APPENDIX 9
Non-Motorised User Impact Assessment

1. INTRODUCTION

1.1. Background

1.1.1. Non-Motorised User (NMU) benefits and public transport (PT) benefits due to bus stop relocation and transport hub and public realm improvements have been considered in the economic assessment of the Hereford City Centre Transport Package (HCCTP). Given that the HCCTP has a substantial focus on public realm, it was considered appropriate to appraise NMU benefits as well as benefits to PT users as a consequence of the proposed re-location of bus stops on Newmarket Street and Blueschool Street, the rerouting to Blueschool Street of country bus services serving the east and the improvement of the quality of bus stops. There will be benefits for pedestrians and cyclists on Newmarket Street/Blueschool Street and Commercial Road from the reduction in carriageway width and additional crossing facilities and from new cycle lanes. The transport hub will reduce walking times between bus and rail and between bus stops and new development around the rail station.

1.2. Method

1.2.1. The approach set out in DfT TAG Unit A5.1 Active Mode Appraisal has been used. The focus was on journey time savings for pedestrians due to bus stop relocation and the new transport hub (calculated according to TAG Unit A1.3 – User and Provider Impacts and the values in TAG Data Book) and journey quality benefits for cyclists and pedestrians due to the public realm improvements (calculated according to TAG Unit A4.1 Social Impact Appraisal).

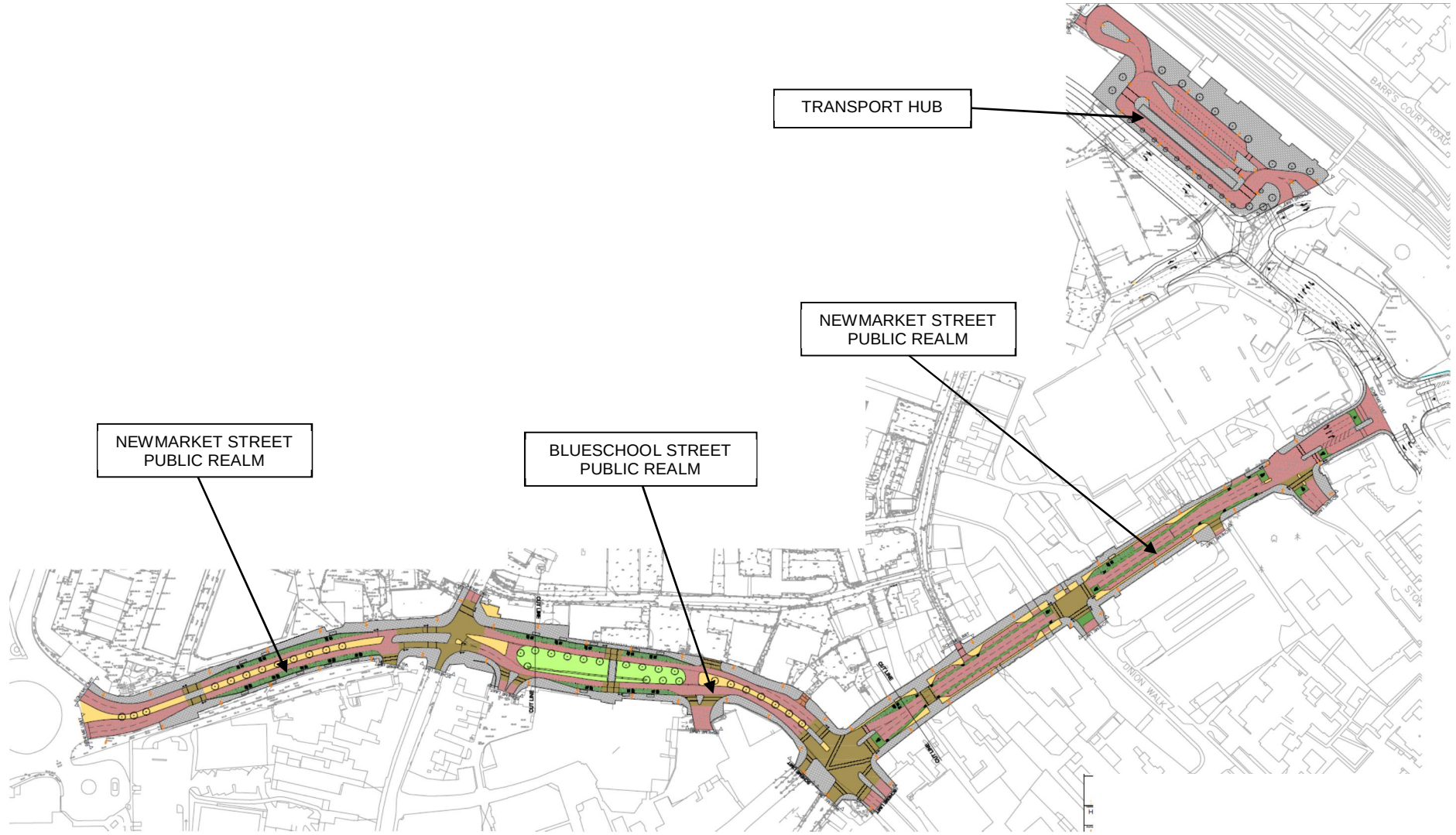
1.2.2. Pedestrian, cycle, bus and rail data collected in 2012, and used in developing the existing multi model transport model for Hereford, formed the starting point of this appraisal. This data, along with new and comprehensive data on all transport modes in the City Centre, collected as a part of Monitoring and Evaluation Plan (MEP) baseline monitoring undertaken during October 2014, has been used to identify numbers of existing pedestrian, cycle, bus and rail users who would benefit from the improvement proposals. Suitable demand growth has been applied to account for future development and growth to estimate the numbers of users who will benefit in the future.

1.2.3. Benefits have been estimated using bespoke Spreadsheets using WebTAG compliant parameters and methods such as the ‘rule-of-half’ benefit calculation, value of time growth, discount rates, 60 year assessment period etc.

1.2.4. As walking and cycling schemes can be highly sensitive to the forecasts and assumptions used, sensitivity tests on the core assumptions of journey time savings and journey quality have been undertaken.

1.2.5. Figure 1 overleaf, illustrates the location of the public realm and Transport Hub elements of the HCCTP.

Figure 1: Public Realm & Transport Hub Improvement Proposals



2. BENEFIT FORECASTS

2.1. Bus Stop Relocation

2.1.1. Economic benefits resulting from the addition and relocation of bus stops on Newmarket Street, Blueschool Street and Commercial Road were estimated from journey time savings which were derived as follows:

- The numbers of bus passengers using the bus stops was obtained from the recent survey;
- The geographical distribution of pedestrian movements to and from the bus stops was estimated from the 2012 walk trip matrices developed for the Hereford multi modal transport model;
- Walk distances between the existing and proposed bus stops and the transport zone origins and destinations was measured in GIS;
- Total walk distances were calculated from the above for the existing and proposed bus stop locations;
- Total daily walk times were estimated assuming an average 5 kph walking speed; and
- Daily walk time savings with the new and relocated bus stops was calculated and converted to annual monetary values using appropriate values of time and annualisation factors.

2.1.2. Counts of the numbers of bus passengers boarding and alighting at bus stops in the city centre were carried out on Tuesday 21st, Wednesday 22nd and Thursday 23rd October 2014. All boarding and alighting passengers from all bus services were recorded during the periods of 0700-0900, 1000-1200, 1300-1500 and 1600-1800 hrs.

2.1.3. The bus survey data was analysed to obtain the average daily numbers of passengers in the survey periods for groups of bus stops as shown on Table 1.

Table 1: Average Daily Bus Passengers

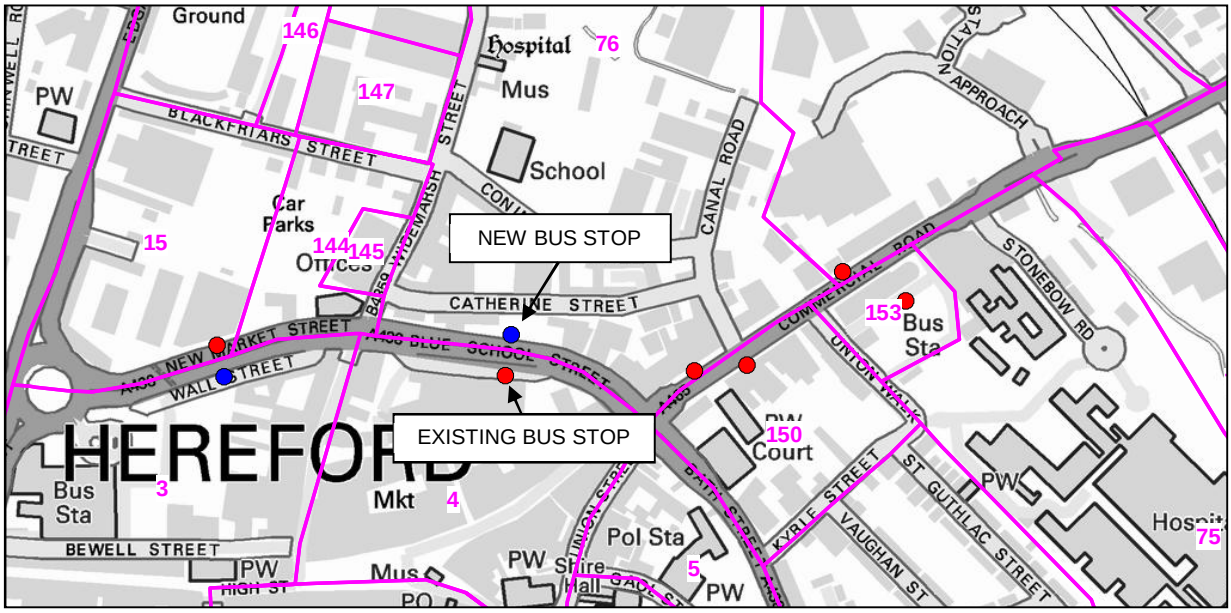
Bus Stop Location	Boarders	Alighters	On Board at Departure
Edgar St	3	4	258
Newmarket St & Blueschool St	254	421	1,600
Commercial Rd	48	320	866
Rail Station	210	95	210
Country Bus Station	580	207	801
Shire Hall	395	270	522
Tesco Bus Station	939	404	1,013
All Locations	2,430	1,722	5,270

2.1.4. Figure 2 illustrates the location of existing and proposed bus stops and shows that new bus stops are proposed on Newmarket Street and Blueschool Street and walk time savings were calculated for these new locations. Other existing bus stops will remain in essentially the same locations and there will be no significant walk time savings.

2.1.5. Also shown on Figure 2 are the Hereford multi-modal model transport zones in the area and these were used to estimate the walk distance saving to the new bus stops. The 2012 model base year walk trip matrices were used to estimate the proportions of walk trips between each bus stop and each of the city centre transport zones.

2.1.6. It was estimated that 676 passengers per day using the bus stops on Newmarket Street and Blueschool Street would save a total of 69 km per day, or 13.80 hours assuming an average walking speed of 5 kph. No new bus stops are proposed on Commercial Road and so no significant walk time savings would be gained.

Figure 2: Bus Stop Proposals



2.1.7. The walk time savings were converted to monetary amounts using values of time obtained from Table A1.3.2 of the TAG Databook and trip purpose proportions obtained from TEMPRO 6.2. Values of time calculations for the 2017 opening year, the 2032 forecast year and 2076 at the end of a 60 year assessment period are shown in Table 2. Trip purpose proportions between 2017 and the 2041 TEMPRO horizon year were interpolated and were kept constant after 2041. The estimated walk time saving of 13.80 hours was then converted to monetary values using the composite values of time to give daily benefit as also shown in Table 2.

2.1.8. It is proposed to reroute country bus services serving the east of Hereford to Blueschool Street on journeys to and from the country bus station. This will enable passengers to have reduced walk distances and time which has been estimated at 8.79 hours per day. This has also been converted to monetary values using the composite values of time to give daily benefit as also shown in Table 2.

Table 2: Bus Passenger Values of Time Benefits

Year	Working	Non-Working		All Purposes	Daily Benefit (£) (See Note 1)
		Commuting	Other		
2017:					
Value of Time (£/hour, Table A 1.3.2)	18.28	7.49	6.64	£7.14/hr	£101.26 / £64.47
Proportion – Ave. Weekday (TEMPRO 6.2)	2.2%	28.0%	69.8		
2032:					
Value of Time (£/hour, Table A 1.3.2)	24.38	9.99	8.86	£9.51/hr	£154.77 / £105.55
Proportion – Ave. Weekday (TEMPRO 6.2)	2.2%	26.4%	71.4%		
2076:					
Value of Time (£/hour, Table A 1.3.2)	62.44	25.58	22.70	£24.33/hr	£776.86 / £494.64
Proportion – Ave. Weekday (TEMPRO 6.2)	2.2%	25.7%	72.1%		

Note 1: £101.26 / £64.47 denotes benefit from bus stop relocation / country bus rerouting.

2.2. Bus Quality Improvements

2.2.1. Improved quality bus stop infrastructure is proposed, including shelters, seating, information, raised kerbs etc., which will provide a range of benefits including improved waiting conditions for passengers, improved access onto and off vehicles for passengers, easier "docking" with kerbline and quicker boarding & alighting with some reductions in dwell times and hence overall journey times.

2.2.2. These benefits will increase the attractiveness of bus travel to the city centre which will increase bus demand and fare revenue. Valuations for bus quality factors, often referred to as "soft measures", are described in TAG A4-1 Social Impact Appraisal and values presented in the TAG Data Book for bus users and car users. These valuations are based on stated preference surveys but are presented in generalised minutes. They are behavioural values and therefore chiefly intended to be applied in modelling, in either mode choice models or in the assignment process, and can be used in an appraisal where bus quality factors are to be considered.

2.2.3. The generalised time values of the appropriate bus improvement proposals, shown in Table 3, would provide a saving of 3.54 generalised minutes. Bus travel to and from the city centre represents 4.5% of bus and car travel according to 2012 multi modal model data. Applying a logit mode share model (standard parameter value of -0.04) to the 3.54 minute generalised cost saving would result in bus share increasing to 5.2%, or by 14.4%.

2.2.4. Bus demand was therefore estimated to increase by 14.4% resulting in a corresponding increase in economic benefit of £23.91 per day in 2017, £39.14 per day in 2032 and £183.42 per day in 2074, based on the value of time benefits in Table 2.

Table 3: Bus Quality Benefit

Soft Measure	Value (minutes)
New Bus Shelters	1.08
New Bus with Low Floor	1.19
New Interchange Facilities	1.27
All	3.54

Source: TAG Data Bood Table M3.2.1: Segmented Values of Bus Quality Interventions (generalised minutes)

2.3. Public Realm

2.3.1. 2012 base year walk and cycle assignments for the 12 hour working day from the Hereford multi-modal transport model were used to identify the daily numbers of pedestrians and cyclists using Newmarket Street, Blueschool Street and Commercial Road. WebTAG journey quality benefit values appropriate for the proposed cycle and public realm improvements were then used to calculate daily monetary benefit.

2.3.2. Table A4.1.6 of the TAG Databook was used for the value of journey ambience benefit of cycle facilities and Table A4.1.7 for values of aspects in the pedestrian environment. Cycle and walk usage in person-minutes and person-km were calculated for each of the model links and summed to give total daily usage and multiplied by the benefit unit rates to give total daily benefit as shown in Table 4 and Table 5

Table 4: Cycle Journey Quality Benefit

Location	Scheme type	Value (p/min)	Daily Usage (Person-Mins)	Daily Benefit (£)
Commercial Road	On-road non-segregated cycle lane	2.97	592.82	17.61
Newmarket Street & Blueschool Street	Wider lane	1.81	596.60	10.80
All				28.41

Table 5: Walk Journey Quality Benefit

Location	Scheme type	Value (p/km)	Daily Usage (Person-km)	Daily Benefit (£)
Commercial Road	Kerb level & Pavement evenness	3.6	3412.37	123.57
Newmarket Street & Blueschool Street			2406.29	87.14
All				210.70

2.4. Transport Hub

2.4.1. The new transport hub next to the rail station is intended to provide a new terminus for country bus services plus some additional city services. The rail passenger interview survey data was expanded to the count of incoming passengers to identify daily numbers of rail passengers using bus to access the station. 2011 Census journey to work data was analysed to identify the residence locations of rail commuters in Hereford and it was found that 49% lived in areas served by country buses. It was recognised that only a small proportion of these would use a bus to access the station and 12.5% was assumed compared with 50% of those with access to city buses. This yielded the conservative estimate of 20% by country bus of rail commuters who use bus to access the station.

2.4.2. Daily walk time savings were then calculated assuming all the country bus services would terminate at the transport hub at the rail station using the walking distance saved from the country bus station to the transport hub. The rail interview survey gave an expanded average of 41 rail passengers per day over the three day survey using bus to access the station and 20%, or 7, of these were estimated to use country buses and would have a reduced walk with the new transport hub. This amounted to 6.8 km per day for both directions, or 1.37 hours per day assuming an average walking speed of 5 kph.

2.4.3. Rail value of time was calculated similarly to bus and gave values of £9.48 per hour in 2017, £12.61 per hour in 2032 and £42.65 per hour in 2076. Applying the values of time to the walk time savings gave total benefit of £13.33 per day in 2017, £21.80 per hour in 2032 and £102.13 per hour in 2076.

2.5. Demand Growth

2.5.1. The above benefits have been based on current non-motorised user demand obtained from the 2012 and 2014 survey data. With the redevelopment of the city centre and future development in and around Hereford there will be growth in rail, bus, cycle and walk trips in the city centre. Demand estimates for the 2032 forecast year were carried out for the multi modal model development and these used NTEM growth plus trip estimates for specific site developments identified in the Core Strategy and Local Plan.

2.5.2. These forecasts gave production and attraction trip ends by transport zone for personal travel by all modes for an average workday. The growth in travel to and from zones influenced by the bus, transport hub and public realm improvements was then identified, as shown in Table 6. It was assumed that non-motorised user demand would increase by the rate of 4.57% per year up to the 2032 year and there would be no growth for the remainder of the assessment period.

Table 6: Trip End Growth Forecasts

Zone	Daily Trip Productions & Attractions By All Modes	
	2012	2032
3	2,513	2,988
4	1,494	4,177
15	132	8,191
76	1,814	1,652
144	415	552
145	744	1,035
146	254	288
147	324	367
148	349	395
All	8,039	19,645
Growth	4.57% per year	

3. ECONOMIC BENEFIT

3.1. Discounted Benefits

3.1.1. The estimated daily benefit of the proposals to each of the non-motorised users (rail, bus, cycle and walk) for each forecast year were then summed to give total daily benefit to all non-motorised users and converted to annual benefit assuming 253 working weekdays per year.

3.1.2. The annual benefit amounts were then discounted to the DfT's 2010 base year using the recommended discount rates of 3.5% for the first 30 years and 3.0% for the following 30 years. Discount annual benefits were then summed to give a present value of £ 5,455,987 for non-motorised user benefits.

Table 7: Discounted Benefits

Year	Benefit (£/day)					Annual Benefit (£/yr)	Discount Factor	Discounted Annual Benefit (£)
	Transport Hub	Bus Stops	Public Realm		Total			
			Cycle	Walk				
2017	14.18	201.74	31.06	230.40	477.38	120,777	0.785991	94,930
2018	15.11	214.95	32.48	240.92	503.46	127,376	0.759412	96,731
2019	16.10	229.05	33.96	251.93	531.04	134,353	0.733731	98,579
2020	17.15	244.03	35.52	263.44	560.14	141,715	0.708919	100,464
2021	18.27	259.96	37.14	275.48	590.85	149,484	0.684946	102,389
2022	19.46	276.90	38.83	288.07	623.26	157,685	0.661783	104,353
2023	20.73	294.99	40.61	301.23	657.55	166,361	0.639404	106,372
2024	22.08	314.30	42.46	314.99	693.84	175,542	0.617782	108,447
2025	23.53	334.94	44.40	329.38	732.26	185,261	0.596891	110,581
2026	25.08	356.99	46.43	344.43	772.93	195,552	0.576706	112,776
2027	26.74	380.55	48.56	360.17	816.01	206,451	0.557204	115,035
2028	28.50	405.74	50.77	376.63	861.65	217,997	0.538361	117,361
2029	30.39	432.68	53.09	393.83	910.00	230,230	0.520156	119,755
2030	32.41	461.48	55.52	411.83	961.24	243,193	0.502566	122,221
2031	34.58	492.27	58.06	430.65	1015.54	256,933	0.485571	124,759
2032	36.89	525.19	60.71	450.32	1073.11	271,497	0.469151	127,373

2033	37.64	535.91	60.71	450.32	1084.58	274,399	0.453286	124,381
2034	38.41	546.92	60.71	450.32	1096.36	277,378	0.437957	121,480
2035	39.20	558.21	60.71	450.32	1108.44	280,435	0.423147	118,665
2036	40.01	569.78	60.71	450.32	1120.82	283,569	0.408838	115,934
2037	40.84	581.64	60.71	450.32	1133.51	286,779	0.395012	113,281
2038	41.69	593.83	60.71	450.32	1146.55	290,077	0.381654	110,709
2039	42.56	606.26	60.71	450.32	1159.86	293,444	0.368748	108,207
2040	43.45	618.96	60.71	450.32	1173.44	296,881	0.356278	105,772
2041	44.36	631.93	60.71	450.32	1187.32	300,391	0.34423	103,404
2042	45.30	645.33	60.71	450.32	1201.67	304,021	0.33259	101,114
2043	46.26	659.03	60.71	450.32	1216.32	307,729	0.321343	98,886
2044	47.24	673.01	60.71	450.32	1231.28	311,515	0.310476	96,718
2045	48.25	687.29	60.71	450.32	1246.57	315,381	0.299977	94,607
2046	49.27	701.87	60.71	450.32	1262.17	319,330	0.289833	92,552
2047	50.33	716.97	60.71	450.32	1278.33	323,416	0.280032	90,567
2048	51.41	732.38	60.71	450.32	1294.83	327,591	0.271875	89,064
2049	52.52	748.13	60.71	450.32	1311.68	331,855	0.263957	87,595
2050	53.65	764.22	60.71	450.32	1328.90	336,211	0.256269	86,160
2051	54.80	780.66	60.71	450.32	1346.49	340,661	0.248804	84,758
2052	56.00	797.72	60.71	450.32	1364.75	345,282	0.241558	83,406
2053	57.22	815.16	60.71	450.32	1383.41	350,004	0.234522	82,084
2054	58.47	832.98	60.71	450.32	1402.49	354,829	0.227691	80,792
2055	59.75	851.19	60.71	450.32	1421.98	359,760	0.22106	79,528
2056	61.06	869.80	60.71	450.32	1441.89	364,798	0.214621	78,293
2057	62.41	889.04	60.71	450.32	1462.48	370,008	0.20837	77,099
2058	63.79	908.71	60.71	450.32	1483.53	375,334	0.202301	75,930
2059	65.20	928.81	60.71	450.32	1505.05	380,777	0.196409	74,788

2060	66.64	949.36	60.71	450.32	1527.04	386,340	0.190688	73,670
2061	68.12	970.37	60.71	450.32	1549.51	392,027	0.185134	72,577
2062	69.63	991.89	60.71	450.32	1572.55	397,855	0.179742	71,511
2063	71.17	1013.85	60.71	450.32	1596.05	403,801	0.174506	70,466
2064	72.75	1036.30	60.71	450.32	1620.08	409,879	0.169424	69,443
2065	74.36	1059.24	60.71	450.32	1644.63	416,092	0.164489	68,443
2066	76.00	1082.70	60.71	450.32	1669.73	422,442	0.159698	67,463
2067	77.67	1106.47	60.71	450.32	1695.18	428,880	0.155047	66,496
2068	79.38	1130.77	60.71	450.32	1721.18	435,459	0.150531	65,550
2069	81.12	1155.61	60.71	450.32	1747.76	442,183	0.146146	64,623
2070	82.90	1180.99	60.71	450.32	1774.92	449,055	0.14189	63,716
2071	84.72	1206.92	60.71	450.32	1802.68	456,077	0.137757	62,828
2072	86.57	1233.17	60.71	450.32	1830.76	463,183	0.133745	61,948
2073	88.45	1259.98	60.71	450.32	1859.46	470,444	0.129849	61,087
2074	90.37	1287.38	60.71	450.32	1888.79	477,863	0.126067	60,243
2075	92.34	1315.38	60.71	450.32	1918.75	485,443	0.122395	59,416
2076	94.35	1343.98	60.71	450.32	1949.36	493,188	0.11883	58,606
							Total Discounted Benefit £	5,455,987

Note: 2010 prices discounted to 2010

3.2. Sensitivity Tests

3.2.1. The uncertainty inherent in the non-motorised user forecasts was assessed by considering the impact of high and low growth scenarios according to the method set out in Section 4.2 of WebTAG Unit M4 Forecasting & Uncertainty.

3.2.2. The high and low growth scenario forecasts were based on a proportion of base year demand added to or subtracted from the demand from the non-motorised user forecasts. The proportion of base year demand to be added is based on a parameter p, given as 1.5% for bus travel and 2.0% for rail travel and was calculated as p multiplied by the square root of number of years between the forecast and base years for up to 36 years. Parameter p values are not provided for active modes but Section 5 of WebTAG Unit A5.1 Active Mode Appraisal notes that the appraisal of walking and cycling schemes can be highly sensitive to the forecasts and assumptions used, and so a higher parameter p

value of 2.5% was used. The maximum proportions calculated for 36 years and more from the base year are shown in Table 8. Uncertainty factors were calculated in this way for each year and for each mode and applied to the discounted benefits giving total discounted benefits of £ 4,970,659 for the low and £ 5,984,805 for the high demand scenarios.

Table 8: Uncertainty Factors

Mode	Parameter p	Uncertainty Proportion	Uncertainty Factor	
			Low	High
Rail	2.0%	36^0.5 x 2.0% = +/- 12%	0.88	1.12
Bus	1.5%	36^0.5 x 1.5% = +/- 9%	0.91	1.09
Cycle	2.5%	36^0.5 x 2.5% = +/- 15%	0.85	1.15
Walk	2.5%	36^0.5 x 2.5% = +/- 15%	0.85	1.15

3.3. Unquantified Benefits

3.3.1. The improved waiting conditions for passengers will result in a reduction in perceived waiting time and the consequent increase in attractiveness of travel by bus will increase demand and fare revenue.

3.3.2. The new and relocated bus stop infrastructure and turnback facilities enabling re-routing of some bus services will also result in a marginal mode shift to bus, increased fare revenue, some bus operator benefits and wider highway decongestion benefits

3.3.3. The economic benefit assessment has not included these effects but they are likely to be relatively small.