APPENDIX TWO – WATERBEACH NEW SETTLEMENT – TRANSPORT CHARACTERISTICS

Waterbeach New Settlement – Transport Characteristics

Introduction

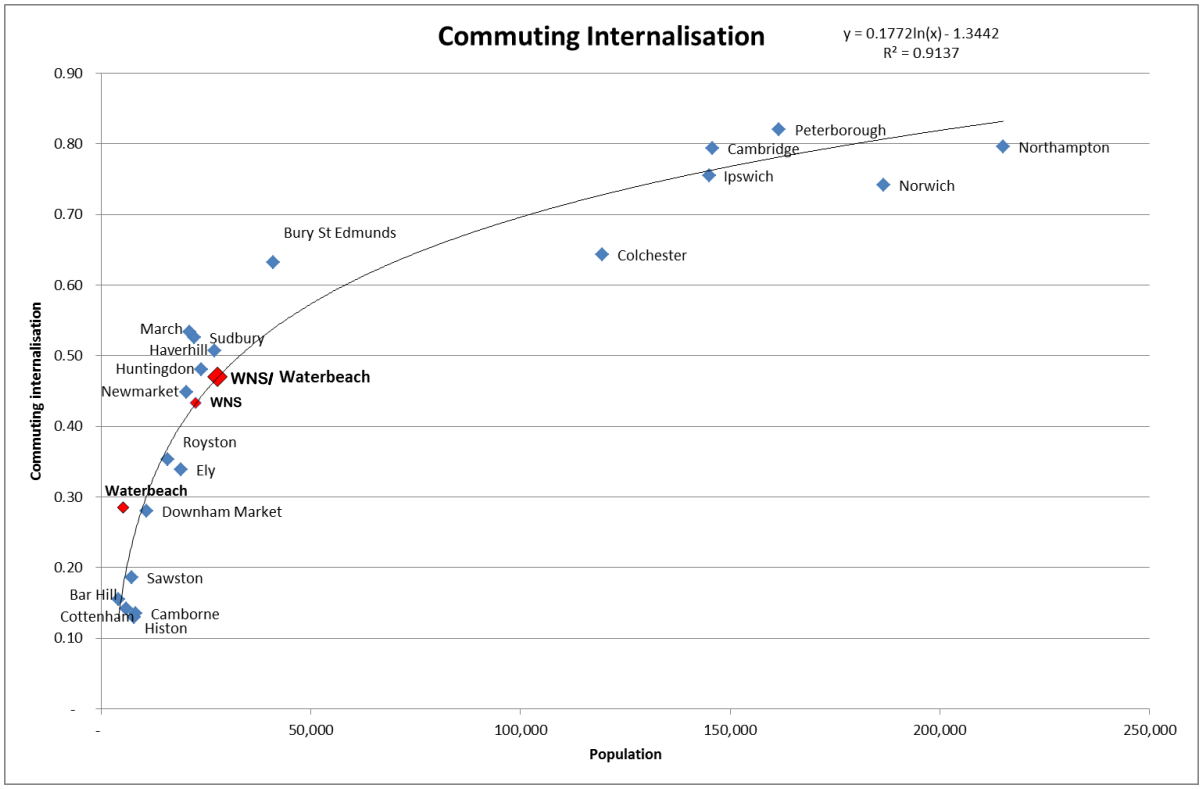
1. Waterbeach New Settlement (WNS) is proposed as an exemplary development in terms of its sustainable transport strategy. This paper responds to a series of questions asking how and why the Waterbeach New Settlement allocation has the opportunity to be inherently sustainable and deliverable in transport terms.

Why support New Settlements?

2. The sustainability benefits of New Settlements have been well documented for many years. The Department of Environment Study "Alternative Development Patterns: New Settlements" by David Lock Associates (1993) identified at Paragraph 12 of the Executive Summary that:

   "larger schemes are more desirable than smaller schemes as these will deliver [inter-alia] greater self-containment and better prospects for public transport…If sustainability is given great weight, new settlements of a scale of 10,000 dwellings – with supporting employment and other services – could be the most desirable form of urban development other than urban infill."

3. The size of the development will ensure that a significant proportion of residents' needs can be met within the settlement itself, with strong self-containment (or "internalisation") for many journey purposes reducing the impacts of the development on the external transport networks. The graph below shows the effect of settlement size on commuting internalisation derived from 2011 Census Origin Destination and Population data. The line of best fit indicates a commuting internalisation rate of 47% for Waterbeach / WNS.



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4. Nearly all non-commuting trips can be met within a large town (such as the proposed New Settlement) due to the generally localised nature of these trips (education, shopping, etc.). This is particularly true during peak travel periods, due to the discretionary choice people can make not to travel to shops etc. at particularly congested times.

Conclusion: New Settlements can generate significantly fewer trips during the peak hours on existing transport networks than the equivalent number of standalone dwellings.

5. WSP and Arup identified in our 2005 paper for the DfT "Impacts of Land Use Planning Policy on Transport Demand and Congestion" that travel distance decreases with increased settlement size, with advantages in locating residential development in urban areas with a minimum population of 25,000 people. People living in settlements of 25,000 to 50,000 population typically travel 33 miles a week less than those living in rural areas.

6. In the context of Waterbeach New Settlement where the population will be c. 27,500 when combined with the population of Waterbeach, this would equate to a weekly reduction of 0.907 million person kilometres, or an annual reduction of over 47 million person kilometres compared to the equivalent number of houses being developed in a dispersed pattern in smaller settlements[i].

Conclusion: New Settlements can reduce person kilometres (and thus transport impacts, congestion, noise and air quality impacts) by tens of millions of person kilometres per year.

7. Preliminary modelling of the Waterbeach New Settlement in the Cambridge Sub Regional Model also identifies these traits. [RD-STRAT-160] identifies in Paragraph 2.3 that:

   "…the new settlement options have advantages in terms of sustainable mode share. The lower car mode share for Waterbeach and Bourn relates to both the greater accessibility by public transport, and the higher level of internal trips. Waterbeach additionally has a larger number of walk and cycle trips to Cambridge."

Why support WNS as a location for a New Settlement?

8. The Planning Inspectorate noted in the "Land North of Bannold Road" appeal decision (Appeal Ref: APP/W0530/A/13/2209166) at Paragraph 81 that the site location in Waterbeach has good public transport and cycle links confirmed by the Council's own Services and Facilities Study39. Paragraph 83 goes on to say:

   "Questions of frequency aside, the fact that Waterbeach has a train service at all gives it a considerable advantage, in terms of choice of sustainable modes of transport, over many other villages in the District."

9. The Commission for Integrated Transport identified in its report "Planning for Sustainable Travel" (prepared by Halcrow in 2009):

   - Planners should consider the advantages of locating development in larger urban areas (minimum 25,000 population) to reduce the need to travel and support public transport provision

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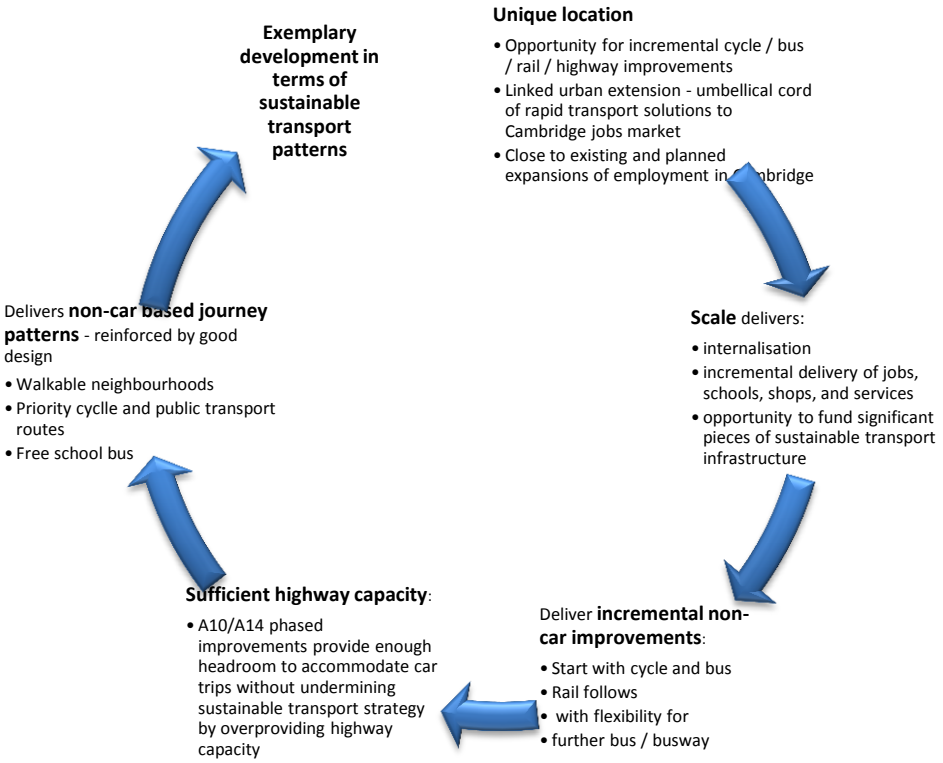
- Development should be avoided near to strategic roads (motorways / dual carriageways), but should be accessible by rail or express bus route
- Development should invest in public transport and make more efficient use of road capacity through traffic demand management
- Development should build at the highest density possible within the local context to support public transport viability; and
- Planners should ensure key facilities are included within the development

10. In terms of the New Settlement's location, the ability to provide high quality cycle, bus and rail connections to Cambridge and Ely is unique within the draft Site Allocations. The proposed size of the settlement is again unique in that it is sufficient to fund substantial investment into each of these modes, including new and improved infrastructure and higher quality and more frequent public transport services.

Conclusion: It is clear that with the interlinked benefits of increased internalisation and shorter average travel distance, that the sustainable transport solution for housing delivery is to prioritise growth in locations capable of supporting a population of at least 25,000. All else being equal, locations such as WNS, which can provide 10,000 homes alongside high quality cycle, bus and rail links to Cambridge should be prioritised for growth and housing delivery.

WNS – Uniquely well placed to deliver a substantial new settlement



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What are the transport constraints to delivering a New Settlement of 10,000 homes?

Cycling

11. The routes between Waterbeach and Cambridge rely on either the un-mettalled towpath along the River Cam, or a route on the A10. It would be possible to introduce an additional high quality cycle route that is direct, smooth surfaced (to allow high speed commuting) and traffic free. A route between Waterbeach and the Jane Coston Bridge in Milton (which provides a safe crossing of the A14 at Milton) and onwards along the Chisholme trail would help to encourage additional cycle trips, in particular for commuters.

12. An additional direct cycle route to the Science Park (avoiding the A10/A14 junction) would be desirable and the existing underpass of the A14 adjacent to Cambridge Regional College could be used to facilitate this route.

Conclusion: A new direct high quality cycle commuter route should be introduced between the New Settlement and the Jane Coston Bridge, allowing onwards connection with the Chisholm Trail. Additionally a new route to the Science Park and Cambridge Regional College would be desirable.

Bus

13. The current service frequency (2 buses per hour during the peak, one bus per hour off-peak) limits the attractiveness of bus mode to capture significant numbers of trips from the new residents especially because buses get caught in the same queues as cars on the A10 corridor.

14. The 2011 Census Data for Waterbeach indicates that 17% of people travel to work in Central Cambridge by bus and 9% to Cambridge as a whole. Census data for St Ives demonstrates that up to 45% of people travelling to Central Cambridge do so by bus, and 27% of people travelling to work in Cambridge as a whole use bus. [Note: there were five buses per hour between St Ives and Cambridge at the time of the Census, and the frequency has since doubled with the introduction of the Cambridgeshire Guided Busway.]

Conclusion: Additional bus services and bus corridor capacity will need to be provided to allow more frequent buses to have fast reliable journey times from Waterbeach to the south of the A10/A14 junction. It is clear from the evidence of bus use from St Ives to Cambridge, and from the guided busway, that there is significant opportunity for increased bus mode share from Waterbeach to Cambridge with the introduction of increased frequency services and sufficient bus priority to ensure journey time reliability.

Rail

15. The existing Waterbeach railway station is located to the south easternmost point of Waterbeach. The platforms are located either side of Clayhithe Road level crossing, with the southbound direction platform being to the south of the road and the northbound platform to the north.

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16. The existing station is unstaffed, tickets must be purchased from machines and there is no enclosed passenger waiting area. Three shelters are provided at the platforms, one at the northbound platform and two at the southbound platform. There is a small station car park with 77 spaces and 12 cycle stands.

17. While access to the platforms is step free, accessibility for wheelchairs is limited because of the lack of staff or ramps to board trains. Furthermore, car drivers using wheelchairs have to cross the level crossing to pass between the northbound platform and the car park.

Conclusion: In general, the station is of a minimal design, with poor access for cars and pedestrians.

18. Station Road is relatively narrow (approximately 5m wide at pinch points), and on-street parking further reduces the available carriageway space so that vehicles must give way to each other in order to pass. The footway on the south side of Station Road is discontinuous, and people are required to use the north side footway to link the Village Centre. The northern footway itself narrows to as little as 0.9m width over a significant length. Whilst the current arrangement may help to slow traffic speeds, it would not be suitable to accommodate a significant increase in traffic when the proposed development is brought forward. The existing footways do not provide sufficient width for wheelchair users or pedestrians with buggies or prams to pass other footway users.

Conclusion: The existing railway station is located between two level crossings and the existing land constraints and access arrangements make it difficult to provide significant upgrades.

19. WSP has presented a preliminary business case and GRIP2 report to the rail industry, which has received support from the Train Operating Companies and Network Rail. The summary of study is that the proposal for a new station provides an opportunity to develop a high quality modern station, located where more people could easily access the station by foot, cycle, or car. The proposals would reduce level crossing traffic to a very small level, with a measurable safety benefit, potentially reducing the risk assessment to a lower level, which would be strongly supported by Network Rail.

20. The change in station location would result in a shorter journey distance for residents in the north east of the village and a longer journey from the south east of the village closest to the existing station. With the construction of the consented new homes north of Bannold Road, there are as many households within 10 minutes of the proposed station as there are from the existing station.

21. A new station at Waterbeach would offer significant benefits to the rail industry and local community including:

    - Improved accessibility for cars, buses, cyclists, and pedestrians
    - Access to a larger population base
    - Increased car parking capacity
    - Potential to provide a modern staffed station with a wider range of facilities

Waterbeach New Settlement – Transport Characteristics

Conclusion: A new station located to the north of the Bannold Road level crossing would allow modern facilities to be provided, still within easy reach of residents of the village, and closer to the combined settlements' centre of the population, maximising patronage.

A new railway station is predicted to be operationally more profitable for the rail industry than retaining the current station, users of the railway station would benefit from significantly enhanced facilities and a greater likelihood of more frequent additional services.

A10 Link Capacity

22. During the am peak hour there were approximately 830 southbound vehicles and 715 northbound vehicles on the A10 south of Car Dyke Road in Waterbeach (2013 data). During the pm peak hour there are approximately 820 southbound and 1075 northbound vehicles making the PM the critical peak for link capacity. Movements from Waterbeach equate to approximately 285 of the am southbound movements and 280 of the pm northbound movements. [ii]

23. The link capacity of a single carriageway road such as the A10 is typically 1590 vehicles per hour[iii]. Using a linear relationship between traffic movements and approximate population (i.e. not accounting for improvements in sustainable mode share and greater internalisation), approximately 9,200 additional homes could be accommodated at Waterbeach New Settlement[iv] before any link improvements are required on the A10. With improvements in internalisation and mode share, well in excess of 10,000 homes could be accommodated by the A10.

24. Dualling the A10 would theoretically provide capacity for approximately 45,000 homes based on link capacity without any improvement in internalisation or mode share[v], but this would undermine the sustainable transport strategy and would not address the very real need for people to travel to and from Cambridge by modes other than private car.

Conclusion: it is clear that there is significant residual link capacity along the A10, and therefore link capacity is not the constraint on settlement. Accordingly, with the proposed sustainable transport infrastructure in place, dualling is not likely to be required to enable the development of Waterbeach New Settlement. The option to dual the A10 remains available as a failsafe mechanism should the capacity increases become essential at some point in the future (or should dualling be desirable for other reasons such as improved connectivity between Ely and the A14/M11 corridors).

A10 Junction Capacity

25. Having established that link capacity is not a constraint on settlement size the Transport Assessment process would assess junction capacities along the A10, where the most significant junction on the A10 is clearly that with the A14

26. The County Council's modelling report RD-STRAT-160 indicates that the Highways Agency's A10/A14 improvements will increase capacity at the A10/A14 junction sufficient to cater for capacity until at least 2031 (When it was tested with 1800 homes assumed at Waterbeach New Settlement).

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27. WSP's initial capacity tests indicate that the improved junction could accommodate an additional 6,650 homes at the New Settlement with the implementation of the Waterbeach New Settlement Transport Strategy[vi].

Conclusion: Subject to detailed capacity testing, which would need to be contained within the transport assessments accompanying planning applications for the proposed development, no additional improvements should be required within the plan period.

28. In addition, the RLW Estates has commissioned the design of a further stage of improvement that could be introduced in advance of the County Council's as yet unidentified grade separation scheme. These improvements are shown on plan SK003 respectively, which is provided in Appendix A. The improvements would deliver capacity capable of accommodating an additional 7,000[vii] homes (i.e. 13,650 homes in total).

29. With the sustainable strategy in place, the initial stage of improvements is expected to deliver sufficient capacity to accommodate more than the allocated 10,000 homes[viii]. Accounting for increases in park and ride capture of existing trips along the A10 corridor the initial improvements could accommodate even more new homes on this corridor[ix].

Conclusion: Highways England's current A10/A14 improvement is likely to be sufficient to accommodate the vehicular trip generation requirements of the New Settlement. RLW Estates' highway engineer's have identified a compatible further improvement scheme (SK003) that provides a failsafe mechanism to ensure that sufficient highway capacity can be provided in the event that the sustainable strategy is not as successful as expected.

Should the County Council's strategic solution for the A10/A14 junction come forward then sufficient capacity will be provided for the full development in any case.

Waterbeach New Settlement – Transport Characteristics

What mode shares are achievable through transport Infrastructure improvements?

30. The Table below sets out the changes in mode share that could be achieved based on empirical evidence of nearby settlements with similar transport characteristics to those envisaged for WNS.[x]

	Train	Bus, minibus or coach	Motorcycle, scooter or moped	Driving a car or van	Passenger in a car or van	Bicycle	On foot
Current Mode Share	9.6%	4.9%	1.4%	64.7%	4.6%	10.1%	4.1%
Empirical Evidence for Change based on infrastructure improvements	9%-point increase based on 43% mode share from Ely to Cambridge compared to 15% from Waterbeach to Cambridge (affecting 1/3 of all external destinations)	2%-point increase based on St Ives trips by bus to Cambridge being 27% compared to 9% from Waterbeach. Additional 5% of car trips captured by proposed busway quality improvements (affecting 50% of all external destinations)	Reduces broadly in line with proportion of mode share	Reduces broadly in line with proportion of mode share	Reduces broadly in line with proportion of mode share	High quality commuter routes similar to those between Great Shelford and Cambridge expected to increase mode share by 10%-points	No change for external trips
Uni-modal mode share target	19.0%	13.9%	N/A	N/A	N/A	20.0%	N/A
Cycle link	8.5%	4.3%	1.2%	57.8%	4.1%	20.0%	4.1%
Bus frequency improvements	8.2%	8%	1.2%	55.5%	3.9%	19.2%	4.1%
Railway station relocation	17.6%	7.1%	1.0%	49.6%	3.5%	17.2%	4.1%
Busway	16.6%	12.1%	1.0%	46.8%	3.3%	16.2%	4.1%
Multi-modal mode share target	**16.6%**	**12.1%**	**1.0%**	**46.8%**	**3.3%**	**16.2%**	**4.1%**
Parking constraint	**19.5%**	**14.2%**	**1.2%**	**37.4%**	**3.9%**	**19.0%**	**4.8%**

Conclusion: It is clear from the available empirical evidence that there is a substantial opportunity to enable modal shift for both the new settlement and the existing village in particular, but also for other locations along the proposed bus corridor. There is the potential for very low car mode shares to be achieved through the provision of exemplary sustainable transport infrastructure.

How would phasing of transport infrastructure deliver appropriate solutions throughout the build out of the development, with sufficient flexibility in that phasing to ensure the viability of delivery?

Within the Local Period

31. The new settlement will benefit from its proximity to Waterbeach, and the ease with which it will be possible to connect into the existing good cycling and public transport links, namely:

    - an hourly bus service between Cambridge and Ely throughout the day Monday-Saturday and a half hourly service at peak times, with a timetabled journey time of 25 minutes (40 minutes at peak times)
    - An hourly rail service to Cambridge and Ely and a (approximately) half hourly service at peak times, with a timetabled journey time to either destination of approximately 7-9 minutes
    - An off road cycle route running parallel to the river and a cycle journey time to the City Centre of approximately 30 minutes.

32. In terms of services and facilities, the village currently supports a primary school and a GP, retail facilities including a post office, bakery, butcher, newsagent, village store, pharmacy and hairdresser. There are numerous employment opportunities within the village itself and nearby at the Cambridge Research Park. The percentage of Waterbeach residents employed

within Waterbeach was 27% and the percentage of Waterbeach employment opportunities taken by Waterbeach residents was 23% (Source: 2011 Census Table WU03EW).

33. Thus, there is an opportunity for the first phases of the development to benefit in sustainable transport terms from the existing land use patterns in the village, and for the new settlement to fund and support enhanced sustainable travel options for both the new residents and the existing villagers. Initial transport measures could include:

- A new high quality direct cycle route from the New Settlement, through Waterbeach, to the Jane Coston Bridge and then onwards to destinations such as St Johns Innovation Park, the Science Park and Central Cambridge. This would further encourage cycle commuting from Waterbeach to Cambridge as evidence from the south of Cambridge (2011 Census flow data - /table WU03EW – for Shelfords and Stapleford) indicates that up to 31% of trips to the City Centre could be by bicycle when high quality commuter links are provided, compared to the current 14% from Waterbeach.
- Increased frequency bus services between Ely and Cambridge, initially on the 9, X9 corridor. At this stage, it is anticipated that every additional 1,000 units could fund the long-term viability (i.e. unsubsidised operation) of one additional bus per hour; however, this could be increased further as increased frequency will increase the mode share along the entire route corridor and not just at Waterbeach and Waterbeach New Settlement.
- Additional capacity for bus priority along the A10 corridor (including a bus lane in addition to the existing highway lanes) between Butt Lane and the A10/A14 junction to ensure the existing and additional bus services can access the Cambridge City bus network without undue delay. These capacity improvements could be converted to additional highway capacity, if necessary, once the proposed busway is installed for later phases of development.
- A free-at-the-point-of-use shuttle bus timetabled to take existing village residents to the new station.
- The new modernised station would provide longer (8-car) platforms, ticket office facilities and barrier controlled revenue protection for the train operators. The station is envisaged to be delivered early by RLW Estates, with a potential opening date in 2020.
- A new secondary school to internalise WNS and Waterbeach education trips.
- Signal controlled junctions on the A10 at Landbeach Road and Car Dyke Road / Waterbeach Road, to improve safety for pedestrian, cycle, and vehicle movements across and along the A10 and to smooth traffic flow at the A10 / A14 junction. In particular these improvements will allow:
  - safer access onto the A10 for residents of Waterbeach and Landbeach
  - residents of Landbeach to access facilities at Waterbeach New Settlement, rather than travelling further to Milton or Cambridge; and
  - improve the cycling route between Landbeach and Cambridge, which will encourage modal shift to bicycle from Landbeach.
- Potential construction access at the western end of Denny End Road or from A10 directly

Beyond the Local Plan Period

34. A first phase busway extension between Cambridge Science Park and the A10 at Butt Lane could come forward at this stage. The southbound bus lane on the A10 introduced during the Local Plan period (prior to 20131) could be converted to general highway capacity with the opening of the first phase of the busway.

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35. Bus service frequencies will continue to increase proportionately with increases in population (approximately one additional bus per hour per 1,000 units).

36. Schools, shopping, leisure and social infrastructure facilities such as doctors surgeries, dentists and health centres will continue to be introduced alongside the new housing to support the populations of both the new settlement and Waterbeach village, maximising the potential internalisation of non-commuting trips throughout the expansion of the new settlement.

37. Our initial analysis indicates that with the package of measures already in place, the remainder of the development can be built out with increases in frequency of bus services providing the additional capacity and sustainable mode share necessary to accommodate the additional housing.

Failsafe infrastructure

38. An extension of the busway from Butt Lane to WNS is desirable, and would in all likelihood encourage some additional bus mode share from the new settlement and existing village towards Cambridge. However, at this initial stage of assessment our analysis indicates that it will not be necessary in addition to the previous phase of infrastructure improvements in order to accommodate the new settlement's trips on the transport networks. The first phase junction improvements and first stage busway will provide the necessary priority. It is possible that the second phase busway could come forward with the support of the County Council in any event.

39. A bus based park and ride could be accommodated within the development to capture trips further north than the existing park and ride at Milton. Although this is not envisaged to be essential to the delivery of the new settlement, it may be desirable to free up capacity at the Milton Park and Ride to cater for east-west movements from the A14, and could come forward much earlier in any case.

40. No further improvements over and above Highways England's currently planned improvements are expected to be necessary at the A10/A14 junction or along the A10 itself. If capacity testing indicates otherwise as the development progresses then the second stage failsafe A10/A14 junction capacity improvement (SK003), or the County Council's proposed grade separated solution, will provide sufficient additional capacity to accommodate the full build out of the New Settlement.

Conclusion: The WNS New Settlement's promoters have identified a series of phased transport infrastructure improvements, which their initial capacity testing indicates will be sufficient to accommodate the full development of the New Settlement.

Additional Failsafe improvements are held in reserve to provide further public transport capacity and mode share and/or highway capacity should this be required. The proposed phasing and associated transport improvements will be tested in appropriate detail at the planning application stage(s) and approved or amended in consultation with the County Council at that time.

Waterbeach New Settlement – Transport Characteristics

What are the costs of the proposed strategy?

WSP has undertaken a cost estimation exercise for the specific schemes outlined in the above transport strategy as set out in the table below.

	0-2000 homes				2000-5000 homes		5000-10000 homes		FAILSAFE MEASURES			
	COMMUTER CYCLE LINK	A10 / LANDBEACH ROAD JUNCTION	A10 / CAR DYKE ROAD / WATERBEACH ROAD JUNCTION	BUTT LANE TO MILTON INTERCHANGE SOUTHBOUND BUSLANE	RELOCATED RAILWAY STATION	RAIL BASED PARK AND RIDE 500 SPACES	1ST PHASE BUSWAY CAMBRIDGE REGIONAL COLLEGE TO BUTT LANE / MILTON PARK AND RIDE	1ST PHASE A14/A10 MILTON INTERCHANGE WORKS	2ND PHASE BUSWAY CAMBRIDGE REGIONAL COLLEGE TO BUTT LANE / MILTON PARK AND RIDE	BUS BASED PARK AND RIDE 500 SPACES	2ND PHASE A14/A10 MILTON INTERCHANGE WORKS	A10 DUALLING
Construction costs												
Preliminaries	95,000	174,200	145,000	216,000	1,250,000	416,000	720,600	207,500	2,882,400	343,150	504,570	3,957,600
Traffic Management	-	87,100	72,500	108,000	-	208,000	180,150	103,750	720,600	171,575	252,285	1,978,800
Construction Works	380,000	871,000	725,000	1,080,000	5,000,000	2,080,000	3,603,000	1,037,500	14,412,000	1,715,750	2,522,850	19,788,000
Base Construction Cost (incl OH&P)	475,000	1,132,300	942,500	1,404,000	6,250,000	2,704,000	4,503,750	1,348,750	18,015,000	2,230,475	3,279,705	25,724,400
Professional fees (12.5%)	59,375	141,538	117,813	175,500	781,250	338,000	562,969	168,594	2,251,875	278,809	409,963	3,215,550
Legal/planning fees (10%)	47,500	113,230	94,250	140,400	625,000	270,400	450,375	134,875	1,801,500	223,048	327,971	2,572,440
Stats/Utility diversions	-	-	-	-	-	-	-	125,000			325,000	325,000
Land/Property Costs and Compensation	-	-	-	-	-	-	-	-	-	-	-	-
Total Construction Cost (excl risk and OB)	581,875	1,387,068	1,154,563	1,719,900	7,656,250	3,312,400	5,517,094	1,777,219	22,068,375	2,732,332	4,342,639	31,837,390
Uplift for Risk and Contingency (40%)	232,750	554,827	461,825	687,960	3,062,500	1,324,960	2,206,838	710,888	8,827,350	1,092,933	1,737,055	12,734,956
Optimism bias (44%)	256,025	610,310	508,008	756,756	3,368,750	1,457,456	2,427,521	781,976	9,710,085	1,202,226	1,910,761	14,008,452
Cost Limit	1,070,650	2,552,204	2,124,395	3,164,616	14,087,500	6,094,816	10,151,453	3,270,083	40,605,810	5,027,491	7,990,455	58,580,798
ESTIMATED INFRASTRUCTURE CONSTRUCTION COST	**1,100,000**	**2,600,000**	**2,100,000**	**3,200,000**	**14,100,000**	**6,100,000**	**10,200,000**	**3,300,000**	**40,600,000**	**5,000,000**	**8,000,000**	**58,600,000**
				9,000,000		20,200,000		13,500,000				112,200,000

41. The sums identified are significantly less than those identified by Cambridgeshire County Council in the Infrastructure Delivery Study document. Based on our discussions with the County Council we understand that their scheme proposals are based on county wide requirements and do not relate to the specific infrastructure that is required to make the proposed new settlement at Waterbeach acceptable in terms of its transport impact. In addition, the County Council has a responsibility to be exceptionally robust with its cost forecasts when estimating as yet undefined, un-designed schemes, whereas our own cost estimates can more accurately reflect the specific proposals that have been designed to accommodate the proposed development.

42. The WNS specific proposals have been produced to demonstrate that there are sufficient appropriate transport solutions that are deliverable at costs which can be phased and are reasonable in the context of delivery of a 10,000 home new settlement.

43. Should the Council wish to bring forward more significant schemes, then the WNS proposals are designed to be entirely complimentary with schemes that are brought forward and it is envisaged that there should be no unnecessary duplication of infrastructure works. If a County Council scheme comes forward instead of a WNS proposed scheme, then the promoters of WNS would contribute to that scheme in proportion with their additional impact on the proposed infrastructure, up to the level of contribution that would be necessary to mitigate the development as a standalone improvement.

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Conclusion: The promoters of WNS have identified an affordable set of transport improvements that can be delivered in phases at appropriate times of the development (to be tested through the Transport Assessment process).It is proposed that the transport improvements would be phased to maximise the opportunity to embrace sustainable modes of travel to create an exemplary development in terms of sustainable transport strategy. These proposed improvements have been assessed as being affordable for the development without relying on external funding from the County Council.

As the New Settlement increases in size the opportunity to increase internalisation and provide long-term self-funding viability for improved public transport services increases accordingly.

If, as evidenced above, car trips can be reduced by 80% through internalisation and 41% by modal shift, then a new settlement will generate 88% fewer external car trips than the equivalent number of standalone residential dwellings dispersed throughout the District.

In addition, the wider benefits brought about by the investment in infrastructure should not be underestimated. For example: the benefits of additional bus patronage as the settlement becomes more established, create a virtuous circle of improved service frequency and quality, which in turn lead to improved mode share and further increased patronage for both residents of the new settlement and Waterbeach as well as all residents along the Cambridge-Ely Route 9 bus corridor and other new route corridors which it will become possible to open up.

This virtuous circle enhances the sustainable transport characteristics of the entire Cambridge-Ely corridor, not just those of the New Settlement itself, reducing reliance on the car and the need for further highway improvements.

[i] 27,500 x 33 = 0.9M; 0.9M*52 = 47M

[ii] Traffic survey data presented in the Transport Assessment for "Land North of Bannold Road" APP/W0530/A/13/2209166

[iii] DMRB Volume 5 Section 1 Part 3 TA 79/99 Table 2 UAP1 9.0m width

[iv] Capacity on A10 = 1590; existing movements 1075 – therefore spare capacity 515; 515/280*5000=9,200

[v] Capacity with additional lane 3600; 3600-1075 = 2525; 2,525/280x5000=45,089

[vi] Estimated future car mode share is 37.4% compared to existing of 67% (0.374/0.67=0.578). Internalisation for existing Waterbeach (estimated as 21.2%) compared to future combined WNS/Waterbeach of 47.4% (0.212/0.474=0.447). To factor the existing 285 trips to reflect future patterns (mode share and internalisation) 285* 0.578*0.447 = 74vehicles. Using residual A10/A14 capacity = 53 car trips; 53 / 74 x 5000 = 3581 dwellings

[vii] 570 car trips(derived from Transyt analysis); 570 / 285 x 5000 = 10,000

[viii] Using the internalisation and mode share correction on the 285 existing trips gives 74 trips as before. 160 / 74 x 5000 = 10,811dwellings, and 570 / 74 x 5000 = 38514 dwellings

[ix] Park and ride trip capture: bus 277; rail 182

(160+277+182) / 74x 5000 = 41,824

(570+277+182) / 74x 5000 = 69527

[x] Mode share changes

- Rail
  - Mode Shares From Ely South to Cambridge

Row Labels	Sum of All categories: Method of travel to work (2001 specification)	Sum of Train

Waterbeach New Settlement – Transport Characteristics

Cambridge 003	89	7	8%
Cambridge 005	76	14	18%
Cambridge 006	38	7	18%
Cambridge 007	246	125	51%
Cambridge 008	47	26	55%
Cambridge 009	14	4	29%
Cambridge 010	24	7	29%
Cambridge 012	178	120	67%
Cambridge 013	105	42	40%
Grand Total	**817**	**352**	43%

- Mode shares from Waterbeach to Cambridge

Row Labels	Sum of All categories: Method of travel to work (2001 specification)	Sum of Train	
Cambridge 001	14	2	14%
Cambridge 003	108	10	9%
Cambridge 004	70	4	6%
Cambridge 005	6	6	100%
Cambridge 006	7	7	100%
Cambridge 007	133	37	28%
Cambridge 008	4	4	100%
Cambridge 009	8	3	38%
Cambridge 010	6	5	83%
Cambridge 011	3	3	100%
Cambridge 012	15	13	87%
Cambridge 013	44	9	20%
Grand Total	**418**	**103**	25%

- Total external trips from Waterbeach 2,039
- 2001 Census external rail mode share for Waterbeach = 10%
- Taking Cambridge trips as a proxy for relative current performance of rail 10% / 0.25 x 0.43 = 17%
- Improve bus connections from Cambridge Station to South Cambridge employment areas – assume additional 5%

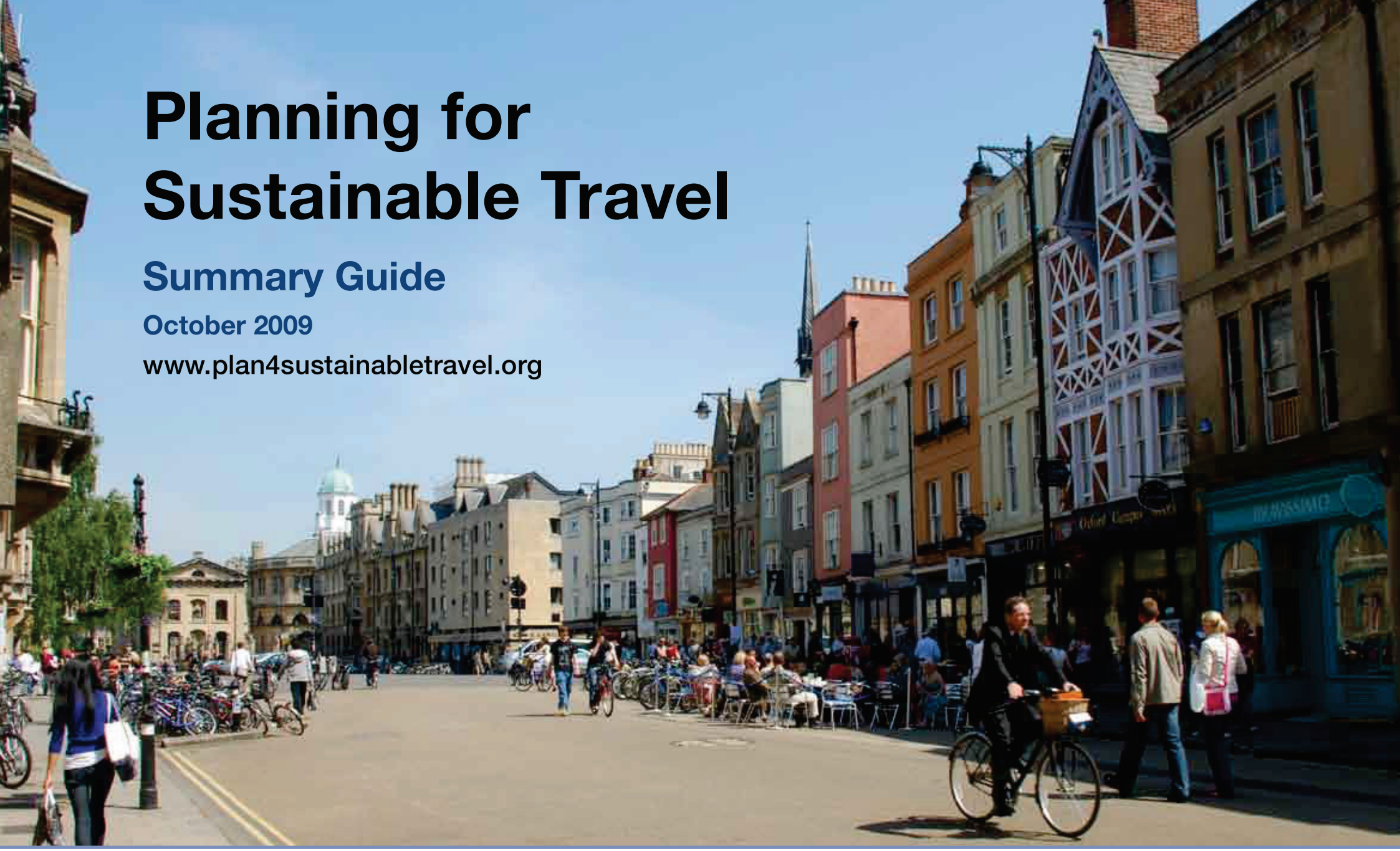
APPENDIX THREE – PLANNING FOR SUSTAINABLE TRAVEL (2009) (EXTRACTS)

Planning for Sustainable Travel

Summary Guide

October 2009

www.plan4sustainabletravel.org



Commission for Integrated Transport

Halcrow Group • Oxford Brookes University • University of Oxford

Planning for Sustainable Travel

Summary Guide

www.plan4sustainabletravel.org

Commission for Integrated Transport

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Further copies of this summary guide are available from the Comission for Integrated Transport (CfIT) or the Halcrow Group. A catalogue record for this guide is available from the British Library.

The aim of this guidance is to provide an up-to-date evidence-based compendium of research for local practitioners and elected members. It comprises best-practice advice aimed at helping to deliver more sustainable decision-making. This guidance is **not** statutory.

CfIT's full role and remit is summarised in the annex, 'Client and Authors', on page 49.

Contents

4. Summary of Practice Advice

A summary of the practice advice contained within the ‘key themes’ pages of the web guide is given below. This provides an overview of each theme, including a definition of potential objectives and a numbered checklist of practice pointers.

The more detailed web guide (www.plan4sustainabletravel.org) also includes relevant extracts from national policy guidance, research evidence, and further reading and case study material. A background technical report, detailing the research literature and individual case studies, is also available via the website.

The themes below are ordered in an approximate spatial hierarchy, with those most relevant to strategic planning presented first, followed by the urban, neighbourhood and development-specific scales, and supporting traffic demand management (TDM) measures.

Theme 1: Settlement Size

Settlement size refers to the total population or number of dwellings within a contiguous built-up area. Larger settlements provide an opportunity for greater self-containment and a mix of uses offering access to a range of shops, services and employment **within** the built-up area, thereby reducing the need for inter-urban travel. We should aim to maximise the proportion of new development that is allocated within or immediately adjacent to larger towns and cities.

Hence, in regional and sub-regional planning, decision-makers are advised to:

1.1 Consider the advantages of locating development in selected larger urban areas (metropolitan areas, cities and large towns, or above 25,000 population at a minimum) to (a) reduce the need to travel, and (b) support public transport provision, by:

- increasing the likelihood of residents finding jobs and utilising facilities, or of services drawing their employees and customers, from within the same urban area;
- tending to have a higher development density;
- creating higher volumes of travel demand on the main corridors; and
- (higher densities and better public transport) requiring and facilitating a managed approach to car parking which itself contributes to lower car ownership and use.

It may not always be practicable or desirable to maximise development in or adjacent to the largest urban areas within any region/sub-region because of the local incidence of housing need, support for smaller, rural communities and their services, restricted land availability and/or environmental or infrastructure constraints. However, the expansion of larger settlements is generally preferable to 'leapfrogging' development to smaller towns or 'spreading' development across a number of settlements.

1.2 Where applicable, development should not be dispersed across and replicating the existing settlement pattern. Strategic traffic generation impacts should contribute to locational considerations. This may involve a review of Green Belt and similar urban containment policies (from the perspective of sustainable transport) where the expansion of settlements may have been prevented. Consider the option of the selective release of land at the edge of larger settlements and in public transport corridors, taking into account:

- the relative accessibility by public transport of alternative locations to jobs and major facilities;
- the likely difference in per capita car mileage; and
- the potential to 'swap' other locations for open space provision.

Development located in larger urban areas supports sustainable travel aspirations (Manchester)

Theme 2: Strategic Development Location

Strategic development location refers to the selection of areas for major new residential and non-residential development (employment, leisure and retail), including the spatial distribution of housing and employment within Growth Areas and Growth Points and between urban centres (Figure 8 illustrates the latter). It is an important input to the apportionment of development between districts at the Regional Spatial Strategy (RSS) level. There is a strong link with development site location, which takes place lower down the strategic scale, where integrating development into the existing urban fabric is considered.

To promote sustainable travel, the aim should be to locate development where travel generation is likely to be reduced. Hence, in locations where there is good public transport accessibility, particularly for short trips to existing or new centres. Development locations which may facilitate long distance journeys by car should be avoided, including at, or near to, junctions on strategic roads (motorways/dual carriageways). This means:

- travel by car is likely to be minimised, both in terms of trip length and mode share;
- opportunities exist, or can be developed, to promote the use of non-car modes; and
- good accessibility is available without requiring car use or relying on local public transport services that depend on subsidy over the long term.

In regional and sub-regional planning, practitioners are advised to:

2.1 Locate major employment, retail and leisure uses with a sub-regional catchment:

i. in the first instance, in existing city and town centres; or

ii. secondarily (where the physical opportunity is not available for option i), at other locations which can be accessed conveniently by public transport from the relevant catchment area.

2.2 Improve the sustainability credentials of urban, 'dispersed conurbation' and suburban locations (which may sometimes be within the formal 'built-up' area) through the application of local traffic demand management measures, including travel plans.

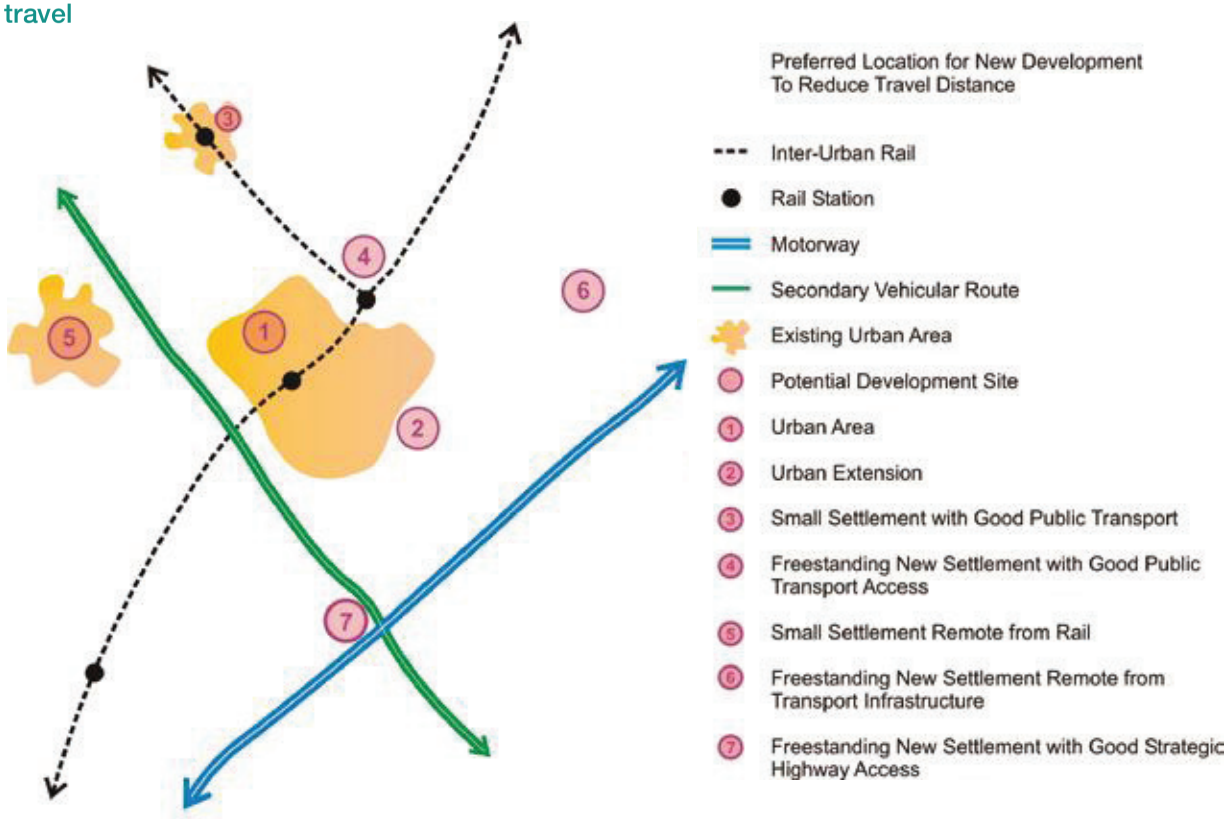
2.3 Avoid workforce-intensive development in non-central locations, close to junctions with motorways and similar dual-carriageway routes unless they enjoy exceptional public transport accessibility (e.g. a rail 'parkway' station). This will discourage short- and medium-distance travel by car on strategic highways and is especially important in cases where new housing is likely to be attractive as a 'dormitory community' for people working in major urban areas accessible by the route.

2.4 Locations for additional housing should also have regard to:

- the proportion of trips likely to be made within the home settlement (i.e. the degree of 'self-containment'); and
- the average distance of trips to places outside the home settlement and the likely proportion to be made by public transport.

2.5 Where significant out-commuting is perceived as inevitable, new housing should be located in settlements that already enjoy good, or can receive improved, public transport accessibility to the relevant external destination(s), for example by virtue of a rail service or express bus route.

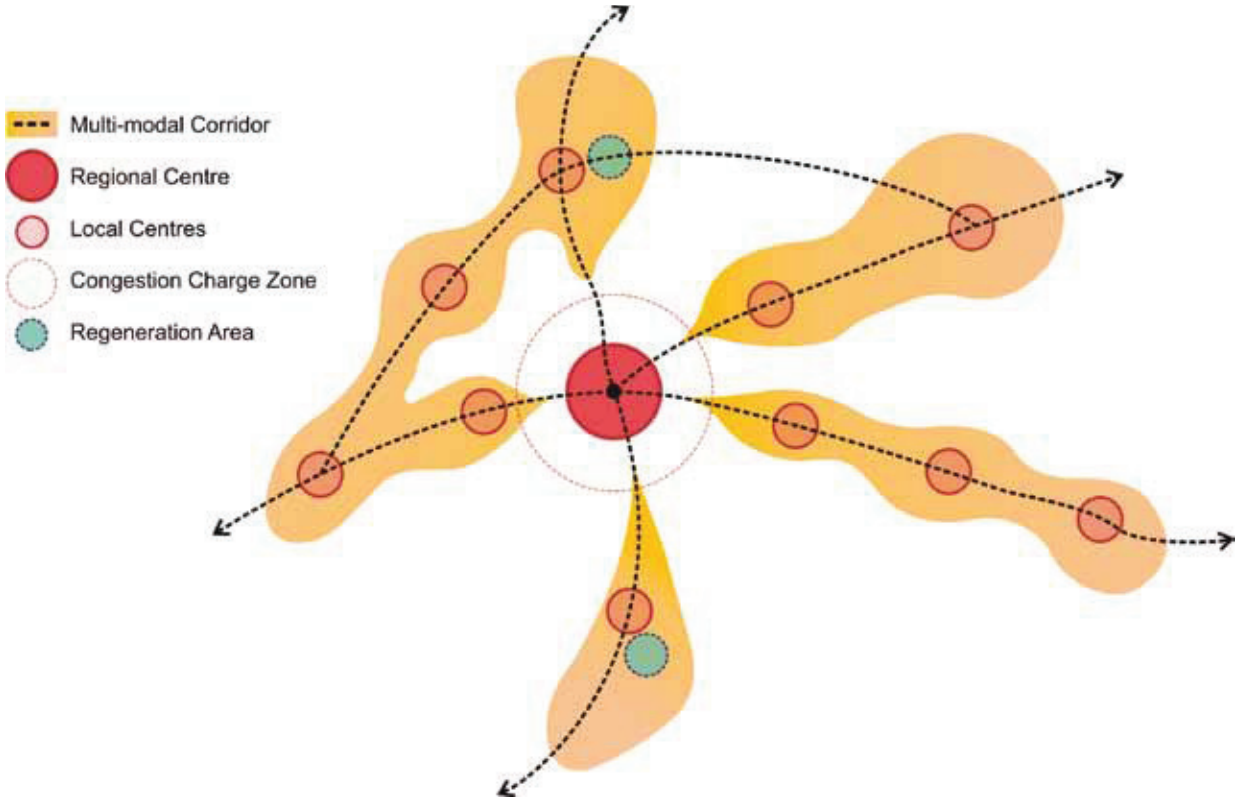
Figure 8: Strategic development location and travel



Theme 3: Strategic Transport Network

The Strategic Transport Network refers to transport infrastructure that supports medium- and long-distance travel, generally between towns and cities or along major corridors in urban areas (Figure 9). It includes all modes whose configuration and design serves, and could potentially influence, spatial development patterns (e.g. rail, bus priority route and highway). The Strategic Network can be conceived as an integrated network of different modes and ownership – with combined conflicts and opportunities. For example, the solution to potential future congestion on the trunk road network may lie in the location of new development.

Figure 9: Strategic Transport Network and development



Built-up areas are not generally 'self-sufficient'. To increase the sustainability of long-distance travel between settlements, the aim should be to:

- increase the efficiency and reliability of the existing public transport network (rail and bus) and invest in public transport infrastructure improvements; and
- create development patterns that support public transport usage and discourage the use of the strategic highway network for short, medium and long distance travel (e.g. commuting). Hence, major development should be located near to public transport nodes where capacity exists or can be developed.

Hence, in regional and sub-regional planning, practitioners are advised to:

3.1 Develop sub-regional and city-regional governance structures (e.g. Multi-Area Agreements) that support an effective process for achieving integration in transport and urban planning.

3.2 Develop key public transport links and networks between cities and towns and within larger conurbations (in collaboration with national government), and locate development adjacent to nodes to make use of capacity.

3.3 Improve the efficiency of the Strategic Transport Network by increasing integration between modes, for example at important urban and edge-of-town interchanges and park-and-ride sites.

3.4 Prioritise public transport infrastructure investments that support desired development patterns.

3.5 Make more efficient use of available road capacity through traffic demand management measures and road space reallocation to more sustainable modes.

Theme 4: Density

Density refers to the intensity of use of land. In UK planning practice, density is generally measured in dwellings per hectare (dph), where the area includes developable residential land.[1]

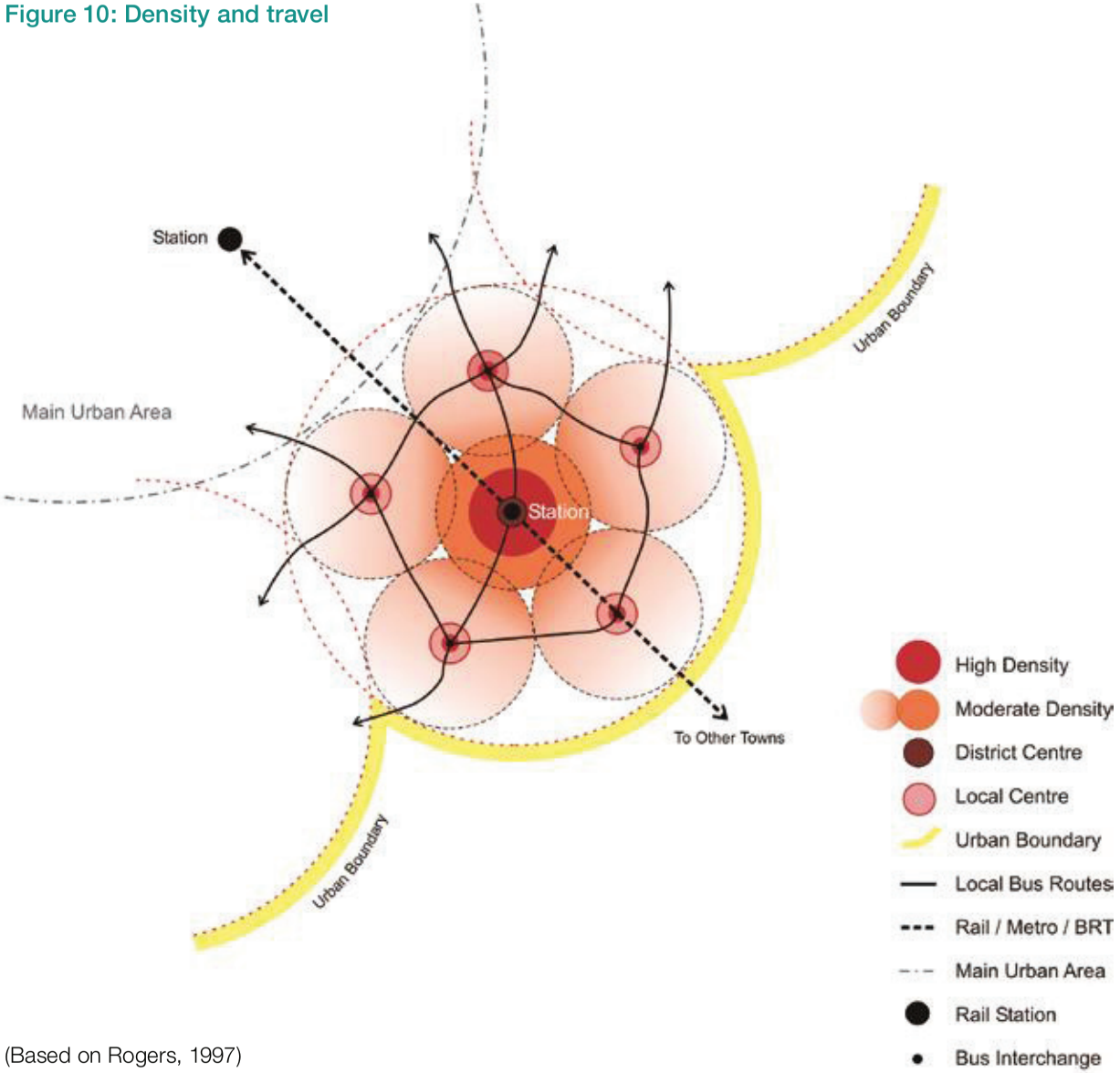
There has been much previous work on the density and sustainability topic. Newman and Kenworthy (1989, 1999) famously developed the relationship between higher density and lower energy consumption for major world cities. The ways of achieving higher residential densities in design quality terms has been examined by many authors, including Rogers (1997), and has been influential on the urban renaissance movement.

[1] Other metrics can be used. For example, gross density includes all land (i.e. including major roads, parks, service facilities, etc.) and is often measured in terms of dph or persons per square kilometre. Gross density is useful for comparing densities across larger areas and for estimating potential public transport demand. Habitable room densities allow different house types to be accommodated. Plot ratios and net site densities are also used. The more recent research is beginning to develop more effective measures of density and **quality**, for example the number of useful facilities per area, such as bookstores or coffee shops.

A number of principles can be derived, with a focus on raising the density of development, particularly around public transport nodes (Figure 10):

- Transport energy consumption and CO_2 emissions are generally lower at higher densities.
- Higher densities lead to greater scope for viable public transport services.
- Density can be an important factor in reducing car use in terms of both mode share and distance travelled.

Figure 10: Density and travel



(Based on Rogers, 1997)

There is continued discussion as to appropriate density levels. *Planning Policy Statement 3* (PPS3) (DCLG, 2006) advises an indicative minimum of 30 dph. Much higher densities can be achieved in many areas, up to 50–100 dph depending on context, and even 100–200 dph or more around important public transport interchanges.

A set of density ranges can be developed for each local area, reflecting contextual issues. In regional, sub-regional and local planning, practitioners are advised to:

4.1 Build to the highest density possible consistent with the local density range, and given quality of life and public transport availability considerations (existing and future). Increased densities need to be consistent with liveability objectives and type of accommodation needs, but the areas around public transport nodes (the 10-minute walk or approximate 800 metre radius catchment) can particularly be the focus for increased densities, again depending on context.

4.2 Consider the interrelationships between public transport accessibility, parking and density in the early stages of strategic planning processes (e.g. Regional Spatial Strategies, Local Development Frameworks), including across urban and suburban areas. Where new public transport capacity is installed, the aim should be to reconfigure development form to support patronage, particularly where suburban, low densities surround interchanges.

4.3 Ensure that local plans maximise the density of residential and commercial development while taking into consideration neighbourhood design and other constraints, as noted in PPS3 (para 46).

Theme 5: Jobs–housing Balance

The jobs–housing balance refers to the approximate (equal) distribution of employment opportunities and workforce population across a geographic area. It is usually measured in terms of the proportion of jobs per household. For example, a jobs-housing balance of 1.25 means there are five jobs for every four households. Qualitative matching between skills, aspirations and job type is critically important, as well as numerical balance.

The aim of the jobs–housing balance is to provide local employment opportunities that may reduce overall commuting distance among residents (and also the reverse – to provide homes near to workplaces). Like most of the urban structure variables, it is a necessary, but **not sufficient** condition for reducing the need to travel. Arguably, it is more important at the strategic travel to work area level, or in peripheral and remote urban areas where opportunities for cross-area commuting are less.

Practitioners are therefore advised to consider the different scales over which the jobs–housing balance is best achieved. This can initially be conceived at a regional and travel to work area level:

5.1 Existing commuting patterns, planned residential and employment locations, and workforce characteristics can all be examined to ensure that there are no mismatches which may encourage car dependency and long journey distances. Effective jobs–housing balances are in the range 1.0–1.5. Increments of new growth should be of sufficient mix to provide balance at the strategic level.

5.2 Large employment generators should be at locations that are the most accessible by public transport, walking and cycling (which are the areas with large population catchments), and vice versa.

5.3 Support housing type and affordability that is consistent with local employment opportunities in order to discourage in/out commuting.

Good balance of employment and other uses, and located near excellent transport links (Hammersmith Broadway)

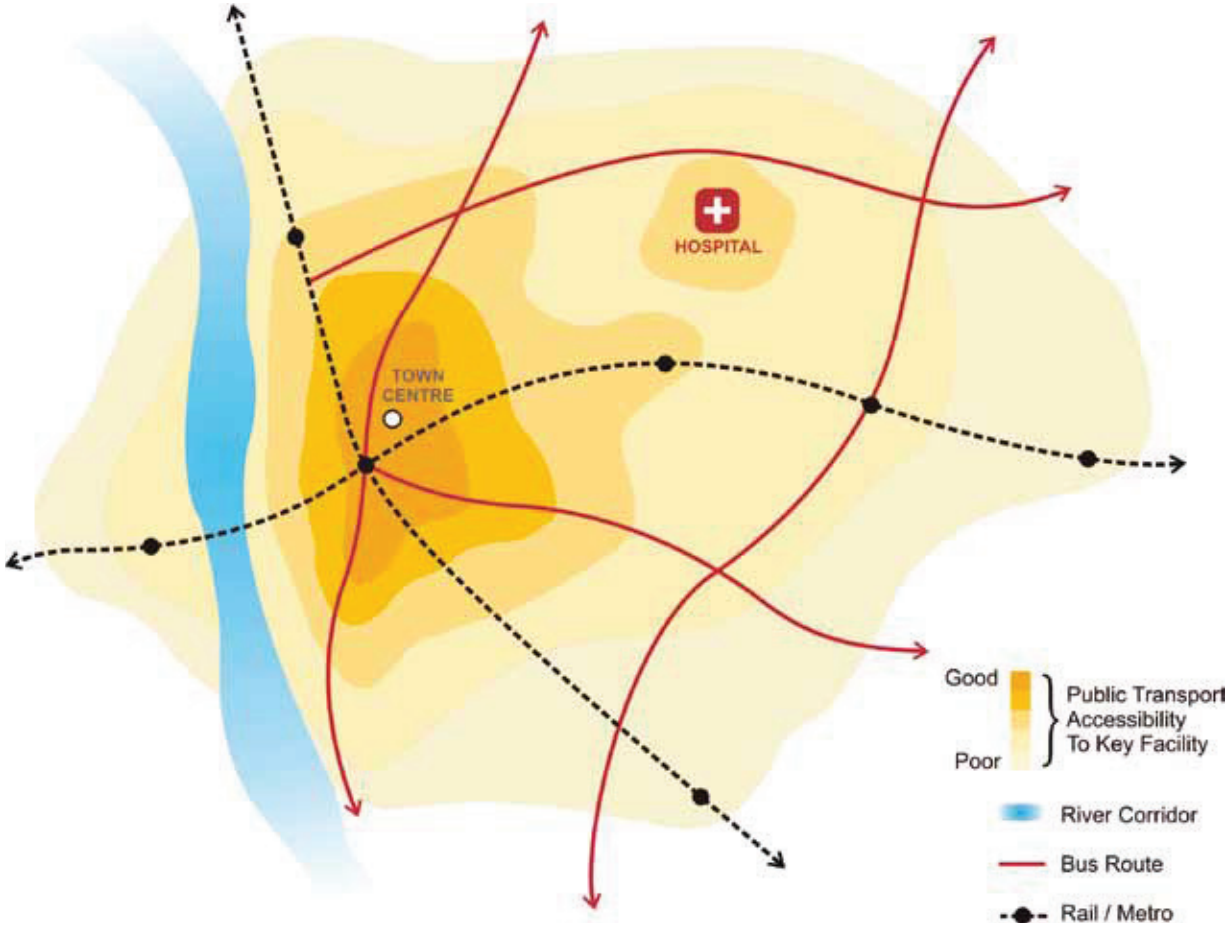
Theme 6: Accessibility of Key Facilities

Accessibility refers to the ease of reaching destinations or activities.[2] Places that are highly accessible can be reached by many people quickly, whereas inaccessible places can only be reached by a few people in the same amount of time (Figure 11). The focus for practitioners can be on improving accessibility rather than mobility, and in moving people rather than vehicles. There are urban and rural dimensions to accessibility planning.

Accessibility is conventionally perceived in physical travel terms, but electronic social interaction is becoming increasingly important. As yet there is little evidence of an aggregate substitution effect (with electronic travel replacing physical travel) – interaction tends to increase. However, this may change over time as the 'network society' takes off (e.g. Castells, 1996; Hall and Pain, 2006; Choo *et al.*, 2005).

[2] Accessibility for persons with disabilities is also an important issue, and is covered in other guidance notes; a broader definition is taken here in terms of accessibility to destinations.

Figure 11: Accessibility and travel



Key facilities serve a wider catchment than the immediate neighbourhood in which they are situated. Examples include employment centres, shopping centres, hospitals, educational institutions, leisure centres and cultural attractions. The accessibility of key facilities is therefore of particular importance because they are major travel generators (for both employees and patrons) and wider access has strong additional social benefits. The lack of accessibility tends to be a larger challenge in rural areas and areas of multiple deprivation. The accessibility of local facilities, such as neighbourhood shops and other day-to-day facilities, is also important and should be maintained and enhanced where applicable.

In order to proactively encourage sustainable travel, the aim should be to locate and manage key facilities so that they will:

- be conveniently accessible by public transport by users and employees within their planned catchment area;

- support and facilitate the improvement of public transport services;
- reduce average travel time and distance;
- maximise the proportion of travel by non-car modes; and
- complement land–use and transport policies, traffic demand management strategies and investment programmes that are being pursued in the area more generally.

Practitioners are therefore advised as follows:

6.1 As far as is practicable, to locate key facilities within town, suburban and rural centres which relate to the catchment areas of the activities concerned, in order to:

- minimise trip distances and travel time to individual facilities;
- create opportunities for trip purposes to be combined in a journey to a single destination (i.e. a centre with a mix of uses);
- provide a high level of public transport service in terms of frequency and speed (as a consequence of the concentration of travel flows); and
- help develop a parking management programme (public and private) consistent with a concentration of travel demand in high-density areas.

6.2 Planning policy guidance requires the identification of a hierarchy of centres. Selection and assessment criteria for centres at the same level of hierarchy should include:

- relative accessibility by public transport from the residential population they are intended to serve and from the area where their workforce will be drawn; and
- accessibility by car compared with other modes.

6.3 If the full requirement for major employment and key facilities cannot be met within established centres, consider other locations on the public transport network which offer, or can be improved to offer, similar levels of accessibility from the relevant catchment area.

6.4 Where key facilities (and/or major employment sites) must be developed outside established centres, include a mixed-use element to facilitate multi-purpose trips and traffic demand management measures and controlled parking on site to complement parking restrictions in the vicinity.

6.5 Where existing centres are redeveloped, seek to enhance accessibility for buses, other public transport, and walking and cycling. Attempt to mitigate the transport consequences when facilities are closed, for example hospitals.

Theme 7: Development Site Location

Development site location refers to the selection of sites for new housing allocations or other new developments. This covers the type of decision that would generally be taken early in the Local Development Framework (LDF) process within the context of housing provision figures set by the Regional Spatial Strategy (RSS) or, in future, the single Regional Strategy (RS). This includes, for example, the apportionment of development between districts. Development site location is often a catalyst for transport interventions, helping to justify or making viable a new transport service. The selected development site should also be well integrated into the existing urban fabric, including local transport networks (existing and new).

The aim of good development site location in relation to sustainable travel should be to locate new housing where:

- the amount of travel by car (trip length and mode share) is likely to be low;
- good accessibility is available or can be created by sustainable modes to:
  - employment and other main facilities in the town or its immediate vicinity;
  - a rail station or other public transport interchange where good services are available to other (larger) centres within the sub-region; and
  - community facilities within the development or the surrounding neighbourhood;
- opportunities exist to:
  - promote the use of walking, cycling and public transport;
  - provide an attractive level of public transport service which does not depend on (additional) subsidy over the longer term;
  - utilise and support existing public transport services and community facilities in the locality;
  - incorporate services or facilities within the development which will improve accessibility by sustainable modes;
  - in certain locations, car-free or low car provision housing will be appropriate.

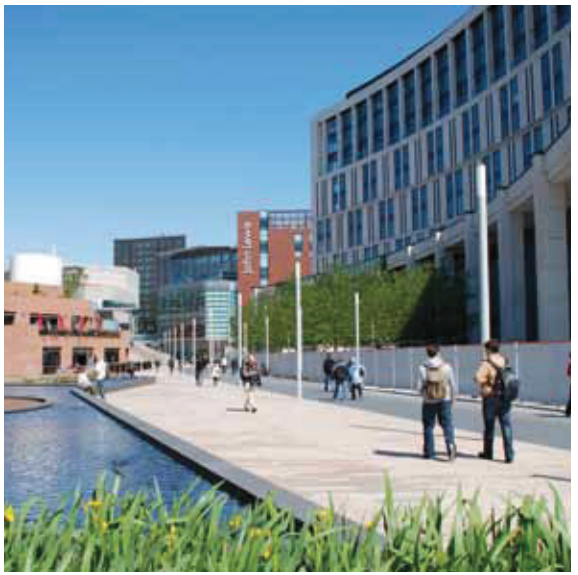
Practitioners working at the local level are advised to adopt a systematic process of identifying new sites for housing development (subject to the availability of sites and other considerations, e.g. flood risk, design and conservation aspirations) as follows:

7.1 Identify and/or assess sites for housing development on the basis of existing accessibility by car and public transport to employment and other key facilities (alongside, but potentially before, other policy objectives). This will help ensure that existing transport investment and services are utilised and requirements for new investment are minimised. Deficiencies in accessibility are unlikely to be remedied by transport measures that can be introduced as part of smaller scale development.

7.2 Include the location and quality of existing bus routes and local facilities, as well as the opportunities presented by the development to bring about improvements in accessibility, as key criteria for final site selection. In particular:

- in larger towns incorporate necessary network links in the layout of a development to enable the utilisation and enhancement of existing urban bus services – larger extensions may justify a dedicated bus service along a radial corridor with priority measures; and
- in small towns focus development on radial corridors in order to utilise and support inter-urban bus services that run along them – again larger extensions may justify their own frequent bus service.

7.3 Create attractive walking, cycling and public transport links with local facilities in the neighbourhoods surrounding the new development.



The new development is very well integrated into the existing urban fabric, including permeable route networks (Liverpool)