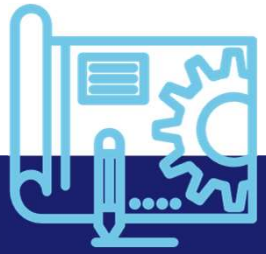
Transport Infrastructure Ireland

Update to PE-SMG-02002 Traffic Assessment for Pavement Design



Kevin Crawley – March 2026

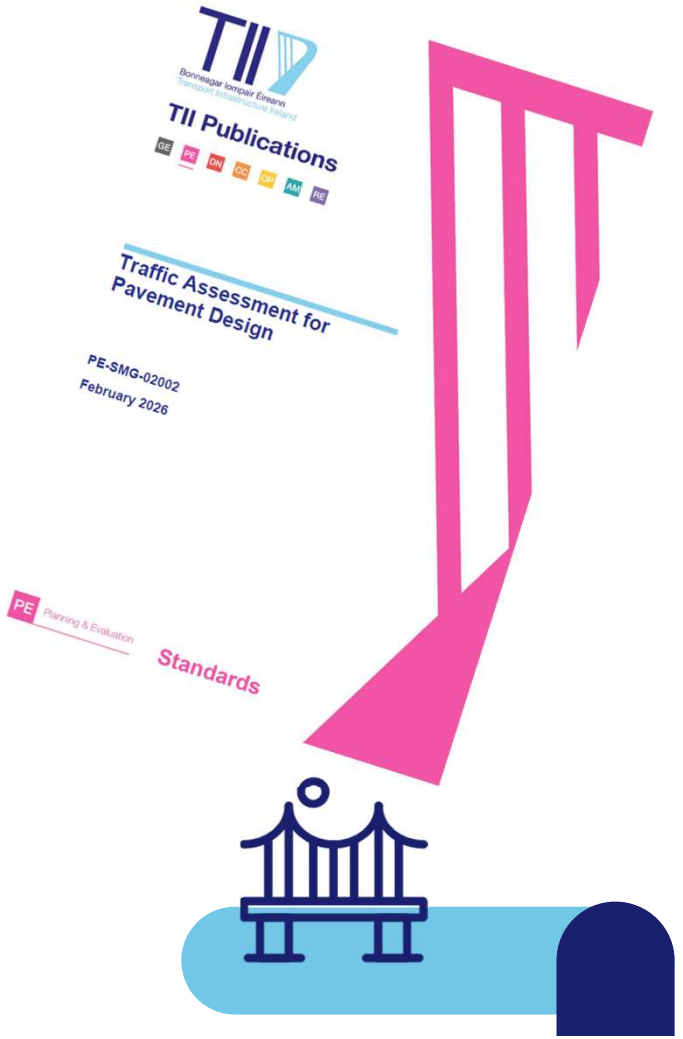
Traffic Assessment for Pavement Design

PE-SMG-02002

Overview of the Standard:

- Used to calculate the Design Traffic (expressed in millions of equivalent passes of a standard 80kN commercial vehicle axle), for both new and existing road schemes using:
  - Commercial Vehicle Flow predicted to be using the heaviest loaded lane at the opening year;
  - required Design Period;
  - Growth rates converted to Growth Factors; and
  - Wear Factors bespoke to Ireland.

- Used to also calculate the relevant traffic flows (AADF) for the determination of PSV and AAV requirements of the coarse aggregates or chippings for new surface courses within DN-PAV-03023.



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Traffic Assessment for Pavement Design PE-SMG-02002

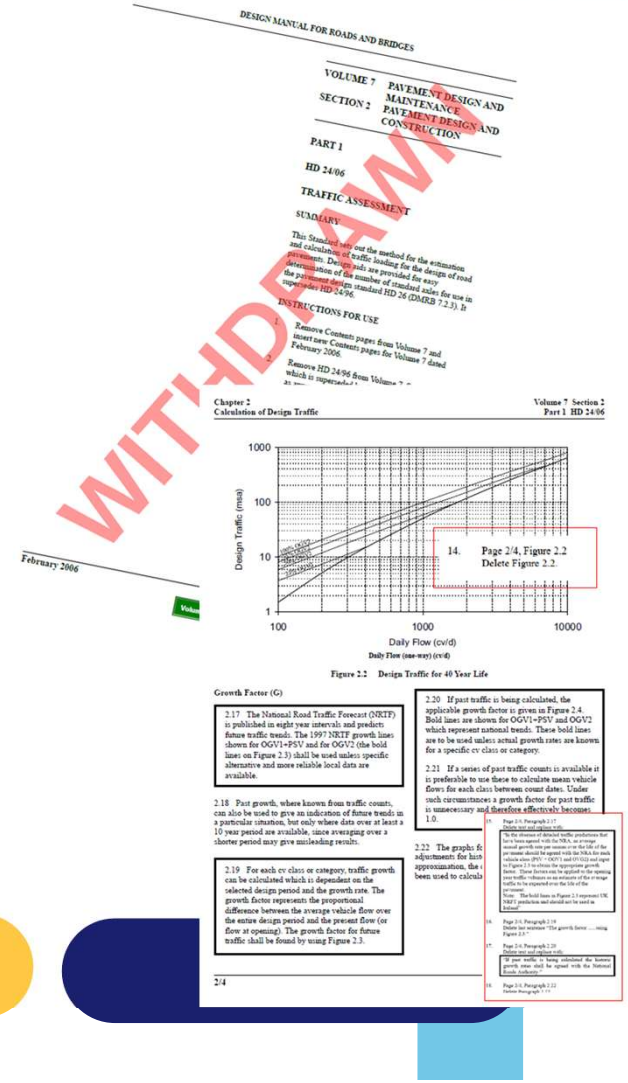
Reasons for Update

Traffic Assessment for Pavement Design

Reasons for Update

Previous Version

- Addendum to UK Highways Agency HD24/06 – 15 & 20 years old!!!
- UK HD24/06 has been updated several times in the intervening period – now CD224
- Based on UK practice and data
- Use of addendum & HD24/06 was difficult to read and follow
- Reliance on consultation with TII for agreements e.g. traffic growth parameters etc.
- Not aligned or consistent with TII PAG documents



Traffic Assessment for Pavement Design

Reasons for Update

Aims

- To deliver a fully rewritten, comprehensive, simple and concise, clear and unambiguous, robust (future-proofed) standard;
- To provide a new traffic assessment for pavement design standard that is bespoke to Ireland and not linked to UK standards or practice;
- To achieve reduced consultation with TII for agreement(s); and
- To facilitate digitalisation for improved quality, by adding equations to existing graphs or otherwise replacing graphs where suitable, to support the use of spreadsheets for calculations.

✓ Comprehensive

✓ Simple and concise

✓ Clear and unambiguous

✓ Robust (future-proofed)

✓ Bespoke to Ireland

✓ Reduced consultation with TII

✓ Facilitates digitalisation for improved quality

Traffic Assessment for Pavement Design PE-SMG-02002

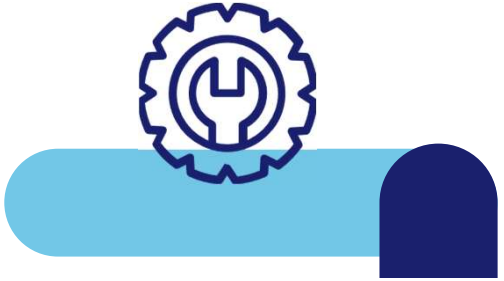
Key Changes & Updates

Traffic Assessment for Pavement Design

Key Changes & Updates

General Changes:

- Changed document title from ‘Traffic Assessment’ to ‘Traffic Assessment for Pavement Design’
- Used new standards template and followed the new drafting rules and formatting.
- Now an independent standard instead of an addendum to an external standard.
- Provision of Glossary of Terms, Abbreviations and Acronyms to assist understanding of users



Traffic Assessment for Pavement Design

Key Changes & Updates

Design Period

- For new road schemes, the design period (Y) shall be the number of years over which traffic is to be assessed (future traffic) as defined in DN-PAV-03021 (i.e. 40 years).

- For existing road schemes, the design period (Y) shall be the minimum structural life required after treatment (future traffic) as defined in AM-PAV-06050 (usually 20 years but can be reduced to 10 years in certain circumstances).

Traffic Assessment for Pavement Design

Key Changes & Updates

Commercial Vehicle Flows

- Commercial Vehicle Flow (CVF) at the **opening year** used to determine the design traffic. (Numerical symbol for CVF is "F").
- AADF (1-way traffic) is the average daily traffic volume in one direction comprising the sum of all vehicles (motorbikes, cars, light goods vehicles, caravan and commercial vehicles).
- CVF is the AADF limited to commercial vehicles (>3.5 tonnes max gross vehicle weight)
- CVF shall, where data is available, be grouped either by commercial vehicle (cv) class or cv category according to the number of axles or articulation
- Updated traffic classification (from UK specific) to now align to TII's freely available online and extensive network of TII Traffic Monitoring Unit (TMU) sites across the national road network.

Table 3.1 – Commercial vehicle classes and categories

Commercial vehicle (cv)	cv class*	cv category
	Buses and coaches	**BUS** (formerly PSV)
	2-axle rigid	**HGV_RIG** (formerly OGV1, but including 4-axle rigid vehicles)
	3-axle rigid	
	4 (or more) axle rigid	
	3-axle articulated	**HGV_ART** (formerly OGV2, but excluding 4-axle rigid vehicles)
	4-axle articulated	
	5-axle articulated	
	6 (or more) axle articulated	

*Classed by axles in contact with the road
PSV = Public service vehicles
OGV = Other goods vehicles

Traffic Assessment for Pavement Design

Commercial Vehicle Flows

New Road Scheme

- A new carriageway or on-line widening. This type of scheme includes major and minor schemes, as defined in PE-PMG-02041; and local improvement schemes, urban renewal schemes and safety improvement schemes (where not forming part of a PARR scheme), as defined in DN-GEO-03030.

- Requires a Transport Model as per PE-PAG-02014 Unit 5.0 – Scoping of Transport Modelling

- CVF shall be determined for each modelled year using the appropriate transport model and associated modelling report

- Requires a minimum percentage of HGV_ART category vehicles as per Figure 3.1 for new road schemes

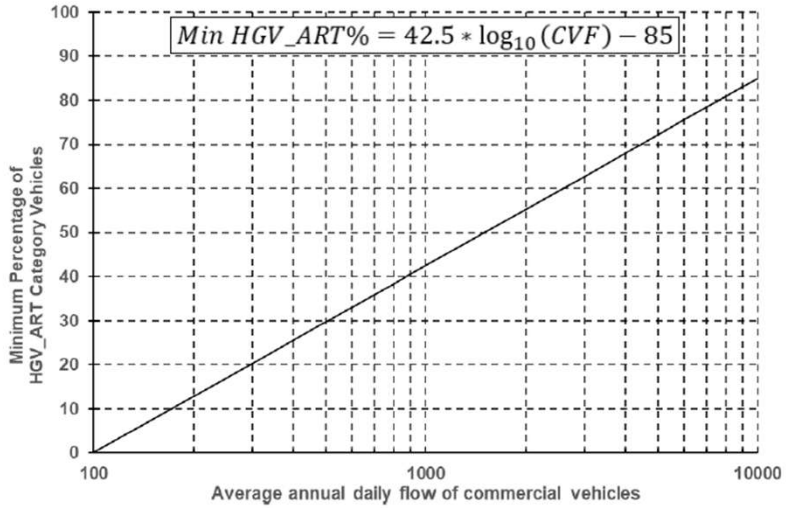


Figure 3.1 – Minimum percentage of HGV_ART category vehicles for new road schemes

Traffic Assessment for Pavement Design

Commercial Vehicle Flows

Existing Road Scheme

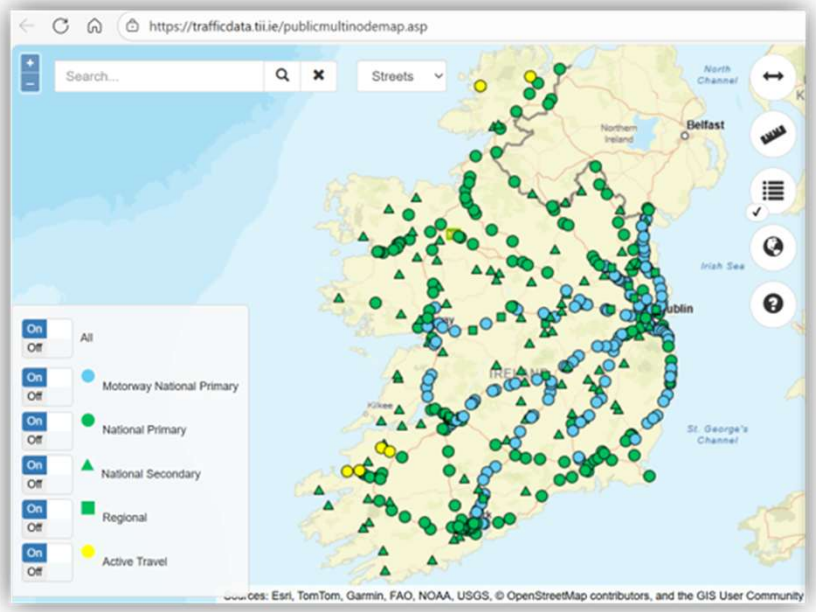
- A pavement asset repair and renewal (PARR) scheme, pavement maintenance scheme, or associated treatments required under TII policy for the management of skid resistance on national roads. Retains some or all of the existing pavement that has received past traffic.

- Determination of CVF

  - Current transport model (if available)

  - Suitable and relevant existing traffic data including TII Traffic Monitoring Units (using most recent 12 months of reliable available data)

  - Scheme specific classified traffic counts over a minimum 14-day period during a neutral period as per PE-PAG-02016 (Unit 5.2)



Traffic Assessment for Pavement Design

Growth Rate(s) to Growth Factor(s)

Annual Growth Rate(s)

- Scheme-specific annual growth rate(s) should be calculated where possible
  - ➢ Calculated Growth Rate – calculated from Transport Model
- Otherwise, a standard county-specific or metropolitan-specific annual growth rate should be used.
  - ➢ Standard Growth Rate – from Tables in PE-PAG-02017 (Unit 5.3)

Table 6.2: Link-Based Growth Rates: County Annual Growth Rates (excluding Metropolitan Area)

County	Low Sensitivity Growth Rates						Central Growth Rates						High Sensitivity Growth Rates					
	2016-2030		2030-2040		2040-2050		2016-2030		2030-2040		2040-2050		2016-2030		2030-2040		2040-2050	
	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV
Dublin	1.0163	1.0303	1.0046	1.0123	1.0036	1.0143	1.0180	1.0317	1.0062	1.0139	1.0050	1.0158	1.0211	1.0348	1.0100	1.0170	1.0099	1.0250
Kildare	1.0180	1.0363	1.0044	1.0135	1.0035	1.0169	1.0197	1.0378	1.0062	1.0155	1.0053	1.0187	1.0229	1.0413	1.0098	1.0191	1.0107	1.0283
Laois	1.0130	1.0265	1.003	1.0105	1.0018	1.0136	1.014	1.0280	1.0047	1.0125	1.003	1.0155	1.0179	1.0314	1.0082	1.0160	1.0090	1.0248
Longford	1.0119	1.0298	1.0019	1.0104	1.0000	1.0138	1.0134	1.0313	1.0038	1.0124	1.0027	1.0157	1.0167	1.0347	1.0072	1.0161	1.0073	1.0256
Louth	1.0134	1.0347	1.0054	1.0153	1.0048	1.0180	1.0148	1.0363	1.0070	1.0174	1.0063	1.0198	1.0177	1.0397	1.0100	1.0211	1.0103	1.0295
Meath	1.0156	1.0349	1.0052	1.0164	1.0043	1.0189	1.0173	1.0365	1.0070	1.0186	1.0059	1.0207	1.0205	1.0400	1.0108	1.0226	1.0116	1.0304
Offlay	1.0103	1.0307	1.0021	1.0119	1.0014	1.0158	1.0118	1.0323	1.0042	1.0139	1.0033	1.0176	1.0152	1.0357	1.0081	1.0176	1.0100	1.0272
Westmeath	1.0145	1.0300	1.0042	1.0126	1.0033	1.0156	1.0161	1.0316	1.0062	1.0147	1.0053	1.0176	1.0194	1.0352	1.0101	1.0185	1.0100	1.0279
Wicklow	1.0140	1.0361	1.0033	1.0153	1.0029	1.0185	1.0157	1.0377	1.0051	1.0173	1.0047	1.0204	1.0189	1.0412	1.0091	1.0211	1.0110	1.0305
Cavan	1.0098	1.0295	1.0024	1.0108	1.0010	1.0140	1.0112	1.0311	1.0041	1.0127	1.0028	1.0158	1.0141	1.0345	1.0076	1.0164	1.0084	1.0256
Donegal	1.0097	1.0270	1.0024	1.0123	1.0017	1.0142	1.0111	1.0286	1.0039	1.0141	1.0035	1.0161	1.0139	1.0320	1.0072	1.0178	1.0094	1.0258
Galway	1.0243	1.0430	1.0087	1.0177	1.0088	1.0218	1.0259	1.0446	1.0109	1.0198	1.0105	1.0236	1.0294	1.0480	1.0148	1.0236	1.0181	1.0336
Leitrim	1.0044	1.0299	0.9973	1.0105	0.9927	1.0140	1.0060	1.0313	0.9990	1.0124	0.9971	1.0157	1.0090	1.0348	1.0025	1.0161	1.0029	1.0257
Mayo	1.0111	1.0314	1.0009	1.0128	1.0005	1.0173	1.0127	1.0330	1.0028	1.0148	1.0026	1.0192	1.0161	1.0364	1.0063	1.0186	1.0097	1.0290
Monaghan	1.0103	1.0236	1.0032	1.0093	1.0021	1.0119	1.0115	1.0252	1.0047	1.0112	1.0041	1.0138	1.0141	1.0285	1.0079	1.0147	1.0080	1.0234
Roscommon	1.0092	1.0267	1.0012	1.0115	1.0001	1.0152	1.0107	1.0284	1.0031	1.0135	1.0022	1.0172	1.0142	1.0318	1.0069	1.0174	1.0075	1.0270
Sligo	1.0133	1.0307	1.0028	1.0118	1.0018	1.0154	1.0147	1.0323	1.0045	1.0136	1.0041	1.0171	1.0178	1.0357	1.0082	1.0173	1.0107	1.0268
Carlow	1.0116	1.0309	1.0027	1.0124	1.0016	1.0161	1.0133	1.0324	1.0047	1.0144	1.0034	1.0178	1.0165	1.0359	1.0085	1.0180	1.0093	1.0275
Clare	1.0139	1.0402	1.0019	1.0138	1.0011	1.0179	1.0156	1.0417	1.0038	1.0157	1.0029	1.0197	1.0191	1.0451	1.0075	1.0193	1.0105	1.0292
Cork	1.0173	1.0361	1.0067	1.0141	1.0059	1.0181	1.0189	1.0377	1.0087	1.0160	1.0078	1.0200	1.0223	1.0411	1.0124	1.0197	1.0154	1.0297
Kerry	1.0094	1.0269	0.9990	1.0094	0.9983	1.0129	1.0111	1.0285	1.0011	1.0113	1.0000	1.0146	1.0144	1.0319	1.0048	1.0150	1.0079	1.0245
Kilkenny	1.0108	1.0253	1.0016	1.0109	1.0006	1.0147	1.0124	1.0268	1.0037	1.0129	1.0027	1.0166	1.0157	1.0302	1.0075	1.0166	1.0087	1.0261
Limerick	1.0199	1.0307	1.0071	1.0110	1.0069	1.0158	1.0215	1.0323	1.0092	1.0130	1.0088	1.0177	1.0249	1.0357	1.0129	1.0167	1.0163	1.0274
Tipperary	1.0102	1.0290	1.0019	1.0096	1.0008	1.0136	1.0119	1.0306	1.0037	1.0116	1.0027	1.0155	1.0152	1.0340	1.0073	1.0152	1.0084	1.0250
Waterford	1.0154	1.0342	1.0059	1.0157	1.0053	1.0203	1.0171	1.0358	1.0079	1.0179	1.0073	1.0220	1.0205	1.0393	1.0119	1.0218	1.0143	1.0319
Wexford	1.0051	1.0196	0.9999	1.0096	0.9989	1.0122	1.0068	1.0211	1.0022	1.0116	1.0006	1.0140	1.0100	1.0245	1.0060	1.0152	1.0077	1.0232

Traffic Assessment for Pavement Design

Growth Rate(s) to Growth Factor(s)

Annual Growth Rate(s)

- There are 2 separate ways to establish the growth factor(s) from the growth rate(s):
  - ➢ Growth Factor for year y, i.e. a growth factor that applies to every individual year; or
  - ➢ Average growth factor over a defined period, i.e. the average annual growth factor that applies over a defined period of one or more years within the design period, where the annual growth rate remains constant.
- Flow chart (Figure 4.1) to provide guidance to user

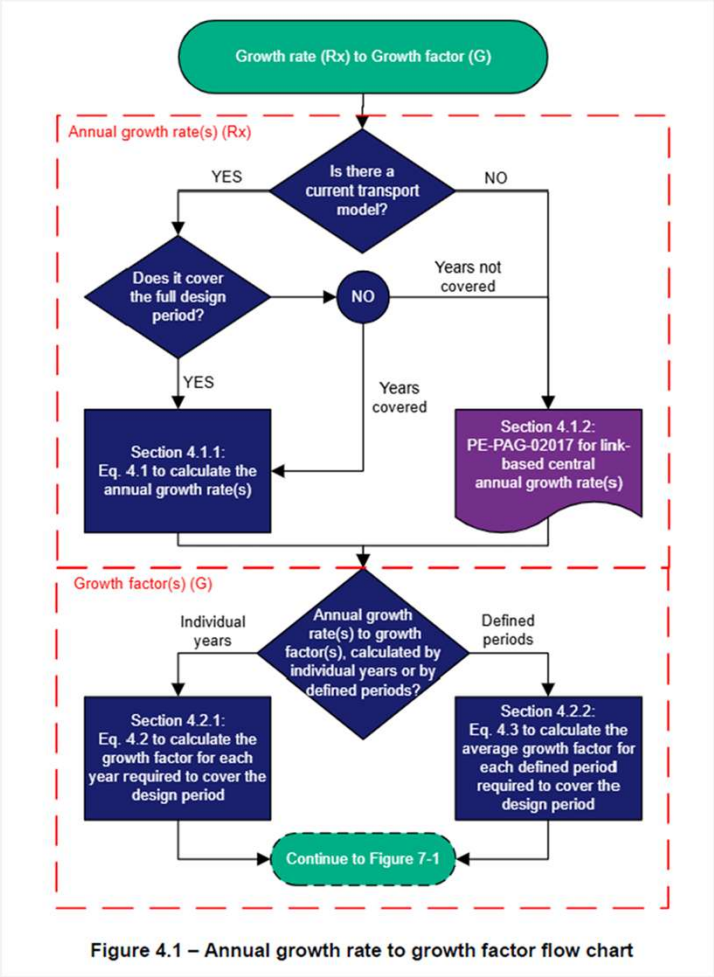


Figure 4.1 – Annual growth rate to growth factor flow chart

Traffic Assessment for Pavement Design

Growth Rate(s) to Growth Factor(s)

Example Calculation

Table B.7 – Calculation of combined growth factor over the design period for an existing road scheme

Design period (year no.)	Annual growth rate (R_x)	&	Growth factor for each year [Eq. 4.2] ($G_y = \prod_{x=1}^{x=n}(R_x)^i$)	or	Defined period (year no.)	Growth factor in year no.1 of defined period [Eq. 4.2] (G_{1x})	No. years in defined period (i_x)	Average annual growth factor over defined period [Eq. 4.3] ($G_{ix} = \left(\frac{(R_x)^{ix}-1}{R_x-1}\right)/i_x$)	Growth factor in each defined period ($G_{1x} * i_x * G_{ix}$)
1	1.0154		1.0154		1	1.0154			
2	1.0154		1.0310		2	-	3	1.0155	3.0934
3	1.0154		1.0469		3	-			
4	1.0139		1.0615		1	1.0615			
5	1.0139		1.0762		2	-			
6	1.0139		1.0912		3	-			
7	1.0139		1.1063		4	-			
8	1.0139		1.1217		5	-			
9	1.0139		1.1373		6	-	10	1.0649	11.3039
10	1.0139		1.1531		7	-			
11	1.0139		1.1692		8	-			
12	1.0139		1.1854		9	-			
13	1.0139		1.2019		10	-			
14	1.0115		1.2157		1	1.2157			
15	1.0115		1.2297		2	-			
16	1.0115		1.2438		3	-			
17	1.0115		1.2581		4		7	1.0352	8.8094
18	1.0115		1.2726		5				
19	1.0115		1.2872		6	-			
20	1.0115		1.3020		7	-			
			$\sum_{y=1}^{y=Y} G_y$ = 23.2062 Growth factor over the design period						$\sum_{x=1}^{x=n} G_{1x} * i_x * G_{ix}$ = 23.2067 Growth factor over the design period

Traffic Assessment for Pavement Design

Key Changes & Updates

Wear Factor (W)

- Previous WP4.2h – Traffic Classification in Pavement Design determined updated wear factors applicable to the commercial vehicle (cv) category of BUS, HGV_RIG and HGV_ART in use on TII's road network
- Updated wear factors now incorporated into the updated PE-SMG-02002.
- New cv category combined - where traffic data not available to determine cv class or category

Table 5.1 – Wear factors for commercial vehicle classes and categories

Commercial vehicle (cv)		Wear factor
cv class	Buses and coaches	2.0
	2-axle rigid	0.4
	3-axle rigid	2.3
	4-axle rigid	3.0
	3 and 4-axle articulated	1.7
	5-axle articulated	2.9
	6 (or more) axle articulated	3.7
cv category	BUS	2.0
	HGV_RIG	0.8
	HGV_ART	2.8
cv category combined	BUS	2.6
	HGV_RIG	
	HGV_ART	

NOTE The 'cv category combined' wear factor represents a conservative combination of the cv category that assumes a minimum 70% HGV_ART.

Traffic Assessment for Pavement Design

Key Changes & Updates

Percentage of Commercial Vehicles in the Heaviest Loaded Lane

- For new road schemes and existing road schemes, all lanes, including the hard shoulder, shall be designed to carry the same future design traffic as the heaviest loaded lane.
- Where there is data available, through the traffic monitoring units (TMU) or transport model, to determine the percentage of vehicles in the heaviest loaded lane (P) at the opening year, that data shall be used.
- Where no data available use Table 6.1

Table 6.1 – Assumed proportion of commercial vehicles in the heaviest loaded lanes

Number of lanes (in one direction)	Flow (F) (cv/day)	P (%)
1	Over 0	P = 100
2 or 3	Up to 5,000	P = 100 – (0.0036 x F)
	Over 5,000 up to 25,000	P = 89 – (0.0014 x F)
	Over 25,000	P = 54
4 or more	Up to 10,500	P = 100 – (0.0036 x F)
	Over 10,500 up to 25,000	P = 75 – (0.0012 x F)
	Over 25,000	P = 45

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Traffic Assessment for Pavement Design PE-SMG-02002

Calculation of Design Traffic

Traffic Assessment for Pavement Design

Design Traffic

Calculation of Future Cumulative Design Traffic

- Flow Chart – Figure 7.1

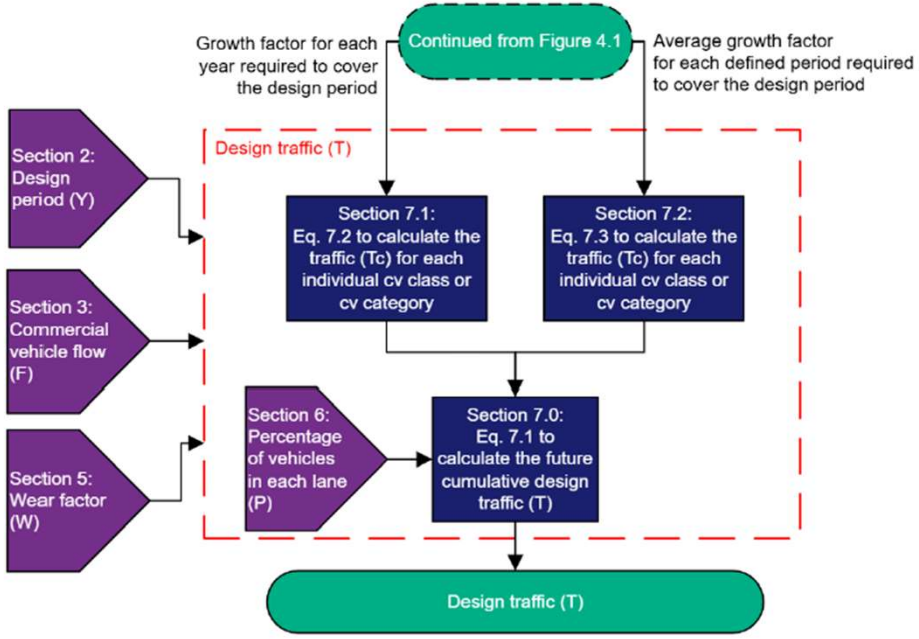

Figure 7.1 – Growth factor(s) to design traffic flow chart

- Equation 7.1

$$T = P * \sum T_c \qquad \text{Equation 7.1}$$

where:

T = total pavement design traffic loading (msa), summed for all cv classes or cv categories over the design period

P = percentage of cv in the heaviest loaded lane, in accordance with **Section 6.1**

T_c = pavement traffic loading (msa), either for the sum of individual years throughout the design period, or the sum of one or more defined periods covering the entirety of the design period, for each individual cv class or cv category.

Traffic Assessment for Pavement Design

Design Traffic

Calculation of Future Cumulative Design Traffic

Table B.8 – Calculation of design traffic over the design period for an existing road scheme

Commercial vehicle (cv) class or cv category or cv combined	CVF at opening year (F_0)	Wear factor (W)	Growth factor over the design period $(\sum_{y=1}^{y=Y} G_y)$ or $(\sum_{x=1}^{x=n} G_{1x} * i_x * G_{ix})$	Weighted future cv traffic (T_c) in msa
BUS	23	2.0		0.39
HGV_RIG	139	0.8	23.2067	0.94
HGV_ART	715	2.8		16.96
	Total weighted future cv traffic in all lanes (ΣT_c)			18.29 msa
	Number of lanes			2
	cv in the heaviest loaded lane (P)			92.00 %
	Design traffic (T)			16.83 msa

where:

$T_c = F_0 * W * 10^{-6} * 365 * [\sum_{y=1}^{y=Y} G_y \text{ or } \sum_{x=1}^{x=n} G_{1x} * i_x * G_{ix}]$ **[Equation 7.2** or **Equation 7.3]**

Design traffic (T) = $\Sigma T_c * P$ **[Equation 7.1** and **Section 6.1]**

Output: design traffic (T), in the heaviest loaded lane = 16.83 million standard axles

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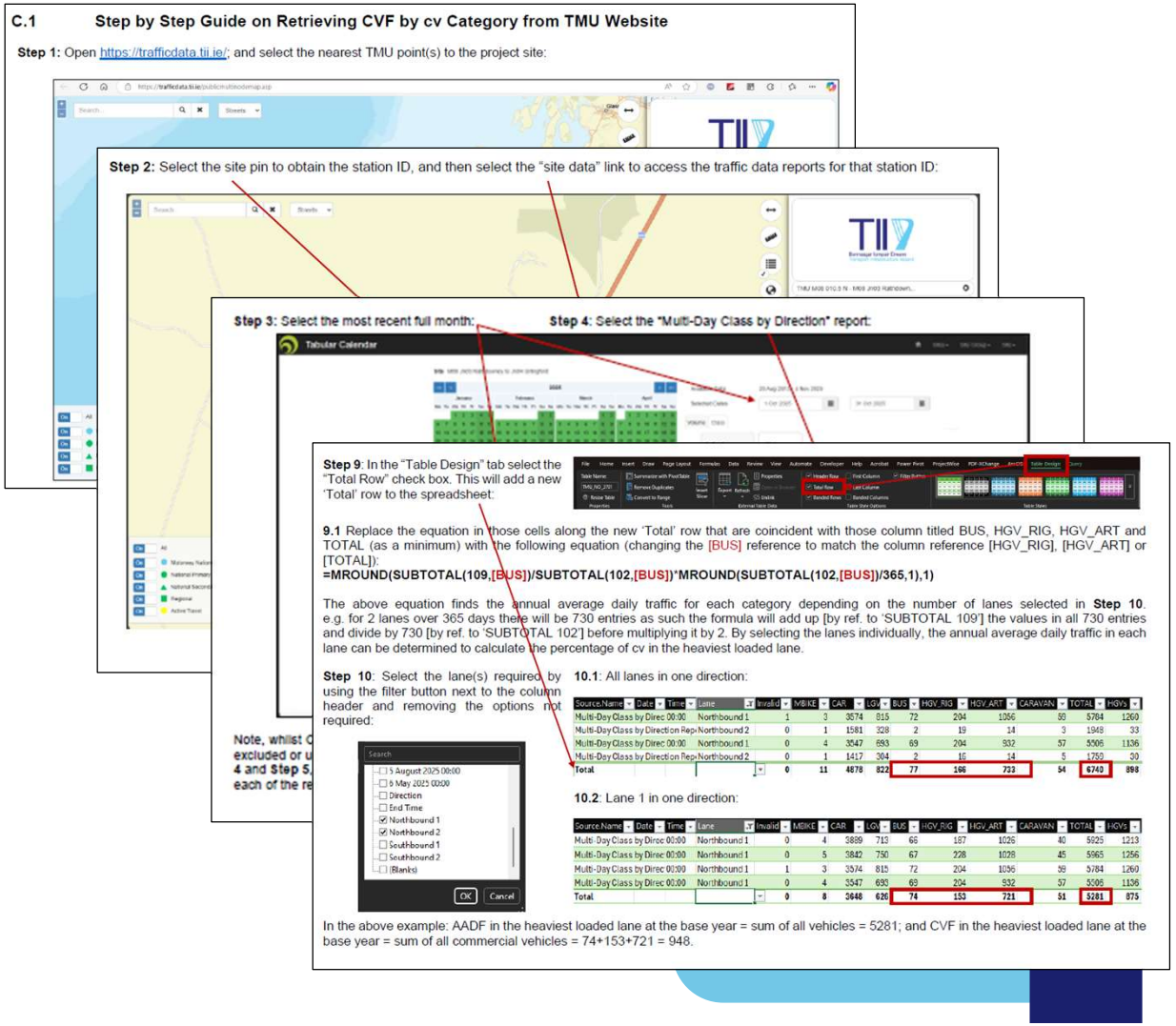
Traffic Assessment for Pavement Design PE-SMG-02002

Appendices

Traffic Assessment for Pavement Design

Appendices:

- Appendix A – Design Traffic Calculation Templates
- Appendix B - Design Traffic Calculation Examples
  - ➢ 3 no. separate examples provided
- Appendix C - Retrieval of Traffic Data from Traffic Monitoring Unit (TMU) Website
  - ➢ 10 step process
- Appendix D - Past Traffic Calculation Example



Thank you

Questions?

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