



A104 IRAP Route Review Process

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Background / Setting the Scene

- The A104 Epping New Road is an important A-Road linking Epping, Theydon Bois, the M25 (via Junction 26) and the M11 (via Junction 7) with Greater London.
- The road runs through Epping Forest, where this is an adjacent high leisure and recreation use by pedestrians, cyclists and equestrians.
- The road is predominately long, and straight, and average vehicle speeds typically exceed the set speed limits.
- 5.5km section of 40mph rural section at the northern section
- Section of 30mph section is only 0.65km and is present as the nature of the route changes from rural to semi-rural and then urban in nature
- Numerous recorded collisions along the entire length



Reviewing the Baseline Data

4												
5	Road name	Section	Distance	Latitude	Longitude	Carriageway	Streetview link	Pedestrian peak hour flow across the road	Pedestrian peak hour flow along the road driver-side	Pedestrian peak hour flow along the road passenger-side	Bicycle peak hourly flow	
6	A104_Part_1	A104_Part_1	0	51.67486291	0.062163137	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
7	A104_Part_1	A104_Part_1	0.1	51.6742073	0.061173817	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
8	A104_Part_1	A104_Part_1	0.2	51.67354533	0.060195551	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
9	A104_Part_1	A104_Part_1	0.3	51.67288159	0.059220383	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
10	A104_Part_1	A104_Part_1	0.4	51.67221815	0.058244677	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
11	A104_Part_1	A104_Part_1	0.5	51.67155274	0.057272457	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
12	A104_Part_1	A104_Part_1	0.6	51.67088416	0.056305879	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
13	A104_Part_1	A104_Part_1	0.7	51.67021477	0.055340748	Undivided road	Streetview	101 to 200	101 to 200	101 to 200	101 to 200	
14	A104_Part_1	A104_Part_1	0.8	51.669555	0.054358566	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
15	A104_Part_1	A104_Part_1	0.9	51.66889661	0.053373933	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
16	A104_Part_1	A104_Part_1	1	51.66823354	0.052397483	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
17	A104_Part_1	A104_Part_1	1.1	51.66756886	0.051423846	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
18	A104_Part_1	A104_Part_1	1.2	51.66690288	0.050452502	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
19	A104_Part_1	A104_Part_1	1.3	51.66623799	0.049479225	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
20	A104_Part_1	A104_Part_1	1.4	51.66557209	0.048507702	Undivided road	Streetview	101 to 200	101 to 200	101 to 200	101 to 200	
21	A104_Part_1	A104_Part_1	1.5	51.66490548	0.047537452	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
22	A104_Part_1	A104_Part_1	1.6	51.66422681	0.046589501	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
23	A104_Part_1	A104_Part_1	1.7	51.66349182	0.045761335	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
24	A104_Part_1	A104_Part_1	1.8	51.66270663	0.045058509	Undivided road	Streetview	101 to 200	101 to 200	101 to 200	101 to 200	
25	A104_Part_1	A104_Part_1	1.9	51.66191821	0.044365026	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
26	A104_Part_1	A104_Part_1	2	51.66112922	0.043673213	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
27	A104_Part_1	A104_Part_1	2.1	51.66032682	0.043023258	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
28	A104_Part_1	A104_Part_1	2.2	51.65950771	0.042429246	Undivided road	Streetview	101 to 200	101 to 200	101 to 200	101 to 200	
29	A104_Part_1	A104_Part_1	2.3	51.65869077	0.041827417	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
30	A104_Part_1	A104_Part_1	2.4	51.65787057	0.041237216	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	
31	A104_Part_1	A104_Part_1	2.5	51.65705985	0.040614243	Undivided road	Streetview	1 to 5	1 to 5	1 to 5	6 to 25	

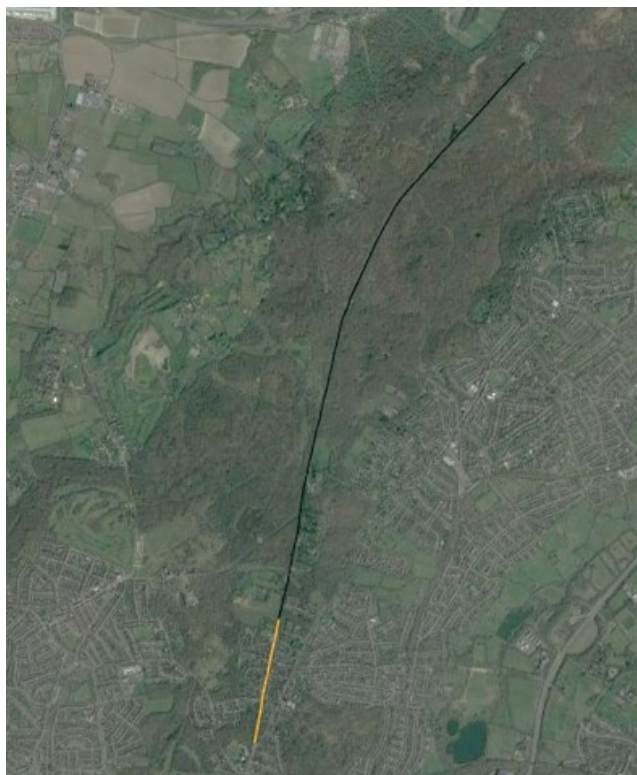
Active Travel / Suppressed Demand

	Road name	Section	Distance	Latitude	Longitude	Carriageway	Streetview	Pedestrian peak hour flow across the road	Pedestrian peak hour flow along the road driver-side	Pedestrian peak hour flow along the road passenger-side	Bicycle peak hourly flow
5	A104_Part_1	A104_Part_1	0	51.67486291	0.062163137	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
6	A104_Part_1	A104_Part_1	0.1	51.6742073	0.061173817	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
7	A104_Part_1	A104_Part_1	0.2	51.67354533	0.060195551	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
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10	A104_Part_1	A104_Part_1	0.5	51.67155274	0.057272457	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
11	A104_Part_1	A104_Part_1	0.6	51.67088416	0.056305879	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
12	A104_Part_1	A104_Part_1	0.7	51.67021477	0.055340748	Undivided ro	Streetview	301 to 400	301 to 400	301 to 400	301 to 400
13	A104_Part_1	A104_Part_1	0.8	51.669555	0.054358566	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
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15	A104_Part_1	A104_Part_1	1	51.66823354	0.052397483	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
16	A104_Part_1	A104_Part_1	1.1	51.66756886	0.051423846	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
17	A104_Part_1	A104_Part_1	1.2	51.66690288	0.050452502	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
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23	A104_Part_1	A104_Part_1	1.8	51.66270663	0.045058509	Undivided ro	Streetview	301 to 400	301 to 400	301 to 400	301 to 400
24	A104_Part_1	A104_Part_1	1.9	51.66191821	0.044365026	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
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26	A104_Part_1	A104_Part_1	2.1	51.66032682	0.043023258	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
27	A104_Part_1	A104_Part_1	2.2	51.65950771	0.042429246	Undivided ro	Streetview	201 to 300	201 to 300	201 to 300	201 to 300
28	A104_Part_1	A104_Part_1	2.3	51.65869077	0.041827417	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50
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30	A104_Part_1	A104_Part_1	2.5	51.65705985	0.040614243	Undivided ro	Streetview	1 to 5	6 to 25	6 to 25	26 to 50

Speed Management Strategy

				Step 1	Add new speed limit for each 100 m section in Column J . If no change just leave as current speed limit.		
				Step 2	Add Basis on how new speed limit will be maintained / enforced in Column K		
				Step 3	Add any initial scheme details in Column L (e.g. which 100m section will have actual average speed camera, fixed camera or engineering measures (Chicanes and narrowings etc)). If no		
				Step 4	Return to RSF for review ahead of speed management meeting.		
Longitude	Carriageway	Streetview link	Existing Speed limit	New Speed Limit	Speed Limit Change Basis	Comment on Proposed Speed Reduction Measures	
0.036425651	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.036097451	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.035776021	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.035435483	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.035121624	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.034796831	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.034469381	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.034145975	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.033870633	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.033726802	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.033538596	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.033312371	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.033029115	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.032730382	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.032440321	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.032156062	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.031860228	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.031523108	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.031224808	Undivided road	Streetview	40mph	40mph	Speed limit + average speed cam	average cameras would be used to enforce compliance with existing speed limit - which has current 85th%tile of a	
0.030933145	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.030629229	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.030339294	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.030029607	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.029727398	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.029438125	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.029132526	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.028866981	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.028624914	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.028370905	Undivided road	Streetview	30mph	30mph	Not Applicable		
0.028115581	Undivided road	Streetview	30mph	30mph	Not Applicable		

IRAP Route Review Tool – Star Rating Existing Scenario – Pedestrians



- Rural Section (40mph) is shown as a 1-star rating for pedestrian safety
- Rural / Urban (30mph) is shown as 3-star rating for pedestrian safety

FSI (Fatal / Serious Injury) estimation Profile (Baseline Pedestrian)



Chainages shown indicate the highest risk for pedestrians (spikes correspond to car park locations / higher ped flows)

United Kingdom / DFT SRF3 Phase 1 / SRF3 - Phase 8 Final model / Essex A104 - Final UDIP

Countermeasures: A104_PART_1-A104_PART_1-3 [0.7]

Countermeasure	FSI Saved	BCR	Active
Central hatching	0.2	36	<input checked="" type="checkbox"/>
Footpath provision driver side (adjacent to road)	0.1	0.8	<input checked="" type="checkbox"/>
Footpath provision passenger side (adjacent to road)	0.1	0.8	<input checked="" type="checkbox"/>
Improve Delineation	0.1	7	<input checked="" type="checkbox"/>
Refuge Island	0.2	1.0	<input checked="" type="checkbox"/>
Additional lane (2 + 1 road with barrier)	0.6	1	<input type="checkbox"/>
Clear roadside hazards - passenger side	0.2	3	<input type="checkbox"/>
Cycle Lane (off-road) (Rural)	0.0	0.8	<input type="checkbox"/>
Cycle Lane (on-road) (Rural)	0.0	2	<input type="checkbox"/>
Duplicate - 1-5 m median	0.6	0.2	<input type="checkbox"/>
Duplicate - <1m median	0.3	0.2	<input type="checkbox"/>
Duplication with median barrier	0.7	0.3	<input type="checkbox"/>
Footpath provision driver side (>3m from road)	0.1	0.6	<input type="checkbox"/>
Footpath provision passenger side (>3m from road)	0.1	0.7	<input type="checkbox"/>
Overtaking lane	-0.2	-0.3	<input type="checkbox"/>
Pedestrian fencing (Rural)	0.1	4	<input type="checkbox"/>
Shoulder sealing driver side (>1m)	0.0	1	<input type="checkbox"/>
Shoulder sealing passenger side (>1m)	0.1	2	<input type="checkbox"/>
Signalised crossing (Rural)	0.1	0.4	<input type="checkbox"/>
Street lighting (mid-block)	0.1	1.0	<input type="checkbox"/>
Unsignalised crossing (Rural)	0.3	1	<input type="checkbox"/>

Save Cancel

Countermeasures Process Repeated for entire route length
100m intervals
6.15km Length in total

United Kingdom / DFT SRF3 Phase 1 / SRF3 - Phase 8 Final model / Essex A104 - Final UDIP

ME / RAP

Route review

Show dataset options

A104_Part_1

A104_Part_1

Undivided road

0.7 (23)

0.8 (17)

0.9 (16)

1 (16)

1.1 (16)

1.2 (16)

COUNTERMEASURES: A104_PART_1-A104_PART_1-3 [0.7]

« »

+ Add Countermeasure

Countermeasure	FSI Saved	BCR	Active
Central hatching	0.2	36	<input type="checkbox"/>
Footpath provision driver side (adjacent to road)	0.1	0.8	<input type="checkbox"/>
Footpath provision passenger side (adjacent to road)	0.1	0.8	<input type="checkbox"/>
Improve Delineation	0.1	7	<input type="checkbox"/>
Refuge Island	0.2	1.0	<input type="checkbox"/>

GOOGLE STREETVIEW

Google

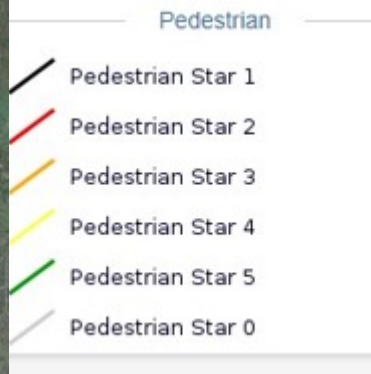
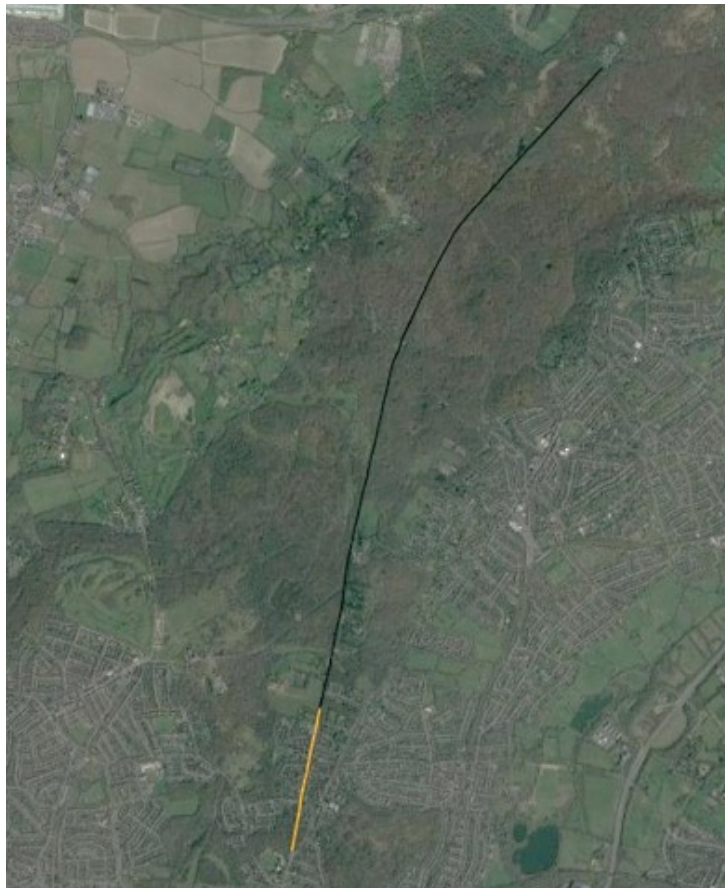
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Countermeasures Issues Identified

- Disparity between coded attributes and on-site representation
- Unable to introduce new countermeasures for an attribute which had not been coded as being defectives
- For example, surfacing / signs
- Had to be re-coded by Admin at the baseline to allow mitigation to be applied.



BASELINE

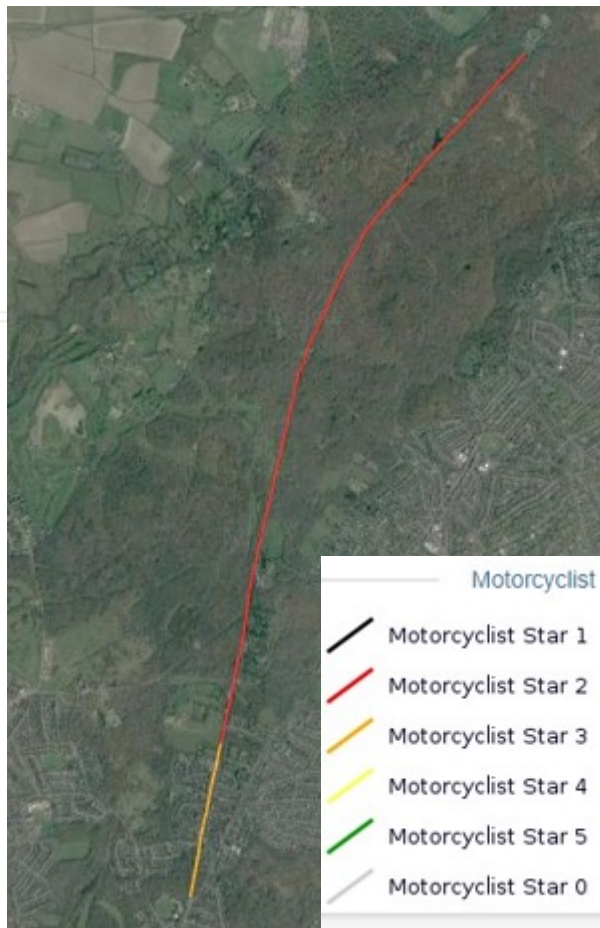


Pedestrian Star
Rating
increased along
length
1 to 2 star
1 to 3 star
3 to 4 star

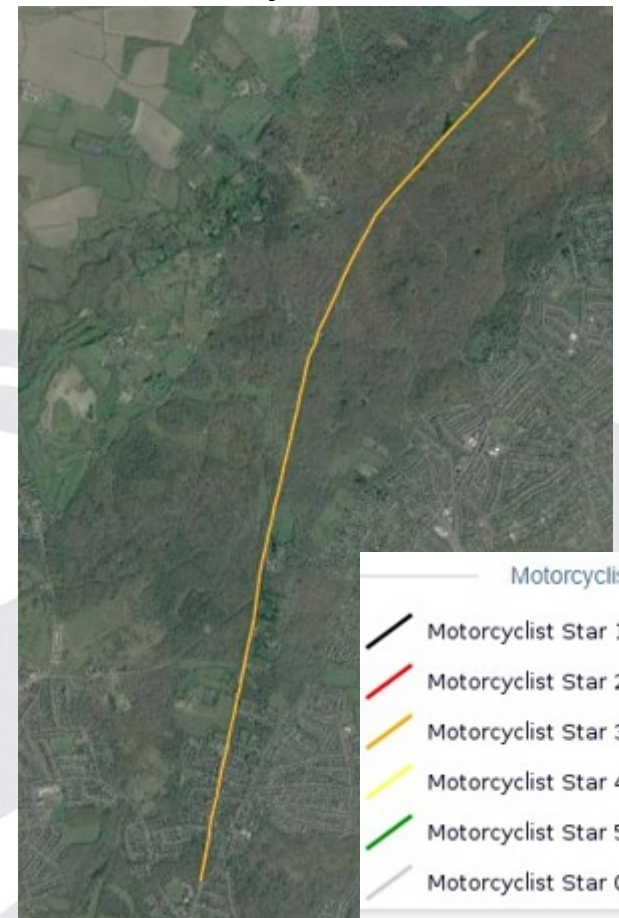
UDIP APPLIED



Motorcyclists – Baseline



Motorcyclists – UDIP



Before – Active Travel Scenario (ATS):

BASELINE STAR RATING								
Data type: Smoothed								
	Vehicle Occupant		Motorcyclist		Pedestrian		Bicyclist	
Star Ratings	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent
3 star or better	6.7	100.0%	1.2	17.91%	1.2	17.91%	1.2	17.91%
5 Stars	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
4 Stars	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
3 Stars	6.7	100.0%	1.2	17.91%	1.2	17.91%	1.2	17.91%
2 Stars	0.0	0.0%	5.5	82.09%	0.0	0.0%	5.5	82.09%
1 Stars	0.0	0.0%	0.0	0.0%	5.5	82.09%	0.0	0.0%
Not applicable	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Totals	6.7	100%	6.7	100%	6.7	100%	6.7	100%

After – User Defined Investment Plans (UDIP):

USER DEFINE STAR RATING								
Data type: Smoothed								
	Vehicle Occupant		Motorcyclist		Pedestrian		Bicyclist	
Star Ratings	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent
3 star or better	6.7	100.0%	6.7	100.0%	1.2	17.91%	1.2	17.91%
5 Stars	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
4 Stars	1.2	17.91%	0.0	0.0%	0.0	0.0%	0.0	0.0%
3 Stars	5.5	82.09%	6.7	100.0%	1.2	17.91%	1.2	17.91%
2 Stars	0.0	0.0%	0.0	0.0%	5.5	82.09%	5.5	82.09%
1 Stars	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Not applicable	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Totals	6.7	100%	6.7	100%	6.7	100%	6.7	100%

User Defined Investment Plan

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countermeasure	length / sites	fsis saved	pv of safety benefit	estimated cost	cost per fsi saved	program bcr
Central hatching	4.90 km	3,00	775,873	61,931	21,483	12.5
Improve Delineation	6.10 km	3,00	889,313	174,025	53,878	5
Footpath provision driver side (adjacent to r...	0.80 km	0,23	61,586	141,436	618,085	0.4
Footpath provision passenger side (adjacent t...	0.80 km	0,19	49,974	129,650	668,237	0.4
Refuge Island	11	0,95	256,747	496,800	520,774	0.5
Street lighting (intersection)	0.10 km	0,41	110,047	49,674	121,485	2.2
Skid Resistance (paved road)	0.20 km	1,00	341,041	104,183	82,217	3.3
Road surface rehabilitation	0.20 km	0,12	32,236	23,795	198,664	1.4
Delineation and signing (intersection)	1	0,19	51,424	17,769	92,998	2.9

- ☐ 17.91% of route (i.e. 1.2km) raised from 3-Star to 4-star for Vehicle Occupants
- ☐ 82.09% of route (i.e. 5.5km) raised from 2-Star to 3-Star for Motorcyclists
- ☐ 82.09% of route (i.e. 5.5km) raised from 1-Star to 2-Star for Pedestrians



Predicted Countermeasure Costs

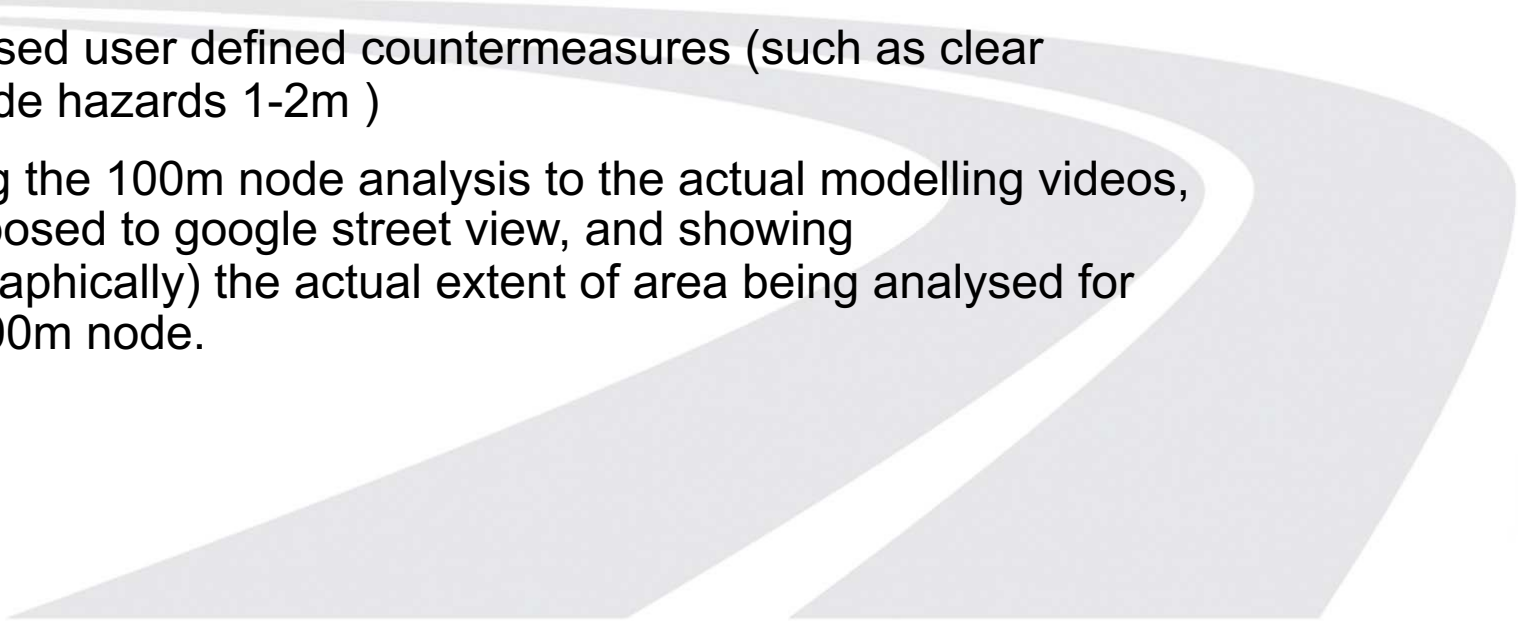
countermeasure	length / sites	fsis saved	pv of safety benefit	estimated cost	cost per fsi saved	program bcr
Central hatching	4.90 km	3	775,873	£61,931.00	21483	12.5
Improve Delineation	6.10 km	3	869,313	£174,025.00	53878	5
Skid Resistance (paved road)	0.20 km	1	341,041	£104,183.00	82217	3.3
Delineation and signing (intersection)	1	0.18	47,921	£17,769.00	99797	2.7
Street lighting (intersection)	0.10 km	0.41	110,047	£49,674.00	121485	2.2
Road surface rehabilitation	0.20 km	0.12	32,236	£23,795.00	198664	1.4
Refuge Island	11	0.95	256,747	£330,000.00	520774	0.5
Footpath provision driver side (adjacent to road)	0.80 km	0.23	61,586	£141,436.00	618085	0.4
Footpath provision passenger side (adjacent to road)	0.80 km	0.19	49,974	£129,650.00	698237	0.4
Clear passenger side roadside 1-5m	0.1km	0.81	213,066	£7,000.00	208335	1.3
SPECS COSTS				£320,000.00		
Total				£1,359,463.00		

Predicted Collision Prevention

- The proposed scheme is expected to prevent
- 30.5 (FSI)Fatal and Serious Injury
- Fatal (2.3) / Serious (28.2) injuries over the 20-year appraisal period
- This is a 36.5 % reduction compared with the baseline,
- There is an expected value of prevention of £17,825,651 over the 20-year appraisal period and an overall road safety BCR of 11.31.



Lessons Learnt

- Speed Compliance as a possible Countermeasure / User Defined input
 - Ability to be able to alter baseline coding (to reflect site observations) whilst still retaining existing countermeasures
 - Increased user defined countermeasures (such as clear roadside hazards 1-2m)
 - Linking the 100m node analysis to the actual modelling videos, as opposed to google street view, and showing (geographically) the actual extent of area being analysed for that 100m node.
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Questions ?

