APPENDIX A

- Traffic-free scenic cycle route
- Cycleway system
- Shared use routes (mopeds prohibited)
- Bridle paths (can be used by cyclists)
- Great North Cycleway Route 12
- On road route
- Useful road link for cyclists
- Underpass
- Pedestrian route
- Toucan crossings
- Recommended tea stops
- Cycle Parking
- Cycle Shopping
- CTC Meeting Point
- Childrens Centre

- Rural area
- Open space
- Woods
- Built up area
- Industrial area
- Neighbourhood Centre
- Place of interest
- Selected stores
- School
- Hospital
- Inset map

Digital Cartography by Pindar 01296 390100
www.pindar.com

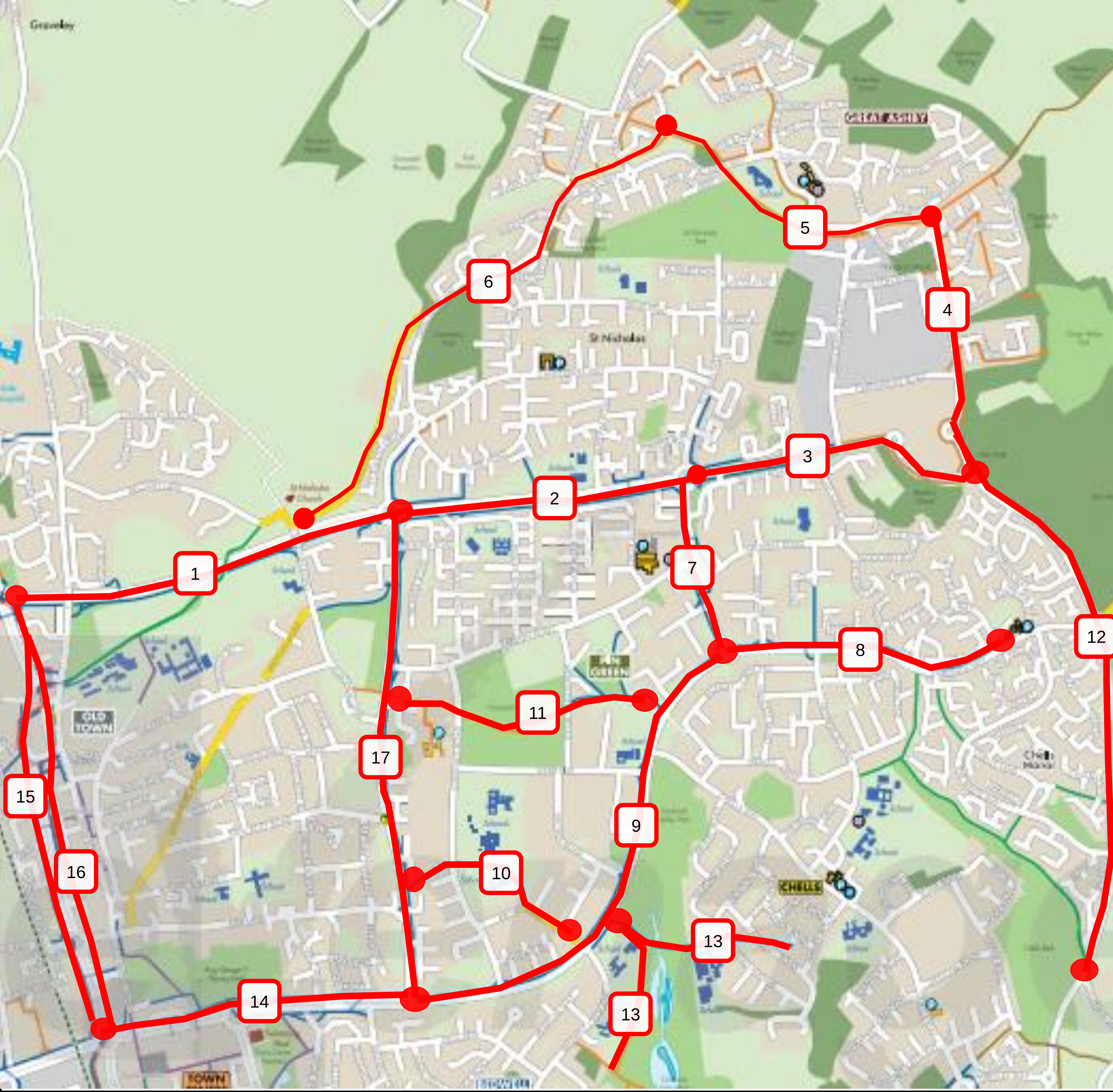
APPENDIX B

Figure 2.3 Cycling Level of Service assessment matrix (part 1)

Factor	Indicator	Critical	Basic CLoS (score=0)	Good CLoS (score=1, or 3 for critical indicators)	Highest CLoS (score=2, or 6 for critical indicators)	Max score
Safety						
Collision risk	Left/right hook at junctions	Heavy streams of turning traffic cut across main cycling stream	Side road junctions frequent and/or untreated. Conflicting movements at major junctions not separated	Fewer side road junctions. Use of entry treatments. Conflicting movements on cycle routes are separated at major junctions	Side roads closed or footway is continuous. All conflicting streams separated at major junction	6
	Collision alongside or from behind	Nearside lane in pinch point range 3.2 to 3.9m	Cyclists in wide (4m+) nearside traffic lanes or cycle lanes less than 2m wide	Cyclists in cycle lanes at least 2m wide	Cyclists with a high degree of separation from motorised traffic	6
	Kerbside activity or risk of collision with door	Narrow cycle lanes <1.5m alongside parking/loading / no buffer	Frequent kerbside activity on nearside of cyclists / cycle lanes giving effective width of 1.5m	Less frequent kerbside activity on nearside of cyclists / cycle lanes giving effective width of 2m	No kerbside activity / Parking and loading on outside of cycling facility	6
	Other vehicle fails to give way or disobeys signals		Reasonable visibility, route continuity across junctions and priority not necessarily clear	Clear route continuity through junctions, good visibility, priority clear for all users, visual priority for cyclists across side roads	Cycle priority at signalised junctions; visual priority for cyclists across side roads	2
Feeling of safety	Separation from heavy traffic		Cycle lanes 1.5-2m wide / ASLs at junctions	Cycle lanes at least 2m wide / some form of separation	Cyclists physically separ-ated from other traffic at junctions and on links	2
	Speed of traffic (where cyclists are not separated)	85th percentile greater than 30mph	85th percentile greater than 25mph	85th percentile 20-25mph	85th percentile less than 20mph	6
	Volume of traffic (where cyclists are not separated)	>1,000 vehicles / hour at peak	500 -1,000 vehicles / hour at peak < 5 per cent HGV or critical	200 - 500 vehicles / hour at peak, <2 per cent HGV	<200 vehicles / hour at peak	6
	Interaction with HGVs	Frequent, close interaction	Some interaction	Occasional interaction	No interaction	6
Social safety	Risk/fear of crime		Risk is managed: no 'ambush spots', reasonable level of street maintenance	Low risk: area is open, and well designed and maintained	No fear of crime: high quality streetscene and pleasant interaction	2
	Lighting		Some stretches of darkness	Few stretches of darkness	Route lit thoroughly	2
	Isolation		Route generally close to activity, for most of the day	Route close to activity, for all of the day	Route always overlooked	2
	Impact of highway design on behaviour		Seeks to controls behaviour in parts	Controls behaviour throughout	Encourages civilised behaviour: negotiation and forgiveness	2
Directness						
Journey time	Ability to maintain own speed on links		Cyclists travel at speed of slowest vehicle/cycle ahead	Cyclists can usually pass traffic and other cyclists	Cyclists choose their own speed (within reason)	2
	Delay to cyclists at junctions		Journey time slightly longer than motor vehicles	Journey time around the same as motor vehicles	Journey time less than motor vehicles (eg cyclists can bypass signals)	2
Value of time	For cyclists compared to private car use (normal weather conditions)		VOT only slightly greater than private car use value due to some site-specific factors	VOT equivalent to private car use value: similar delay-inducing factors and convenience	VOT less than private car use value due to attractive nature of route	2
Direct-ness	Deviation of route (against straight line)		Deviation factor 35-50 per cent	Deviation factor 20-35 per cent	Deviation factor <20 per cent	2
Coherence						
Connec-tions	Ability to join/leave route safely and easily		Cyclists do not have to dismount to connect to other routes	Cyclists can connect to other routes relatively easily	Cyclists provided with have dedicated conn-ections to other routes	2
	Density of other routes		Network density mesh width >400m	Network density mesh width 250 - 400m	Network density mesh width <250m	2
Way-finding	Signing		Basic road markings provided	Some signs and road markings, making it hard to get lost	Consistent signing of range of routes and destinations at decision points	2

Figure 2.3 Cycling Level of Service assessment matrix (part 2)

Factor	Indicator	Critical	Basic CLoS (score=0)	Good CLoS (score=1, or 3 for critical indicators)	Highest CLoS (score=2, or 6 for critical indicators)	Max score
Comfort						
Surface quality	Defects: non cycle friendly ironworks, raised/ sunken covers/gullies	Major defects	Some localised defects but generally acceptable	Minor defects only	Smooth high grip surface	6
Surface material	Construction: asphalt concrete, HRA or blocks/bricks/sets		Hand laid asphalt; no unstable blocks/sets	Machine laid asphalt concrete or HRA; smooth blocks	Machine laid asphalt concrete; smooth and firm blocks undisturbed by turning vehicles	2
Effective width without conflict	Allocated riding zone range. Lane allocation each direction	<1.5m Superhighway <1.2m elsewhere	1.5-2.0m Superhighway 1.2-1.5m elsewhere (or 3-3.2m shared bus/cycle lane)	2.0-2.5m Superhighway 1.5-2.0m elsewhere (or 4.0m+ bus lane)	>2.5m Superhighway >2m elsewhere	6
Gradient	Uphill gradient over 100m		>5 per cent	3-5 per cent	<3 per cent	2
Deflect-ions	Pinch points caused by horizontal deflections		(Remaining) lane width <3.2m	(Remaining) lane width >4.0m	Traffic is calmed so no need for horizontal deflections	2
Undu-lations	Vertical deflections		Round top humps	Sinusoidal humps	No vertical deflections	2
Attractiveness						
Impact on walking	Highway layout, function and road markings adjusted to minimise impact on pedestrians		Largely achieves Pedestrian Comfort Level (PCL) B but C in some high activity locations	No impact on pedestrian provision / PCL never lower than B	Pedestrian provision enhanced by cycling provision / PCL A	2
Greening	Green infrastructure or sustainable materials incorp-orated into design		No greening element	Some greening elements	Full integration of greening elements	2
Air quality	PM10 & NOX values referenced from concentration maps		Medium to High	Low to Medium	Low	2
Noise polution	Noise level from recommended riding range		>78DB	65-78DB	<65DB	2
Minimise street clutter	Signage and road markings required to support scheme layout		Little signage in excess of regulatory requirements	Moderate amount of signage, particularly around junctions	Minimal signage, eg. for wayfinding purposes only	2
Secure cycle parking	Ease of access to secure cycle parking within businesses and on street		Minimum levels of cycle parking provided (ie to London Plan standards)	Some cycle parking provided above minimum, to meet current demand, and attention to quality and security	Cycle parking is provided to meet future demand and is of good quality, securely located	2
Adaptability						
Public transport inte-gration	Smooth transition between modes or route continuity maintained through interchanges		No additional consideration for cyclists within interchange area	Cycle route continuity maintained through interchange and some cycle parking available	Cycle route continuity maintained and secure cycle parking provided. Transport of cycles available.	2
Flexibility	Facility can be expanded or layouts adopted within area constraints		No adjustments are possible within constraints. Road works may require some closure	Links can be adjusted to meet demand but junctions are constrained by vehicle capacity limitations. Road works will not require closure; cycling will be maintained although route quality may be compromised to some extent	Layout can be adapted freely without constrain to meet demand or collision risk. Adjustments can be made to maintain full route quality when roadworks are present	2
Growth enabled	Route matches predicted usage and has exceedence built into the design		Provision copes with current levels of demand	Provision is matched to predicted demand flows	Provision has spare capacity for large increases in predicted cycle use	2
TOTAL (max 100)						



Link

Stevenage Cycle Strategy

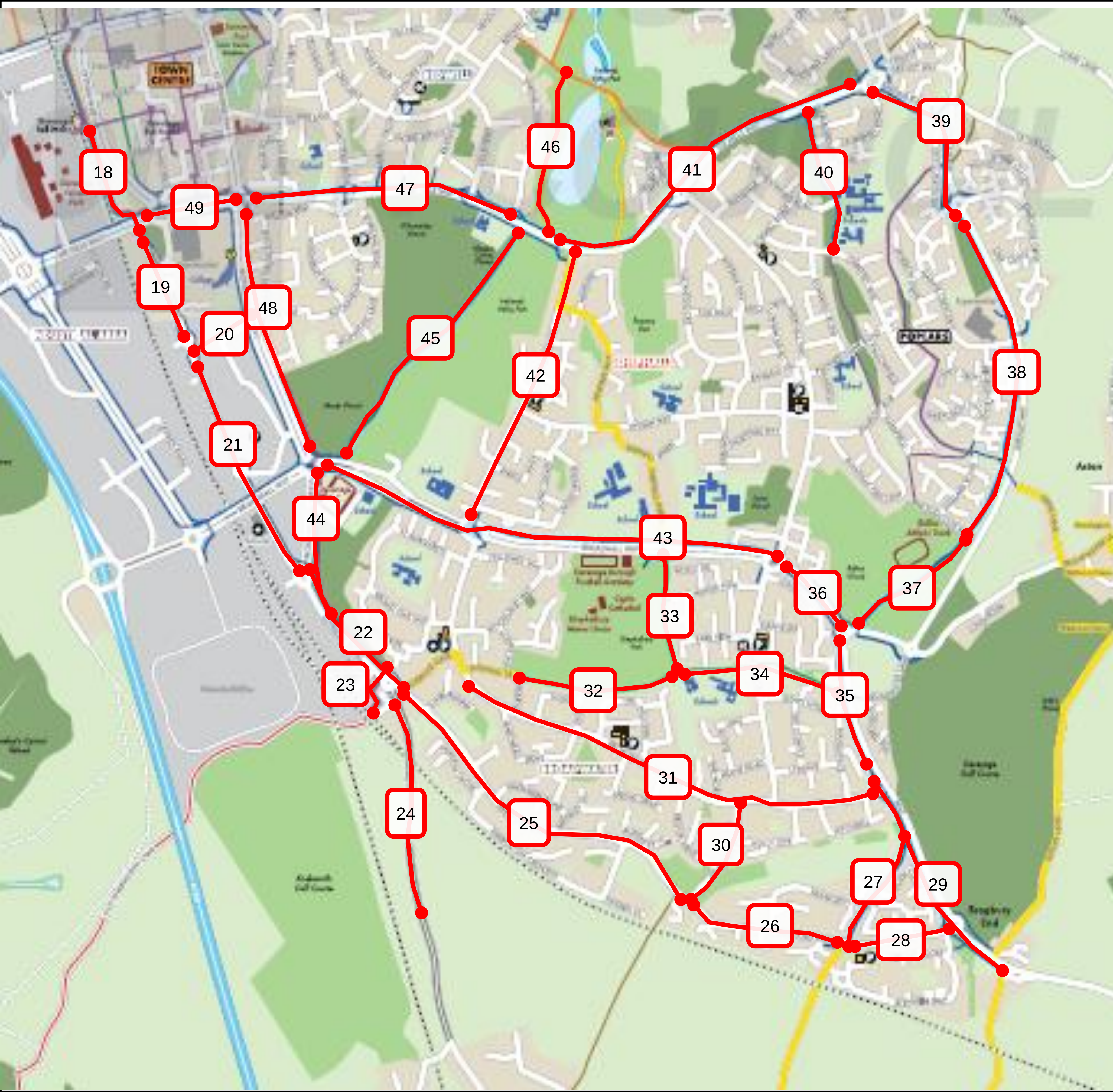
Cycle Audit Link Locations

SCALES:	NTS		
DRAWN:	CHECKED:	DATE:	REVISION:

vectos
transport planning specialists

Network Building, 97 Tottenham Court Road, London W1T 4TP
Tel: 020 7580 7373 Email: london@vectos.co.uk www.vectos.co.uk

DRAWING REFERENCE:
Figure 1



Link

Stevenage Cycle Strategy

Cycle Audit Link Locations

SCALES:	NTS		
DRAWN:	CHECKED:	DATE:	REVISION:

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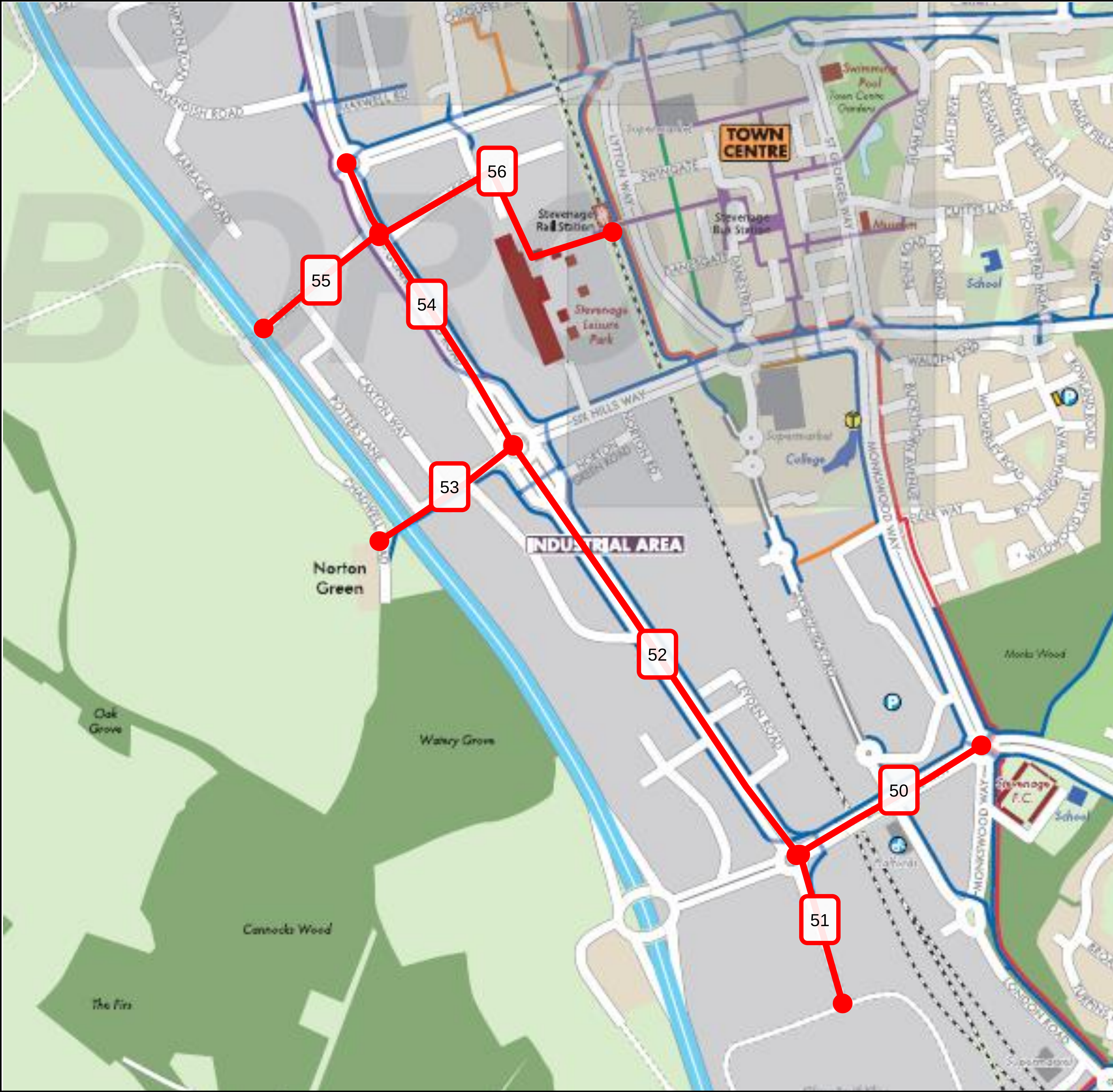
Network Building, 97 Tottenham Court Road, London W1T 4TP
Tel: 020 7580 7373 Email: london@vectos.co.uk www.vectos.co.uk

DRAWING REFERENCE:

Figure 2



Link

Stevenage Cycle Strategy

Cycle Audit Link Locations

SCALES:	NTS		
DRAWN:	CHECKED:	DATE:	REVISION:

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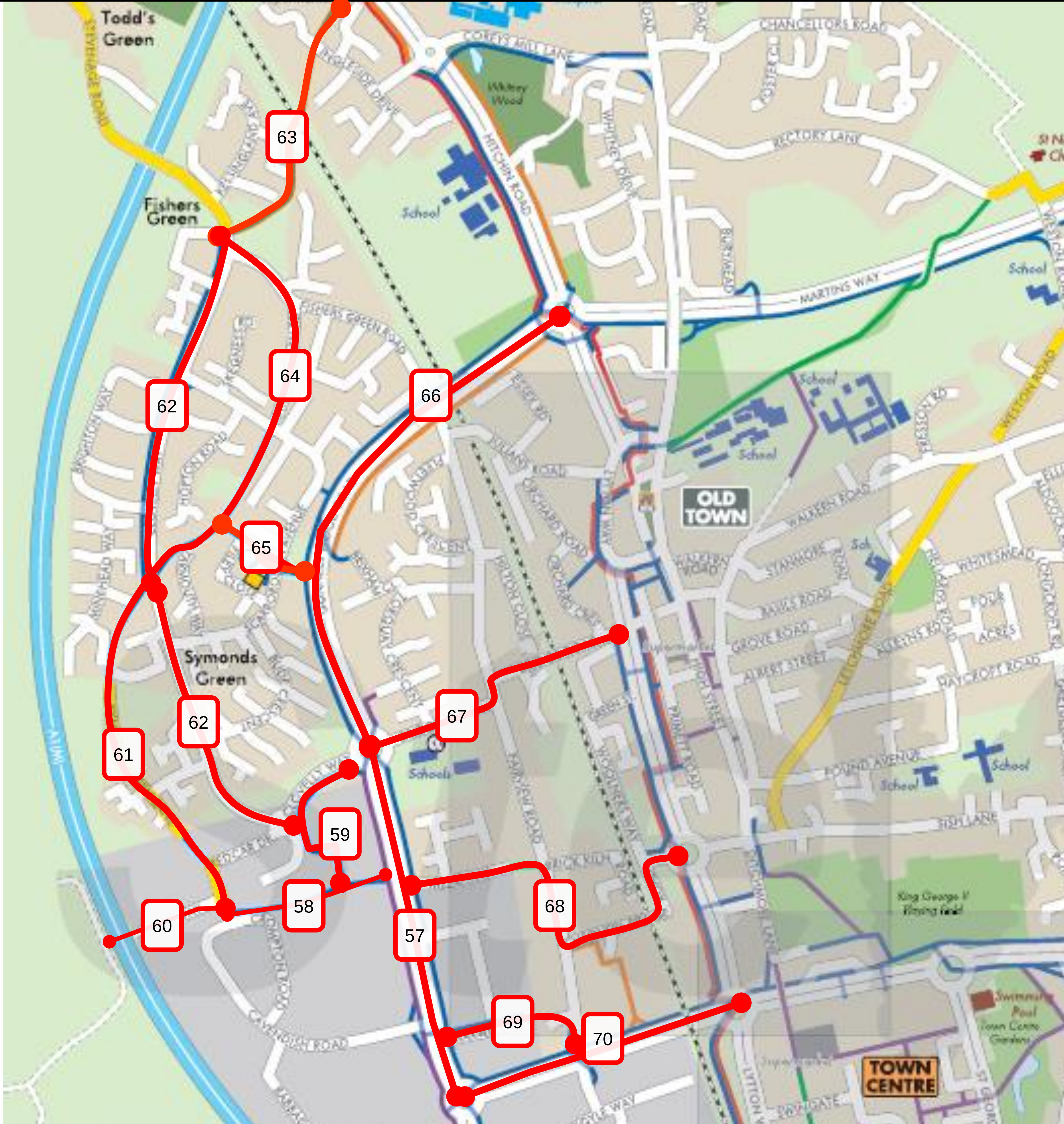
Tel: 020 7580 7373 Email: london@vectos.co.uk www.vectos.co.uk

DRAWING REFERENCE:
Figure 3



Link

Stevenage Cycle Strategy

Cycle Audit Link Locations

SCALES:	NTS		
DRAWN:	CHECKED:	DATE:	REVISION:

vectos
transport planning specialists

Network Building, 97 Tottenham Court Road, London W1T 4TP
Tel: 020 7580 7373 Email: london@vectos.co.uk www.vectos.co.uk

DRAWING REFERENCE:

Figure 4

Stevenage Local Plan Cycleway Assessment

Link Photos

09/03/2017

162669

Link 1- Martins Way A602 Roundabout to Grace Way Roundabout.

Link 2 - Martins Way Grace Way Roundabout to A1155 Roundabout
 
Link 3- Martins Way A1155 Roundabout to Greseley Way Roundabout


Link 4-Greseley Way Roundabout with Martins Way to Great Ashy Way Roundabout with Grasmere

Link 5- Great Ashy Way Roundabout with Grasmere to Great Ashby Roundabout with Bray Drive.

PHOTOS TO BE INSERTED

Link 6- Great Ashby Roundabout with Bray Drive to Weston Road Martins Way junction.

PHOTOS TO BE INSERTED

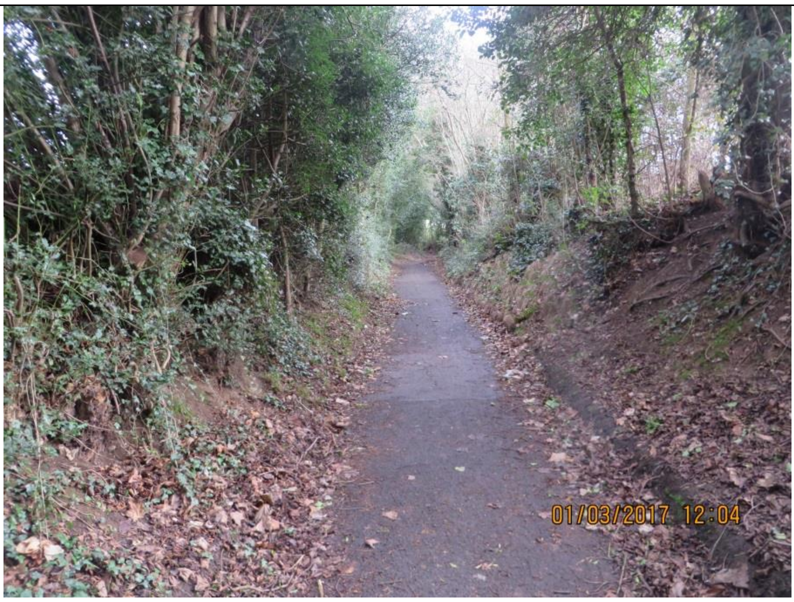
Link 7- A1155 Roundabout with Martins Way to A1155 Roundabout with B1037.
 
Link 8-B1037 Roundabout with A1155 to Stevenage Pharamcy.


Link 9-A1155 junction with Grace Way to A1155 Roundabout with B1037

Link 10-Southern Cycleway linking Grace Way with A1155.

Link 11- Northern Cycleway linking Grace Way with A1155

Link 12-Gresley Way Roundabout with B1037 to Gresley Way Roundabout with Gresley
PHOTOS TO BE INSERTED
Link 13-A1155 Cycleway link with Telford Avenue



Link 14-A1155 Roundabout with Grace Way to A1155 Roundabout with A602

Link 15-Western Old Town Route

Link 16-Eastern Old Town Route

Link 17-Grace Way


01/03/2017 12:27

Link 18 – Lytton Way
 
Link 19 – London Road between Sixhills Way and Broadhall Way


Link 20 – London Road link to Monkswood Way
  

Link 21 – London Road between Sixhills Way and Broadhall Way
  


CYCLISTS
DISMOUNT
Town Centre
Knebworth House
Hitchin A602
Motorway A1(M)
1 Knebworth House

Link 22 – London Road between Monkswood Way and Hertford Road
  

Link 23 – Connection from London Road to Old Knebworth Lane

Link 24 – Stevenage Road

Link 25 – Hertford Road


SLOW

Link 26 – Hertford Road

Link 27 – Segregated Link between Hertford Road and Broadhall Way
  

Link 28 – Hertford Road

Link 29 – Broadhall Way

Link 30 – Ashdown Road

Link 31 – Broadwater Crescent

Link 32 – Shephall Lane

Link 33 – Link East of Shephalbury Park

Link 34 – Link connecting Shephalbury Park with Broadhall Way
 
Link 35 – Broadhall Way



Attractions
Broadwater
Chells
Shephall
Football Ground

Link 36 – Broadhall Way

Link 37 – Gresley Way


Link 38 – Gresley Way

Link 39 – Gresley Way

Link 40 – Cycleway south of Six Hills Way connecting to Barnwell School

Link 41 – Six Hills Way

Link 42 – Valley Way

Link 43 – Broadhall Way

Link 44 – Monkswood Way south of Broadhall Way


Station
Football ground


Town Centre A602
London
he North
-1(M)
Hitchin
A602
Ware
Hertford
A602
Fairlands
Valley Park
Stevenage
Leisure Park
Knebworth
House

Link 45 – Cycle route through Fairlands Valley Park south of Six Hills Way
 

Link 46 – Cycle route through Fairlands Valley Park north of Six Hills Way

Link 47 – Six Hills Way

Link 48 – Monkswood Way


END OF
ROUTE

Link 49 – Six Hills Way west of Monkswood Way
 


CYCLE LANE
LOOK
BOTH WAYS

Link 50 – Broadhall Way

Link 51 – Cycleway to GSK

Link 52 – Gunnels Wood Road south of Six Hills Way
  


Station
GSK & Science Park
3 mins
4 mins
Town Centre

Link 53 - Six Hills Way west of Gunnels Wood Road

Link 54 – Gunnels Wood Road between Six Hills Way and Fairlands Way


ABEL
SMITH
HOUSE

Link 55 – Bessemer Drive

Link 56 – Argyle Way and Stevenage Leisure Park

Link 57 – Gunnels Wood Road between Fairlands Way and Clovelly Way
 


GUNNELLS WOOD
OLD TOWN
ADVANCE WARNING
FAIRLANDS WAY
CYCLE
IMPROVEMENT
WORKS
Starts: Mon 6 Mar 2017
for 2 weeks

Link 58 – Meadway (west of Gunnels Wood Road)

Link 59 – link between Meadway and Clovelly Way

Link 60 – Mead Way north of Symonds Green Lane

Link 61 – Symonds Green Lane

Link 62 – Clovelly Way

Link 63 – Link between Clovelly Way and Hitchin Road


Link 64 – Symonds Green Road
 

Link 65 – Scarborough Avenue
 

Link 66 – Gunnels Wood Road north of Clovelly Way

Link 67 – Bridge Road

Link 68 – Meadway east of Gunnels Wood Road

Link 69 – Maxwell Road

Link 70 – Fairlands Way

		Link Scores																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Safety	**(max possible = 48)**																	
Collision risk	Left/right hook at junctions	6	6	3	3	3	3	6	3	6	3	6	3	6	6	3	3	3
	Collision alongside or from behind	6	6	3	3	3	3	6	6	6	6	6	6	6	6	3	3	3
	Kerbside activity or risk of collision with door	6	6	6	6	3	6	6	6	6	6	6	6	6	6	6	3	3
	Other vehicle fails to give way or disobeys signals	2	2	1	1	1	1	2	1	2	1	2	1	2	2	1	1	1
Feeling of safety	Separation from heavy traffic	2	2	2	1	1	1	2	2	2	1	2	1	2	2	1	1	2
	Speed of traffic (where cyclists are not separated)	-	-	3	3	3	3	-	3	-	6	-	3	-	-	3	3	3
	Total volume of traffic (where cyclists are not separated)	-	-	3	3	3	3	-	3	-	6	-	3	-	-	3	3	3
	Interaction with HGVs	6	6	3	3	6	3	6	6	6	6	6	3	6	6	3	3	6
Social safety	Risk/fear of crime	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	1
	Lighting	1	1	1	1	1	1	0	0	0	1	1	1	0	0	1	2	1
	Isolation	1	1	1	1	1	1	0	1	1	1	0	1	0	1	2	2	1
	Impact of highway design on behaviour	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Directness	**(max possible = 8)**																	
Journey time	Ability to maintain own speed on links	2	2	2	1	2	1	2	2	2	1	2	1	2	2	2	1	2
	Delay to cyclists at junctions	2	2	2	1	2	1	2	1	2	1	2	1	1	1	2	1	1
Value of time	For cyclists compared to private car use (normal weather conditions)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Directness	Deviation of route (against straight line or nearest main road alternative)	2	2	2	2	2	2	2	2	2	1	2	2	2	1	1	2	2
Coherence	**(max possible = 6)**																	
Connections	Ability to join/leave route safely and easily	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1
	Density of other routes	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
Way-finding	Signing	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Comfort	**(max possible = 20)**																	
Surface quality	Defects: non cycle friendly ironworks, raised/ sunken covers/gullies	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface material	Construction	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2
Effective width without conflict	Clear nearside space in secondary position or motor vehicle speed/ volume in primary position	6	6	6	3	3	3	6	3	6	3	3	3	3	6	6	3	6
Gradient	Uphill gradient over 100m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Deflections	Pinch points caused by horizontal deflections	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Undulations	Vertical deflections	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Impact on walking	Pedestrian Comfort Level (PCL)	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2
Greening	Green infrastructure or sustainable materials incorporated into design	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	1	2
Minimise street clutter	Signing required to support scheme layout	2	2	2	2	1	0	1	2	2	2	1	1	2	1	1	1	1
Secure cycle parking	Ease of access to secure cycle parking on- and off-street	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0
Adaptability	**(max possible = 6)**																	
Public transport integration	Smooth transition between modes or route continuity maintained through interchanges	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flexibility	Facility can be expanded or layouts adopted within area constraints	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Growth enabled	Route matches predicted usage and has exceedence built into the design	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total		**69**	**69**	**65**	**59**	**60**	**53**	**64**	**65**	**67**	**69**	**63**	**60**	**61**	**62**	**63**	**60**	**62**

Link Scores

		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Safety	**(max possible = 48)**																
Collision risk	Left/right hook at junctions	6	3	6	3	6	6	3	3	3	6	3	6	3	3	6	6
	Collision alongside or from behind	6	3	6	3	6	6	3	3	3	6	3	6	3	0	6	6
	Kerbside activity or risk of collision with door	6	3	6	3	6	6	3	3	3	6	3	6	3	0	6	6
	Other vehicle fails to give way or disobeys signals	2	1	2	1	2	1	2	1	1	1	2	2	1	1	2	2
Feeling of safety	Separation from heavy traffic	1	0	1	0	1	1	0	0	0	1	0	1	0	0	1	1
	Speed of traffic (where cyclists are not separated)	-	6	-	3	-	-	0	0	0	-	0	-	0	3	-	-
	Total volume of traffic (where cyclists are not separated)	-	3	-	3	-	-	0	3	3	-	0	-	0	3	-	-
	Interaction with HGVs	6	3	3	3	6	6	0	3	3	6	0	6	3	3	6	6
Social safety	Risk/fear of crime	2	2	2	1	1	0	1	2	2	0	2	1	2	1	0	0
	Lighting	1	2	1	1	1	0	1	2	2	0	1	2	2	2	1	1
	Isolation	1	2	1	1	0	0	1	2	2	0	2	1	2	1	0	0
	Impact of highway design on behaviour	1	2	2	1	2	1	1	1	1	1	2	1	2	1	1	1
Directness	**(max possible = 8)**																
Journey time	Ability to maintain own speed on links	2	0	2	0	2	2	1	1	1	2	2	2	2	1	2	2
	Delay to cyclists at junctions	2	1	2	0	2	1	0	2	2	1	2	2	1	0	2	2
Value of time	For cyclists compared to private car use (normal weather conditions)	2	1	2	1	2	1	0	1	1	2	1	2	1	0	2	2
Directness	Deviation of route (against straight line or nearest main road alternative)	2	2	2	2	2	1	2	1	1	2	2	2	2	1	2	2
Coherence	**(max possible = 6)**																
Connections	Ability to join/leave route safely and easily	2	1	2	1	2	0	0	2	2	2	2	2	0	1	1	1
	Density of other routes	2	2	2	1	2	1	0	1	2	1	0	1	0	1	1	1
Way-finding	Signing	1	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0
Comfort	**(max possible = 20)**																
Surface quality	Defects: non cycle friendly ironworks, raised/ sunken covers/gullies	3	6	6	3	3	0	3	3	3	3	3	3	6	3	3	3
Surface material	Construction	2	2	2	1	2	0	1	1	1	1	2	2	2	1	1	1
Effective width without conflict	Clear nearside space in secondary position or motor vehicle speed/ volume in primary position	6	3	6	3	6	6	0	3	3	6	3	6	3	0	6	6
Gradient	Uphill gradient over 100m	2	2	2	1	1	0	1	1	1	2	2	1	0	2	2	2
Deflections	Pinch points caused by horizontal deflections	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2
Undulations	Vertical deflections	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
Attractiveness	**(max possible = 12)**																
Impact on walking	Pedestrian Comfort Level (PCL)	2	1	2	2	2	1	2	2	2	1	2	2	2	2	2	2
Greening	Green infrastructure or sustainable materials incorporated into design	1	1	1	1	2	2	0	0	0	2	0	1	1	0	1	1
Minimise street clutter	Signing required to support scheme layout	2	2	1	1	2	1	2	1	1	2	2	1	1	0	2	2
Secure cycle parking	Ease of access to secure cycle parking on- and off-street	2	1	1	2	2	0	1	0	0	0	0	0	0	1	1	1
Adaptability	**(max possible = 6)**																
Public transport integration	Smooth transition between modes or route continuity maintained through interchanges	2	1	2	1	2	0	0	0	0	0	1	1	0	0	1	1
Flexibility	Facility can be expanded or layouts adopted within area constraints	0	0	2	1	2	1	1	2	2	1	2	2	2	1	1	1
Growth enabled	Route matches predicted usage and has exceedence built into the design	2	2	2	2	2	0	1	2	2	1	1	1	1	0	2	2
Total	**(max possible =96)**																
TOTAL	TOTAL	**73**	**62**	**72**	**50**	**74**	**47**	**35**	**50**	**51**	**60**	**49**	**68**	**49**	**36**	**65**	**65**

		34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Safety	**(max possible = 48)**																
Collision risk	Left/right hook at junctions	6	6	6	6	3	6	6	3	3	6	3	6	6	6	6	6
	Collision alongside or from behind	6	6	6	6	3	6	6	6	0	6	3	6	6	6	6	6
	Kerbside activity or risk of collision with door	6	6	6	6	3	6	6	6	0	6	3	6	6	6	6	6
	Other vehicle fails to give way or disobeys signals	1	2	2	2	1	1	2	0	1	2	1	2	2	2	2	2
Feeling of safety	Separation from heavy traffic	1	1	2	2	0	1	1	1	0	1	1	2	2	2	2	2
	Speed of traffic (where cyclists are not separated)	0	-	-	-	-	-	-	-	0	-	3	-	-	-	-	-
	Total volume of traffic (where cyclists are not separated)	0	-	-	-	-	-	-	-	0	-	0	-	-	-	-	-
	Interaction with HGVs	6	6	6	6	6	3	6	6	0	6	3	6	6	6	6	6
Social safety	Risk/fear of crime	0	1	1	0	0	1	0	1	2	1	0	0	0	1	1	2
	Lighting	1	1	1	0	1	1	1	1	2	0	1	0	1	2	1	2
	Isolation	0	1	1	0	1	1	1	0	2	1	0	0	1	1	1	2
	Impact of highway design on behaviour	1	1	1	1	1	1	1	1	2	1	2	2	2	2	1	1
Directness	**(max possible = 8)**																
Journey time	Ability to maintain own speed on links	2	2	2	2	2	2	2	2	1	2	1	2	2	2	1	2
	Delay to cyclists at junctions	1	2	2	2	1	2	2	0	1	2	1	2	2	2	0	2
Value of time	For cyclists compared to private car use (normal weather conditions)	2	1	1	2	1	1	2	1	1	2	1	2	2	2	1	2
Directness	Deviation of route (against straight line or nearest main road alternative)	2	2	1	2	2	1	0	2	2	2	2	0	0	2	2	2
Coherence	**(max possible = 6)**																
Connections	Ability to join/leave route safely and easily	1	2	1	0	2	2	2	1	0	2	1	1	2	2	1	2
	Density of other routes	1	2	2	0	2	1	0	1	0	1	0	1	2	2	1	2
Way-finding	Signing	0	0	0	0	0	0	0	0	0	1	2	0	0	0	2	2
Comfort	**(max possible = 20)**																
Surface quality	Defects: non cycle friendly ironworks, raised/ sunken covers/gullies	3	3	3	3	3	3	3	6	3	3	3	6	6	6	3	6
Surface material	Construction	1	1	2	3	1	1	2	2	1	1	2	2	2	2	1	1
Effective width without conflict	Clear nearside space in secondary position or motor vehicle speed/ volume in primary position	6	6	6	6	0	3	3	3	3	6	3	6	6	6	3	3
Gradient	Uphill gradient over 100m	2	0	0	2	0	1	2	1	0	2	1	1	1	1	1	2
Deflections	Pinch points caused by horizontal deflections	2	2	2	2	1	1	2	0	2	2	2	1	1	2	2	2
Undulations	Vertical deflections	2	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2
Attractiveness	**(max possible = 12)**																
Impact on walking	Pedestrian Comfort Level (PCL)	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	2
Greening	Green infrastructure or sustainable materials incorporated into design	1	0	0	1	1	0	1	1	0	1	1	2	1	1	2	2
Minimise street clutter	Signing required to support scheme layout	2	1	1	2	0	1	0	1	2	2	2	2	2	1	0	2
Secure cycle parking	Ease of access to secure cycle parking on- and off-street	1	0	1	0	0	1	0	0	1	0	1	2	0	1	1	1
Adaptability	**(max possible = 6)**																
Public transport integration	Smooth transition between modes or route continuity maintained through interchanges	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
Flexibility	Facility can be expanded or layouts adopted within area constraints	1	0	0	0	2	0	0	0	1	1	1	2	2	1	2	2
Growth enabled	Route matches predicted usage and has exceedence built into the design	2	1	1	0	1	1	2	1	1	2	1	2	2	1	1	1
Total	**(max possible =96)**																
TOTAL	TOTAL	**63**	**60**	**61**	**60**	**43**	**52**	**57**	**49**	**36**	**65**	**49**	**68**	**69**	**72**	**60**	**75**

		Link Scores																				
		50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
							Safety (max possible = 48)															
Collision risk	Left/right hook at junctions	6	6	3	3	3	3	0	3	6	6	not part of network - to be upgraded as part of development	6	3	6	3	6	6	3	3	6	6
	Collision alongside or from behind	6	6	3	3	3	3	3	3	6	6		6	3	6	3	6	6	3	6	6	6
	Kerbside activity or risk of collision with door	6	6	6	6	6	6	6	6	6	6		6	6	6	3	6	6	3	6	6	6
	Other vehicle fails to give way or disobeys signals	2	2	1	1	1	1	1	1	2	2		2	1	2	1	2	2	1	1	1	2
Feeling of safety	Separation from heavy traffic	2	2	1	1	1	1	1	1	2	2		2	1	2	1	2	2	1	2	2	2
	Speed of traffic (where cyclists are not separated)	-	-	-	-	-	-	3	3	-	-		6	3	-	3	-	-	3	6	6	-
	Total volume of traffic (where cyclists are not separated)	-	-	-	-	-	-	3	3	-	-		6	3	-	3	-	-	3	6	6	-
	Interaction with HGVs	6	6	3	3	3	3	3	3	6	6		6	3	6	3	6	6	3	6	6	6
Social safety	Risk/fear of crime	1	1	1	2	1	0	1	1	0	1		1	1	0	1	1	1	1	1	1	1
	Lighting	2	2	1	1	1	0	1	1	0	1		1	1	1	1	1	1	1	1	1	0
	Isolation	1	1	1	2	1	1	1	1	0	1		1	2	0	1	1	1	2	1	1	1
	Impact of highway design on behaviour	1	1	1	1	1	1	1	1	1	1		2	1	0	1	1	1	1	1	1	1
							Directness (max possible = 8)															
Journey time	Ability to maintain own speed on links	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
	Delay to cyclists at junctions	2	2	1	1	1	1	1	1	2	1		2	1	2	1	2	2	1	2	2	2
Value of time	For cyclists compared to private car use (normal weather conditions)	1	1	1	1	1	1	1	1	2	2		2	2	2	2	2	2	2	2	2	2
Directness	Deviation of route (against straight line or nearest main road alternative)	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
							Coherence (max possible = 6)															
Connections	Ability to join/leave route safely and easily	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
	Density of other routes	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
Way-finding	Signing	1	2	1	0	1	0	0	1	0	0		1	1	0	0	0	1	0	0	0	1
							Comfort (max possible = 20)															
Surface quality	Defects: non cycle friendly ironworks, raised/ sunken covers/gullies	3	6	3	3	3	3	0	3	3	3		3	3	0	3	3	3	3	3	0	3
Surface material	Construction	2	2	2	2	2	2	2	2	1	1		2	2	0	2	2	2	2	2	0	2
Effective width without conflict	Clear nearside space in secondary position or motor vehicle speed/ volume in primary position	6	6	6	6	6	6	3	6	3	6		6	6	3	6	6	6	6	6	6	6
Gradient	Uphill gradient over 100m	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
Deflections	Pinch points caused by horizontal deflections	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
Undulations	Vertical deflections	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
							Attractiveness (max possible = 12)															
Impact on walking	Pedestrian Comfort Level (PCL)	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2
Greening	Green infrastructure or sustainable materials incorporated into design	1	1	1	1	1	2	0	1	2	2		2	2	2	2	2	2	1	2	1	2
Minimise street clutter	Signing required to support scheme layout	2	2	2	2	2	2	1	2	2	2		2	2	2	2	2	2	1	1	1	2
Secure cycle parking	Ease of access to secure cycle parking on- and off-street	0	2	0	1	1	1	1	1	0	0		0	0	0	0	1	0	0	0	0	0
							Adaptability (max possible = 6)															
Public transport integration	Smooth transition between modes or route continuity maintained through interchanges	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0
Flexibility	Facility can be expanded or layouts adopted within area constraints	2	2	2	2	2	2	1	2	2	2		2	2	2	2	2	2	2	2	2	2
Growth enabled	Route matches predicted usage and has exceedence built into the design	2	2	2	2	2	2	1	2	2	2		2	2	2	2	2	2	2	2	2	2
							Total (max possible =96)															
TOTAL	**TOTAL**	**71**	**78**	**58**	**60**	**59**	**57**	**52**	**65**	**64**	**69**		**85**	**67**	**60**	**62**	**72**	**72**	**61**	**78**	**75**	**71**

APPENDIX C

Lighting of Cycle Paths

Technical Information Note No. 29

March 2012

sustrans
JOIN THE MOVEMENT

About Sustrans

Sustrans makes smarter travel choices possible, desirable and inevitable. We're a leading UK charity enabling people to travel by foot, bike or public transport for more of the journeys we make every day. We work with families, communities, policy-makers and partner organisations so that people are able to choose healthier, cleaner and cheaper journeys, with better places and spaces to move through and live in.

It's time we all began making smarter travel choices. Make your move and support Sustrans today. www.sustrans.org.uk

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Contents

Introduction

In rural areas traffic free routes are generally unlit, as the majority of users will be recreational and will normally only use the route in daylight.

However, in urban and urban fringe areas a substantial number of trips are made for a specific purpose, and if cycling is to play an important role as an alternative to the car for short journeys it must be promoted as an around-the-clock means of transport, rather than just a daylight activity. Cycle journeys will be made after dark, especially during the winter months, and it should be possible to justify the lighting of many cycle routes. Traffic free routes with predominantly utility use should therefore normally be lit.

It is important that the provision of lighting is considered at an early stage in the design process, so that the issues can be properly considered and the needs of users taken fully into account in the choice of equipment and the design of the scheme.

The Note focuses primarily on issues to be addressed in deciding whether to light a traffic free route and the choice of appropriate lighting; specific consideration is given to the lighting of tunnels and other enclosed spaces, and to bats and lighting. It also briefly considers the lighting of cycle tracks adjacent to the carriageway and cycle lanes on the carriageway.

Pros and cons of lighting

The benefits of lighting a traffic free route may include enabling users to:

- Orientate themselves and navigate the route ahead
- Identify other users ahead
- Detect potential hazards
- Discourage crime and increase a sense of personal security

However, in lighting such routes consideration also needs to be given to wider factors, including:

- Limiting levels of light pollution
- Level of ambient brightness in the surrounding area
- The visual impact of the lighting equipment
- Intrusion on nearby properties
- Vandalism issues
- Proximity of electricity supply
- Energy usage
- Costs of installation, operation and maintenance

Whether a route should be lit, and how

Lighting should generally be provided on all routes where cycling can be expected after dark. Lighting will be particularly important on commuter routes and routes forming part of a safe routes to school network, where usage is sustained throughout the longer periods of darkness associated with the winter months.

Dutch experience shows that cycle routes remote from natural surveillance, such as those across parks, may not be used after dark once user levels have fallen, even if lighting is provided. In these cases a lit on-road alternative should be identified that matches the desire line as closely as possible and avoids heavily trafficked roads.

It is not expected that routes outside built up areas used primarily for recreation would normally need to be lit except where there are road safety concerns, such as at crossings or where the track is directly alongside the carriageway.

The provision of street lighting at locations where nuisance issues or anti-social behaviour is frequently reported can help reduce these problems.

The decision on whether or not to provide street lighting will normally involve a risk assessment and possibly a safety audit.

Once the decision has been made that a route should be lit, selecting the preferred option for lighting should include consideration of:

- Reasons for installing lighting
- Consistency of lighting provision along the route: users must feel safe and be confident that once they embark on the route they do not encounter sections where they feel insecure
- Expected level of use after dark
- Use of solar studs or bollards that provide a lower level of illumination but are less intrusive and cheaper
- Use of lower height columns and lower brightness levels to control light distribution
- Minimising light pollution, including consideration of switching off or dimming the lighting during certain times, say between midnight and 06:00 am.
- Use of sensors to switch lighting on when movement is detected
- Lighting of obstructions such as bollards or barriers
- Lighting other hazards such as unexpected bends and steep drops, and intersections between paths
- Whether there is a safe and convenient alternative route via lit streets
- Requirements of the local authority’s adoptable standards

Design of lighting

Standards, advice and legislation

The main relevant references for the design of lighting along cycle routes are:

- BS 5489-1: 2003 - Code of Practice for the Design of Road Lighting; Section 9 refers to the lighting of cycle tracks and this is the main document that the Council's Street Lighting Section would refer to if a cycle track is to be illuminated.

- Lighting of Cycle Tracks, Institution of Lighting Engineers (now Institution of Lighting Professionals) Technical Report Number 23, 1998 is largely out of date although its principles can still be applied to a certain degree.

A further useful reference is Guidance Notes for the Reduction of Obtrusive Light, by the Institution of Lighting Professionals (2005), at http://www.britastro.org/dark-skies/pdfs/ile.pdf

Brief advice is also contained in:

- LTN 2/08: Cycle Infrastructure Design; Section 8.12

- Cycling England Design Portfolio, C.10 Lighting

The Highways Act 1980, section 65(1) contains powers to light cycle tracks. However, there is no legal obligation under the Highways Act to provide street lighting on the adopted highway and in this present climate many authorities are actively trying to decrease the level of new lighting installations due to spiralling energy costs and carbon reduction commitments.

Design lighting levels

The main purpose of lighting footpaths and cycle tracks after dark are: to show the direction that the route takes; to enable cyclists and pedestrians to orientate themselves; to detect the presence of other cyclists, pedestrians and other hazards and to discourage crime against people and property. In addition to this lighting in enclosed spaces such as tunnels may be required to ensure users feel comfortable when using these areas. For the purpose of lighting design the characteristics of use may be summed up as follows:

- Type of users: cyclists and pedestrians

- Speed of users: up to 30 mph

- Direction of travel: bidirectional

- Potential crime risk: normal to high (this takes account of the perception of crime risk as well as the actual risk).

These factors can then be applied using CEN 13201-1 & 13201-2 (as recommended by BS 5489-1:2003) to provide a recommended illumination level.

The recommended levels are up to 5 lux maintained average and 1 lux minimum maintained; lower levels of lighting can be provided in normal risk areas. It should be noted, however, that different light sources create different patterns of light. A series of smaller individual sources will create a much more uniform lux level and so avoid dark spots, so is generally preferred by users.

Current lighting design standards (as set out in BS 5489) for pedestrian areas produce a requirement for lighting measured on the horizontal (ground) surface. Vertical illumination is important and can be calculated in the same way looking at both how cyclists themselves are illuminated and how other vertical surfaces are lit. Providing light to surrounding vertical surfaces (walls, shop fronts etc) can make the area much more attractive and increase the feeling of safety (removing what is perceived as dangerous darkness) and make navigation easier.

Overspill of lighting onto adjacent properties can also be an issue. It can be quite complicated in that where people already have some overspill they may quite like it (allows them to insert their front door keys etc); however, where it does not already happen they may not be so keen. New urban cycle routes may need to assess these impacts and deal with them accordingly.

Lamp sources

The following types of light sources are suitable for lighting cycle routes:

- **SON lamps** give a very efficient lighting source, and white SON will provide good contrast and colour rendition.
- **SOX lamps** are the most efficient of the traditional lamp sources but at the expense of colour rendering. There are usually the least desirable option.
- **Induction lamps** combine high efficiency with good colour rendering.
- **LED lamps** combine high efficiency (using approx one third of the power of traditional sources) with good colour rendering.
- **Linear fluorescent lamps** give an efficient light source with good colour rendering properties, however their output is temperature dependent (optimum is 25 deg.C). Due to their length they are most appropriate for surface mounting, such as bridges and tunnels.

All lamps will need to be in corrosion resistant and vandal proof housings. IP65 is the minimum rating for water ingress that should be used.

Colour temperature and colour rendering

Colour temperature is the visual colour of the reflected light source, e.g. 2700K warm and 4000k cooler or bluer. The colour temperature of lighting is important when it comes to colour recognition, feeling of safety and apparent brightness. New technologies such as LED and compact fluorescent (CFL) are available in much cooler colour temperatures (4000-5000k) which appear to be a much whiter, or even bluer, light than traditional sodium type luminaires (2100k) which appear more orange. The lower the colour temperature the less the eye is able to distinguish different colours which may make people feel less secure and also at the bluer end of the spectrum the eye sees the light as being brighter.

Colour rendering is the quality of light usually called the CRI index where sun light represents 100% of all visible colours. CRI90 = 90% of all colours visible. SOX has a CRI of 44 and LED & metal halide a CRI 80 to 90. Colour rendering can have a big impact on the quality of lighting, whether externally or within confined spaces. Generally the cooler the colour temperature the brighter the light appears for the same measured output. However at the low end of the colour temperature scale blue light can leave people feeling cold and detached from the environment. A colour temperature of 4000k provides a good balance of colour rendering and overall appearance.

Choice of lighting option

Low energy alternatives such as LEDs provide a number of benefits – better colour temperature, longer life but also an increase capital cost. However, the technology of LEDs is moving quickly and improvements in design are being accompanied by falling prices. Reflecting this trend, TfL has recently made the decision that all new street lighting in London should be LED.

Other things being equal, Sustrans recommends that LEDs should be considered as the first option for a lighting scheme. However, a lighting scheme will normally need to meet the local authority's adoptable standards and these vary between authorities. Early discussion of the options with the local authority is therefore essential.

Path lighting options

Lighting columns

Description

Lighting columns comprise a lamp unit on a column anchored in a concrete base. Generally, the taller the lighting column, the larger the area illuminated; however, for a given level of illumination, a taller column requires a more powerful light source. Columns on traffic free routes are generally between 4m and 6m in height with spacing between 25m and 35m; actual requirements are determined with reference to the power of the lamp and the width of path to be lit. Columns will normally be provided as a single sided arrangement; this improves route delineation and appearance and reduces cabling costs.

Lighting technology is advancing at a fast pace, and the more conventional light sources are increasingly being replaced by LEDs, which are more efficient and durable but until recently have been significantly more expensive. Sustrans generally recommends the use of LED technology due to their considerably lower energy use.

Benefits

Conventional lighting columns provide good lighting of the route that allows users to see the route ahead to detect potential hazards and generally increases their sense of personal security.

The height of lamp columns makes them less susceptible to vandalism than lower level lighting, and if appropriate this can be improved through the use of taller columns.

Suitability

Lighting columns should be located so that they do not impinge on the available width of path.

Vehicle or cherry picker access will be required for maintenance; otherwise fold down columns may be specified.

In sensitive areas the level of illumination may preclude the use of columns, or impose restrictions on their design or operation.

Where a low level of use is expected during the night consideration may be given to dimming or switching off the lights between certain hours.

Suppliers / brands

There is a wide range of suppliers of suitable equipment.

Costs

Provision of lighting columns on a new build scheme can be expected to cost around £80k to £90k per km, including the power supply.

Retrofitting lighting on existing paths is generally more costly, with the example of the Bristol to Bath Railway path costing some £117k per km (see case study).

Case Study: Bristol to Bath Railway Path; 2009

This lighting scheme extension included 66 columns spaced every 30m for 2km. Having removed the cost of tree works, the final outturn cost of the scheme was £234,593. This includes design fees (including planning & surveys etc), contractors costs for works and the statutory undertakers' connection costs. This gives a cost of £3,553 per column, or £117.30 per linear metre.

The lighting used on the Railway Path was Philips CosmoPolis lamps in Iridium housings, on 6m CU Phosco mid hinged columns. As an energy saving feature the lighting design looked at the use of LEDs but didn't consider them appropriate at the time. Given the advances even in the short time since this installation they would now consider them if they were to start afresh. This was partly a cost issue as LEDs at the time were approx £700 (vs. £300) per fitting, but this gap is shrinking. As a cost saving measure the BBRP lighting is set to dim between midnight and 6am from 60w to 45w. This was one of the reasons for opting for the Philips lights. Western Power Distribution provided the electrical supply, which means that they are now responsible for the maintenance of the supply cabling, with the Local Authority then only being responsible for the infrastructure from the ground up.

Case Study: Plymouth Connect2 Scheme; 2011

The Connect2 Stonehouse Creek scheme is a 800m long shared use path with 26 street lighting columns at around 34m spacing, light units in the subway and wide based posts with light units. The 26 columns are 5m tall foldable columns with LED lanterns designed for S5 lighting class for facial recognition. The 26 columns are specified to consume 416 Watts in total. Approximate costs for the street lighting alone was £71k, excluding fees, contract uplifts and VAT.

Bollards

Description

A number of lighting schemes on traffic free routes have used lighting units fitted in bollards. The bollards spill light down across the path and the lower level of the lighting from these reduces light pollution and is less likely to affect bats.

More recent developments make use of LED technology.

Solar powered versions are available for use in areas where wiring is unfeasible or inconvenient, or where security concerns demand lighting that is off-grid.

Benefits

Lighting units in bollards light the route to a sufficient level for users to see the path ahead and deter undesirable


Worcester

activities, and some may be adoptable by highway authorities.

On the Worcester Connect2 scheme the police view was that a lower level of lighting would be best to deter anti social gatherings; this also achieves objectives of not detracting from views and not interfering with bats.

Suitability

Low level lighting units fitted within bollards may be more susceptible to vandalism.

Early discussion will be needed with the highway authority if the route is to be adopted, to determine whether the equipment will meet their requirements.

Bollards are unlikely to give sufficient illumination to meet the requirements of BS 5489.

Suppliers / brands

Worcester Connect2 scheme used CHRB7.700.WH.180.R from Chromatica Ltd

Annapolis™ Smart Solar Bollard does not require mains electricity.

Costs

Worcester Connect2 scheme : the price of the bollard is approx. £530 plus an optional extra cost of £35 for a painted finish. Connection costs to mains electricity are extra.

The Annapolis™ Smart Solar Bollard retails from around £575, depending on the specification.

Case Study: Worcester 2011

Bollard lighting has been installed along the Riverfront in Worcester between Copenhagen Street and the Diglis Basin. These comprise root mounted 900mm high bollards installed at 12m intervals along one side of the path, with mains powered LEDs pointing towards the path surface. These comprise a brushed stainless steel body, polycarbonate protector and sealed IP68 high flux 180 degree LED array. Electronic driver supplied fully potted with 2no IP68 waterproof connectors, for loop in/loop out facility.

The bollards are IP68 rated (this is the "Ingress Protection" code; 6 means it is dust tight, 8 means it is protected against complete, continuous submersion in water for 15 metres. Scales run from 0 to 6 and 0 to 8 respectively); the bollards were developed specifically for Worcester and we understand that these are the first LED bollards to achieve this top rating.

Surface mounted solar studs


Cambridge

Description

Solar studs were originally developed as a solution for providing lighting at rural junctions where it was not considered cost effective to provide street lighting. They are placed in the road as brighter alternative to cats eyes. However, they are increasingly being used as a way of providing lighting on traffic free routes in urban and urban fringe areas.

The units themselves consist of a solar panel that charges a battery during the day and LEDs that light up at night by means of a photo sensor. The lighting is sufficient to waymark the route but the studs do not provide enough light to illuminate the surface, so small obstructions may not be visible to users. The studs are sufficient to make a path usable at night, particularly at dusk when there is a small amount of daylight. Whilst waymarking a path with studs in itself offers nothing in the way of increased personal security, the resultant increase in patronage may make people feel more secure.

They have been used successfully on traffic free routes in many locations, including Cambridgeshire, Peterborough, Bristol and Edinburgh. The studs are generally installed at intervals along each edge of the path. In Peterborough they have been used in different colours to demarcate the separate pedestrian and cycle paths on a segregated route.

Benefits

Solar studs have much less impact on wildlife than traditional lighting.

Solar studs have no operational costs and much lower maintenance implications than traditional lighting as they do not require an electricity supply.

Where provided on otherwise unlit routes, user feedback on the use of solar studs has been very positive.

Suitability

Ensure that models are chosen with long lifespan (8 to 10 years); some cheaper models are advertised with lifespan as little as two years. They should also be inset into the path; some models are nailed to the surface and can be easily removed.

Path maintenance must address issues of leaf fall covering the studs in the autumn and encroachment of verges hiding the studs.

Solar studs can also serve to highlight barriers / bollards in the path, changes in alignment and the edge of a path adjacent to a river.

Lighting is very directional, so closer spacing may be required on bends

Studs do not provide enough light to illuminate the path ahead, so are unlikely to be suitable where there are concerns over personal security.

Studs do not give sufficient illumination to meet the requirements of BS 5489

Suppliers / brands

Astucia

Trax-eyes

Geveko

Costs

Experience in Bristol suggests a cost, including installation, of £50 per stud, or £11k per km at 5m intervals.

Birmingham estimate a cost of £4.5k per km at 10m intervals

Some older units in Cambridge are still operational after 10 years; once the battery fails the units have to be replaced.

Case Study: Solar Studs in Bristol; 2008 to 2011

The solar powered lights have been provided on a number of paths in Bristol. The studs used cost £24.99 each, then the fixative used to secure them is £75/15kg drum. The Council has only ever used the supplier to carry out the installation themselves, their labour charge being £1,500/day.

The fixative will secure approximately 14 studs per drum and their installation team can on average complete 150 studs per day. Employing separate contractors is possible to carry out the installation, but would require some training and tooling up for the contractor.

Based on the 4 sites completed in the city, the Local Authority has settled on the spacing between the studs of 5m staggered on each side of the path (so one stud every 10m on one side of the path). Our average cost of supply and installation per linear metre for estimating purposes is £11 or, approximately £50/stud installed.

Case Study: Solar Studs in Cambridgeshire: a decade of experience

Cambridgeshire has been using Astucia F type solar studs for 10 years, and the units have held up well during that period. Studs are use in pairs – one either side of the path – spaced at 18m intervals, which provides a good balance between cost and effectiveness. Spacing is reduced on bends or where there is a hazard. Costs work out at around £50/stud installed, though extra where traffic management is required (likely where they are used alongside unlit carriageways – see below). Such studs can be hard wired as well, as used at Cam Leisure Park.

Tunnels and bridges

Lighting design

General principles have been outlined in the section above on Design of Lighting. These also apply within tunnels, underpasses, subways and bridges, with the proviso that as these are enclosed spaces concerns over the perception of safety are heightened and lighting needs to ensure that users feel comfortable when using the space. Lighting levels appropriate to high risk areas should be applied due to the higher perceived risk and the design should use a series of smaller individual sources to create an even light level. As with external lighting colour rendering can have a big impact on the quality of lighting in an enclosed space.

This section focuses specifically on tunnels, but the principles largely apply to other enclosed spaces, such as underpasses, subways and bridges.

The following types of light sources are suitable for tunnel lighting:

- SON lamps – white SON is suitable for tunnel entrances and the central run of the tunnel
- SOX lamps – due to their colour rendering they are suitable for the tunnel entrances only
- Induction lamps – suitable for tunnel entrances and the central run of the tunnel
- LED lamps – suitable for tunnel entrances and the central run of the tunnel
- Linear fluorescent lamps – suitable for tunnel entrances and the central run of the tunnel

Vandal-proof lighting systems should generally be used.

Lamp positioning

The positioning of the lamps requires some thought. In terms of efficiency mounting lamps on the crown of a tunnel, or suspended a metre below, is best. This also keeps the lamps and cabling out of the reach of potential vandals. In rectangular sectioned underpasses surface mounted corner fittings should be satisfactory in most situations.

In some cases it would be appropriate to light the tunnel from a lower height. This is typically when there is limited access for maintenance or ecological issues require a dark area to remain at the tunnel crown.

There are examples of the use of lamps on bollards to light a tunnel, and of floor recessed lighting in underpasses.

Tunnel wall treatments

It can be beneficial to paint tunnel walls white as this reflects more light, however this may not be possible if the structure is listed, where the surface remains damp or if it would meet significant opposition from local groups. The surface will need maintaining with repainting periodically.

Ecology

Tunnels are a frequent site of conflict as they often need to be lit, but could contain bat roosts. As part of planning a route a suitably qualified ecologist should be employed in undertaking a phase 1 and protected species survey. This should highlight if there is a likelihood of bats residing within a tunnel. Further advice is given below in the Bats and Lighting section.

Switching / timing

If the tunnel is to be lightly used it may be beneficial to have a demand operated lighting system. This can be switched using PIR sensors or broken beam systems. Care must be taken to ensure that the lighting will not switch off when people are still inside the tunnel. Switching systems do not work with all light sources, and are only appropriate for LED or linear fluorescent lamps. The sensor switches themselves can be a point of failure and pose a potential maintenance issue over their expected lifespan, so they should fail in such a way that they lights will be left on if they do.


Dartford

In longer tunnels it may seem a good idea to have switched sections within the tunnel to conserve energy. However, discussions with users when planning the Bath Two Tunnels scheme indicated that this can cause a problem with people's perception of risk / fear, as they would prefer to remain unaware of someone approaching until they can see them. Any consideration of this approach should take account of this.

The lighting can be on a timer system and appropriate times can be selected. Typical lighting times might be 5am to 11pm as this is when the tunnel will be most used, however in inner city areas 24hr lighting would be more appropriate if there is 24hr street lighting nearby.

Underpasses, subways and longer bridges should generally be lit at all times.

Supply

In remote locations supply can be an issue so this should be assessed along with the requirement to light the tunnel.

Emergency lighting

Depending on the length of the tunnel and likely level of use this may be appropriate. If the tunnel is on a curve and there are locations where neither portal of the tunnel is visible then emergency lighting will generally be necessary for personal security reasons. There are detailed standards for emergency lighting within buildings which specify testing frequency, battery life etc however these standards may not be appropriate for all tunnels. A suitably qualified lighting engineer should be consulted on the best way of implementing an emergency lighting system.

Case Study: Dartford Connect2 Scheme

Lighting is encased in a steel hollow section which is pretty much vandal proof. They also pipe classical music through the tunnel 24/7 and it is proven to deter those who normally commit such acts of vandalism. As a whole set up it works extremely well and the tunnel is well used now that vandalism issues are largely resolved.

Bats and lighting

Bats roost and feed along the National Cycle Network and use it to commute through the landscape. Lines of trees and hedgerows are particularly important for bats and rivers and canals are also important for foraging. Some bat species are very sensitive to light, and installing inappropriate lighting can destroy feeding areas and prevent bats from moving through the landscape. The installation of lighting near a roost can constitute a criminal offence by disturbing the bats using it or obstructing access to it. Therefore, wherever lighting is being introduced to an unlit area, bats are a consideration. Tunnels are a frequent site of conflict as they often need to be lit for us to use, but could contain bat roosts.

Only install lighting where it is needed, and then consider its exact purpose; how much light is needed and when? Light the path enough for us to use without lighting the areas that bats use. If defining the route is sufficient, consider use of surface mounted solar studs that won’t light up the surrounding environment.

Ways to make lighting more bat friendly, you can consider;

- Reducing the frequency and brightness of lights;
- Situating lights away from features of particular value to bats;
- Using sodium lights, particularly high pressure ones, rather than mercury or metal halide lamps;
- Using glass covers for lights unless in areas subject to vandalism;
- Using flat lantern covers rather than dished ones;
- Using light spill accessories such as hoods and shields;
- Using a planting scheme as a light barrier;
- Using motion sensors for lighting very sensitive sites like tunnels;
- Adjusting the height of the lighting column to reduce light spillage;

- Limiting the hours the route is lit each night;
- For new routes, use a non-reflective surface under the lights; or,
- Lighting the route only during the winter months when bats are in hibernation.

In some cases it will be necessary to conduct bat surveys prior to lighting a route. This is in situations where bat species that are particularly sensitive to the effects of lighting are present, where roosts are likely to be present or where the feature to be lit could have particular importance for bat conservation. In some situations, the species of bat present and ways in which the feature is used may mean that lighting is not possible without commiting an offence.

Discussion with Natural England / Scottish Natural Heritage / Countryside Council for Wales / Northern Ireland Environment Agency should assist is deciding on the appropriate forms / times of lighting.

For further details refer to:

Bat conservation trust document – bats and lighting in the uk: downloadable on - http://www.bats.org.uk/publications_detail.php/243/bats_and_lighting_in_the_

DfT interim advice sheet - http://www.dft.gov.uk/ha/standards/ians/pdfs/ian116.pdf

Case Study: Traffic Free Route, Whitstable

Planning Condition: Prior to the route coming into use, the Monaro Urban Contemporary form of lighting herein permitted consisting of a maximum average luminance of 10 Lux and minimum of 3 Lux and LED Lamps mounted on lighting columns not exceeding 4 metres in height spaced not less than 17.5 metres apart, shall be installed at locations to be submitted, and agreed in writing, by the Local Planning Authority. The lighting shall be installed in accordance with the details above and in those locations as agreed by the Local Planning Authority, unless subsequently otherwise agreed in writing by the Local Planning Authority. The route shall only be illuminated in winter months during the hours of darkness, however illumination shall be switched off at 20:00 (8pm) on any given day during the winter period with no re-illumination of the lighting taking place until dusk the following day.

Reasons: To prevent disturbance to feeding and commuting bats to coincide with the bat hibernation period and to prevent harmful light spillage that may negatively impact on the amenities of neighbouring occupiers.

Routes adjacent to the carriageway

The approach to lighting of cycle tracks adjacent to the carriageway will depend on the width of the verge or margin strip and whether the carriageway itself is lit.

Lit carriageways

Where the cycle track runs adjacent to a lit carriageway, the lighting designer should firstly measure or calculate the light contribution from the carriageway luminaires to determine whether additional lighting may be necessary. Any proposed planting in the verge should be taken into account.

If additional lighting is required, either the cycle track can be lit separately or the carriageway lighting can be supplemented by in-fill lighting along the cycle track itself.

Unlit carriageways

Where a cycle track is close to the carriageway illumination of the cycle track alone should normally be avoided. However, in such situations cyclists may be blinded or dazzled by the lights of oncoming vehicles and find it hard to see the path edge, particularly on tracks alongside high speed rural roads. The presence of cyclists may also confuse motorists on high speed roads who do not expect to see white lights on their nearside. These hazards can be reduced or avoided by:

Cambridgeshire

- Keeping the cycle track as far away as possible from the carriageway edge
- Signing a suitable alternative route.
- Providing cycle tracks on each side of the carriageway, enabling cyclists to travel with flow.

Consideration may also be given to the introduction of surface mounted solar studs to mark the edges of the cycle track. Experience in Cambridgeshire has found these studs, at 12m centres, to be very helpful in combating the effects of dazzle on cyclists using an adjacent path. Because the light the studs give out is directional the spacing should be tightened up at points such as bends, bollards and bridges. Red studs can be used to denote where it is necessary to give way.

Road crossings

Where cycle tracks cross roads the lighting at the crossing point should be upgraded to match that provided for pedestrian crossings. Guidance is given in the Institution of Lighting Engineers (now Institution of Lighting Professionals) Technical Report Number 12 Lighting of Pedestrian Crossings (2007).

Manchester

Cycle lanes

Not all roads containing cycle lanes will be lit, but where lighting is provided it should illuminate the cycle lanes and the carriageway together. The lighting should be designed to BS 5489.

On Wilmslow Rd in Manchester, the council has trialled the use of surface mounted solar studs to reinforce the cycle lane markings. These have been used in areas where collisions with cyclists have been identified during the hours of darkness especially at side road junctions.

White lights are used along the cycle lane, with more closely spaced green lights at side road crossings. The white studs are spaced at between 8 - 10 metre intervals along the cycle lanes depending on the straightness of the road (8 metres on sections with bends and 10 metres on straight sections). Green studs are spaced at 2 metres intervals across side road junctions / lay-bys and busy entrances / exits.

Obstructions and other hazards in unlit areas

Bollards, chicanes and fence ends either within the path or abutting it need to be clearly visible to path users. Within lit areas they should at least be a contrasting colour to their surroundings and preferably include reflective strips, to ensure that they are conspicuous to the partially sighted and to approaching cyclists.

In unlit areas further measures may need to be included to help cyclists see any obstructions, or other hazards alongside the path such as unexpected bends or a riverbank, during the hours of darkness. Suggested measures include:

- Retro-reflective strips, either self adhesive or nailed on, e.g. Class 1 Honeycomb (White or Yellow) BS. Plus 2 EN12899-1
- Thermoplastic markings, preferably with ballotini glass beads, either on the path surface or on the obstruction itself
- Surface mounted LED solar studs (available in red and green as well as white) to steer users away from the hazard or LED uplighters to emphasise the obstruction with an added dramatic effect.

Cyclists using an unlit traffic free route after dark can be expected to travel at a speed appropriate to their forward visibility and to be using lights; however, when used on an unlit traffic free route bicycle lighting that complies with the Road Vehicles Lighting Regulations 1989 (amended) may provide quite limited illumination of the path ahead.

Each location should be assessed on a case by case basis, taking account of the expected level and type of use after dark as well as the visual impact during the hours of daylight of any measures to assist users in the dark. Where appropriate a simple risk assessment should be undertaken.