APPENDIX 9.1 – GLOSSARY OF ACOUSTIC TERMINOLOGY

Glossary of Acoustic Terminology

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of (hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is presented in the table below.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A). Note that the time constant and the period of the noise measurement should be specified. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

Term	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds S1 and S2 is given by 20 log10 (S1/S2). The decibel can also be used to measure absolute quantities

Term	Description
	by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Fast Time Weighting	An averaging time used in sound level meters.
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).

APPENDIX 9.2 – SURVEY METHODOLOGY AND MEASUREMENT RESULTS

TECHNICAL APPENDIX 9.2

SURVEY METHODOLOGY AND MEASUREMENT RESULTS

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, in accordance with the principles of BS 7445[1] and following the guidance given in BS 4142. The noise parameters of $L_{Aeq,T}$, $L_{A90,T}$, $L_{A10,T}$, $L_{AFmax,T}$ and $L_{ASmax,T}$ were recorded during the measurement period.

The measurements were undertaken at a height of between 1.2 and 1.5 metres above local ground level and under free-field conditions. The acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[2]. A full inventory of the equipment is shown in the Table 9.1.

Table 9.1: Inventory of Acoustic Measurement Equipment		
Item	**Make & Model**	**Serial Numbers**
Sound Level Meters	Blue Solo	60582 & 60672
Calibrator	CAL 21	51231410

The noise measurement equipment used during the survey was calibrated at the start and end of the measurement period. The calibrator used had itself been calibrated by a UKAS accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on the sound level meter.

The microphone was fitted with a protective windshield for the measurement duration. Weather conditions during the survey were warm and dry and wind speeds of less than $5ms^{-1}$ in a south westerly direction.

Full tabulated measurement results for Measurement Positions 1 and 6 are presented in Tables 9.2 and 9.3.

[1] British Standard 7445: 2003: Description and measurement of environmental noise, HMSO

[2] British Standard 61672: 2003: Electroacoustics Sound lever meters, Part 1 Specifications, HMSO

Recorded Measurement Data

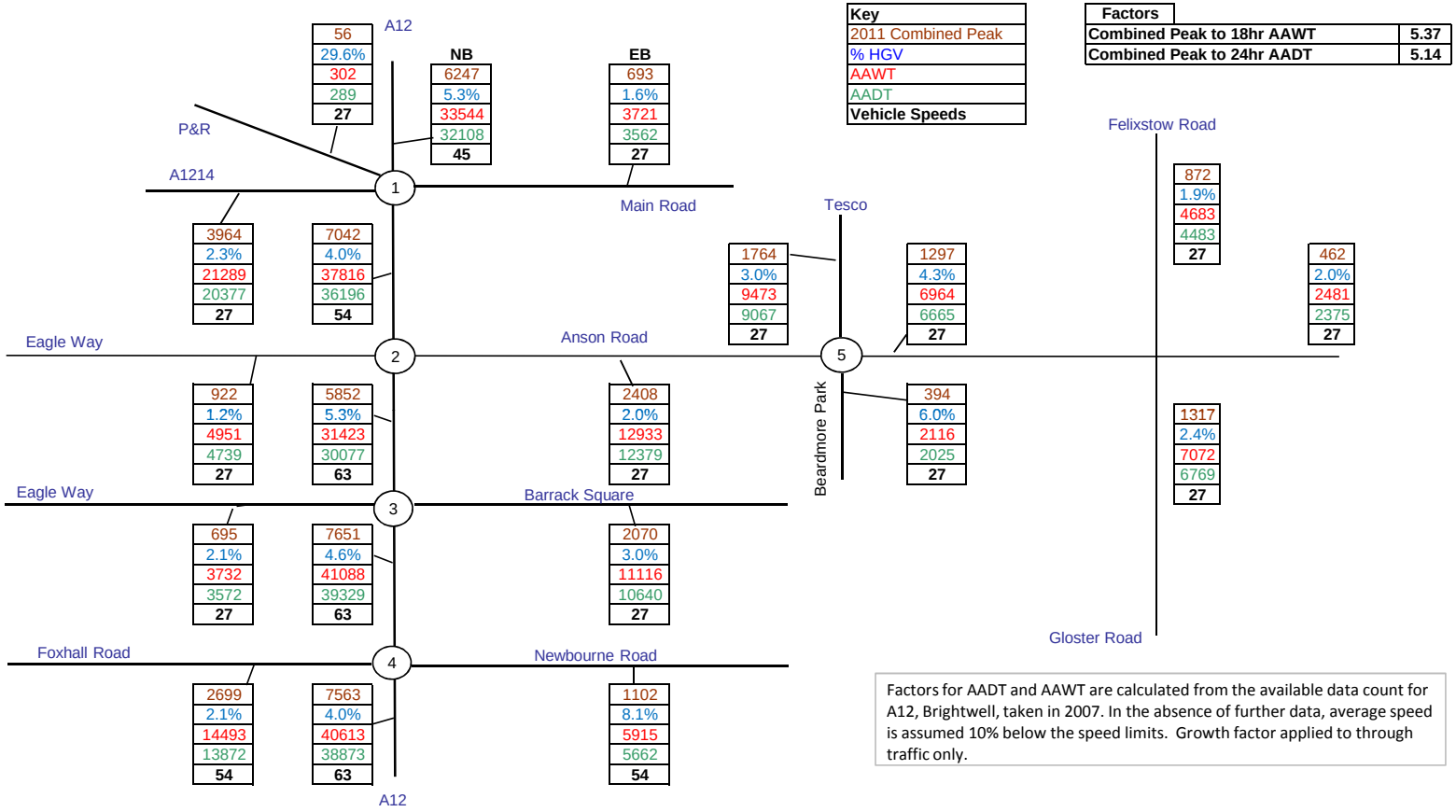
Table 9.2: Recorded Measurement Data – Noise Measurement Position 1				
Period	**Noise Levels, Free-field dB**			
	$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{AFmax}
08/04/2008 14:22	72	61	75	83
08/04/2008 14:52	72	62	75	88
08/04/2008 15:22	73	64	76	87
08/04/2008 16:22	74	68	77	82
08/04/2008 16:52	75	69	78	85
08/04/2008 17:22	75	69	77	81
08/04/2008 20:52	68	52	73	85
08/04/2008 21:22	67	51	72	82
08/04/2008 21:52	69	54	73	85
08/04/2008 22:22	66	47	71	81
08/04/2008 23:00	65	46	69	82
08/04/2008 23:30	63	39	64	84
09/04/2008 00:00	60	34	60	80
09/04/2008 00:30	57	34	56	78
09/04/2008 01:00	59	31	58	80
09/04/2008 01:30	58	32	57	78
09/04/2008 02:00	57	33	55	77
09/04/2008 02:30	57	30	55	78
09/04/2008 03:00	60	35	59	79
09/04/2008 03:30	63	37	65	82
09/04/2008 04:00	61	36	63	80
09/04/2008 04:30	66	43	70	83
09/04/2008 05:00	65	44	69	80
09/04/2008 05:30	69	52	74	85
09/04/2008 06:00	71	54	76	82
09/04/2008 06:30	73	62	78	83
09/04/2008 07:00	74	67	78	83
09/04/2008 07:05	73	62	77	81
09/04/2008 07:10	74	64	78	82
09/04/2008 07:15	75	66	78	82
09/04/2008 07:20	75	66	78	82

Table 9.2: Recorded Measurement Data – Noise Measurement Position 1				
Period	**Noise Levels, Free-field dB**			
	$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{AFmax}
09/04/2008 07:25	75	64	79	82
09/04/2008 07:30	75	66	78	82
09/04/2008 07:35	75	63	79	83
09/04/2008 07:40	76	69	79	83
09/04/2008 07:45	75	67	78	82
09/04/2008 07:50	76	68	79	83
09/04/2008 07:55	76	69	79	82
09/04/2008 08:00	76	71	79	82
09/04/2008 08:05	77	70	79	82
09/04/2008 08:10	76	68	79	83
09/04/2008 08:15	76	69	79	83
09/04/2008 08:20	74	65	78	81

Table 9.2: Recorded Measurement Data – Noise Measurement Position 6				
Period	**Noise Levels, Free-field dB**			
	$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{AFmax}
12/03/2009 09:07	62	58	64	67
12/03/2009 09:22	62	58	64	74
12/03/2009 09:37	61	58	63	67
12/03/2009 09:52	61	58	63	66
12/03/2009 10:07	62	58	63	67
12/03/2009 10:22	61	58	63	67
12/03/2009 10:37	61	58	63	67
12/03/2009 10:52	61	58	63	66
12/03/2009 11:07	62	58	64	67
12/03/2009 11:22	62	59	64	68
12/03/2009 11:37	62	59	64	66
12/03/2009 11:52	62	59	64	66
12/03/2009 12:07	64	61	65	68

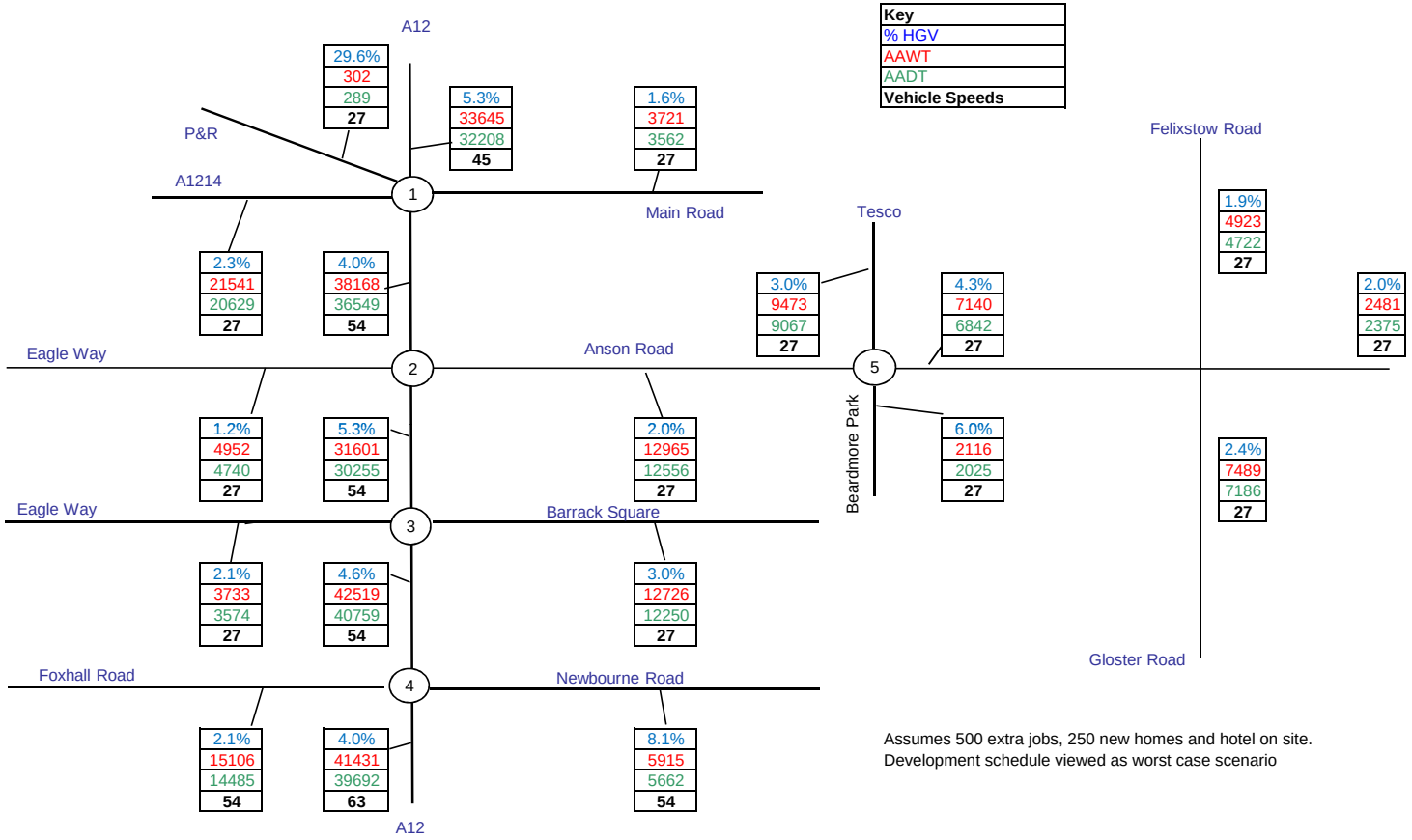
APPENDIX 9.3 – TRAFFIC DATA USED IN THE ASSESSMENT – SUPPLIED BY ITP

2011 Two Way Flows No Development



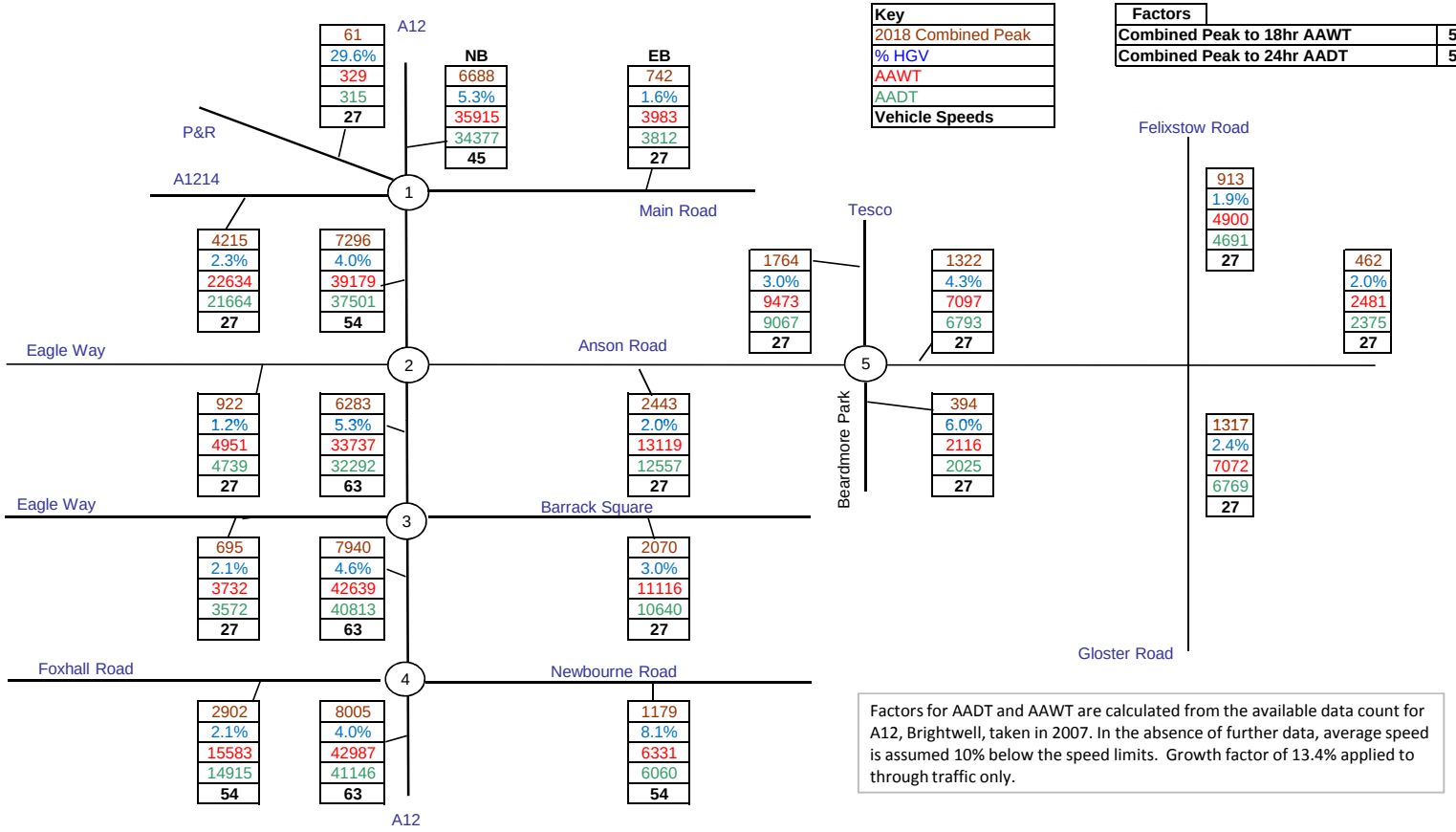
Factors for AADT and AAWT are calculated from the available data count for A12, Brightwell, taken in 2007. In the absence of further data, average speed is assumed 10% below the speed limits. Growth factor applied to through traffic only.

2011Two Way Flows With Development



Assumes 500 extra jobs, 250 new homes and hotel on site.
Development schedule viewed as worst case scenario

2018 Two Way Flows No Development

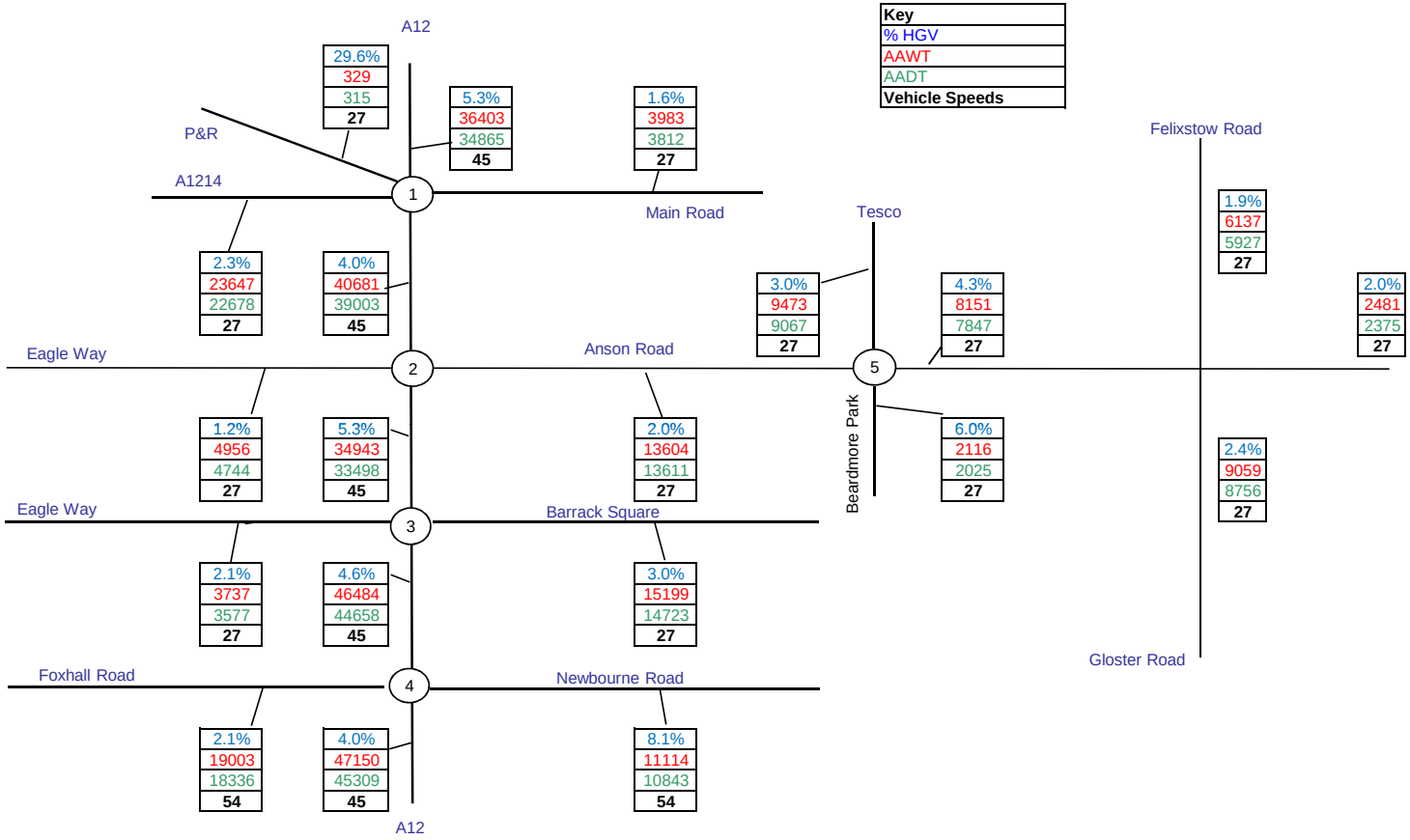


Key
2018 Combined Peak
% HGV
AAWT
AADT
Vehicle Speeds

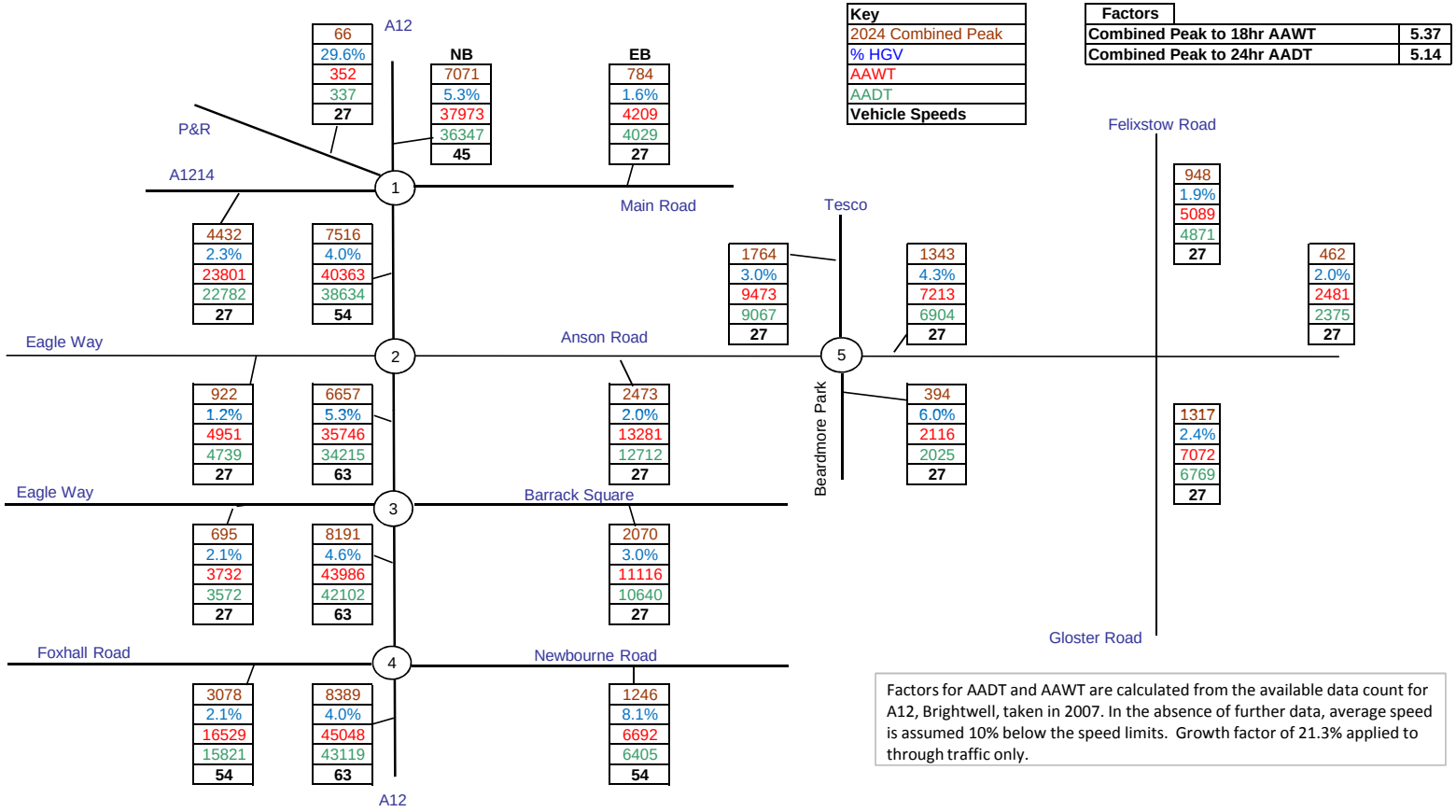
Factors	
Combined Peak to 18hr AAWT	5.37
Combined Peak to 24hr AADT	5.14

Factors for AADT and AAWT are calculated from the available data count for A12, Brightwell, taken in 2007. In the absence of further data, average speed is assumed 10% below the speed limits. Growth factor of 13.4% applied to through traffic only.

2018 Two Way Flows With Development



2024 Two Way Flows No Development

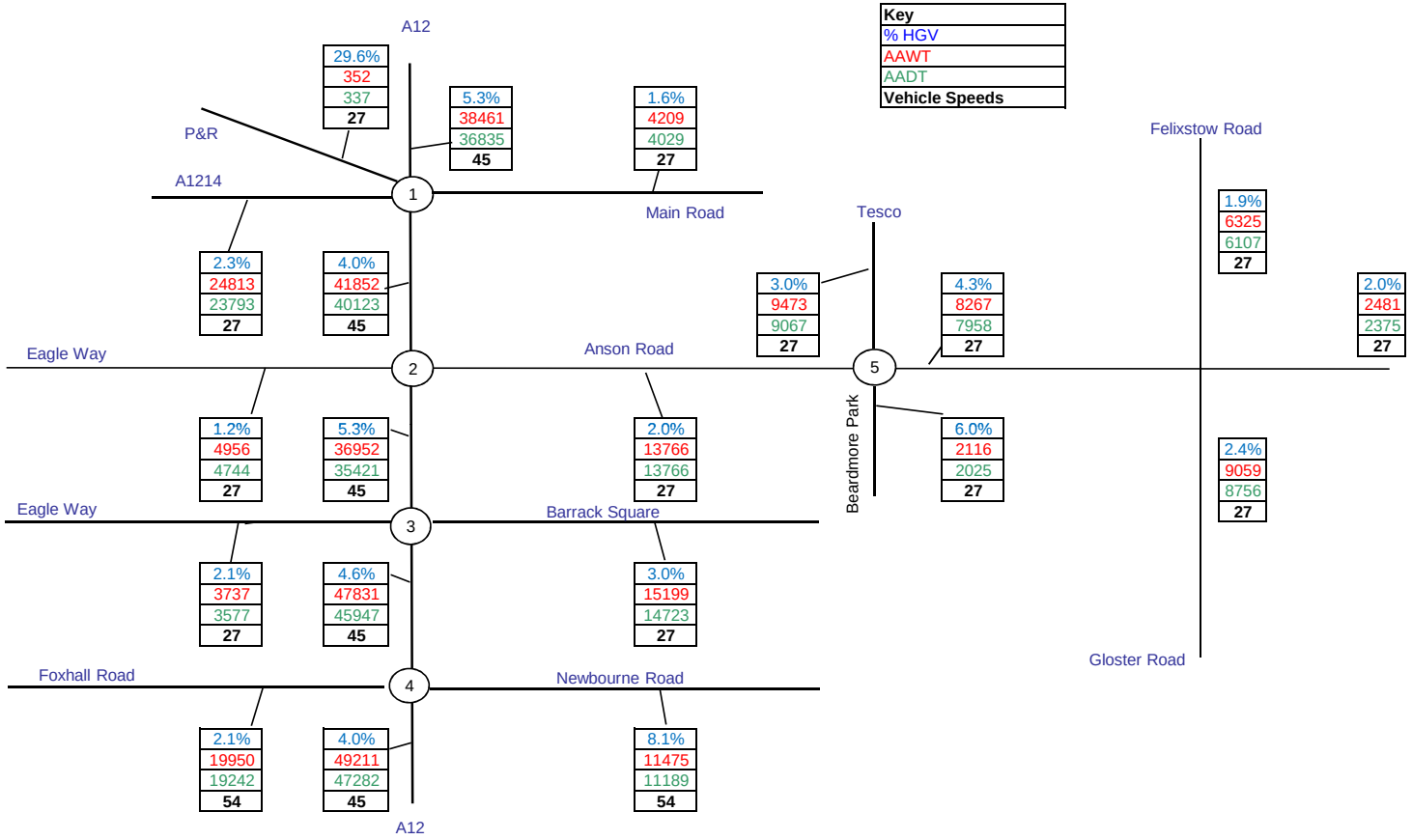


Key
2024 Combined Peak
% HGV
AAWT
AADT
Vehicle Speeds

Factors	
Combined Peak to 18hr AAWT	5.37
Combined Peak to 24hr AADT	5.14

Factors for AADT and AAWT are calculated from the available data count for A12, Brightwell, taken in 2007. In the absence of further data, average speed is assumed 10% below the speed limits. Growth factor of 21.3% applied to through traffic only.

2024 Two Way Flows With Development



APPENDIX 9.4 – DEMOLITION AND CONSTRUCTION PLANT USED FOR NOISE PREDICTIONS

TECHNICAL APPENDIX 9.4

DEMOLITION AND CONSTRUCTION PLANT USED FOR NOISE PREDICTIONS

Table 9.4.1: Construction Plant and Source Noise Levels Assumed (Demolition)		
Activity	**Source Reference**	**L_{Aeq} dB (10m)**
Pulveriser on Excavator	BS5228 C1, 9	90
Handheld Pneumatic Breaker	BS5228 C1, 6	83
Tracked Excavator (Loading Rubble Dump Truck)	BS 5228 C1, 10	85
Tracked Excavator (Spreading Rubble)	BS 5228 C1, 12	82
Tracked Crusher (Concrete)	BS 5228 C1, 14	82
Gas Cutter (Steel)	BS 5228 C1, 18	79
Breaking Windows	BS 5228 C1, 20	81
Dump Truuck (Dumping Rubble)	BS 5228 C1, 11	80

Table 9.4.2: Construction Plant and Source Noise Levels Assumed (Site Preparation)		
Activity	**Source Reference**	**L_{Aeq} dB (10m)**
Tracked Excavator (clearing)	BS5228 C2,5	76
Dozer (Earthworks)	BS5228 C2,10	80
Tracked Excavator (excavation)	BS5228 C2,16	75
Dump Truck (Tipping Fill)	BS5228 C2,30	79
Dozer (Towing Roller)	BS5228 C2,36	81
Vibratory Plate	BS5228 C2,41	80
Hydraulic Vibratory Compactor	BS5228 C2,42	78
Water Pump	BS5228 C2,45	65

Table 9.4.3: Construction Plant and Source Noise Levels Assumed (Sub-structure)		
Activity	**Source Reference**	**L_{Aeq} dB (10m)**
CFA - Crawler Mounted Rig	BS5228 C3, 22	80

Table 9.4.3: Construction Plant and Source Noise Levels Assumed (Sub-structure)		
Activity	**Source Reference**	**L_{Aeq} dB (10m)**
CFA - Tracked excavator (cage insertion)	BS5228 C3, 24	74
CFA - Concrete Pump	BS5228 C3, 25	78
Tracked Mobile crane	BS5228 C3, 29	70
Handheld Gas Cutter	BS5228 C3, 35	65
Generator	BS5228 C3, 22	73
Concrete Mixer Pump Discharging & Pumping	BS5228 C4, 28	75
Sheet Steel piling (hydraulic)	BS5228 C3, 9	63
Power Pack	BS5228 C3, 10	68
Pump Boom and Vibrating Poker	BS5228 C4, 36	71

Table 9.4.4: Construction Plant and Source Noise Levels Assumed (Super-structure)		
Activity	**Source Reference**	**L_{Aeq} dB (10m)**
Concrete Mixer Pump Discharging & Pumping	BS5228 C4, 28	77
Pump Boom and Vibrating Poker	BS5228 C3, 36	71
Mobile telescopic crane	BS5228 C4,41	71
Concrete Cutting (circular saw)	BS5228 C4,70	91
Generator	BS5228 C4, 86	65

Table 9.4.5: Construction Plant and Source Noise Levels Assumed (Roads)		
Activity	**Source Reference**	**L_{Aeq} dB (10m)**
Road Planer	BS5228 C5, 7	82
Spreading Shipping/Fill (Dozer)	BS5228 C5, 12	80
Earth Works (Tracked Excavator)	BS5228 C5, 18	80
Vibratory Roller	BS5228 C5, 21	80