (EMA) connectivity	i) Derby – EMA - Nottingham cycle expressway	• 10km A6005 corridor cycle expressway Beeston to Draycott • 3.57km Derby Riverside Path extension to Borrowash (to form cycle expressway) • 3.43km Derby Canal Path extension to Swarkestone (EMA route) • 11km additional infrastructure to link Clifton (Nottingham) to EMA	• AMAT appraisal of cycling uplift • MODEL calculated trip reductions applied to base O-D trip matrices (excluding walking and non-trip diversions) in Derby & Nottingham Strategic Model for 1km buffer around routes
	ii) Bikeshare programme	• 10 Cycle Hub secure bike parking at key destinations along the route • Bike/e-bike hire scheme (30 hire locations / 625 bikes).	• AMAT appraisal of cycle expressway + bikeshare impacts • MODEL calculated trip reductions applied to base O-D trip matrices (excluding walking and non-trip diversions) in Derby & Nottingham Strategic Model for 1km buffer around routes with bike hire docks
	iii) Inter-urban bus priority improvements	• Future-proofing of RTI + HOPS systems • New Robin Hood products (Student PAYG) • Robin Hood top-up at tram TVM's • EMV card validators at locations/buses • Bus lane/signal priority (A52, A6, A609) • Derby contactless EMV upgrades	• ITP spreadsheet (TCF1) to estimate RTI amenity value • MODEL impact of reduced inter-green periods on A52/A6/A609) • MODEL reduced delay penalty across the network

Package	Scheme	Details for appraisal	Appraisal method
	iv) EM Airport / Gateway DRT	• New DRT service EMA – Gateway – Kegworth Parkway Station through brokerage system	• MODEL traditional fixed line PT route with bus every 20 mins from 5am – 12am • ITP spreadsheet (TCF1) to calc wider benefits of EV bus operating distances
	v) D2N2 EV charge point network	• 90 additional EV chargers • 50% at PT interchanges	• ITP spreadsheet (TCF1) to calc environmental impacts of more EV trips
C: Nottingham urban growth corridors	i) Southern growth corridor (E-W) extension	• 0.85km Thane Rd bus & ULEV lane + Clifton Bridge junction improvement • 0.85km Colwick Loop Rd bus & ULEV lane (Private Rd No. 1 to Victoria Park Way) • Colwick Level X-ing signal & camera upgrade • RTI information extension (50 TFT screens + 9 totems) • 0.85km cycle lane along Thane Rd	• MODEL encoded bus lane improvements impact on patronage and congestion • ITP spreadsheet to calc pax amenity bens • AMAT appraisal of cycling uplift
	ii) Central and Western bus priority corridors	• Traffic light priority A609 Ilkeston Rd (Canning Circus to Wollaton Vale – 13 junctions • Traffic light priority A610 Canning Circus to Nuthall Rd – 10 junctions • Traffic light priority A60 Lower Parliament St to Queens Drive A453 – 17 junctions • A60 corridor SCOOT treatment (Canal St – Mansfield Rd/Forest Rd junction) • RTI upgrade 60 TFT screens + 6 totems	• MODEL reduced inter-green period of signals being upgraded • ITP spreadsheet to calc pax amenity bens

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Package	Scheme	Details for appraisal	Appraisal method
	iii) Northern bus priority corridors	• 2 x SCOOT junction installations (Hucknall Rd / Bestwood Rd & Bestwood Park Dr) • 1 x MOVA install (Arnold Rd / Edwards Ln) • Bus lane enforcement cameras • NUH Campus Road Improvements to support larger bus capacity on the Medilink service • Carey Rd/Stockhill/David's Lane level crossing cameras and traffic signals • 0.73km Springfield Ln – Cross St bus lane (Bestwood / Arnold) • 0.28km Thackereys Lane to A60 bus lane (Bestwood / Arnold) • 0.23km B6004 bus lane nr Burford Primary School (Bestwood / Arnold)	• MODEL reduced inter-green period of signals being upgraded • MODEL impact of encoded bus lanes on journey times and PT patronage / decongestion
	iv) Park & Ride upgrades	• Expand Phoenix P&R (657 to 1,000 spaces) • Expand Hucknall P&R (439 to 900 spaces) • Deliver Leapool P&R (0 to 200 spaces)	• Existing Park & Rides included in model (which does not offer capacity constraint) • MODEL new P&R service from A60/A614 junction
	v) LCWIP priority cycle corridors	• New River Trent ped/cycle crossing – 0.25km bridge • Ring Road improvement – 4.0km • LCWIP South: Queens Drive to Thane Rd – 1.8km • LCWIP North: Hucknall Rd Greenway – 3.4km • LCWIP North East: St Anns Well Rd – 3.5km • LCWIP East: A612 corridor – 2.5km	• AMAT appraisal for each cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)

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Package	Scheme	Details for appraisal	Appraisal method
	vi) Workplace capital travel grants	• Change in travel behaviour at Nottingham-based business	• No appraisal possible
D: Derby urban growth corridors	i) Smart Park & Ride Hubs	• 0.85km bus lane • 3 x improved junctions • +600 P&R spaces • +60 EV charge points • 0.85km cycleway	• MODEL impact of encoded bus lane / pinch point removal schemes on journey times and PT patronage/decongestion • MODEL 2 new Park & Ride sites and PCU trip reduction impact • AMAT appraisal for cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)
	ii) Bus + rapid transit improvements	• Infinity Park – City Centre DRT service • 2.5km eRT route: Cathedral Qtr – Pride Park • 15 junctions improved • 150 bus shelters upgraded • 60 RTI displays upgraded to TFT screens	• MODEL new PT service between Infinity Park & City centre (20 min headway) • MODEL new eRT route between Pride Park and Cathedral Quarter (10 min headway) • ITP spreadsheet to estimate RTI benefits
	iii) LCWIP priority cycling routes	• 3.8km City centre – Mickleover cycleway • 3km Pentagon Island – Spondon cycleway (50% off-road and 50% on-road) • 2.5km City Centre – Raynesway (A52) cycleway	• AMAT appraisal for cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)
	iv) Workplace capital travel grants	• Change in travel behaviour at Derby-based business	• No appraisal possible

4. 'High' investment proposal – schemes and modelling approach

Package	Scheme	Details for appraisal	Appraisal method
A: City Centre Integration	i) Nottingham city centre hubs and interchange	• 500m off-road cycleway Canal St East • 350m off-road cycleway Station St East • 140m off-road cycleway Trent St • Enhanced station pax facilities + cycle hub • City centre signage improvements • Broadmarsh EV charging • 200m Queens Bridge Rd + Junction cycleway • 220m London Rd + Station St Junction cycleway • 200m Tollhouse Hill/Talbot St cycleway	• AMAT appraisal of cycling uplift based on local count/model/PCT data & sample out-turn evidence from Sustrans • MODEL calculated trip reductions applied to base O-D trip matrices (excluding walking and non-trip diversions) in Derby & Nottingham Strategic Model for 1km buffer around routes
	ii) Nottingham city centre public realm	• 370m Carrington St public realm upgrade (1,550sqm) • 250m Colin St public realm upgrade (3,000sqm) • 450m Middle Hill (2,100sqm) • Sussex St public realm (5,650sqm) • 300m Broadmarsh W/Castle Rd public realm	• VURT appraisal of footfall numbers, claiming amenity benefit for 90% of local footfall data (and/or ORR rail entry/exit data in absence of local counts).

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Package	Scheme	Details for appraisal	Appraisal method
	iii) Derby city centre hubs and interchange	• Derby bus station vehicle exit upgrade • Morledge/Bus Station junction improvement • Derby Cockpitt bus gate • Derby Derwent Bridge bus gate • 1.5km 2-way bus lane Corporation St/Morledge • 1.31km Morledge/Siddals Rd public realm • 1.31km Morledge/Siddals Rd cycleway • 24 bay RTI upgrade	• MODEL specific scheme details (based on proposals) to determine bus system impacts on patronage and congestion • VURT appraisal of footfall • AMAT appraisal of cycling uplift • ITP spreadsheet to calc pax amenity bens
	iv) Derby city centre public realm	• 1000m St Peter's St (The Spot) public realm • 1000m Becketwell public realm upgrade • 1000m St Peter's/Albert/Victoria St, Cornmarket • 1000m St Peter's St off-road cycleway	• VURT appraisal of footfall • AMAT appraisal of cycling uplift
B: Strategic Derby – Nottingham – East Mids Airport (EMA) connectivity	i) Derby – EMA - Nottingham cycle expressway	• 13.5km A6005 corridor cycle expressway Beeston to Borrowash • 3.57km Derby Riverside Path extension to Borrowash (to form cycle expressway) • 4.27km Derby Canal Path upgrade to Swarkestone + crossing improvements • 11km additional infrastructure to link Clifton (Nottingham) to EMA • 3km Sutton Bonington extension	• AMAT appraisal of cycling uplift • MODEL calculated trip reductions applied to base O-D trip matrices (excluding walking and non-trip diversions) in Derby & Nottingham Strategic Model for 1km buffer around routes

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Package	Scheme	Details for appraisal	Appraisal method
	ii) Bikeshare programme	• 30 Cycle Hub secure bike parking at key destinations along the route • Bike/e-bike hire scheme (60 hire locations / 1,250 bikes).	• AMAT appraisal of cycle expressway • MODEL calculated trip reductions applied to base O-D trip matrices (excluding walking and non-trip diversions) in Derby & Nottingham Strategic Model for 1km buffer around routes with bike hire docks
	iii) Inter-urban bus priority improvements	• Future-proofing of RTI + HOPS systems • New Robin Hood products (Student PAYG) • Robin Hood top-up at tram TVM's • EMV card validators at locations/buses • Bus lane/signal priority (A52, A6, A609) • Derby contactless EMV upgrades	• ITP spreadsheet (TCF1) to estimate RTI amenity value • MODEL impact of reduced inter-green periods on A52/A6/A609) • MODEL reduced delay penalty across the network
	iv) EM Airport / Gateway DRT	• New DRT service EMA – Gateway – Kegworth Parkway Station through brokerage system	• MODEL traditional fixed line PT route with bus every 15 mins from 5am – 12am • ITP spreadsheet (TCF1) to calc wider benefits of EV bus operating distances
	v) D2N2 EV charge point network	• 120 additional EV chargers • 50% at PT interchanges	• ITP spreadsheet (TCF1) to calc environmental impacts of more EV trips

Package	Scheme	Details for appraisal	Appraisal method
C: Nottingham urban growth corridors	i) Southern growth corridor (E-W) extension	• 0.85km Thane Rd bus & ULEV lane + Clifton Bridge junction improvement • 0.85km Colwick Loop Rd bus & ULEV lane (Private Rd No. 1 to Victoria Park Way) • Colwick Level X-ing signal & camera upgrade • RTI information extension (50 TFT screens + 9 totems + PMR to SIM upgrade) • 0.85km cycle lane along Thane Rd	• MODEL encoded bus lane improvements impact on patronage and congestion • ITP spreadsheet to calc pax amenity bens • AMAT appraisal of cycling uplift
	ii) Central and Western bus priority corridors	• Traffic light priority A609 Ilkeston Rd (Canning Circus to Wollaton Vale – 13 junctions • Traffic light priority A610 Canning Circus to Nuthall Rd – 10 junctions • Traffic light priority A60 Lower Parliament St to Queens Drive A453 – 17 junctions • A60 corridor SCOOT treatment (Canal St – Mansfield Rd/Forest Rd junction) • 'Switch on' traffic light priority at 64 existing SCOOT/MOVA junctions (Appendix A) • RTI upgrade 60 TFT screens + 12 totems • Victoria + Bulwell Bus Station Improvements	• MODEL reduced inter-green period of signals being upgraded • ITP spreadsheet to calc pax amenity bens of RTI and bus station improvements

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Package	Scheme	Details for appraisal	Appraisal method
	iii) Northern bus priority corridors	• 2 x SCOOT junction installations (Hucknall Rd / Bestwood Rd & Bestwood Park Dr) • 1 x MOVA install (Arnold Rd / Edwards Ln) • Bus lane enforcement cameras • NUH Campus Road Improvements to support larger bus capacity on the Medilink service • Carey Rd/Stockhill/David's Lane level crossing cameras and traffic signals • 0.73km Springfield Ln – Cross St bus lane (Bestwood / Arnold) • 0.28km Thackereys Lane to A60 bus lane (Bestwood / Arnold) • 0.185km A60 Petrol Station to Arch Hill north end bus lane (Bestwood / Arnold) • 0.23km B6004 bus lane nr Burford Primary School (Bestwood / Arnold) and 0.076km B6004 nr Coleridge Close • Pinch point removal A610 Nottingham – Cinderhill • Pinch Point removal A60 Cross St to Sir Robinson Way • Pinch Point removal B5010 Nottingham Rd / Bramcote	• MODEL reduced inter-green period of signals being upgraded • MODEL impact of encoded bus lane / pinch point removal schemes on journey times and PT patronage/decongestion
	iv) Park & Ride upgrades	• Expand Phoenix P&R (657 to 1,000 spaces) • Expand Hucknall P&R (439 to 900 spaces) • Deliver Leapool P&R (0 to 200 spaces) • Deliver Wilford Lane P&R (0 to 160 spaces)	• Existing Park & Rides included in model (which does not offer capacity constraint) • MODEL new P&R service from A60/A614 junction • MODEL new tram P&R (vehicle interception) from Wilford Lane

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Package	Scheme	Details for appraisal	Appraisal method
	v) LCWIP priority cycle corridors	• New River Trent ped/cycle crossing – 0.25km bridge • Ring Road improvement – 4.0km • LCWIP South: Queens Drive to Thane Rd – 1.8km • LCWIP North: Hucknall Rd Greenway – 3.4km • LCWIP North East: St Anns Well Rd – 3.5km • LCWIP East: A612 corridor – 2.5km • LCWIP North West: Wigman/Beechdale – 3.1km	• AMAT appraisal for each cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)
	vi) Workplace capital travel grants	• Change in travel behaviour at Nottingham-based business	• No appraisal possible
D: Derby urban growth corridors	i) Smart Park & Ride Hubs	• 1.00km bus lane • 7 x improved junctions • +800 P&R spaces • +80 EV charge points • 1.00km cycleway	• MODEL impact of encoded bus lane / pinch point removal schemes on journey times and PT patronage/decongestion • MODEL 4 new Park & Ride sites and PCU trip reduction impact • AMAT appraisal for cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)
	ii) Bus + rapid transit improvements	• Infinity Park – City Centre DRT service • 3.1km eRT route: Cathedral Qtr – Pride Park • 25 junctions improved • 225 bus shelters upgraded • 89 RTI displays upgraded to TFT screens	• MODEL new PT service between Infinity Park & City centre (~20 min headway) • MODEL new eRT route between Pride Park and Cathedral Quarter (10 min headway) • ITP spreadsheet to calc pax amenity bens of RTI and bus shelter improvements

Package	Scheme	Details for appraisal	Appraisal method
	iii) LCWIP priority cycling routes	• 4.5km City centre – Mickleover cycleway • 7.36km Pentagon Island – Spondon cycleway (50% off-road and 50% on-road) • 3.20km City Centre – Raynesway (A52) cycleway	• AMAT appraisal for cycleway component, then feed outputs (with diversionary factors applied) into MODEL (per other schemes)
	iv) Workplace capital travel grants	• Change in travel behaviour at Derby-based business	• No appraisal possible

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