Appendix 5: Methodology for Transport Accessibility Assessment

Title	Gloucestershire Strategic Development Locations: Transport Accessibility Assessment - Methodology
Date	28/01/2020
Author(s)	[redacted]
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1. Introduction

1.1 Integrated Transport Planning Ltd worked alongside Land Use Consultants Ltd (LUC) to support the District Councils in Gloucestershire with undertaking an assessment of strategic development opportunities. This work has informed the Councils' search for suitable and available Strategic Development Land (SDL) beyond existing boundaries. It informs ongoing work to satisfy an early review of the Gloucester City, Cheltenham Borough, and Tewkesbury Borough Councils' Joint Core Strategy (JCS), formally adopted in December 2017 and so far subject to Issues and Options consultation.

Overview of approach

1.2 For the purpose of this work, **accessibility** refers to the ability to get to a given place – such as a workplace, healthcare facility, urban centre, or place of education – by different modes of travel. We acknowledge the term can have other meanings within the transport planning profession – including the physical accessibility of public transport vehicles and public realm, and the comprehensible/visual accessibility of information about transport services (WebTAG Unit A4.1).

1.3 Our approach recognises that transport accessibility can often be influenced through improvements to public transport routes and services, and highway networks, but that certain locations are more advantageous than others in respect of their scope for people to complete every-day journeys by sustainable transport options (walking, cycling, public transport) if they were developed for housing or employment purposes. This typically owes to the presence of existing routes and services, and/or the proximity of locations to existing important destinations such as workplaces, urban centres, schools, and healthcare facilities.

1.4 The approach was discussed with Gloucestershire County Council officers, and key stakeholders, and is considered proportionate to the stage of the JCS Review. It has been developed to provide sufficient detail to the District Council planning officers to inform initial sifting and refinement of a set of potential growth locations in respect of

identified priorities, prior to more detailed analyses. The methodology we applied recognises that the desirability of future strategic growth locations will be subject to wider planning considerations and constraints, of which access to opportunities by sustainable transport options is but one factor. As such:

- For each metric, the assessment areas are considered in isolation, and are not cumulative. Cumulative assessments are expected to inform later stages of the strategic growth location selection process, as specific packages of development locations are grouped and compared against each other (alongside possible transport network improvements to accommodate the movement of people and goods that growth is expected to generate).
- Red / Amber / Green scores reflect either qualitative or quantitative considerations – varying from metric to metric – and have been informed by ITP's technical specialists and their professional insights as strategic transport planners. Wherever possible, comparisons between assessment areas are made in relative terms, with scored thresholds typically defined based on clear 'gaps' between groups of objectively calculated values.
- No weightings have been applied to the RAG scores. The evidence prepared will be used by the JCS team at the District Council Planning Authorities as a tool to identify which assessment areas meet/do not meet their priorities.
- As such, we have not sought to define an overall RAG score for each assessment area since it would overly simplify the transport accessibility assessment results. The relative merits of each assessment area, and each accessibility metric applied, can be considered in relation to the local planning and transport authority's policy priorities in conjunction with wider planning considerations.
- Detailed considerations and potential growth impacts, such Health; Personal Security / Crime; Road Safety; Carbon; Severance; Social Inclusion, have not been considered at this stage in the JCS review process. They are expected to become pertinent when specific site options are being compared later in the process.

  In isolation, the presence of Red or Amber scores do not necessarily mean that an assessment area should be removed from consideration. The presence of red scores is considered a reasonable indication that greater investment in sustainable transport connections that may be required to improve accessibility to potential development locations within an assessment area/reduce private car reliance.
- A distinction, through the assessment area sifting process, can be made between locations that are predominantly 'green/amber' in transport accessibility terms, and those which are predominantly 'amber/red'. Our expectation is that such distinctions will be set alongside wider planning considerations by Planning and Transport Officers involved in the JCS's development.

Purpose of this Technical Note

1.5 This Technical Note sets out the methodology applied by ITP to a high-level transport accessibility assessment of areas containing potential strategic development locations within the agreed study area. It has been used to objectively appraise and contrast each assessment area in respect of their sustainable transport accessibility and connections to existing places and facilities, using the criteria summarised in Table 1-1 and detailed in Section 2 of this Note.

1.6 The five measures of accessibility summarised in Table 1-1 are holistic considerations which are relevant to current users of local transport networks (whose journeys could be affected by the transport impacts of any future growth) and potential future residents and employees who come to live/work in new growth locations. As such they are pertinent to car drivers, public transport users, walkers and cyclists; commuters, leisure and business travellers; and employers transporting goods and services.

Table 1-1: Overview of transport accessibility assessment criteria

No.	Metric	Red / Amber / Green measure
1	Capacity of the road network	Qualitative geospatial comparison of each assessment area in relation to current and forecast (to 2031, no improvement) road network capacity during the AM peak: • Green = spare capacity on major roads in vicinity of area. • Amber = some congestion on major roads in vicinity of area. • Red = significant congestion and lack of capacity on major roads in vicinity of area, meaning additional car-based trips are likely to worsen existing delays.
2	Access to employment	**Public transport:** Number of workplaces (a proxy for filled employment positions, or 'jobs' derived from Census, 2011) accessible in the Gloucestershire / Urban Areas within 45mins travel time by walking and public transport from a single point (either the geo-spatial centroid, or a chosen point close to the existing public transport network if in a large assessment area) within each assessment area: • Green = More than 50,000 workplaces (jobs). • Amber = 25,000 – 50,000 workplaces (jobs). • Red = Less than 25,000 workplaces (jobs). **Road:** Number of workplaces (a proxy for filled employment positions, or 'jobs' derived from Census, 2011) accessible in the Gloucestershire / Urban Areas within 30mins travel time by ***road / private car*** (using

No.	Metric	Red / Amber / Green measure
		TrafficMaster average road speed data from the AM peak) from a single point (centroid or chosen point close to existing highway network if in a large assessment area) of each assessment area: • Green = More than 275,000 workplaces (jobs). • Amber = 250,000 – 275,000 workplaces (jobs). • Red = Less than 250,000 workplaces (jobs).
3	Access to other key services and facilities by public transport	Ability to access urban centres, healthcare and education facilities from a single point (centroid or chosen point close to existing network if in a large assessment area) within each assessment area: • Green = Accessible to services within 20 mins. • Amber = Accessible to services between 20 and 40 mins. • Red = Accessible to services over 40 mins.
4	Private car use by commuters	Car mode split, derived from Method of Travel to Work question in the Census, 2011. Thresholds (based on identifiable gaps between groupings of areas) defined as: • Green = Less than or equal to 69% by car. • Amber = 70% to 72% by car. • Red = 73% or more.
5	Proximity to sustainable transport networks	• Green = Located along existing strategic walk / cycle routes, area centroid within 2.5km of a rail station and/or outline area within 500m of high frequency bus routes to Town / City centres / employment areas. • Amber = development option within 500m of a low freq. bus route, or an interchange away from higher freq. services to town / city / employment areas, and / or area centroid 5km from rail station serving Gloucestershire. Not directly on, but linked to strategic walk / cycle routes. • Red = divorced from existing strategic walk / cycle routes, rail, or frequent bus corridors.

1.7 ITP has applied similar RAG-scored approaches to inform due consideration of the relative merits of broad assessment areas / areas of search to the development of Local Plans and Local Plan Reviews in other locations. The method has been tested through the statutory planning process and found to be sufficiently robust and proportionate by Planning Inspectors. It has supported the process of iterative site identification, transport improvement option generation, and cumulative impact mitigation in line with MHCLG's National Planning Policy Guidance on transport evidence base preparation for plan making and decision taking.

1.8 ITP's work complements that undertaken by Navigus Planning, to determine the scope for transport-related infrastructure improvements to be delivered in conjunction with housing and employment growth were it to be allocated in each of the 55 assessment areas. The results of ITP's analysis have been incorporated within LUC's Report and Appendices covering each of the assessment area, with this Technical Note detailing the method applied to scoring each of the transport accessibility metrics.

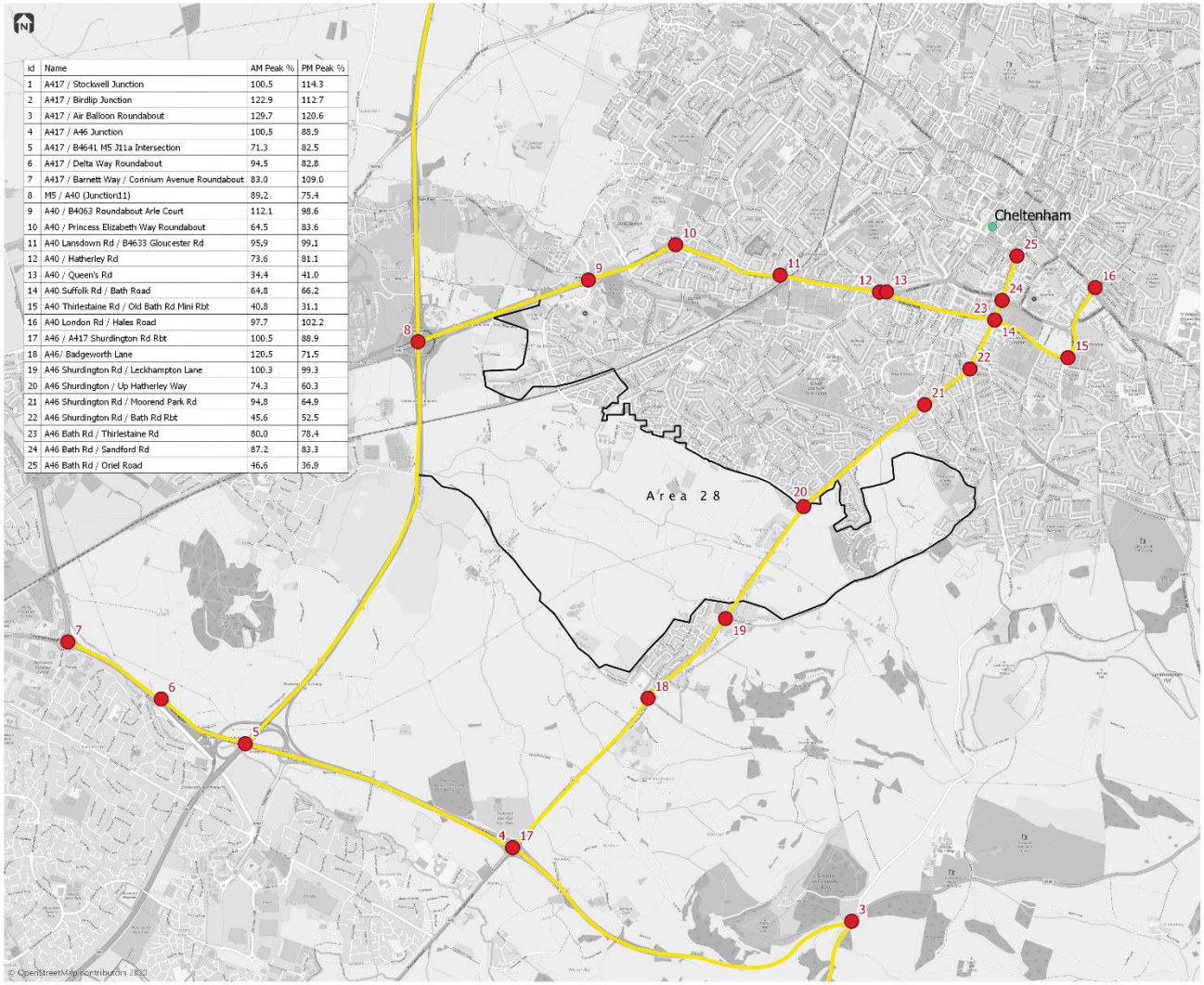
2. Detailed explanation of methodology

Metric 1: Capacity of the road network

2.1 Qualitative geospatial comparison of each assessment area in relation to current and forecast road network capacity relative to predicted trips (example map shown in Figure 2-1):

- Based on evidence drawn from the Joint Core Strategy Transport Evidence Base (May 2017).
- ITP's assessment focused upon the 2031 'Do Nothing' and 'Do Minimum' model test results for highway links and junctions that are close to each assessment area during the AM peak period (07:00 – 09:00).
- These model tests assume no / limited investment in transport improvements, but include allocated (at the time) future housing and employment growth – thereby reflecting a reasonably pessimistic forecast of future highway network conditions.
- Our analysis considered the routes, and traffic congestion hotspots, that people who might come to reside in the assessment areas (in which specific growth sites have not been defined) may seek to use during AM peak periods when travelling to places of work, education and nearby urban centres.
- PM peak periods were not considered, in view of the large total number of areas to be assessed (55) since the trends are broadly the inverse of those predicted in the PM peak, reflecting the tidality of many road network movements during these times.
- Forecast AM peak conditions were interrogated to understand where delays are predicted to occur on key nearby highway links/junctions in relation to the assessment areas, based on forecast Ratio of Flow to Capacity (RFC) values.
- We note that RFC values greater than 90% (i.e. links or junctions operating beyond 90% of their design capacity during peak times) typically result in progressively worsening delays and congestion during peak times on highway links and junctions.

Figure 2-1: Capacity of the road network



Id	Name	AM Peak %	PM Peak %
1	A417 / Stockwell Junction	100.5	114.3
2	A417 / Birdlip Junction	122.9	112.7
3	A417 / Air Balloon Roundabout	129.7	120.6
4	A417 / A46 Junction	100.5	88.9
5	A417 / B4641 M5 J11a Intersection	71.3	82.5
6	A417 / Delta Way Roundabout	94.5	82.8
7	A417 / Barnett Way / Corinium Avenue Roundabout	83.0	109.0
8	M5 / A40 (Junction11)	89.2	75.4
9	A40 / B4063 Roundabout Arle Court	112.1	98.6
10	A40 / Princess Elizabeth Way Roundabout	64.5	83.6
11	A40 Lansdown Rd / B4633 Gloucester Rd	95.9	99.1
12	A40 / Hatherley Rd	73.6	81.1
13	A40 / Queen's Rd	34.4	41.0
14	A40 Suffolk Rd / Bath Road	64.8	66.2
15	A40 Thirlestaine Rd / Old Bath Rd Mini Rbt	40.8	31.1
16	A40 London Rd / Hales Road	97.7	102.2
17	A46 / A417 Shurdington Rd Rbt	100.5	88.9
18	A46/ Badgeworth Lane	120.5	71.5
19	A46 Shurdington Rd / Leckhampton Lane	100.3	99.3
20	A46 Shurdington / Up Hatherley Way	74.3	60.3
21	A46 Shurdington Rd / Moorend Park Rd	94.8	64.9
22	A46 Shurdington Rd / Bath Rd Rbt	45.6	52.5
23	A46 Bath Rd / Thirlestaine Rd	80.0	78.4
24	A46 Bath Rd / Sandford Rd	87.2	83.3
25	A46 Bath Rd / Oriel Road	46.6	36.9

Prepared	Reviewed	Date
LT	NT	Jan 20

Key

- Assessment Area 28
- SRN critical junctions
- SRN key sections

Client
Gloucestershire County Council

Project
Gloucestershire JCS Strategic Development Options Review

Figure title
Assessment Area 28 AM and PM Peak road network capacity (JCS Do Nothing model test)

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Figure number	Date
Figure 2-1	Jan 2020

Metric 2: Access to employment

2.2 The number of workplaces in Gloucestershire / Urban Areas (a proxy for filled employment positions, or 'jobs' derived from Census, 2011) that are accessible by existing walking + public transport (bus and rail), and road (private vehicle) were calculated for each of assessment area using the Visography TRACC software tool. This type of analysis provides an estimate of the potential number of jobs that can be accessed at a given time of day/day of week, and does not consider practicalities such as the frequency of service (public transport) or capacity (public transport and highway accessibility) at these times.

2.3 The following accessibility modelling settings were applied in Visography TRACC:

- PT network for Gloucestershire (July 2019 Traveline data).
- Demographic data (employment levels) covering Gloucestershire / Urban Areas were derived from the 2011 Census.
- Public transport stop located closest to geographic central point (centroid) of each assessment area was used as a trip origin:
    - As the assessment areas are quite large, the exact centroid would likely give zero accessibility for a number of locations, where it wasn't close enough to a public transport stop – meaning no comparison could be made.
    - Where necessary to obtain a reasoned accessibility score, ITP's team selected a location within larger assessment areas that lay within walking distance of existing public transport/highway networks. Wherever applied, this approach reflects the practical reality that specific locations at which new homes / employment sites may be delivered (e.g. within each assessment area) are not currently identified. It also reflects that larger growth sites would influence existing public transport and highway connections such that they divert to connect these locations. For these assessment areas, the accessibility scores reflect the numbers of jobs that can be reached by car / walk + public transport from the nearest public transport stop / highway link on the network. Even so, some assessment areas still score poorly – reflecting the lower levels of jobs that are accessible from their locations.
- Road speed assumptions:
    - Average speeds taken from GIS data provided by Gloucestershire County Council (derived from TrafficMaster) on key road links.
- Calculations:
    - AM peak 07:00-09:00, weekdays (to match JCS evidence base model times).

    - Minimum walk distance to PT network 800m (longer than the 400m convention applied in urban areas, but reflecting that current PT networks do not typically extend into the assessment areas themselves, and the locations of the assessment areas).
- A peak hour journey time for 45 minutes was selected based on a balance of times from the following sources:
    - National Travel Survey 2018: 37 minute average commute (Local-bus, other than London).
    - TUC report on average commute times: 52 minutes (drivers).

2.4 The accessibility analysis outputs from across all 55 assessment areas were used to iteratively determined the RAG score thresholds, rather than defining the thresholds prior to conducting the analysis. This reflects the reality that accessibility levels can vary widely across the country, and that a local baseline needs to be established to then define what reflects a good / average / sub-optimal degree of job accessibility. Natural breaks in the dataset were used to determine the RAG score thresholds, through which 'Red', 'Amber' and 'Green' groupings were defined. This approach is consistent with the overarching principle that the assessment areas are being compared to one another.

2.5 Cycling accessibility was not considered, since ITP's experience is that a wide range of locations are usually *theoretically* accessible by bike. In reality the provision of dedicated and safe cycling infrastructure, and the topography of routes, plays a key role in shaping the extent to which people are prepared to cycle for everyday journeys. These routes are seldom sufficiently well-mapped to facilitate such journey time accessibility analyses, and therefore the cycle accessibility profiles derived are unrealistically positive. Metric 5 considers the physical proximity of assessment areas to National Cycle Network infrastructure, thereby ensuring some representation of cycling as a travel mode in this early stage assessment of potential areas for growth.

2.6 Figure 2-2 (walk + public transport) and Figure 2-3 (road-based transport, such as private car trips) visualise the employment accessibility output profile for an example Assessment Area.

Figure 2-2: Access to employment by public transport

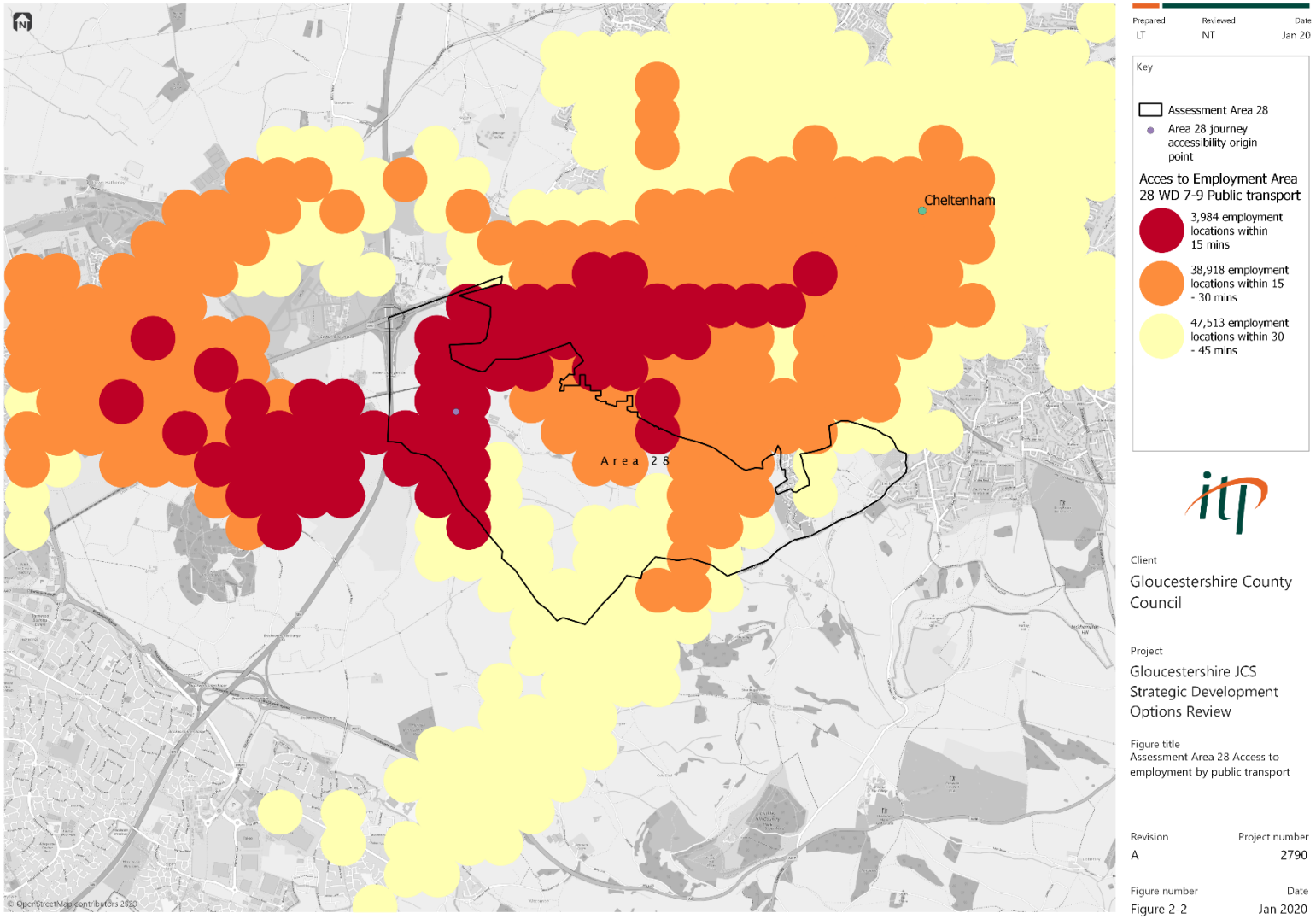
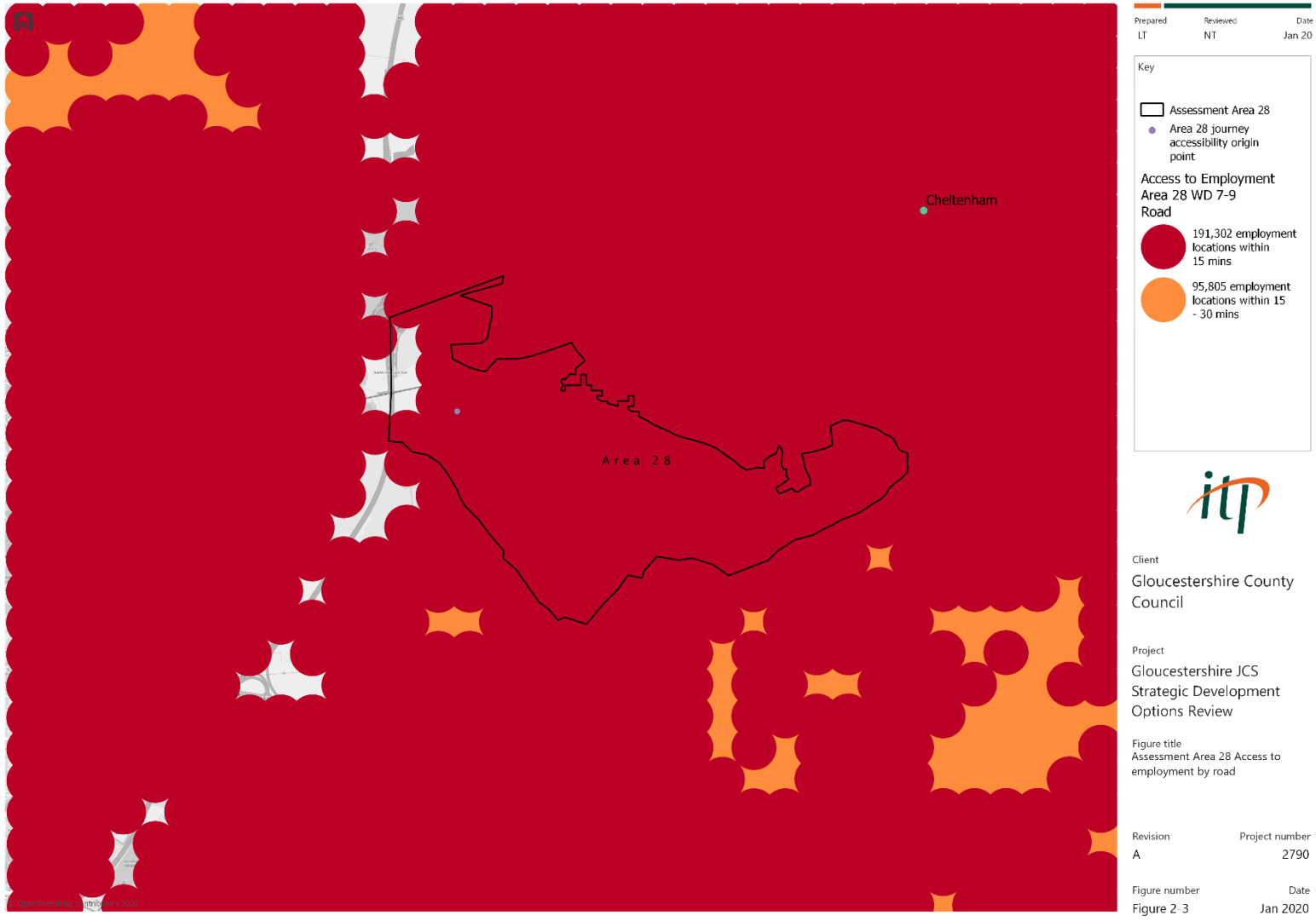


Figure 2-3: Access to employment by road-based transport (e.g. private car)



Metric 3: Access to other services and facilities by public transport

2.7 ITP conducted a qualitative geospatial comparison of each assessment area in relation to current key services and facilities by walking and public transport (bus and rail) options, based on the TRACC outputs for each area. For the same reasons as defined in relation to Metric 3, no cycle journey time accessibility consideration was included in respect of these key services.

2.8 The spatial locations of key services were defined by Gloucestershire County Council (through its previous TRACC accessibility analyses), and provided to ITP's team as GIS data. The key service sites include:

- Urban centres
- Healthcare (hospitals and health centres)
- `Education (primary and secondary schools)

2.9 The following accessibility modelling settings were applied in Visography TRACC:

- PT network for Gloucestershire (July 2019 Traveline data).
- Calculations:
  - AM peak 07:00-09:00, weekdays.
  - Minimum walk distance to PT network 800m.

2.10 The same approach to placing the journey origin location within large assessment areas (where the centroid would have been distant from existing public transport routes/nodes) was used as for Metric 2. A one-to-many approach was adopted for the analysis, thereby enabling holistic consideration of theoretical walk + public transport journey time accessibility from the centroid (or placed trip origin) in each assessment area to all nearby key services to be considered.

2.11 Figure 2-4, Figure 2-5 and Figure 2-6 show the mapped outputs that were used to inform ITP's assessment for this metric, and have been presented for an example assessment area.

Figure 2-4: PT Access to urban centres

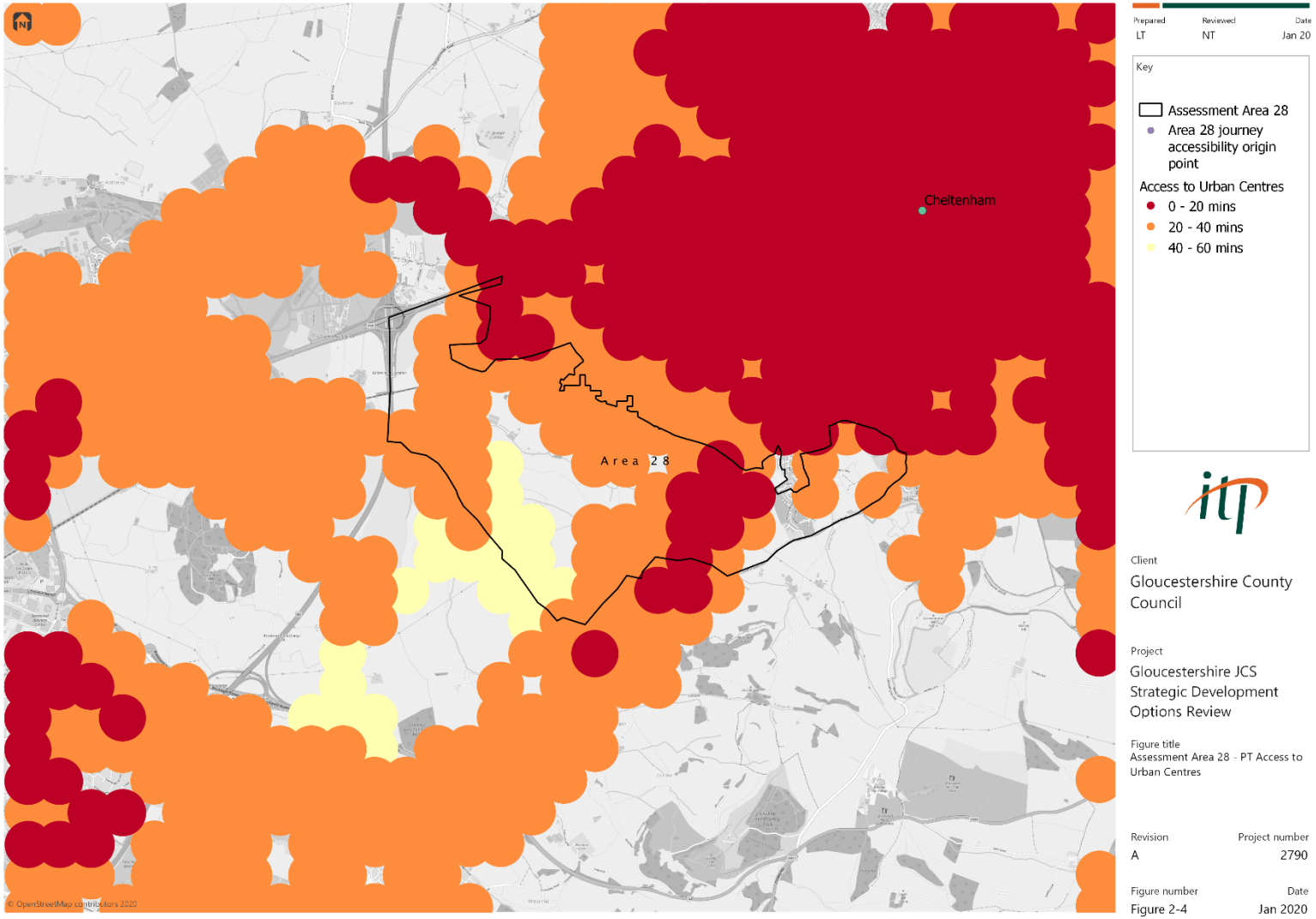


Figure 2-5: PT access to healthcare sites

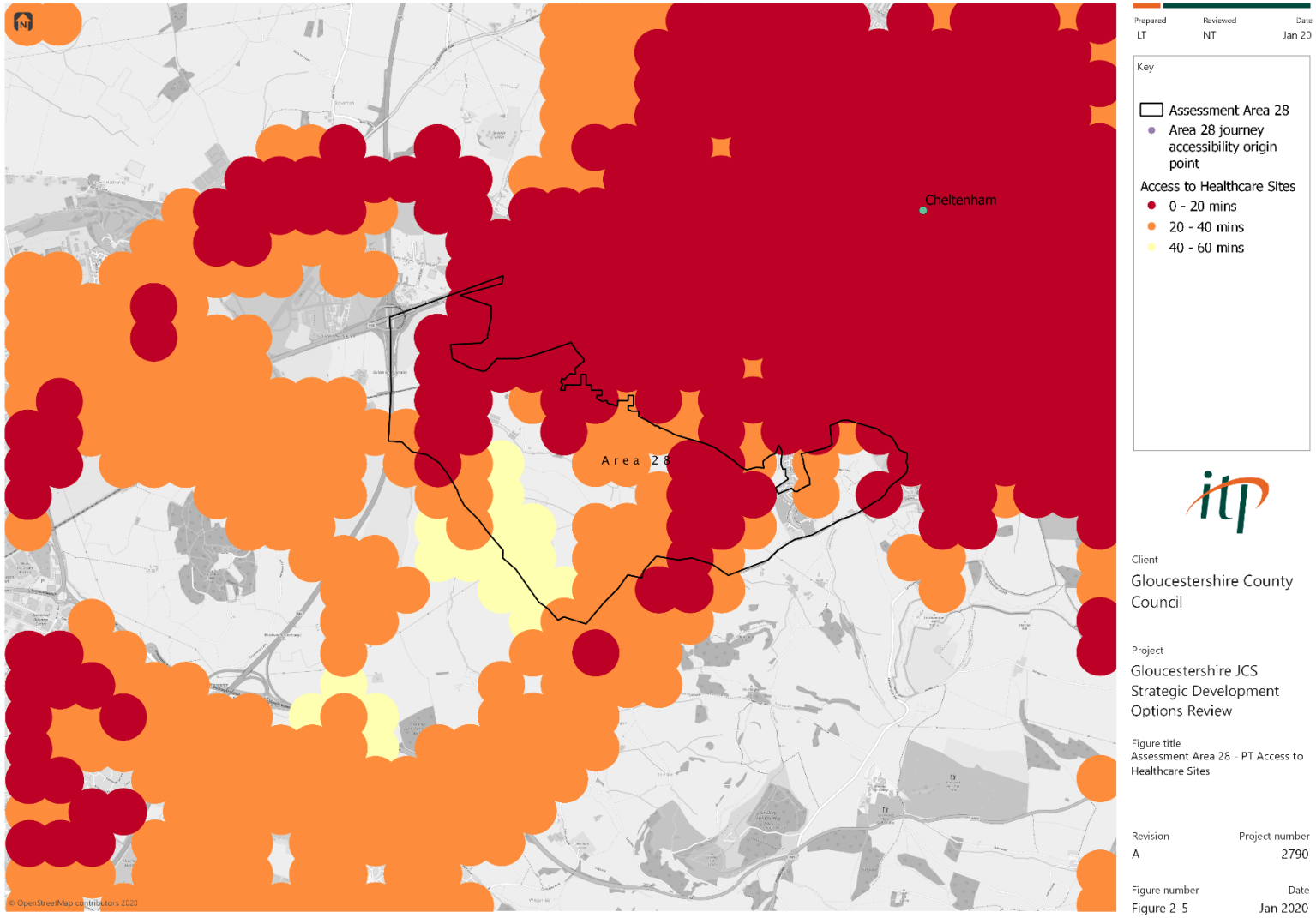
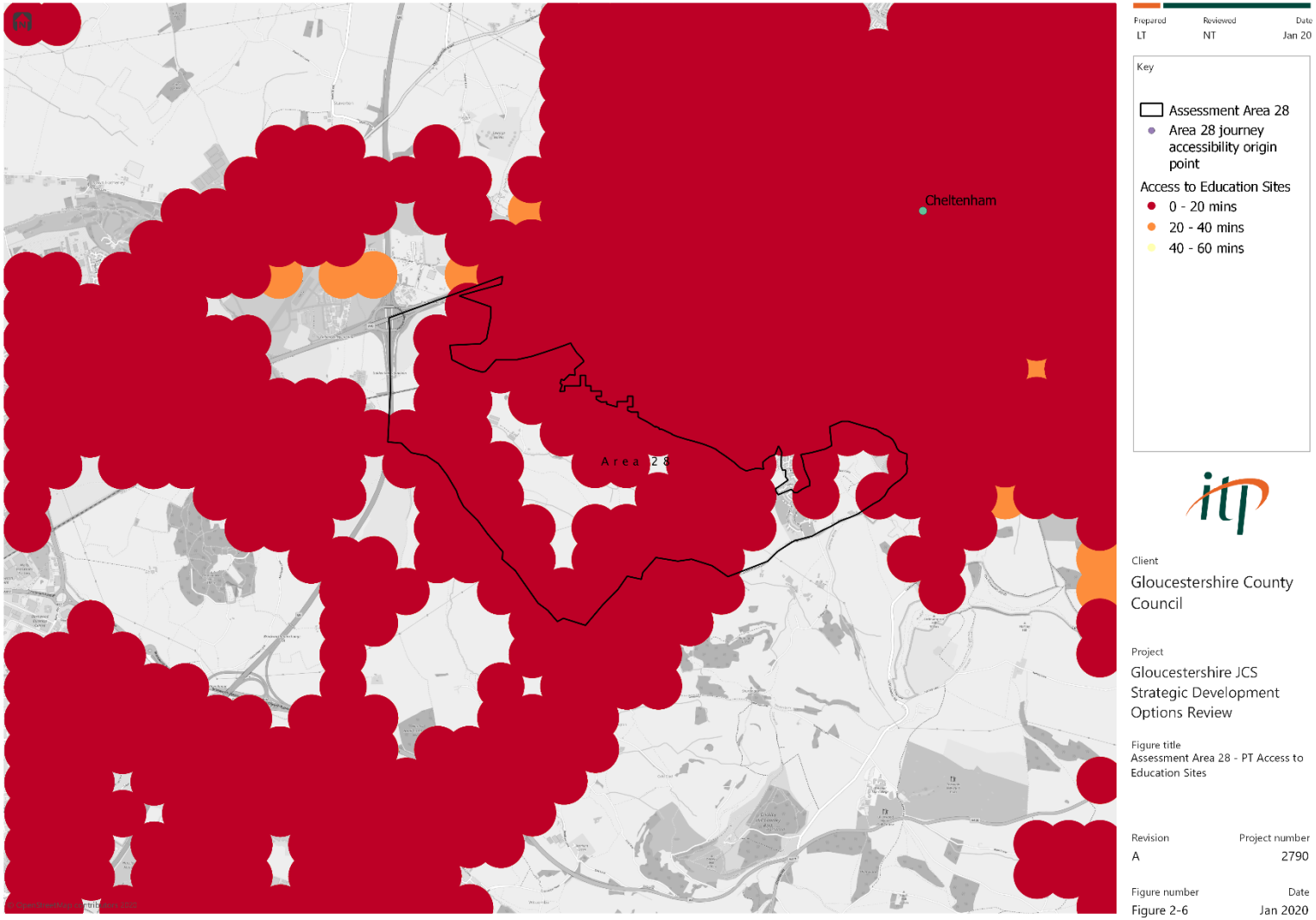


Figure 2-6: PT access to education



Metric 4: Private car use by commuters

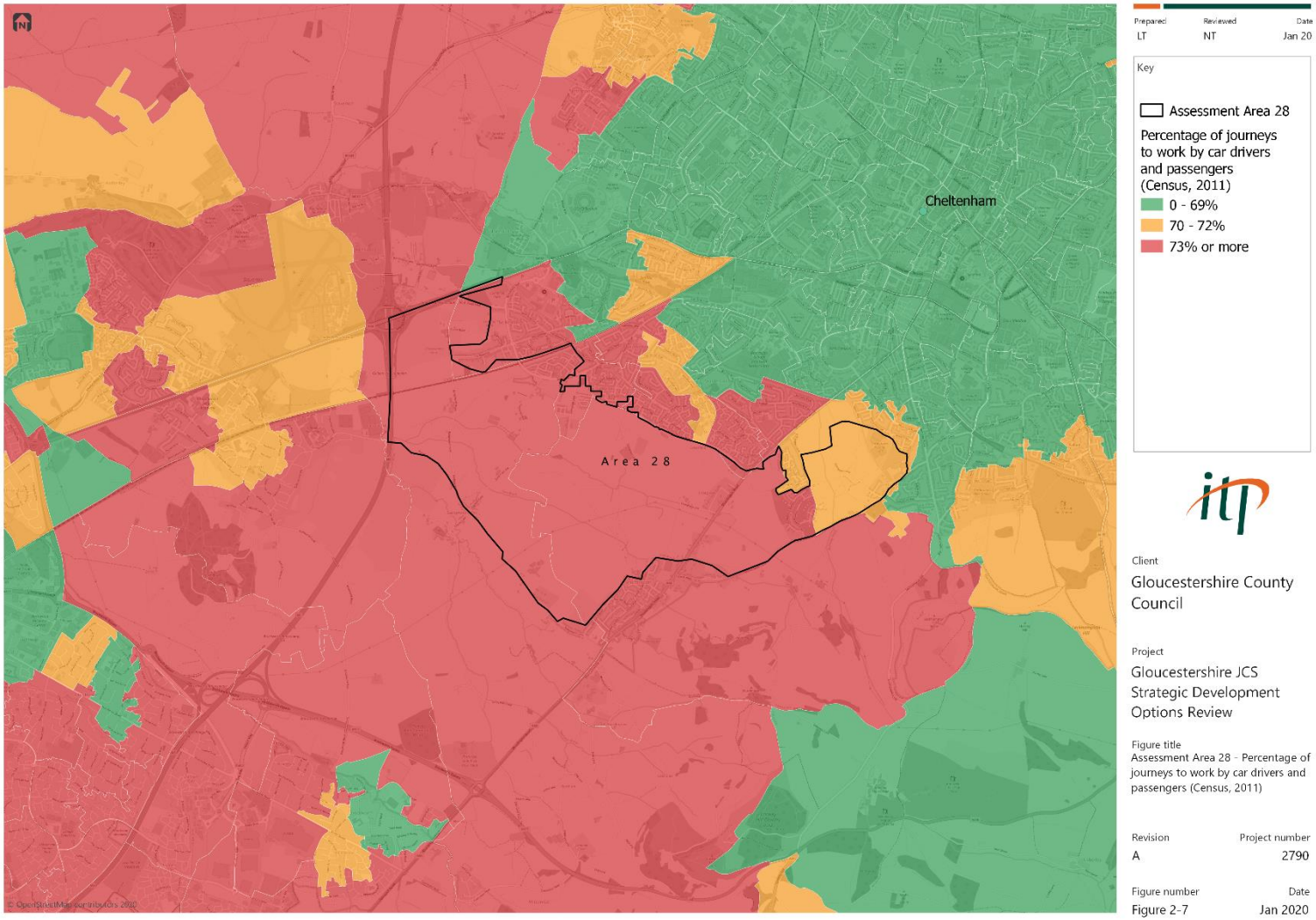
2.12 The commuter travel mode split was derived from responses to the 2011 Census question related to 'Method of Travel to Work' for the Lower Super Output Areas (LSOAs) contained within each assessment area (or as an average taken across the most appropriate neighbouring LSOAs).

2.13 Responses from unemployed people (as defined in the Census table for 'method of travel to work) were removed from the dataset to derive a new total number of people travelling to work, from which the mode split for each assessment area was calculated. For the purpose of this assessment the car (including car driver and car passenger) mode split was subsequently used to define the R/A/G status of each search area, on the basis that it provides a good proxy for the sustainability (or otherwise) of existing commuter travel patterns.

2.14 Thresholds were determined through natural breaks in the data, so as to iteratively group the assessment areas into reasonable consistent groups between which there are evidence gaps in the proportions of commuter trips made by car.

2.15 Figure 2-7 visualises this analytical output for an example assessment area.

Figure 2-7: Percentage of journeys to work by car drivers and passengers (Census, 2011)



Metric 5: Proximity to sustainable transport networks

2.16 A qualitative geospatial assessment / comparison of how well connected each assessment area is (in spatial proximity terms) to existing sustainable transport infrastructure and services drew on the following sources of information:

- Local bus service information and route maps (we considered proximity to bus routes, rather than stops, on the basis it is typically straightforward to provide additional bus stops for new development locations where an existing bus service runs nearby).
- Local rail service information and route maps (we considered proximity to rail stations, rather than lines, on the basis it is expensive and challenging to provide additional railway stations – even if a development location is immediately adjacent to an existing railway line).
- Gloucestershire cycling and walking maps available from the County Council's website.
- Open source walking and cycling datasets.

2.17 The Red/Amber/Green scoring criteria defined in Table 1-1 were applied in relation to each assessment area, with the aim of highlighting those which are located close to existing sustainable transport services and infrastructure. An average across the three elements (proximity to rail, walking and cycle network and bus routes) was then used to derive an overall RAG for proximity to sustainable transport.

2.18 The distance thresholds to rail stations (2.5km and 5km) and bus routes (500m) were defined based on a similar previous RAG assessment methodology ITP's team developed for use in Cherwell (Oxfordshire), and which was recently tested through Examination in Public in respect of that District's Local Plan Review. The distances reflect that:

- 500m (~5 mins) is a relatively conservative distance for people to walk to a bus stop, particularly so with high frequency rail services.
- 2.5km (~30 mins) is at the upper end of a comfortable walk to a rail station, but reflects a comfortable cycle ride (max 10 mins) or short bus trip to access rail services.
- 5km is beyond a reasonable walking distance to a rail station, but reflects a modest cycle ride (max 20 mins) or modest bus trip to access rail services.

2.19 The evidence that lies behind these distance thresholds is set out below:

- Research published in 2015[1], used data from the National Travel Survey (NTS) to obtain mean average and 85th percentile distances for journeys where walking is the main mode of travel, and also where it represents the first stage of a public transport trip (i.e. walking distances to a bus stop or railway station). The study found the 800m average distance typically used as a 'rule of thumb' for walking distances to rail stations is lower than those many people actually walk in order to access rail services. Based on the researcher's analyses of NTS data, a 1.01km mean average and 1.61km 85th percentile walk distance were proposed as updated practical distances that should be used for planning purposes.
- On cycling, people can, and do:
  - **Cycle further than average distances recorded nationally**: Average individual cycle trip lengths across all people in England are 3.4 miles/5.47km (DfT's NTS 0303)[2]. This has increased by 52% since 2002, but is not a limit beyond which everyday cycling must be considered impossible. Strava's 2018 commute data[3], which at 17.9 million logged trips is one of the largest UK samples of commuter cycling activity (albeit derived from a subset of adults that are likely to be more active than the general population), reveals the median average commute in 2018 was 7.5 miles/12.1km.
  - **Spend increasing amounts of time cycling and walking**: Government statistics on average travel to work times by mode indicate that typical bicycle commuting time has increased from a GB-wide average of 16 mins per-commuter trip in 2002, to 22 mins in 2017 (see DfT TSGB 0111[4]). The average time per walked commuter trip has also increased from 12 mins in 2002 to 14 mins in 2017.

2.20 At this stage, no account was taken of the capacity implications associated with transport infrastructure – simply whether it was present or not in relation to each assessment area. We anticipate that capacity considerations – most notably those linked to public transport service capacity constraints – will be considered in later stages of the JCS review's assessment process.

2.21 Figure 2-8, Figure 2-9 and Figure 2-10 provide a spatial context for an example assessment area – highlighting the outputs ITP's team drew upon in order to develop the RAG scores for each area under Metric 5.

[1] WYG (2015) *How far do people walk?* Presented at the PTRC Transport Practitioners' Meeting, London, July 2015
[2] DfT National Travel Survey Dataset 0303 (2018): Average trip length by main mode: England, 2002 to 2017.
[3] Strava UK Year in Sport 2018 (YIS Pressbook_UK-Ireland), page 21.
[4] DfT Transport Statistics GB (2018): Average time taken to travel to work by region of workplace and usual method of travel

Figure 2-8: Proximity to rail stations

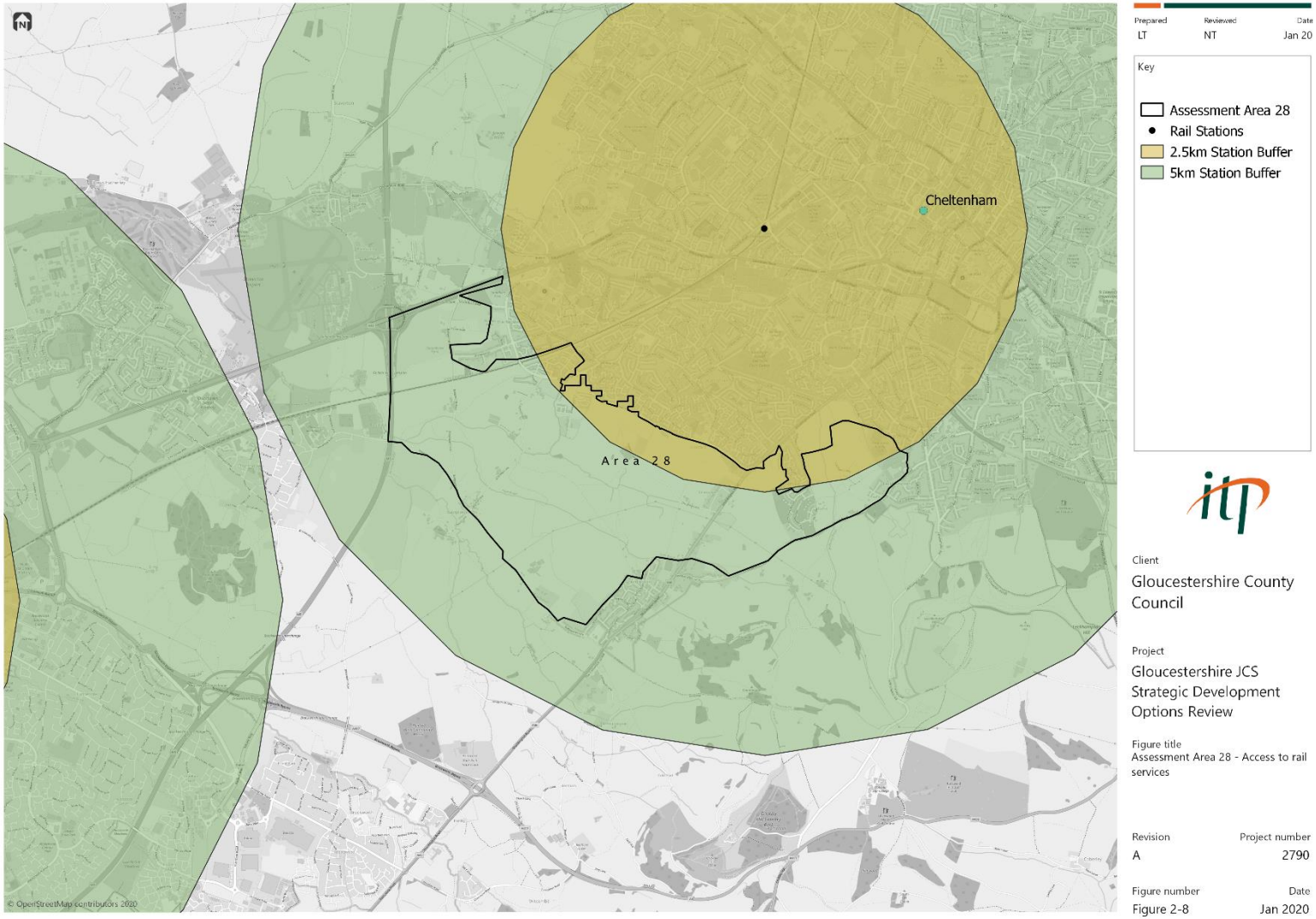


Figure 2-9: Proximity to bus services

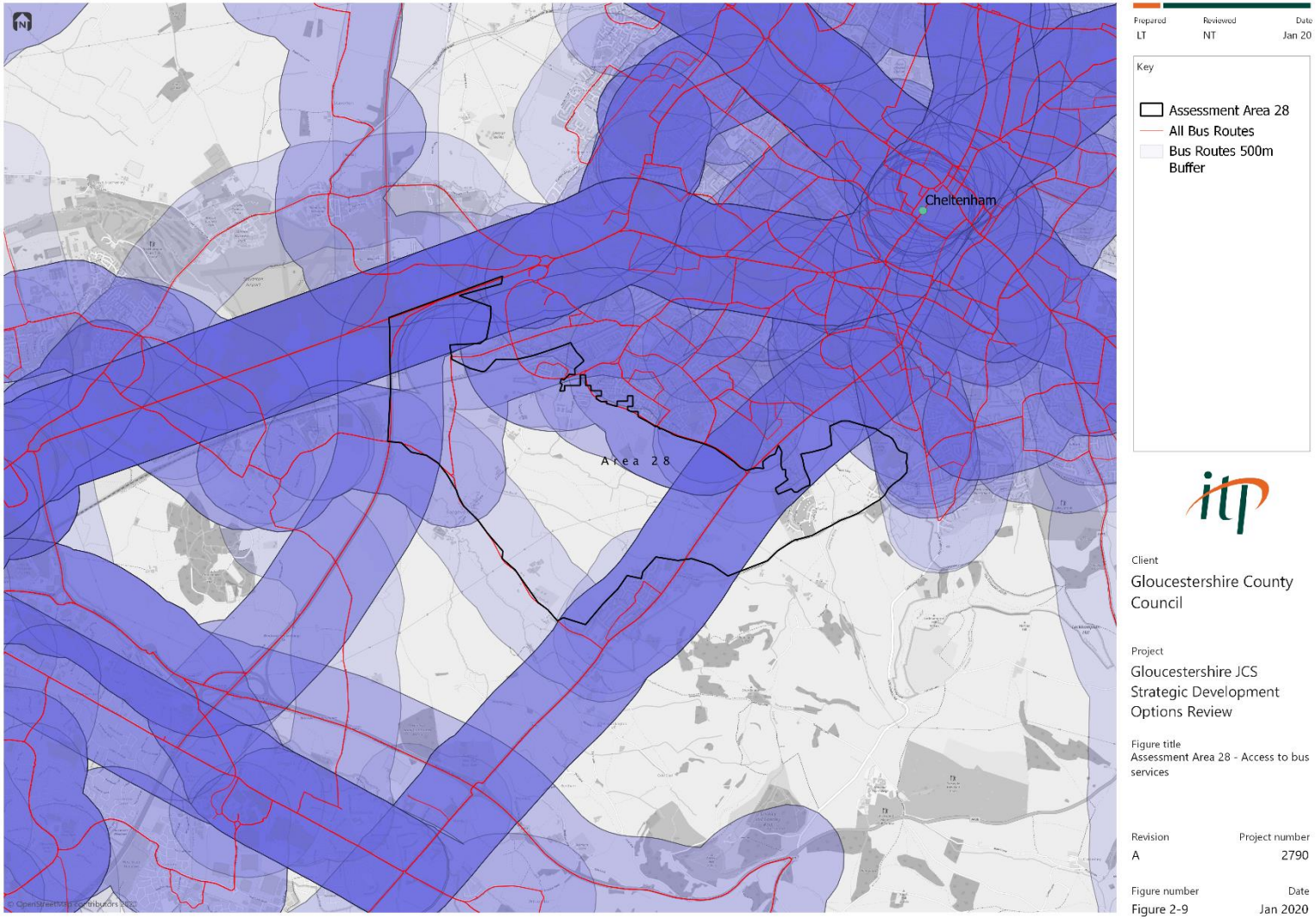


Figure 2-10: Proximity to National Cycle Network