

REVIEW OF EQUIVALENT STANDARD AXLE VALUES USED IN THE PAYGO MODEL

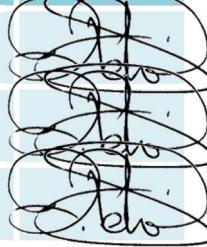
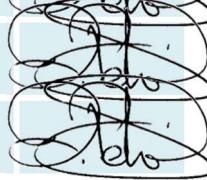
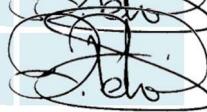
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EXECUTIVE SUMMARY

Background

The National Transport Commission (NTC) uses a pay-as-you-go (PAYGO) model to allocate and recover road costs relating to heavy vehicle operations in Australia. According to the NTC (2018), “*the primary objective of PAYGO is to deliver nationally consistent heavy vehicle charges that recover both capital and operating costs related to heavy vehicle use as they are incurred*”, thereby promoting the optimal use of the existing road network by industry. The NTC’s PAYGO model includes 35 different vehicle categories.

Key parameters used in the NTC’s PAYGO model include the average gross mass (AGM) and equivalent standard axles (ESA) for each vehicle category. AGM is measured in tonnes and reflects the average total vehicle mass (ie the mass of the vehicle itself plus the load being carried). ESA is a non-dimensional measure of the relative pavement wear associated with different loads, axle groups and tyre configurations. The ESA for a particular vehicle is the sum of the ESA for each of the vehicle’s axle groups.

PTT was commissioned by the NTC to calculate new AGM and ESA values for use in its PAYGO model, for the upcoming 2021 Heavy Vehicle Charges Determination.

Aim

The aim of this project was to:

- (a) calculate new ESA and AGM values to be used in NTC’s PAYGO model for all vehicle categories (except motorcycles);
- (b) calculate new ESA and AGM values using an appropriate methodology and the most recently available Weigh in Motion (WIM) data (where possible); and
- (c) document the latest estimates of AGM and ESA values by state, vehicle category and axle configuration.

Study Scope

The geographical scope for this project included all States and Territories of Australia, except the Northern Territory, which ceased collecting WIM data in 2007. Temporally, the study covered the three year period from 2017 to 2019.

Methodology

Light Vehicles: PAYGO Categories 2-6

National estimates of the AGM and ESA values for PAYGO Categories 2 to 6 were prepared using a “first principles” approach. The AGM was calculated using the average kerb weight, vehicle occupancy, fuel capacity and load for the ten most popular make / model combinations within each category, based on the 2019 ABS Motor Vehicle Census. The ESA for each category was calculated using the standard formula, assuming an equal share of the AGM between the front and rear axles.

Heavy Vehicles: PAYGO Categories 7-35 (excluding Category 30)

National estimates of the AGM and ESA values for PAYGO Categories 7 to 35 (excluding Category 30) were estimated from WIM data for the period covering 2017 to 2019, for all States and Territories, except NT. A total of 208 million “clean” WIM records were used during this phase of the work.

A series of “rules” for allocating individual WIM records to a particular PAYGO Category were developed and applied. These rules are reproduced in Appendix B.

The raw WIM data supplied by the state road authorities and Transmetric underwent a series of quality checks, to identify and remove (a) out of scope records, (b) records with partial or inconsistent data, (c) records associated with equipment failure and (d) outliers. The latter were defined as records with an ESA value greater or less than ± 1.5 standard deviations from the initial state mean for each PAYGO Category.

Several of the PAYGO Categories rely on a “hard” mass boundary to differentiate them from other vehicle categories. These definitions do not allow for any overlap associated with overloading or under-loading of trucks in adjacent categories. To reduce this bias, a process was agreed with the NTC to redistribute these WIM records based on data contained in the ABS Survey of Motor Vehicle Use.

The “clean” WIM records were then weighted to reflect the observed distribution in VKT reported in the ABS Survey of Motor Vehicle Use. This step is required to minimise the potential for bias introduced by the non-uniform distribution of WIM sites between and within states.

This is the first time that buses (PAYGO Category 31-35) have been incorporated fully into an analysis of ESA values using WIM data.

Non Freight Trucks: PAYGO Category 30

National estimates of the AGM and ESA values for PAYGO Category 30 were prepared based on the number of registered vehicles reported in the 2019 ABS Motor Vehicle Census. The weighted average AGM for two, three and four axle vehicles was calculated directly from the ABS Motor Vehicle Census data. The ESA for each category was calculated using the standard formula, based on the average axle group shares observed in the WIM data for similarly configured rigid trucks.

Key Findings

The resulting national estimates of AGM and ESA for each PAYGO Category are presented in Table 1, together with the ESA value currently used in the NTC’s PAYGO model. Major differences between the former and the latter are highlighted. Relative to the current ESA values used in the NTC’s PAYGO model, the latest data suggest that the national average ESA values for the following vehicles categories are significantly (>50%) lower than the current ESA values used by the NTC:

- Category 5: 4WDs: light commercial
- Category 6: Light commercials & Other light vehicles
- Category 7: Light rigid trucks
- Category 8: Rigid trucks: 2 axles: no trailer: $4.5 < GVM \leq 7.0$ t
- Category 9: Rigid trucks: 2 axles: no trailer: $7.0 < GVM \leq 12.0$ t
- Category 11: Rigid trucks: 2 axles: with trailer: $GCM \leq 42.5$ t
- Category 12: Rigid trucks: 3 axles: no trailer: $4.5 < GVM \leq 18.0$ t
- Category 15: Rigid trucks: 4 axles: no trailer: $4.5 < GVM \leq 25.0$ t

By comparison, the latest ESA estimates for the following vehicles categories are significantly (>50%) higher than the current ESA values used by the NTC:

- Category 2: Passenger cars
- Category 3: Passenger vans and Light buses
- Category 4: 4WDs: passenger
- Category 10: Rigid trucks: 2 axles: no trailer: GVM > 12.0 t
- Category 14: Rigid trucks: 3 axles: with trailer: GCM ≤ 42.5 t
- Category 17: Rigid trucks: 4 axles: with trailer: GCM ≤ 42.5 t
- Category 31: Buses: 2 axles: 3.5 < GVM ≤ 4.5 t
- Category 32: Buses: 2 axles: 4.5 < GVM ≤ 10.0 t
- Category 33: Buses: 2 axles: GVM > 10.0 t
- Category 34: Buses ≥ 3 axles
- Category 35: Buses articulated

The differences between the NTC's current PAYGO values and the latest estimates highlighted in Table 1 confirms the NTC's decision to implement this review.

Recommendations

It is recommended that the NTC:

- (a) update the AGM and ESA values used in its PAYGO model based on the values in Table 1 above;
- (b) use the rules provided in Appendix B to allocate individual WIM records to a particular PAYGO Category; and
- (c) monitor the ongoing change in AGM and ESA values used in its PAYGO model on a regular basis (eg every 3-5 years) to ensure that the latter:
 - is based on the most up-to-date data available; and
 - captures industry trends with respect to changing vehicle combinations, axle configurations and mass limits

Table 1: RESULTS

PAYGO Category	Description	New AGM Value (t)	Current ESA Value	New ESA Value	ESA Difference	Scale of Difference ⁽¹⁾
2	Passenger cars	1.63	0.000	0.001	0.001	**
3	Passenger vans and Light buses	2.11	0.000	0.003	0.003	**
4	4WDs: passenger	2.37	0.000	0.005	0.005	**
5	4WDs: light commercial	2.55	0.044	0.006	-0.038	**
6	Light commercials & Other light vehicles	2.27	0.042	0.004	-0.038	**
7	Light rigid trucks	2.78	0.047	0.014	-0.033	**
8	Rigid trucks: 2 axles: no trailer: $4.5 < GVM \leq 7.0$ t	3.97	0.116	0.028	-0.088	**
9	Rigid trucks: 2 axles: no trailer: $7.0 < GVM \leq 12.0$ t	6.00	0.610	0.203	-0.407	**
10	Rigid trucks: 2 axles: no trailer: $GVM > 12.0$ t	11.76	1.562	2.347	0.785	**
11	Rigid trucks: 2 axles: with trailer: $GCM \leq 42.5$ t	8.44	1.142	0.429	-0.713	**
12	Rigid trucks: 3 axles: no trailer: $4.5 < GVM \leq 18.0$ t	6.21	0.966	0.184	-0.782	**
13	Rigid trucks: 3 axles: no trailer: $GVM > 18.0$ t	14.75	2.064	2.091	0.027	
14	Rigid trucks: 3 axles: with trailer: $GCM \leq 42.5$ t	26.31	1.666	2.725	1.059	**
15	Rigid trucks: 4 axles: no trailer: $4.5 < GVM \leq 25.0$ t	8.16	1.176	0.157	-1.020	**
16	Rigid trucks: 4 axles: no trailer: $GVM > 25.0$ t	19.37	2.469	2.625	0.156	
17	Rigid trucks: 4 axles: with trailer: $GCM \leq 42.5$ t	27.80	1.878	3.055	1.176	**
18	Rigid trucks: 3,4+ axles: with trailer: $GCM > 42.5$ t	40.13	4.512	4.655	0.143	
19	Articulated trucks: single trailer: 3 axle rig	13.13	1.262	0.947	-0.314	
20	Articulated trucks: single trailer: 4 axle rig	18.76	1.449	1.969	0.521	*
21	Articulated trucks: single 3 axle trailer: 5 axle rig	17.68	1.514	1.741	0.228	
22	Articulated trucks: single 2 axle trailer: 5 axle rig	26.40	1.988	2.785	0.798	*
23	Articulated trucks: single trailer: 6 axle rig	28.94	2.104	2.707	0.604	*
24	Articulated trucks: B-double: < 9 axle rig	36.53	2.810	3.937	1.127	*
25	Articulated trucks: B-double: ≥ 9 axle rig	47.00	2.945	4.202	1.256	*
26	Articulated trucks: B-triple	52.94	3.524	4.465	0.941	*
27	Articulated trucks: Road train: 2 trailers	48.35	3.275	3.306	0.031	
28	Articulated trucks: Road train: 3 trailers	67.88	4.120	4.065	-0.055	
29	Articulated trucks: single trailer: > 6 axle rig	33.12	2.299	2.785	0.486	
30	Other trucks (non-freight)	11.63	1.546	1.512	-0.034	
31	Buses: 2 axles: $3.5 < GVM \leq 4.5$ t	3.96	0.020	0.041	0.021	**
32	Buses: 2 axles: $4.5 < GVM \leq 10.0$ t	6.02	0.050	0.115	0.065	**
33	Buses: 2 axles: $GVM > 10.0$ t	12.99	1.080	2.378	1.298	**
34	Buses: ≥ 3 axles	17.08	0.910	3.854	2.944	**
35	Buses: articulated	18.38	1.325	2.528	1.203	**

(1) ** = difference $> \pm 50\%$, * = difference $> \pm 25\%$, blank = difference $\leq \pm 25\%$

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GLOSSARY

ABS Australian Bureau of Statistics

ACT Australian Capital Territory

AGM Average Gross Mass

Axle group location (refer Figure G1):

Steer: steerable axle group on a truck

Rigid: rear axle group of a rigid truck

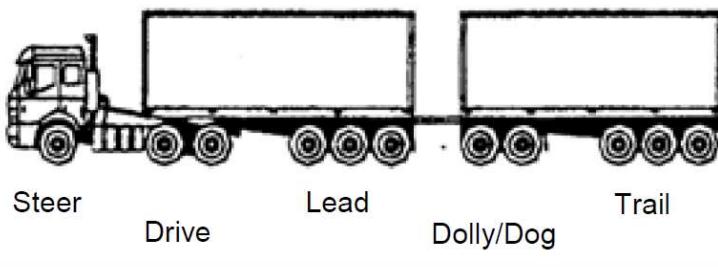
Drive: drive axle group of a prime mover

Lead: trailer axle group that is not the last in a configuration or a dolly/dog axle group

Dolly/Dog: steerable axle group linked to a preceding vehicle/component by an A hitch

Trail: last trailer in a truck trailer combination (both A and B)

Figure G1: AXLE GROUP LOCATIONS



Axle group type:

SAST: single axle single tyre

SADT: single axle dual tyre

TAST: tandem axle single tyre

TADT: tandem axle dual tyre

TRDT: tri-axle dual tyre

QADT: quad axle dual tyre.

ESA Equivalent Standard Axles

GVM Gross Vehicle Mass

km Kilometre

n/a Not applicable

NSW New South Wales

NT Northern Territory

NTC National Transport Commission

PAYGO Pay-As-You-Go

PTT Pekol Traffic and Transport

QLD Queensland

SA South Australia

SE Standard Error

SMVU Survey of Motor Vehicle Use

t Tonne(s)

TAS Tasmania

VIC Victoria

VKT Vehicle kilometre(s) travelled

WA Western Australia

WIM Weigh In Motion

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1.0 INTRODUCTION

1.1 Background

The National Transport Commission (NTC) uses a pay-as-you-go (PAYGO) model to allocate and recover road costs relating to heavy vehicle operations in Australia. According to the NTC (2018), “*the primary objective of PAYGO is to deliver nationally consistent heavy vehicle charges that recover both capital and operating costs related to heavy vehicle use as they are incurred*”, thereby promoting the optimal use of the existing road network by industry. The NTC’s PAYGO model includes 35 different vehicle categories, as summarised in Table 1.1 below.

Table 1.1: PAYGO MODEL VEHICLE CATEGORIES

Vehicle Category	Description
1	Motorcycles
2-6	Passenger cars, passenger vans, light buses, 4WDs and light commercial vehicles
7-18	Rigid trucks (with or without trailers)
19-23, & 29	Articulated trucks (with trailers)
24-26	B-doubles and B-triples
27-28	Road trains
30	Other (non-freight carrying) trucks
31-35	Buses

Key parameters used in the PAYGO model include the average gross mass (AGM) and equivalent standard axles (ESA) for each vehicle category. AGM is measured in tonnes and reflects the average total vehicle mass (ie the mass of the vehicle itself plus the load being carried). ESA is a non-dimensional measure of the relative pavement wear associated with different loads, axle groups and tyre configurations. The ESA for a particular vehicle is the sum of the ESA for each of the vehicle’s axle groups.

In 2019, the NTC commissioned a review of ESA values for a sample of five heavy vehicle categories. This review found that there had been a sufficient change in ESA values for the five heavy vehicle categories reviewed, warranting a full re-calculation of all ESA values used in the NTC’s PAYGO model. Accordingly, PTT was commissioned by the NTC to calculate new AGM and ESA values for use in its PAYGO model, for the upcoming 2021 Heavy Vehicle Charges Determination.

1.2 Aim

The aim of this project was to:

- (d) calculate new ESA and AGM values to be used in NTC’s PAYGO model for all vehicle categories (except motorcycles);
- (e) calculate new ESA and AGM values using an appropriate methodology and the most recently available Weigh in Motion (WIM) data (where possible); and
- (f) document the latest estimates of AGM and ESA values by state, vehicle category and axle configuration.

1.3 Scope

Vehicle Categories 2-6

National estimates of the AGM and ESA values for vehicle categories 2 to 6 were prepared using a “first principles” approach, based on the GVM of the more popular make and models within each vehicle category.

Vehicle Categories 7-35 (excluding Category 30)

National estimates of the AGM and ESA values for vehicle categories 7 to 35 were estimated from WIM data for the period covering 2017 to 2019. The geographical scope of this phase of the work included all states and the ACT. The Northern Territory ceased collecting WIM data in 2007.

Vehicle Category 30

National estimates of the AGM and ESA values for category 30 were estimated based the number of registered vehicles, by GVM and number of axles, for non-freight carrying trucks as reported in the 2019 ABS Motor Vehicle Census.

1.4 Data Sources

The information used during the course of this project was obtained from the following sources:

- WIM data supplied by state roads authorities and/or Transmetric for the 2017-2019 period
- regional VKT data (for weighting purposes) was obtained from a detailed crosstabulation of the Survey of Motor Vehicle Use (SMVU) data prepared by the ABS for the NTC for the 2012-2018 period
- the number of vehicles by make and model in the national motor vehicle fleet was derived from the ABS Motor Vehicle Census for 2019
- in service AGM values and the share of registered vehicles for certain PAYGO Categories were obtained from the ABS SMVU and used to redistribute WIM records between similar PAYGO Categories

1.5 Report Outline

This report begins by detailing the methodology used to collate, clean, re-distribute and weight the latest WIM data (Chapter 2).

The process used to estimate National AGM and ESA values for all vehicle categories (except motorcycles) is then discussed (Chapter 3).

The following seven chapters (4-10) tabulate the latest estimates of AGM and ESA values by vehicle category, state, area of operation and axle configuration, together with the corresponding level of confidence.

The report concludes by comparing the ESA values derived in this study with those currently used in the NTC’s PAYGO model and presents recommendations for further work (Chapter 11).

2.0 WIM DATA PROCESSING

The approach used to collate, clean, re-distribute and weight the WIM data for vehicle categories 7 to 35 involved:

- data collation
- allocating region ID number
- allocating vehicle categories
- data cleaning
- re-distribution
- data weighting

These are discussed in turn below.

2.1 Data Collation

The aim of this phase of work was to collate the WIM data for each state and the ACT into a consistent format for subsequent processing.

Datafiles containing WIM data for a specific year and/or site were supplied by the state road authorities for QLD, SA and WA, while Transmetric provided the equivalent data on behalf of NSW, VIC, TAS and ACT. Each datafile contained a number of records (or lines of information).

Given the large number of records to be processed, it was decided to import the raw data into a series of Microsoft Access databases. The Access databases contained the following fields for each state:

- unique record ID number
- site ID number
- date (and time for some States) of observation
- Austroads vehicle class
- axle configuration
- gross vehicle mass (in tonnes)
- the axle group mass for each axle group (in tonnes)
- the axle spacing (in metres) between each axle (axle group spacing for WA)

A total of 1.31 billion records were obtained from the states, although a significant portion of these (about 77%) were light vehicles which could not be classified into one of the corresponding PAYGO Categories (ie vehicle categories 1-6) using the available WIM data. This left just under 283 million WIM records pertaining to trucks and buses (ie PAYGO Categories 7-35, excluding Category 30). The number and share of the raw WIM records by state are summarised in Table 2.1.

Table 2.1: NUMBER AND SHARE OF RAW WIM RECORDS BY STATE (million)

Vehicle Class	NSW	VIC	QLD	SA	WA	TAS	ACT	AUST
All Vehicles	194.0	767.1	257.9	41.6	13.9	22.5	8.78	1,305.8
	14.9%	58.7%	19.7%	3.2%	1.1%	1.7%	0.7%	100.0%
Trucks and Buses	81.8	143.1	31.1	6.98	13.6	3.24	2.75	282.6
	28.9%	50.6%	11.0%	2.5%	4.8%	1.1%	1.0%	100.0%

The large number of records for VIC and NSW reflects the number of WIM sites in these states, relative to the national total. For example, of the 121 WIM sites nationally, 42 and 35 of these were located in VIC and NSW respectively, representing 34.7% and 28.9% of the nation's share of WIM sites.

However, the share of WIM sites in each state does not reflect the share of heavy vehicle travel undertaken in each state. Accordingly, the WIM records were weighted in accordance with the share of vehicle kilometres travelled (VKT) by each vehicle category, in each state, prior to calculating the national average ESA values. The weighting process is detailed in Section 2.6 below.

2.2 Allocating Region ID Number

The aim of this phase of work was to ascribe each WIM record to a specific geographical region within each state. This was done so that the subsequent weighting process (detailed in Section 2.6) accounted for the different amount of travel (ie VKT) that occurs in capital city, provincial urban and rural areas.

This process involved cross-referencing the site ID number on each WIM record against the geographical location of that site (ie capital city, provincial urban or rural). The latter are tabulated in Appendix A for each state.

2.3 Allocating Vehicle Categories

The aim of this phase of work was to ascribe each WIM record to a specific PAYGO category based on a combination of the following information pertaining to each record:

- Austroads vehicle class
- axle configuration
- gross vehicle mass (in tonnes)
- the axle spacing (in metres) between each axle (axle group spacing for WA)

A set of rules were developed in consultation with the NTC to identify the most likely PAYGO category for each WIM record. For example, the rule used to identify Category 28 (Articulated trucks: Road train: 3 trailers) vehicles was relatively straight forward, given that a limited number of unique axle configurations define this category, namely:

- Austroads Class = 11 and Axle Configuration = 1,2,3,2,3,3
- Austroads Class = 11 and Axle Configuration = 1,2,3,3,3,3
- Austroads Class = 12 and Axle Configuration = 1,2,3,2,3,2,3
- Austroads Class = 12 and Axle Configuration = 1,2,3,3,3,2,3
- Austroads Class = 12 and Axle Configuration = 1,2,3,3,3,3,3

However, in other cases, more complex rules were required, particularly where the combination of Austroads Class, Axle Configuration and GVM was the same across multiple PAYGO Categories. In such cases, differences in Axle Group Spacing were used to differentiate between PAYGO Categories. For example, the rule used to identify Category 23 (Articulated trucks: single trailer: 6 axle rig) vehicles was:

- Austroads Class = 9 and Axle Configuration = 123 and Axle Spacing #3 > 6.4

Several PAYGO categories are defined by hard mass boundaries based on the registered GVM of the vehicle. For example, Categories 12 and 13 both include Austroads Class 4 vehicles, with an axle configuration of 1,2. These two categories of vehicles are distinguished by a hard mass boundary of 18t. However, we found that reliance on the registered GVM during this phase of the work tended to over-estimate the AGM (and possibly the ESA) for categories defined by a hard mass boundary. Therefore, for these categories, an additional process was undertaken to redistribute the WIM records based on data obtained from the ABS Survey of Motor Vehicle Use (SMVU). This process is discussed in more detail below in Section 2.4 below.

Rules for identifying WIM records generated by buses and coaches were based on various combinations of Austroads Class, axle configuration and axle spacing, consistent with the findings of our earlier 2013 work (PTT 2013). In some cases (eg Category 35), the specifications for a sample of typical makes and models of vehicles were reviewed to determine the minimum / maximum AGM values for the category. This information was then used in the allocation process.

Multiple rules were required for certain PAYGO Categories, while the order in which the rules were processed was also important. The final set of rules applied during this stage of the work is tabulated in Appendix B.

2.4 Redistribution

As noted above, an additional step was required to redistribute WIM records between PAYGO Categories with a hard mass boundary. These include:

- Categories 7, 8, 9 and 10
- Categories 12 and 13
- Categories 15 and 16
- Categories 14, 17 and 18

The aim of this phase of work was to reduce the potential for bias associated with the “hard” mass boundaries used to differentiate various PAYGO Categories. For example, Austroads Class 3 includes four PAYGO Categories, as follows:

- Category 7: Light rigid trucks $3.5 < \text{GVM} \leq 4.5\text{t}$
- Category 8: Rigid trucks: 2 axles: no trailer: $4.5 < \text{GVM} \leq 7.0\text{t}$
- Category 9: Rigid trucks: 2 axles: no trailer: $7.0 < \text{GVM} \leq 12.0\text{t}$
- Category 10: Rigid trucks: 2 axles: no trailer: $\text{GVM} > 12.0\text{t}$

The “hard” mass boundaries used to differentiate between these four PAYGO Categories do not allow for any overlap associated with overloading or under-loading of trucks in adjacent categories.

Initially, we applied the procedure originally developed by ARRB (2013) to redistribute a sample of WIM records between adjacent categories with the same vehicle configuration, but with different registration mass limits, to simulate the overlap in terms of measured mass. However, we found that the resulting AGM and ESA values were significantly higher than those used in the NTC PAYGO model.

Through consultation with the NTC, an alternative re-distribution process was developed for these PAYGO Categories to accommodate a wider range of AGM values either side of the hard mass boundaries. The steps involved in this alternative process are discussed in more detail below.

Category 7, 8, 9 & 10

These categories contain vehicles with the same Austroads class (3) and axle configuration (11). However, each category has different mass limits, namely 3.5-4.5t, 4.5-7.0t, 7.0-12.0t and >12.0t. The redistribution process involved the following steps:

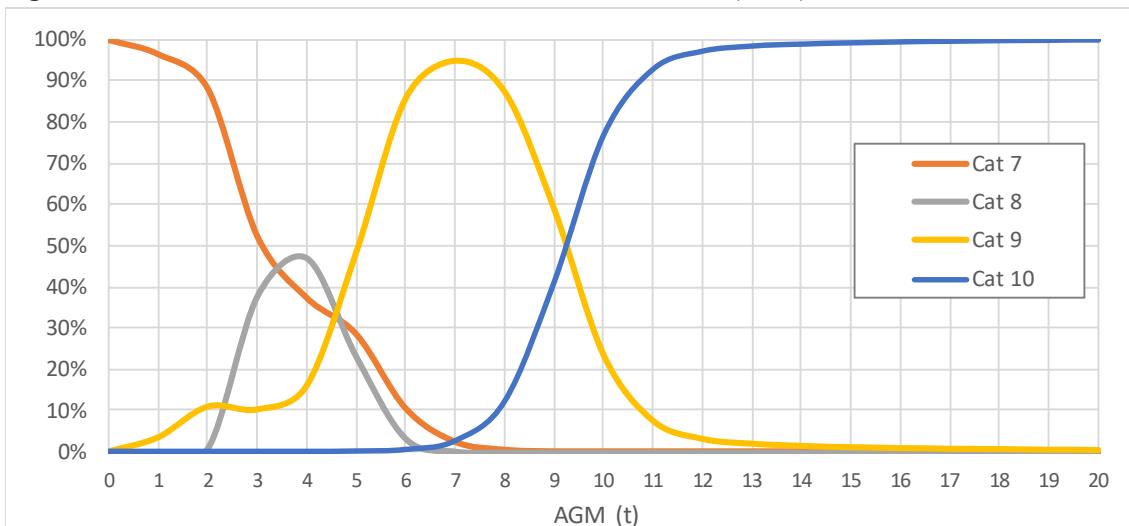
- using the ABS SMVU data, lower (15th percentile) and upper (85th percentile) limits for the AGM within each category were identified, together with the overall share of registered vehicles within each category was calculated, for each state
- a series of “share curves” were then developed that reflected the lower / upper AGM values and overall share of registered vehicles from the ABS SMVU data for each category and state
- the WIM records for the nominated Austroads class (3) and axle configuration (11) were then randomly allocated to one of the four possible PAYGO Categories (7-10), based on the recorded AGM value and the percentage shares within the corresponding 1t increment

By way of example, Table 2.2 contains the range of AGM values and the share of registered vehicles derived from the ABS SMVU data for NSW, for vehicles in Austroads class 3, with an axle configuration of 1,1. As shown, there is a significant overlap between the range of AGM values across the four PAYGO Categories. This highlights the problem with using a single AGM value to differentiate between categories. The corresponding share curves are shown in Figure 2.1 for NSW and reflect a wider distribution of AGM values that better reflects real world conditions.

Table 2.2: SMVU DATA FOR CATEGORY 7, 8, 9 & 10 (NSW)

PAYGO Category	AGM Range (t)	Share of Vehicles
7	1.6 - 4.1	46%
8	1.9 - 6.2	10%
9	3.3 - 10.3	30%
10	5.7 - 15.4	14%

Figure 2.1: SHARE CURVES FOR CATEGORY 7, 8, 9 & 10 (NSW)



Category 12 & 13

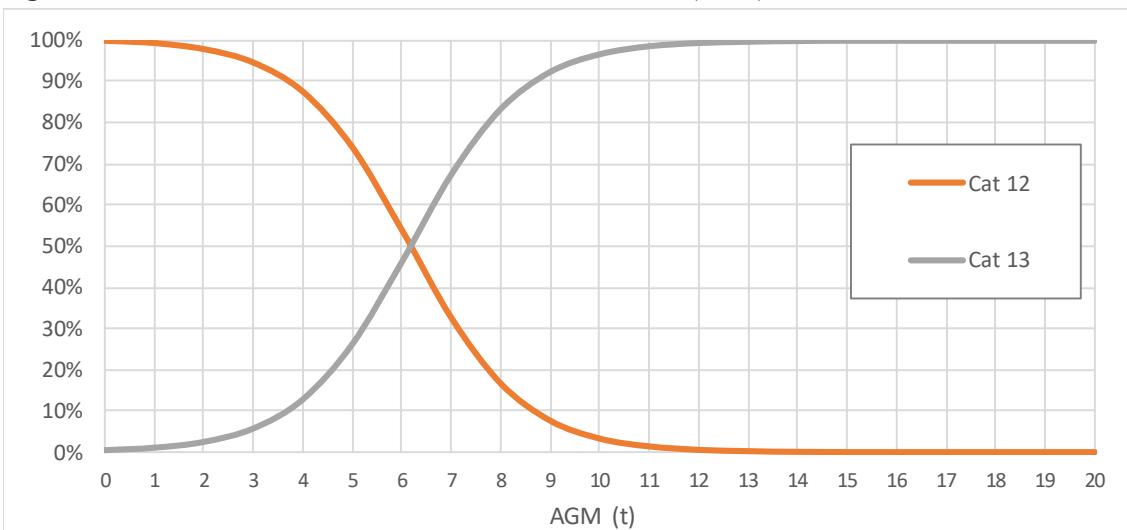
As above, these two categories contain vehicles with the same Austroads class (4) and axle configuration (12). The redistribution process was similar to that described above, using the ABS SMVU data to identify the range in AGM values and the overall share of vehicles within each category, leading to the derivation of “share curves” for each category and state.

The range of AGM values and the share of registered vehicles derived from the ABS SMVU data are listed in Table 2.3 for each category for NSW, while corresponding share curves are shown in Figure 2.2.

Table 2.3: SMVU DATA FOR CATEGORY 12 & 13 (NSW)

PAYGO Category	AGM Range (t)	Share of Vehicles
12	5.9 – 16.2	3%
13	8.2 – 25.7	97%

Figure 2.2: SHARE CURVES FOR CATEGORY 12 & 13 (NSW)



Category 15 & 16

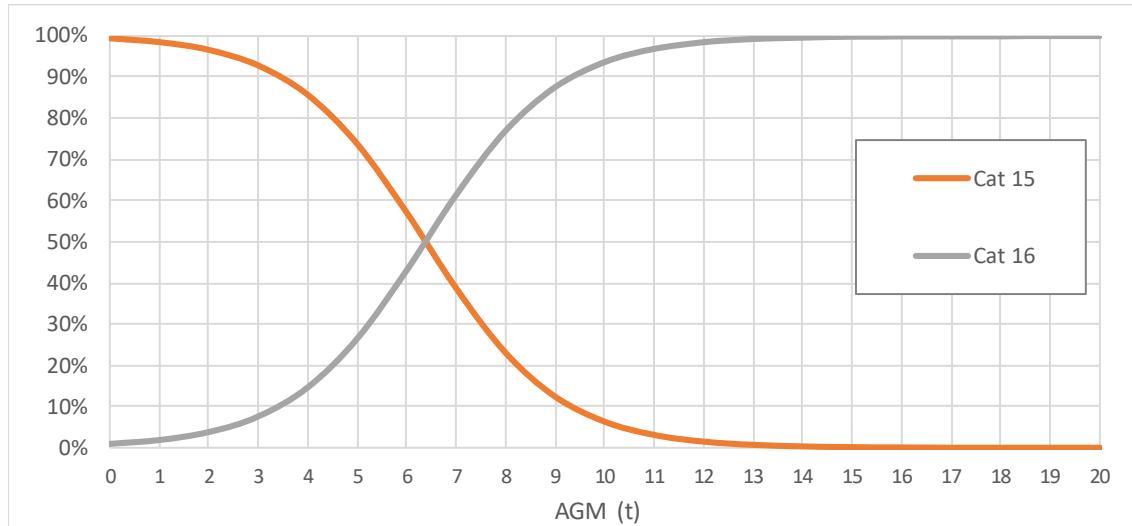
These two categories contain vehicles with the same Austroads class (5) and axle configuration (22). The redistribution process was similar to that described above, using the ABS SMVU data to identify the range in AGM values and the overall share of vehicles within each category, leading to the derivation of “share curves” for each category and state.

The range of AGM values and the share of registered vehicles derived from the ABS SMVU data are listed in Table 2.4 for each category for NSW, while corresponding share curves are shown in Figure 2.3.

Table 2.4: SMVU DATA FOR CATEGORY 15 & 16 (NSW)

PAYGO Category	AGM Range (t)	Share of Vehicles
15	13.8 – 23.4	1%
16	9.8 – 32.6	99%

Figure 2.3: SHARE CURVES FOR CATEGORY 15 & 16 (NSW)



Category 14, 17 & 18

Vehicles in Categories 14, 17 and 18 represent 3 and 4 axle rigid trucks with trailer. Vehicles in Category 14 and 17 have a different number of steer axles (ie 1 and 2 respectively), while Category 18 contains both of these configurations. Additional steps were required to redistribute the WIM records between these three PAYGO Categories.

In consultation with the NTC, it was agreed that vehicles with certain axle configurations were more likely to represent a particular PAYGO Category and were allocated accordingly. For example, WIM records with an axle configuration of 1,2,2 represent a 3 axle rigid truck with a 2 axle pig trailer. Given the limited load carrying capacity of this combination, it was agreed that they were unlikely to be PBS vehicles and thus all such records could be allocated to PAYGO Category 14. Of the 15 different axle configurations across these three categories, 11 were allocated in this fashion, as summarised in Table 2.5.

For the remaining four axle configurations, an additional step was required to redistribute WIM records between:

- Category 14 and 18 for 3-axle rigid trucks with a 3 or 4 axle trailer
- Category 17 and 18 for 4-axle rigid trucks with a 3 or 4 axle trailer

The redistribution process used here was similar to that described above. The ABS SMVU data was used to identify the range in AGM values and the overall share of vehicles within each category, leading to the derivation of "share curves" for each category and state.

The range of AGM values and the share of registered vehicles derived from the ABS SMVU data are listed in Tables 2.6 and 2.7 for each category for NSW, while corresponding share curves are shown in Figures 2.4 and 2.5.

Table 2.5: INITIAL ALLOCATION OF CATEGORY 14, 17 & 18 WIM RECORDS

Axle Configuration	Description	No WIM Records	Share of WIM Records ⁽¹⁾	Expected Share of PBS Vehicles	NTC Category	Further Redistribution Required
123	3-axle rigid, 3-axle pig	17,290,562	54.6%	Low	14	No
122	3-axle rigid, 2-axle pig	4,547,622	14.4%	Low	14	No
1212	3-axle rigid, 3-axle dog	4,007,296	12.7%	Some	14 & 18	Yes
1222	3-axle rigid, 4-axle dog	2,092,982	6.6%	Some	14 & 18	Yes
1233	3-axle rigid, 6-axle dog	2,334,524	7.4%	High	18	No
1211	3-axle rigid, 2-axle dog	445,812	1.4%	Low	14	No
222	4-axle rigid, 2-axle pig	216,807	0.7%	Low	17	No
223	4-axle rigid, 3-axle pig	152,199	0.5%	Low	17	No
2212	4-axle rigid, 3-axle dog	142,719	0.5%	Some	17 & 18	Yes
2222	4-axle rigid, 4-axle dog	112,529	0.4%	Some	17 & 18	Yes
2223	4-axle rigid, 5-axle dog	96,765	0.3%	High	18	No
2211	4-axle rigid, 2-axle dog	85,842	0.3%	Low	17	No
221	4-axle rigid, 1-axle pig	72,621	0.2%	Low	17	No
2233	4-axle rigid, 6-axle dog	64,749	0.2%	High	18	No
1223	3-axle rigid, 5-axle dog	12,623	0.0%	High	18	No

(1) Share expressed as a percentage of the 31.7 million WIM records with the above axle configurations

Table 2.6: SMVU DATA FOR 3-AXLE RIGID TRUCKS WITH 3/4 AXLE TRAILER (NSW)

PAYGO Category	AGM Range (t)	Share of Vehicles
14	13.8 – 41.1	17%
18	13.9 – 54.8	83%

Table 2.7: SMVU DATA FOR 4-AXLE RIGID TRUCKS WITH 3/4 AXLE TRAILER (NSW)

PAYGO Category	AGM Range (t)	Share of Vehicles
17	17.5 – 41.5	4%
18	15.4 – 64.2	96%

The share curves for the 3 and 4 axle rigid trucks with 3 and 4 axle trailers shown in Figures 2.4 and 2.5 respectively are very similar and reflect high percentage of Category 18 (ie PBS vehicles) within each group.

Figure 2.4: SHARE CURVES FOR 3-AXLE RIGID TRUCKS WITH 3/4 AXLE TRAILER (NSW)

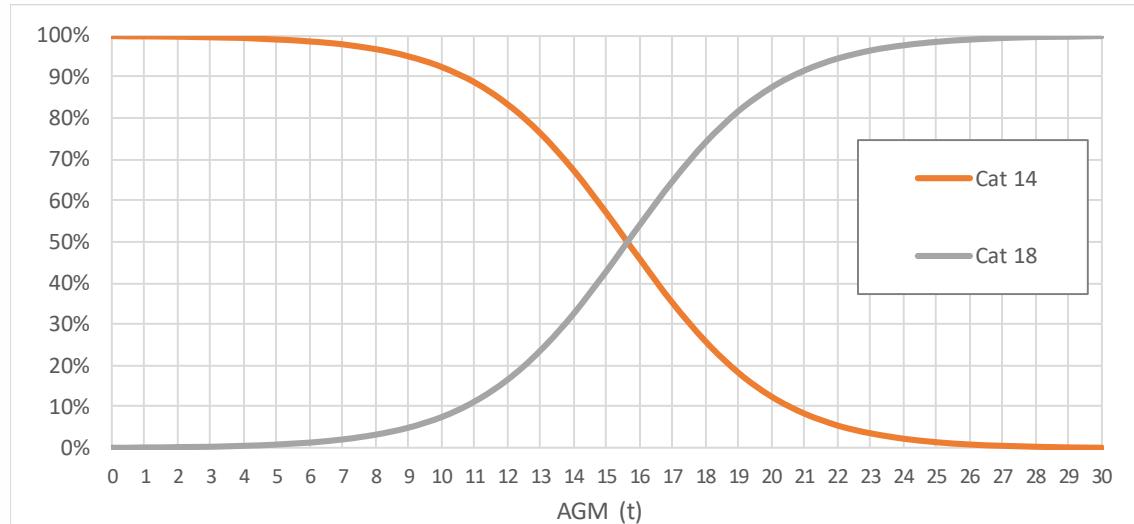
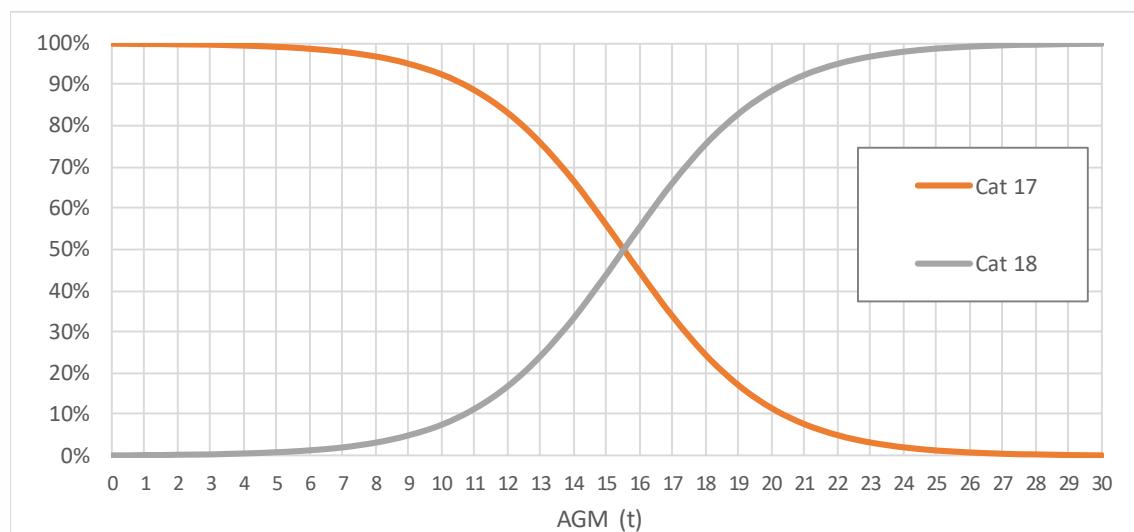


Figure 2.5: SHARE CURVES FOR 4-AXLE RIGID TRUCKS WITH 3/4 AXLE TRAILER (NSW)



2.5 Data Cleaning

The aim of this phase was to identify and remove outliers from the WIM database to account for:

- equipment failure
- out of scope records (eg date outside target range or site not in nominated state)
- outliers
- records with partial or inconsistent data

Equipment Failure

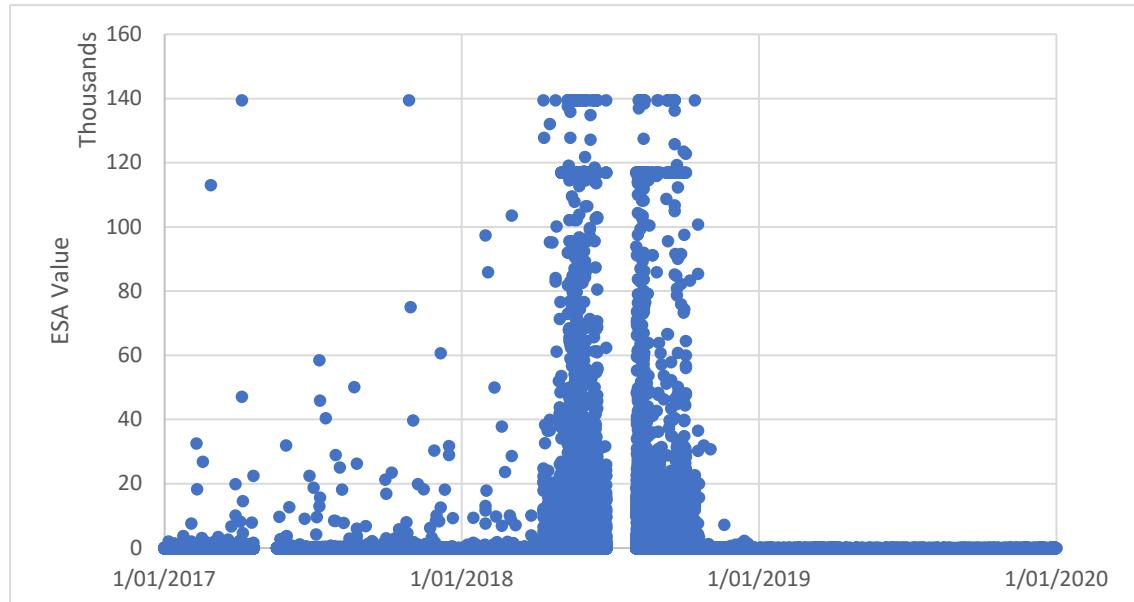
A total of 3.1 million records were excluded due to obvious failure of the WIM equipment.

By way of example, Figure 2.6 plots the ESA for each Category 10 (Rigid trucks: 2 axles: no trailer: GVM > 12.0t) record for Site 29 in NSW for the whole 2017-2019 period. A noticeable gap in the data is evident for July 2018, with a significant number of unreasonably high values occurring for several months either side of this gap.

The distribution of ESA values shown in Figure :

- would artificially inflate the final ESA value for this category, if these records were included in the analysis
- draws into question the veracity of all of the WIM records for this site for the middle half of 2018

Figure 2.6: CATEGORY 10 ESA VALUES: NSW – SITE 29



It was therefore decided to exclude all WIM records for this site for 2018, so as not to introduce a seasonal bias to the analysis (eg by including data for only part of the year).

These and similar records accounted for 1.1% of the 283 million WIM records pertaining to trucks and buses in the database. The exclusion of these records would significantly reduce the potential for over-stating the true ESA value and minimise the potential impact of a seasonal bias in the remaining data.

Out of Scope Records

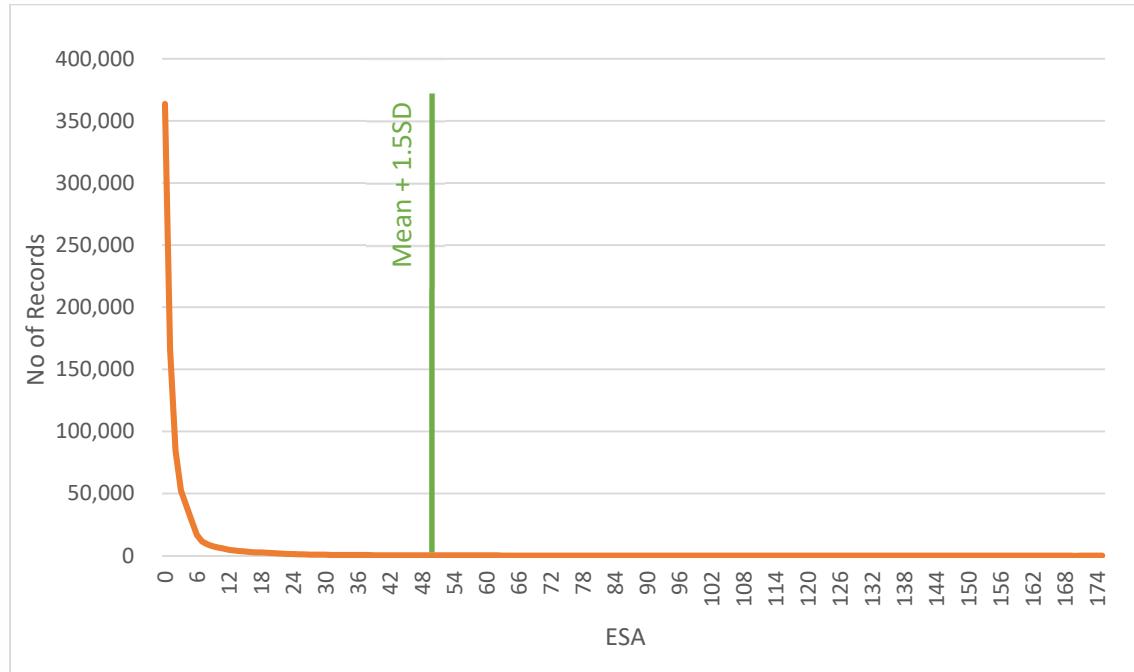
A total of 3.7 million records were found to be “out of scope”, either because they fell outside of the 2017-2019 time period or the site ID did not coincide with one of the nominated sites within the nominated state. These accounted for 1.3% of the 283 million WIM records pertaining to trucks and buses contained in the database. Given the very small number involved, the exclusion of these records from the analysis was not expected to have a material effect on the final results.

Outliers

A review of the WIM data revealed a significant number of records with extremely high ESA values.

By way of example, Figure 2.7 plots the number of records by ESA value for Category 16 (Rigid trucks: 4 axle: no trailer: GVM > 25.0t) in QLD. It includes a clear peak around an ESA value of 1, with a very long tail out to the right. The average ESA value for this set of data is 6.59, which is significantly higher than the current value of 2.47 used in the NTC’s PAYGO model.

Figure 2.7: CATEGORY 16 ESA VALUES: QLD



Clearly, the inclusion of such extreme values in the calculation of the average ESA value significantly skews the result upward. Therefore, it was decided to exclude records with an ESA value greater or less than ± 1.5 standard deviations from the initial State mean for each PAYGO category.

The vertical line in Figure 2.7 is plotted at $+1.5$ standard deviations from the initial mean ESA value. The average ESA value for records to the left of this line is 3.26, which is much closer to the current value used in the NTC's PAYGO model.

A total of 6.3 million records were determined to be outliers using the above methodology, accounting for 2.2% of the 283 million WIM records pertaining to trucks and buses in the database. The exclusion of these records would significantly reduce the potential for over-stating the true ESA values for each vehicle category.

Records with Partial / Inconsistent Data

A further 0.99 million records were found to have partial or inconsistent data, such as records with an axle configuration of "123" (ie a vehicle with three axle groups), but only two axle group masses (ie one missing axle group mass). These accounted for 0.3% of the 283 million WIM records pertaining to trucks and buses in the database. As above, given the very small number involved, the exclusion of these records was not expected to have a material effect on the final results.

Clean Records

A total of 268 million "clean" records were output by this phase of the work, as summarised in Table 2.8.

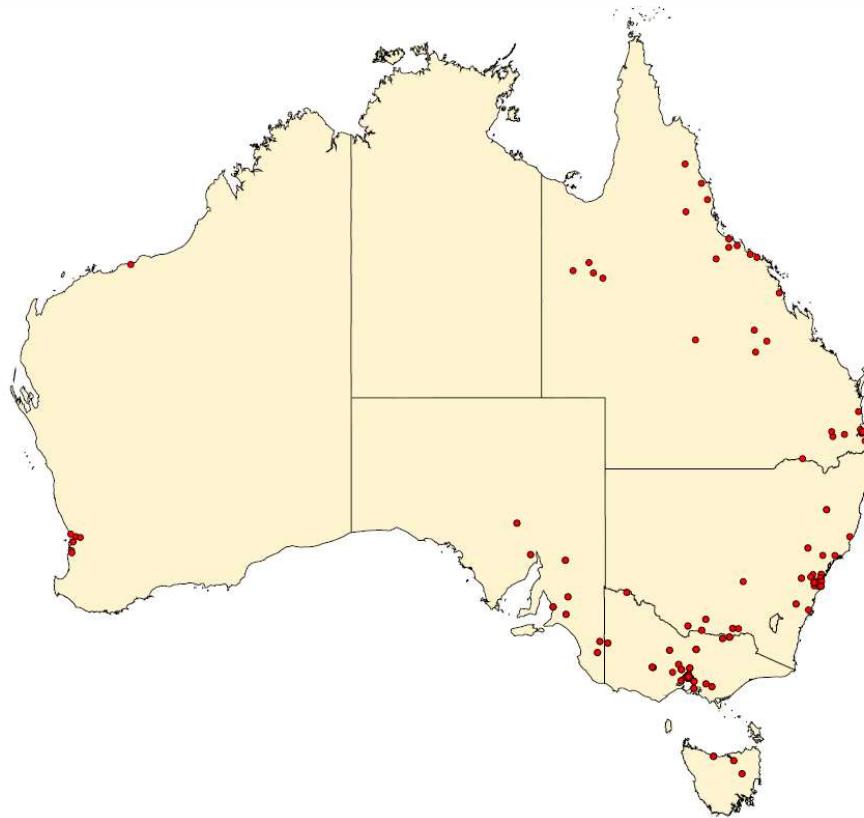
Table 2.8: NUMBER OF CLEAN RECORDS BY PAYGO CATEGORY AND STATE (million)

Category	NSW	VIC	QLD	SA	WA	TAS	ACT	AUST
7	12.1	28.8	4.85	0.886	2.79	0.674	0.851	50.9
8	2.52	6.04	1.01	0.179	0.948	0.135	0.188	11.0
9	8.12	18.0	3.10	0.549	2.32	0.417	0.537	33.1
10	4.11	9.17	1.78	0.281	1.14	0.214	0.290	17.0
11	1.48	6.15	0.983	0.329	0.529	0.132	0.071	9.68
12	0.259	0.432	0.007	0.018	0.016	0.010	0.112	0.853
13	6.93	13.7	2.86	0.416	1.07	0.195	0.109	25.2
14	5.90	6.69	2.69	0.534	1.24	0.220	0.017	17.3
15	0.041	0.190	0.028	0.003	0.017	0.002	0.039	0.321
16	2.06	2.93	0.839	0.121	0.222	0.057	0.053	6.28
17	0.097	0.255	0.047	0.004	0.071	0.031	0.004	0.508
18	3.06	2.90	0.857	0.144	0.432	0.079	0.008	7.48
19	0.142	0.196	0.128	0.031	0.018	0.004	0.003	0.521
20	0.379	0.743	0.179	0.022	0.019	0.006	0.003	1.35
21	0.203	0.303	0.081	0.012	0.007	0.004	0.001	0.611
22	0.909	1.42	0.298	0.103	0.001	0.050	0.008	2.79
23	13.3	21.5	5.27	1.05	0.838	0.466	0.063	42.6
24	3.63	3.51	1.08	0.191	0.071	0.157	0.011	8.66
25	9.30	13.7	2.50	1.21	0.001	0.195	0.021	26.9
26	0.060	0.086	0.052	0.034	0.172	0.005	0.000	0.410
27	0.193	0.330	0.506	0.286	0.615	0.001	0.000	1.93
28	0.008	0.000	0.205	0.100	0.046	0.000	0.000	0.359
29	0.187	0.228	0.034	0.001	0.003	0.001	0.002	0.456
31	0.384	0.946	0.003	0.036	0.030	0.020	0.035	1.45
32	0.093	0.183	0.060	0.005	0.019	0.005	0.001	0.366
33	0.108	0.139	0.023	0.003	0.012	0.004	0.000	0.288
34	0.035	0.046	0.007	0.001	0.003	0.000	0.001	0.093
35	0.008	0.006	0.004	0.000	0.000	0.000	0.000	0.018
Total	75.6	138.6	29.5	6.55	12.6	3.08	2.43	268.4

2.6 Data Weighting

The aim of this phase of work was to calculate and append a weight to each “clean” WIM record to ensure that the final dataset reflects the observed distribution in VKT reported in the ABS SMVU. This step is required because the distribution of WIM sites is not uniform across states, as demonstrated in Figure 2.8.

Figure 2.8: GEOGRAPHICAL DISTRIBUTION OF WIM SITES



Weights were calculated for each state and PAYGO Category, as detailed below using QLD PAYGO Category 23 as an exemplar. The calculations for all PAYGO Categories are included in Appendix C.

Step 1: Count Number of Records by Region

The number of “clean” WIM records, tabulated for each year and region, is shown in Table 2.9 for QLD PAYGO Category 23.

Table 2.9: NUMBER OF RECORDS BY REGION AND YEAR (QLD PAYGO CAT 23)

Year	CAPITAL CITY	PROVINCIAL URBAN	RURAL
2017	788,883	28,509	9,484
2018	1,523,083	358,518	129,289
2019	1,928,344	146,782	357,061

Step 2: Calculate Proportion of Records by Region

Using the values in Table 2.9, the proportion of the national total of “clean” WIM records for each year and region was calculated. The resulting proportions summed to one nationally to ensure that the ESA values reflect “average” conditions across the specified time period.

By way of example, the proportions calculated for QLD PAYGO Category 23 are shown in Table 2.10 relative to the national total of “clean” Category 23 records (ie 42.6 million from Table 2.8).

Table 2.10: PROPORTION OF RECORDS BY REGION AND YEAR (QLD PAYGO CAT 23)

Year	CAPITAL CITY	PROVINCIAL URBAN	RURAL
2017	0.01853	0.00067	0.00022
2018	0.03579	0.00842	0.00304
2019	0.04531	0.00345	0.00839

Step 3: Calculate VKT by Region

Crosstabulations of distance travelled by area of operation by type of vehicle and state of registration were supplied by the ABS for the 2012, 2014, 2016 and 2018 editions of the SMVU. These were used to calculate the VKT by year and area. In doing so, care was taken to:

- (a) account for the variability in the raw SMVU data by “smoothing” the reported values in line with the underlying trend;
- (b) exclude VKT undertaken in the NT, given that this territory is not represented in the WIM data;
- (c) allocate a proportion (ie 50%) of interstate VKT for each state to capital city, provincial urban and rural areas, in the same proportions reported for intrastate VKT; and

adopt the distribution of VKT from a similar category / State in cases where insufficient or no SMVU data was available for a particular category. Table 2.11 presents the total VKT over the three years of the specified time period by PAYGO Category and state.

Table 2.11: VKT BY PAYGO CATEGORY AND STATE (2017-2019) (Mkm)

Vehicle Category	NSW	VIC	QLD	SA	WA	TAS	ACT	AUST
7	3.11	1.84	2.35	0.406	0.927	0.111	0.065	8.81
8	0.358	0.722	0.356	0.152	0.357	0.074	0.009	2.03
9	1.97	1.23	1.55	0.314	0.602	0.158	0.041	5.87
10	1.28	1.00	0.735	0.173	0.511	0.073	0.019	3.80
11	0.210	0.402	0.197	0.075	0.179	0.009	0.004	1.08
12	0.027	0.016	0.076	0.016	0.019	0.005	0.001	0.161
13	1.44	1.11	1.20	0.217	0.535	0.110	0.026	4.64
14	0.126	0.134	0.169	0.024	0.083	0.009	0.003	0.547
15	0.008	0.010	0.015	0.001	0.008	0.001	0.000	0.043
16	0.390	0.259	0.492	0.044	0.095	0.022	0.011	1.31
17	0.016	0.021	0.016	0.000	0.006	0.002	0.001	0.063
18	0.891	0.955	0.712	0.095	0.223	0.068	0.010	2.95
19	0.013	0.011	0.008	0.003	0.009	0.001	0.000	0.044
20	0.031	0.077	0.059	0.025	0.007	0.012	0.000	0.211
21	0.096	0.022	0.079	0.023	0.015	0.004	0.000	0.239
22	0.314	0.278	0.223	0.103	0.086	0.013	0.004	1.02
23	2.61	2.89	1.94	0.574	0.737	0.275	0.018	9.05
24	0.388	0.221	0.170	0.029	0.111	0.025	0.000	0.942
25	2.03	2.74	2.01	1.13	0.366	0.071	0.017	8.37
26	0.188	0.108	0.360	0.189	0.905	0.001	0.000	1.75
27	0.188	0.108	0.360	0.189	0.905	0.001	0.000	1.75
28	0.029	0.069	0.218	0.079	0.559	0.000	0.000	0.954
29	0.170	0.209	0.240	0.048	0.517	0.021	0.000	1.21
31	0.080	0.105	0.025	0.039	0.018	0.004	0.002	0.273
32	0.282	0.210	0.132	0.047	0.094	0.018	0.013	0.797
33	1.15	0.790	0.608	0.202	0.468	0.069	0.072	3.36
34	0.084	0.035	0.144	0.038	0.044	0.005	0.009	0.359
35	0.015	0.013	0.017	0.011	0.005	0.003	0.005	0.069
Total	17.5	15.6	14.5	4.25	8.39	1.17	0.332	61.7

Similarly, Table 2.12 summarises the quantum of travel for PAYGO Category 23 in QLD by year and region output by this process.

Table 2.12: VKT BY REGION AND YEAR (QLD PAYGO CAT 23) (Mkm)

Year	CAPITAL CITY	PROVINCIAL URBAN	RURAL
2017	0.218	0.127	0.314
2018	0.223	0.122	0.302
2019	0.227	0.116	0.291

Step 4: Calculate Proportion of VKT by Region

The proportion of VKT by year and region was calculated by dividing the values in Table 2.12 with the corresponding national total from table 2.11 (ie 9.05 million VKT). As above, the resulting proportions sum to one nationally, thereby ensuring that the ESA values calculated later reflect “average” conditions across the three years of the specified time period. The proportion of VKT by region and year for QLD PAYGO Category 23 is shown in table 2.13.

Table 2.13: PROPORTION OF VKT BY REGION AND YEAR (QLD PAYGO CAT 23)

Year	CAPITAL CITY	PROVINCIAL URBAN	RURAL
2017	0.02406	0.01409	0.03466
2018	0.02461	0.01347	0.03341
2019	0.02512	0.01286	0.03218

Step 5: Calculate Data Weights

The data weights were calculated by dividing the proportion of VKT (from Table 2.13) by the corresponding proportion of records (from Table 2.10). The resulting weights for QLD PAYGO Category 23 are shown in Table 2.14.

Table 2.14: DATA WEIGHTS BY REGION AND YEAR (QLD PAYGO CAT 23)

Year	CAPITAL CITY	PROVINCIAL URBAN	RURAL
2015	1.298	21.04	155.5
2016	0.688	1.599	11.00
2017	0.554	3.728	3.836

In terms of PAYGO Category 23 for QLD, the majority of the weights are above one. This reflects the lower than average share of WIM records compared to the share of VKT undertaken by PAYGO Category 23 vehicles in these years and regions. Cases where the weights are below one indicate a higher than average share of WIM records relative to the corresponding share of VKT.

Step 6: Append Data Weights

Once the data weights were calculated for all PAYGO Categories, they were appended to the “clean” WIM records, based on the year and region of each record.

3.0 DETERMINATION OF ESA VALUES AND CONFIDENCE INTERVALS

3.1 Category 2-6

As noted earlier, it is not possible to differentiate between the various light vehicle categories (ie PAYGO category 2-6) based on the WIM data because these vehicles have the same Austroads class (1 and 2), axle configuration (11) and no GVM limits.

Accordingly, national ESA estimates for these categories were prepared using a “first principles” approach, generally as follows:

- the 2019 ABS Motor Vehicle Census was interrogated to tabulate the number of registered vehicles by make and model
- the most popular make/model combinations were identified for each of the following PAYGO Categories:
 - PAYGO Category 2: passenger cars
 - PAYGO Category 3: passenger vans and light buses
 - PAYGO Category 4: 4WDs passenger vehicles
 - PAYGO Category 5: 4WDs light commercial vehicles
 - PAYGO Category 6: light commercials and other light vehicles
- the carsales.com website was interrogated to determine the share of 2WD/4WD vehicles for those make/model combinations available with different drive types
- the “kerb weight” or tare weight and fuel tank capacity were obtained for these vehicles from vehicle specification data
- the average vehicle occupancy, obtained from the 2020 edition of the Australian Transport Facts (PTT 2020), was converted to kilograms assuming an average adult mass of 80kg
- the mass of fuel was added, given the density of fuel and assuming 50% capacity
- the mass of freight / tools of trade was added to PAYGO Category 5 and 6 vehicles, based on those reported in the 2020 edition of the Australian Transport Facts (PTT 2020), which in turn are derived from the ABS Survey of Motor Vehicle Use
- the total vehicle mass (GVM) thus calculated (ie GVM = kerb weight + passengers + fuel + freight or tools)
- the GVM was assumed to be equally distributed between the front and rear axle
- finally, the ESA for each vehicle was calculated based on the following formulae:
 - $ESA = \text{Number of Axles} \times (\text{GVM } (t) / (2 \times \text{Reference Load } (t)))^4$
 - where Number of Axles = 2 and Reference Load $(t) = 5.40t$

The top ten make/model combinations within each of these PAYGO Categories and the resulting weighted average national AGM and ESA values are presented in Chapter 4. Weighting was based on the number of registered vehicles in each of the top ten make/model combinations reported by the ABS for the national fleet.

3.2 Category 7-35 (excluding Category 30)

The aim of this phase of work was to calculate the average ESA value for the heavy vehicle categories in the NTC PAYGO model. This was done by applying the standard formula and reference loads published by the NTC (2005) to the clean WIM records.

Firstly, the ESA for each axle group was calculated based on the reported axle group mass (in tonnes) and the following formulae, using the reference load values (in tonnes) in Table 3.1:

- $$\text{ESA} = (\text{Axle Group Mass (t)} / \text{Reference Load (t)})^4$$

Table 3.1: REFERENCE LOAD VALUES

Axle Configuration	Single / Single	Single / Dual	Twin / Single	Tandem / Dual	Tri / Dual	Quad / Dual
Load (kN)	53	80	89	135	182	226
Load (t)	5.40	8.15	9.07	13.8	18.6	23.0

Source: [Austroads \(2017\)](#)

Table 3.1 does not include the TAG axle configuration (drive axle with dual wheels followed by a non-drive axle with single wheels) which is common in most three-axle rigid buses. As outlined in our previous work for the NTC (PTT 2013), the reference load for the TAG axle is calculated by:

- $$\text{TAG Axle Ref. Load} = (\text{Twin Axle - Single Tyre Ref. Load} / 2) + (\text{Tandem Axle - Dual Tyre Ref. Load} / 2)$$

The axle group ESA values were summed to produce a total vehicle ESA value for each record. This value was appended to each record. Finally, the weighted national average ESA value was calculated for each PAYGO Category.

Appendix D contains the average ESA value for each PAYGO Category, by State and year. As shown, there is a significant degree of variation in ESA value across states and between years within the same State.

3.3 Category 30

National estimates of the AGM and ESA values for Category 30 were estimated based on the number of registered vehicles, by GVM and number of axles, for non-freight carrying trucks in Australia, as reported in the 2019 ABS Motor Vehicle Census (MVC).

The 2019 ABS MVC includes a total of 24,700 registered vehicles classified as non-freight carrying trucks (eg tow trucks, mobile cranes, cherry pickers, ambulances etc). Of these, 99.7% had either two, three or four axles. For the purpose of this assessment, the following axle group configurations were assumed for these vehicles:

- 2-axle (87.0% of non-freight carrying trucks): 11
- 3-axle (8.6% of non-freight carrying trucks): 12
- 4-axle (4.2% of non-freight carrying trucks): 22

The national average GVM (in tonnes) for each of the above group of vehicles was calculated from the 2019 ABS MVC data. This was apportioned to the various axle groups based on the shares observed in the WIM data for similarly configured rigid trucks, as summarised below:

- 2-axle: 43% / 57%
- 3-axle: 35% / 65%
- 4-axle: 45% / 55%

The ESA for each axle group was calculated using the methodology detailed in Section 3.2, which was summed to produce a national value for each of the above group of vehicles. Finally, a

national ESA value for the whole Category was derived based on the number of registered vehicles with 2, 3 and 4 axles.

3.4 Confidence Intervals

The level of confidence in the resulting ESA value for each PAYGO category was determined by calculating the confidence interval associated with a $\pm 1\%$ error, given the mean ESA value, the standard deviation in ESA values and the sample size for each PAYGO Category, using the following formula:

$$Z_{\alpha/2} = \frac{\sqrt{n} \times 0.01 \times \bar{X}}{\sigma}$$

where:

- Z = Area under the normal curve
- α = 1 – Confidence interval
- n = Sample Size
- \bar{X} = Mean ESA value
- σ = Standard deviation in ESA value

The resulting confidence intervals are documented together with the national ESA values in the following chapters. The majority of national ESA values have a $\pm 1\%$ confidence interval $\geq 99\%$, which suggests that the national ESA values output by this study have a high degree of confidence.

4.0 PASSENGER CARS & VANS, LIGHT BUSES, 4WDs AND LCVs

4.1 Category 2 (Passenger cars)

These vehicles correspond to Austroads class 1 and have an axle configuration of 11. Details of the 10 most popular make / model combinations for this category are presented in Table 4.1.

Table 4.1: CATEGORY 2: VEHICLE DETAILS

No	Make / Model	Registrations	Kerb Weight (kg)	Fuel Tank Capacity (L)
1	Holden Commodore	822,126	1,675	61
2	Toyota Corolla	748,764	1,370	47
3	Toyota Camry	507,583	1,565	55
4	Mazda 3	493,666	1,367	51
5	Ford Falcon	405,927	1,787	68
6	Hyundai i30	289,256	1,365	49
7	Mitsubishi Lancer	234,973	1,367	59
8	Volkswagen Golf	217,667	1,283	50
9	Toyota Yaris	214,787	1,065	38
10	Subaru Forester	195,831	1,582	56
AUST		4,130,580	1,484	54

Overall, the 10 make / model combinations listed in Table 4.1 represent about 30% of the national passenger vehicle fleet. The national average vehicle occupancy for passenger cars was 1.42 persons. Based on the above sample, the national average GVM for passenger cars is estimated to be 1.62t, with an ESA of 0.001 and 99.9% confidence that the error associated with this estimate is less than $\pm 1\%$.

4.2 Category 3 (Passenger vans & light buses)

These vehicles also correspond to Austroads class 1 and have an axle configuration of 11. Details for the 10 most popular make / model combinations for this category are presented in Table 4.2.

Table 4.2: CATEGORY 3: VEHICLE DETAILS

No	Make / Model	Registrations	Kerb Weight (kg)	Fuel Tank Capacity (L)
1	Kia Carnival	49,406	2,171	80
2	Toyota Tarago	40,500	1,808	65
3	Honda Odyssey	33,872	1,798	55
4	Hyundai iMax	14,534	2,208	75
5	Toyota Hiace	8,970	2,640	70
6	Toyota Avensis	8,344	1,435	60
7	Toyota Estima	8,263	1,790	65
8	Volkswagen Multivan	7,048	1,873	80
9	Hyundai iLoad	6,342	2,087	75
10	Mazda MPV 4D Wagon	5,270	1,753	70
AUST		182,549	1,970	69

Overall, the 10 make / model combinations listed in Table 4.2 represent just over 1% of the national passenger car fleet. Based on a national average vehicle occupancy for passenger vans and light buses of 1.96 persons, the national average GVM for passenger vans and light buses is estimated to be 2.15t, with an ESA of 0.003 and 99.9% confidence that the error in this estimate is less than $\pm 1\%$.

4.3 Category 4 (4WDs: passenger)

These vehicles also correspond to Austroads class 1 and have an axle configuration of 11. Details for the 10 most popular make / model combinations for this category are presented in Table 4.3.

Table 4.3: CATEGORY 4: VEHICLE DETAILS

No	Make / Model	Registrations	Kerb Weight (kg)	Fuel Tank Capacity (L)
1	Toyota Landcruiser	411,712	2,690	138
2	Toyota Prado	174,438	2,348	119
3	Toyota Rav4	143,573	1,633	60
4	Mitsubishi Pajero	142,767	2,210	78
5	Nissan Patrol	95,253	2,837	140
6	Honda CRV	92,560	1,580	58
7	Holden Captiva	91,051	1,876	65
8	Mitsubishi Outlander	73,676	1,565	60
9	Nissan X-Trail	70,933	1,538	60
10	Jeep Grand Cherokee	67,295	2,242	93
AUST		1,363,258	2,222	100

Overall, the 10 make / model combinations listed in Table 4.3 represent just under 10% of the national passenger car fleet. Based on a national average vehicle occupancy for 4WD passenger vehicles of 1.44 persons, the national average GVM for 4WD passenger vehicles is estimated to be 2.38t, with an ESA of 0.005 and 99.9% confidence that the error associated with this estimate is less than $\pm 1\%$.

4.4 Category 5 (4WDs: light commercial)

These vehicles also correspond to Austroads class 1 and have an axle configuration of 11. Details for the 10 most popular make / model combinations for this category are presented in Table 4.4.

Overall, the 10 make / model combinations listed in Table 4.4 represent just over 54% of the national light commercial vehicle fleet. The national average vehicle occupancy for 4WD light commercial vehicles was 1.32 persons, while the average load carried (ie freight and/or tools of trade) was 390kg. Based on the above sample, the national average GVM for 4WD light commercial vehicles is estimated to be 2.55t, with an ESA of 0.006 and 99.9% confidence that the error in this estimate is less than $\pm 1\%$.

Table 4.4: CATEGORY 5: VEHICLE DETAILS

No	Make / Model	Registrations	Kerb Weight (kg)	Fuel Tank Capacity (L)
1	Toyota Hilux	545,293	2,046	80
2	Mitsubishi Triton	230,327	1,863	75
3	Ford Ranger	225,255	2,101	80
4	Nissan Navara	221,288	1,897	80
5	Holden Colorado	143,839	1,947	76
6	Toyota Landcruiser	111,153	2,690	130
7	Holden Rodeo	74,547	1,758	76
8	Mazda BT-50	73,927	1,898	76
9	Isuzu D-Max	64,330	1,955	76
10	Nissan Patrol	57,909	2,066	175
AUST		1,747,869	2,021	85

4.5 Category 6 (Light commercials & other light vehicles)

These vehicles also correspond to Austroads class 1 and have an axle configuration of 11. Details for the 10 most popular make / model combinations for this category are presented in Table 4.5.

Table 4.5: CATEGORY 6: VEHICLE DETAILS

No	Make / Model	Registrations	Kerb Weight (kg)	Fuel Tank Capacity (L)
1	Ford Falcon	166,005	1,680	81
2	Toyota Hiace	160,075	1,800	70
3	Toyota Hilux	156,462	1,610	80
4	Holden Commodore	108,474	1,679	71
5	Holden Rodeo	90,911	1,700	76
6	Mitsubishi Triton	56,233	1,710	75
7	Ford Ranger	50,353	1,883	80
8	Nissan Navara	49,931	1,725	80
9	Hyundai iLoad	35,233	2,084	75
10	Ford Transit Van/Cab Chassis	33,917	2,334	80
AUST		907,593	1,747	76

Overall, the 10 make / model combinations listed in Table 4.5 represent just over 28% of the national light commercial vehicle fleet. The national average vehicle occupancy for light commercials and other light vehicles was 1.32 persons, while the average load carried (ie freight and/or tools of trade) was 390kg. Based on the above sample, the national average GVM for light commercials and other light vehicles is estimated to be 2.27t, with an ESA of 0.004 and 99.9% confidence that the error in this estimate is less than $\pm 1\%$.

5.0 RIGID TRUCKS

5.1 Category 7 (Light rigid trucks)

These vehicles correspond to Austroads class 3, with an axle configuration of 11 and a GVM of 3.5-4.5t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.1 and Table 5.2 respectively, while Figure 5.1 plots the distribution in AGM by state and axle group.

Table 5.1: CATEGORY 7: WEIGHTED AVERAGE AGM (tonnes)

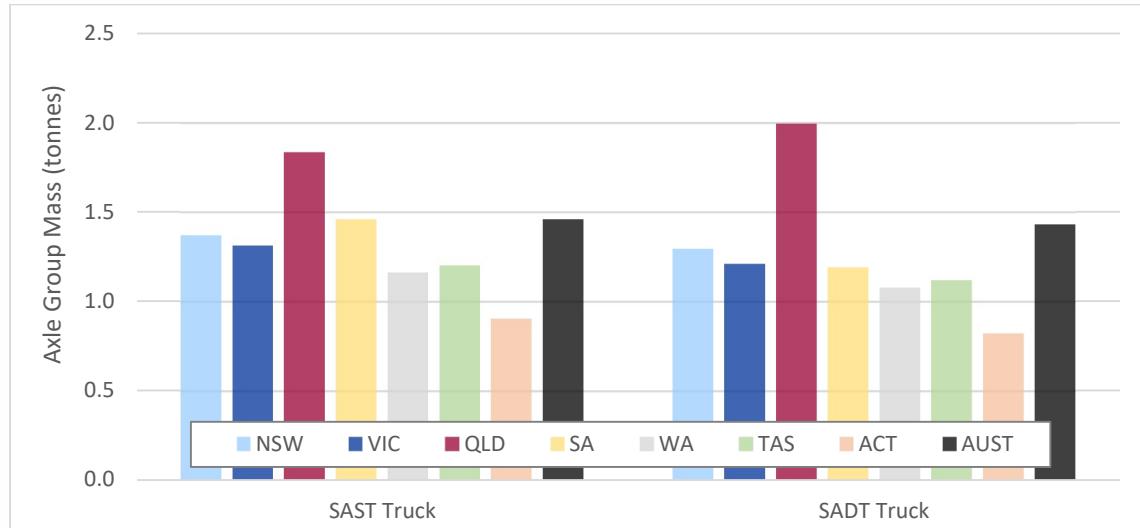
State	Sample (million)	Truck		Vehicle Average
		SAST	SADT	
NSW	12.08	1.37	1.29	2.67
VIC	28.81	1.31	1.21	2.53
QLD	4.85	1.83	2.00	3.42
SA	0.89	1.46	1.19	2.65
WA	2.79	1.16	1.08	2.24
TAS	0.67	1.20	1.12	2.32
ACT	0.85	0.90	0.82	1.73
AUST	50.94	1.46	1.43	2.78
SE	n/a	6.14E-05	8.49E-05	1.40E-04

Table 5.2: CATEGORY 7: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Vehicle Average
		SAST	SADT	
NSW	12.08	0.006	0.002	0.008
VIC	28.81	0.005	0.001	0.007
QLD	4.85	0.023	0.009	0.033
SA	0.89	0.007	0.001	0.008
WA	2.79	0.003	0.000	0.003
TAS	0.14	0.003	0.001	0.004
ACT	0.85	0.002	0.000	0.002
AUST	50.94	0.010	0.003	0.014
SE	n/a	1.51E-06	7.67E-07	1.98E-06

The national average ESA value of 0.014 is significantly lower than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Figure 5.1 indicates a consistent pattern in AGM across states, with the SADT values being similar to the corresponding SAST values. The AGM values for QLD are also significantly higher and the values in the ACT are significantly lower than the other States.

Figure 5.1: CATEGORY 7: AGM BY STATE AND AXLE GROUP


5.2 Category 8 (Rigid trucks: 2 axles: no trailer: $4.5 < \text{GVM} \leq 7.0\text{t}$)

These vehicles correspond to Austroads class 3, with an axle configuration of 11 and a GVM of 4.0-7.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.3 and Table 5.4 respectively, while Figure 5.2 plots the distribution in AGM by state and axle group.

Table 5.3: CATEGORY 8: WEIGHTED AVERAGE AGM (tonnes)

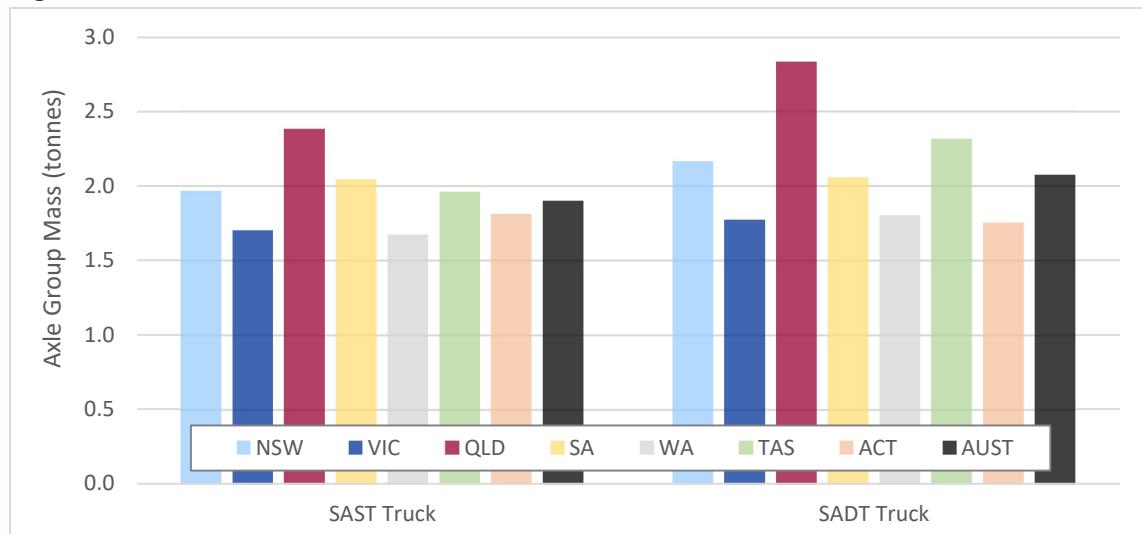
State	Sample (million)	Truck		Vehicle Average
		SAST	SADT	
NSW	2.52	1.97	2.16	4.13
VIC	6.04	1.70	1.77	3.48
QLD	1.01	2.38	2.83	5.19
SA	0.18	2.04	2.06	4.10
WA	0.95	1.67	1.80	3.48
TAS	0.14	1.96	2.31	4.27
ACT	0.19	1.81	1.75	3.56
AUST	11.01	1.90	2.07	3.97
SE	n/a	1.04E-04	1.55E-04	2.08E-04

The national average ESA value of 0.028 is significantly lower than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 5.4: CATEGORY 8: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Vehicle Average
		SAST	SADT	
NSW	2.52	0.022	0.007	0.030
VIC	6.04	0.011	0.003	0.015
QLD	1.01	0.045	0.020	0.064
SA	0.18	0.024	0.006	0.030
WA	0.95	0.011	0.003	0.015
TAS	0.14	0.020	0.008	0.029
ACT	0.19	0.014	0.003	0.017
AUST	11.01	0.020	0.007	0.028
SE	n/a	4.15E-06	2.28E-06	5.02E-06

Figure 5.2 indicates a consistent pattern in AGM across states. The AGM values for QLD are also significantly higher than the other States.

Figure 5.2: CATEGORY 8: AGM BY STATE AND AXLE GROUP


5.3 Category 9 (Rigid trucks: 2 axles: no trailer: $7.0 < \text{GVM} \leq 12.0\text{t}$)

These vehicles correspond to Austroads class 3, with an axle configuration of 11 and a GVM of 7.0-12.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.5 and Table 5.6 respectively, while Figure 5.3 plots the distribution in AGM by state and axle group.

Table 5.5: CATEGORY 9: WEIGHTED AVERAGE AGM (tonnes)

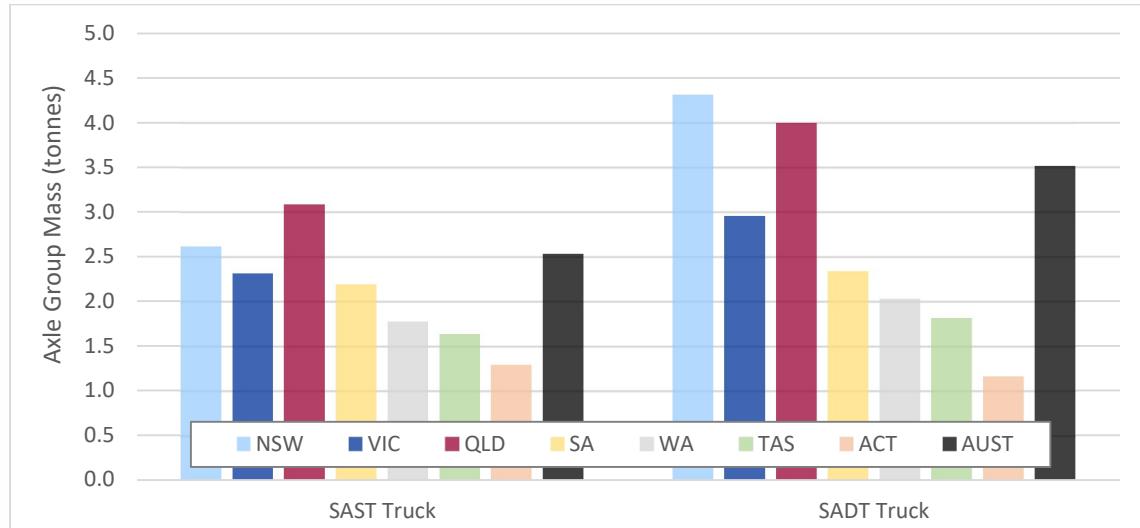
State	Sample (million)	Truck		Vehicle Average
		SAST	SADT	
NSW	8.12	2.61	4.31	6.93
VIC	18.04	2.31	2.96	5.27
QLD	3.10	3.09	3.99	6.91
SA	0.55	2.19	2.34	4.53
WA	2.32	1.77	2.03	3.81
TAS	0.42	1.64	1.82	3.45
ACT	0.54	1.29	1.16	2.45
AUST	33.09	2.53	3.52	6.00
SE	n/a	1.59E-04	2.81E-04	3.75E-04

The national average ESA value of 0.203 is significantly lower than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 5.6: CATEGORY 9: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Vehicle Average
		SAST	SADT	
NSW	8.12	0.110	0.188	0.298
VIC	18.04	0.063	0.045	0.108
QLD	3.10	0.163	0.108	0.271
SA	0.55	0.054	0.025	0.078
WA	2.32	0.024	0.014	0.038
TAS	0.42	0.016	0.009	0.025
ACT	0.54	0.004	0.001	0.005
AUST	33.09	0.099	0.104	0.203
SE	n/a	1.88E-05	2.50E-05	3.25E-05

Figure 5.3 indicates that the axle group masses are (a) significantly higher for QLD for all axle types, (b) significantly lower for TAS and the ACT for all axle types (c) significantly higher for SADT axles for NSW.

Figure 5.3: CATEGORY 9: AGM BY STATE AND AXLE GROUP


5.4 Category 10 (Rigid trucks: 2 axles: no trailer: GVM > 12.0t)

These vehicles correspond to Austroads class 3, with an axle configuration of 11 and a GVM of >12.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.7 and Table 5.8 respectively, while Figure 5.4 plots the distribution in AGM by state and axle group.

Table 5.7: CATEGORY 10: WEIGHTED AVERAGE AGM (tonnes)

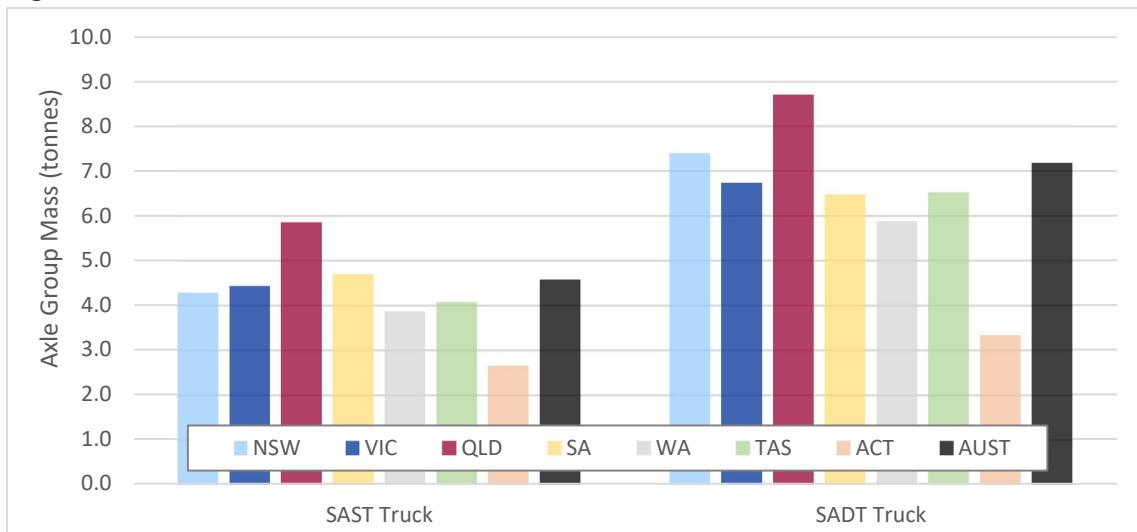
State	Sample (million)	Truck		Vehicle Average
		SAST	SADT	
NSW	4.11	4.28	7.39	11.67
VIC	9.17	4.43	6.73	11.16
QLD	1.78	5.85	8.70	14.55
SA	0.28	4.69	6.47	11.16
WA	1.14	3.86	5.87	9.73
TAS	0.21	4.07	6.51	10.58
ACT	0.29	2.65	3.33	5.98
AUST	16.98	4.57	7.18	11.76
SE	n/a	3.56E-04	4.73E-04	6.85E-04

The national average ESA value of 2.347 is significantly higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 5.8: CATEGORY 10: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Vehicle Average
		SAST	SADT	
NSW	4.11	0.854	0.935	1.789
VIC	9.17	1.558	0.903	2.461
QLD	1.78	2.453	2.247	4.700
SA	0.28	0.809	0.596	1.405
WA	1.14	0.343	0.368	0.711
TAS	0.21	0.479	0.651	1.130
ACT	0.29	0.164	0.198	0.362
AUST	16.98	1.268	1.079	2.347
SE	n/a	2.89E-03	1.27E-03	3.50E-03

Figure 5.4 indicates a consistent pattern in AGM across states, with the SADT values being significantly higher than the corresponding SAST values. The AGM values for the ACT are also significantly lower than the other States.

Figure 5.4: CATEGORY 10: AGM BY STATE AND AXLE GROUP


5.5 Category 11 (Rigid trucks: 2 axles: with trailer: GCM ≤ 42.5t)

These vehicles correspond to Austroads class 5, 6, 7 or 8, with an axle configuration of 111, 112, 113, 1111 or 1112 and a GVM ≤ 42.5t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.9 and Table 5.10 respectively, while Figure 5.5 plots the distribution in AGM by state and axle group.

Table 5.9: CATEGORY 11: WEIGHTED AVERAGE AGM (tonnes)

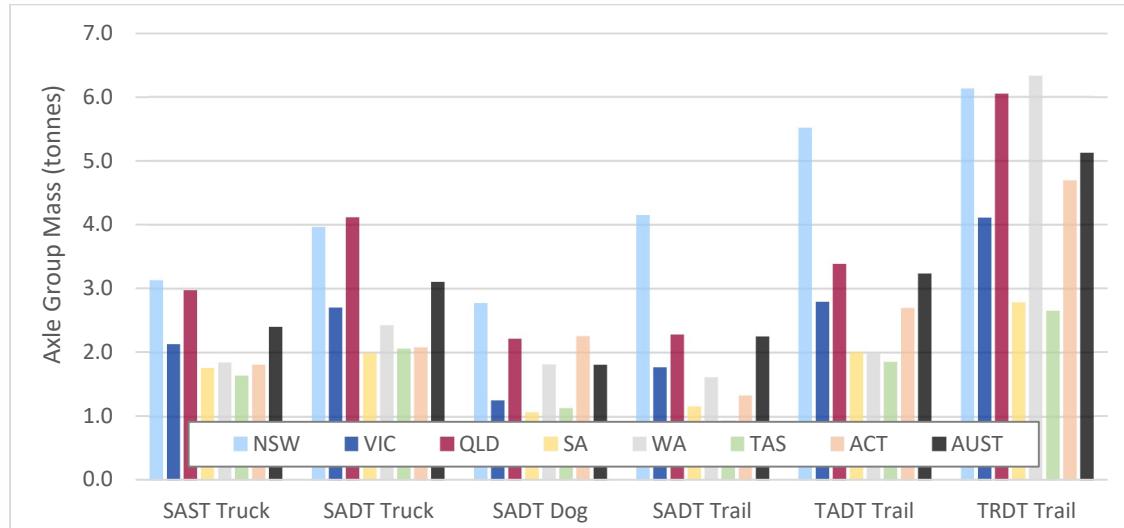
State	Sample (million)	Truck		Dog	Trail			Vehicle Average
		SAST	SADT	SADT	SADT	TADT	TRDT	
NSW	1.48	3.13	3.96	2.77	4.15	5.51	6.13	12.12
VIC	6.15	2.13	2.70	1.25	1.77	2.79	4.11	7.34
QLD	0.98	2.97	4.11	2.21	2.28	3.38	6.05	10.15
SA	0.33	1.76	1.99	1.06	1.15	2.00	2.79	5.52
WA	0.53	1.84	2.42	1.81	1.61	1.98	6.33	6.17
TAS	0.13	1.64	2.06	1.13	0.93	1.85	2.65	5.20
ACT	0.07	1.80	2.08	2.25	1.32	2.70	4.69	5.91
AUST	9.68	2.40	3.10	1.80	2.25	3.23	5.12	8.44
SE	n/a	4.38E-04	6.44E-04	1.11E-03	1.67E-03	1.77E-03	7.44E-02	1.59E-03

The national average ESA value of 0.429 is significantly lower than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9 % confidence.

Table 5.10: CATEGORY 11: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Dog	Trail			Vehicle Average
		SAST	SADT	SADT	SADT	TADT	TRDT	
NSW	1.48	0.342	0.195	0.162	0.455	0.353	0.079	0.937
VIC	6.15	0.138	0.101	0.018	0.065	0.040	0.046	0.296
QLD	0.98	0.295	0.246	0.038	0.066	0.032	0.082	0.592
SA	0.33	0.054	0.033	0.001	0.011	0.004	0.002	0.095
WA	0.53	0.060	0.043	0.014	0.029	0.004	0.022	0.116
TAS	0.13	0.033	0.024	0.006	0.008	0.004	0.003	0.063
ACT	0.07	0.057	0.033	0.092	0.024	0.014	0.053	0.112
AUST	9.68	0.186	0.131	0.048	0.131	0.091	0.052	0.429
SE	n/a	1.37E-04	1.08E-04	1.33E-04	2.03E-04	2.17E-04	5.69E-03	2.58E-04

Figure 5.5 indicates that the axle group masses are (a) significantly higher for NSW, VIC and QLD for all axle types, (b) significantly lower for SADT Dog and SADT Trail axles for most States and (c) significantly higher for TRDT Trail axles for all States.

Figure 5.5: CATEGORY 11: AGM BY STATE AND AXLE GROUP


5.6 Category 12 (Rigid trucks: 3 axles: no trailer: $4.5 < \text{GVM} \leq 18.0\text{t}$)

These vehicles correspond to Austroads class 4, with an axle configuration of 12 and a GVM of 4.5-18.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.11 and Table 5.12 respectively, while Figure 5.6 plots the distribution in AGM by state and axle group.

Table 5.11: CATEGORY 12: WEIGHTED AVERAGE AGM (tonnes)

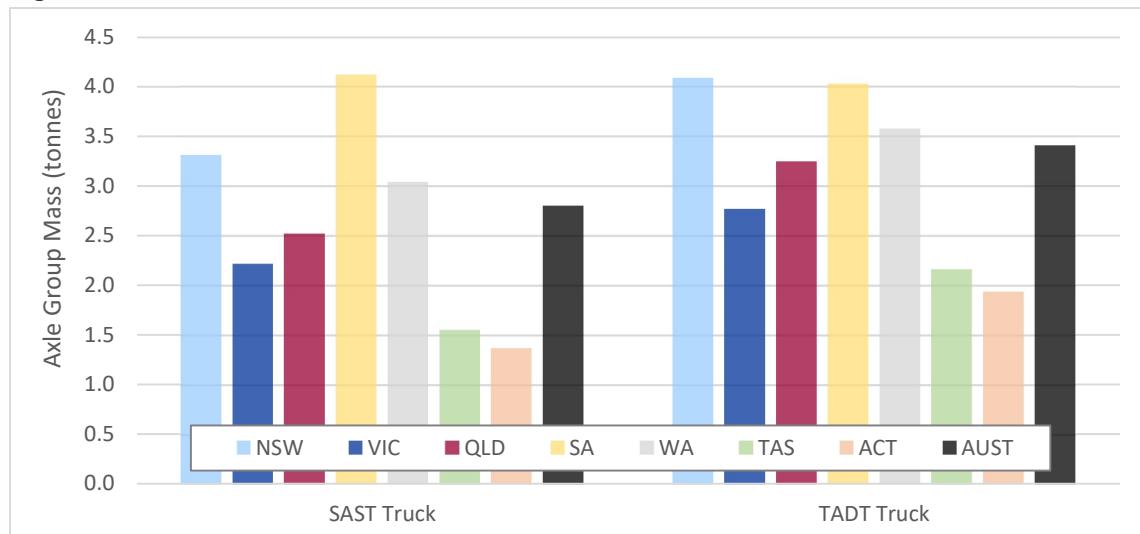
State	Sample (million)	Truck		Vehicle Average
		SAST	TADT	
NSW	0.26	3.31	4.08	7.39
VIC	0.43	2.21	2.77	4.98
QLD	0.01	2.52	3.25	5.76
SA	0.02	4.12	4.02	8.14
WA	0.02	3.04	3.58	6.61
TAS	0.01	1.55	2.16	3.71
ACT	0.11	1.37	1.94	3.31
AUST	0.85	2.80	3.41	6.21
SE	n/a	1.16E-03	1.31E-03	1.99E-03

The national average ESA value of 0.184 is significantly lower than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 5.12: CATEGORY 12: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Vehicle Average
		SAST	TADT	
NSW	0.26	0.265	0.017	0.282
VIC	0.43	0.155	0.008	0.163
QLD	0.01	0.077	0.004	0.082
SA	0.02	0.556	0.016	0.571
WA	0.02	0.201	0.010	0.211
TAS	0.01	0.028	0.002	0.030
ACT	0.11	0.006	0.001	0.006
AUST	0.85	0.176	0.009	0.184
SE	n/a	2.03E-04	1.72E-05	2.06E-04

Figure 5.6 presents a more varied set of results between States, although the AGM values for TADT Truck are generally higher than the SAST axle type.

Figure 5.6: CATEGORY 12: AGM BY STATE AND AXLE GROUP


5.7 Category 13 (Rigid trucks: 3 axles: no trailer: GVM > 18.0t)

These vehicles correspond to Austroads class 4, with an axle configuration of 12 and a GVM >18.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.13 and Table 5.14 respectively, while Figure 5.7 plots the distribution in AGM by state and axle group.

Table 5.13: CATEGORY 13: WEIGHTED AVERAGE AGM (tonnes)

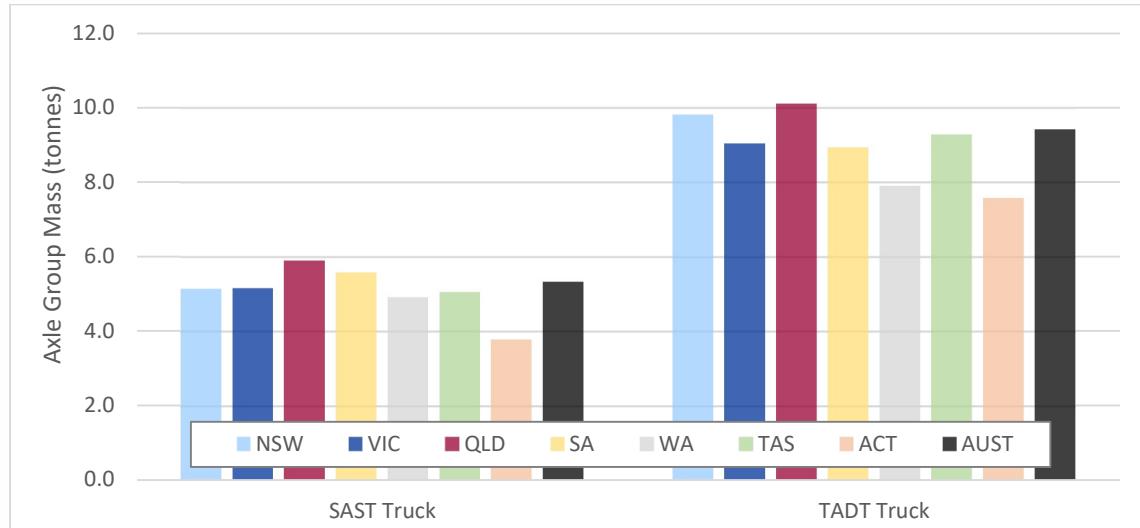
State	Sample (million)	Truck		Vehicle Average
		SAST	TADT	
NSW	6.93	5.13	9.82	14.95
VIC	13.67	5.16	9.05	14.21
QLD	2.86	5.90	10.10	16.00
SA	0.42	5.58	8.94	14.51
WA	1.07	4.92	7.90	12.82
TAS	0.19	5.06	9.29	14.34
ACT	0.11	3.78	7.58	11.36
AUST	25.24	5.32	9.42	14.75
SE	n/a	2.71E-04	8.27E-04	9.67E-04

The national average ESA value of 2.091 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 5.14: CATEGORY 13: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Vehicle Average
		SAST	TADT	
NSW	6.93	1.042	0.541	1.583
VIC	13.67	1.266	0.493	1.759
QLD	2.86	2.592	0.972	3.564
SA	0.42	1.391	0.411	1.802
WA	1.07	0.879	0.263	1.142
TAS	0.19	0.949	0.424	1.373
ACT	0.11	0.674	0.405	1.078
AUST	25.24	1.491	0.600	2.091
SE	n/a	9.73E-04	4.38E-04	1.17E-03

Figure 5.7 indicates a consistent pattern in AGM across states, with the TADT values being significantly higher than the corresponding SAST values.

Figure 5.7: CATEGORY 13: AGM BY STATE AND AXLE GROUP


5.8 Category 14 (Rigid trucks: 3 axles: with trailer: GCM ≤ 42.5t)

As per the redistribution process detailed in Section 2.4 (Table 2.5) these vehicles correspond to:

- all vehicles with an axle configuration of 122, 123 or 1211
- a share of vehicles with an axle configuration of 1212 or 1222

The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.15 and Table 5.16 respectively, while Figure 5.8 plots the distribution in AGM by state and axle group.

Table 5.15: CATEGORY 14: WEIGHTED AVERAGE AGM (tonnes)

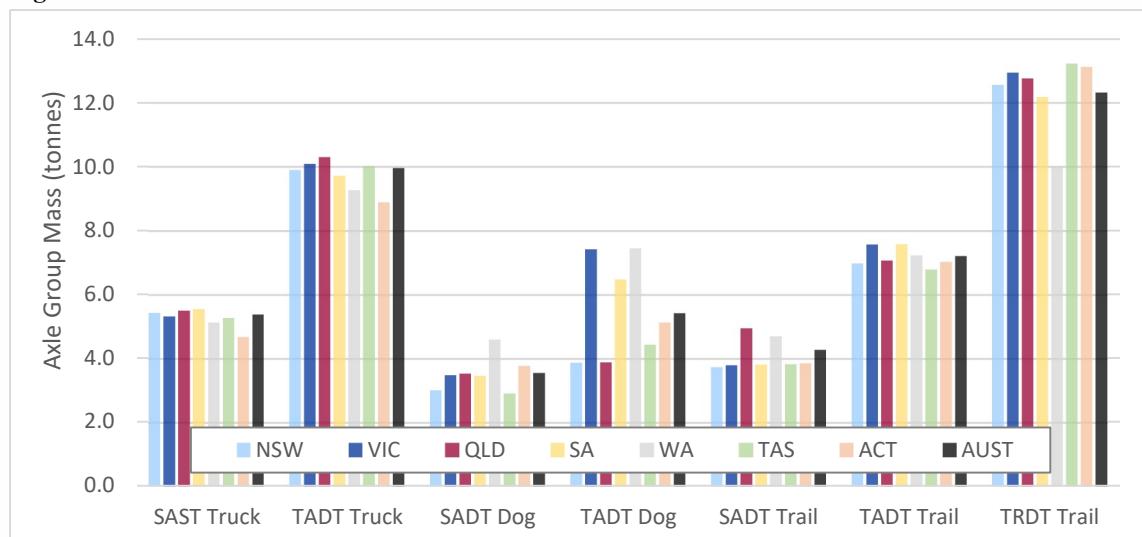
State	Sample (million)	Truck		Dog		Trail			Vehicle Average
		SAST	TADT	TADT	TRDT	SADT	TADT	TRDT	
NSW	5.90	5.43	9.89	3.01	3.87	3.73	6.97	12.55	26.29
VIC	6.69	5.32	10.09	3.48	7.41	3.79	7.56	12.94	26.70
QLD	2.69	5.50	10.29	3.52	3.88	4.95	7.06	12.76	27.15
SA	0.53	5.55	9.72	3.46	6.47	3.81	7.58	12.18	26.32
WA	1.24	5.12	9.26	4.60	7.44	4.69	7.23	10.01	24.08
TAS	0.22	5.27	10.01	2.91	4.43	3.82	6.78	13.23	26.23
ACT	0.02	4.68	8.88	3.77	5.13	3.85	7.02	13.12	22.70
AUST	17.29	5.38	9.96	3.54	5.41	4.27	7.21	12.32	26.31
SE	n/a	2.94E-04	1.09E-03	2.54E-03	1.15E-02	9.45E-02	6.08E-03	2.48E-03	2.71E-03

The national average ESA value of 2.725 is significantly higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than ±1% with 99.9% confidence.

Table 5.16: CATEGORY 14: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Dog		Trail			Vehicle Average
		SAST	TADT	TADT	TRDT	SADT	TADT	TRDT	
NSW	5.90	1.140	0.625	0.062	0.011	0.187	0.292	0.606	2.273
VIC	6.69	1.201	0.697	0.211	0.446	0.233	0.376	0.705	2.504
QLD	2.69	2.064	1.002	0.185	0.026	0.497	0.400	0.977	3.877
SA	0.53	1.236	0.581	0.122	0.148	0.235	0.337	0.603	2.344
WA	1.24	0.888	0.414	0.213	0.256	0.207	0.213	0.298	1.593
TAS	0.22	1.079	0.695	0.066	0.031	0.180	0.220	0.714	2.300
ACT	0.02	0.898	0.536	0.145	0.033	0.276	0.386	0.723	1.931
AUST	17.29	1.404	0.726	0.163	0.165	0.299	0.335	0.701	2.725
SE	n/a	4.73E-04	1.09E-03	6.71E-04	2.78E-03	1.26E-02	1.04E-03	4.65E-04	8.69E-04

Figure 5.8 indicates a consistent pattern in AGM between States, within each axle group type, with the latter being highest for TRDT Trail and TADT Truck axles. Also, the AGM is significantly higher for TADT Dog axles for VIC, SA and WA.

Figure 5.8: CATEGORY 14: AGM BY STATE AND AXLE GROUP


5.9 Category 15 (Rigid trucks: 4 axles: no trailer: $4.5 < \text{GVM} \leq 25.0\text{t}$)

These vehicles correspond to Austroads class 5, with an axle configuration of 22 and a GVM of 4.5-25.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.17 and Table 5.18 respectively, while Figure 5.9 plots the distribution in AGM by state and axle group.

Table 5.17: CATEGORY 15: WEIGHTED AVERAGE AGM (tonnes)

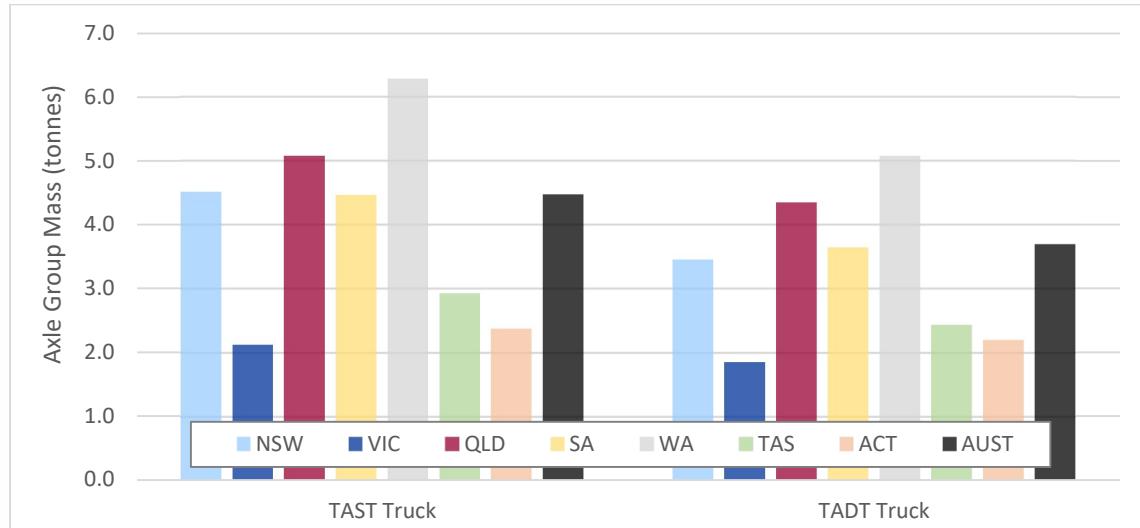
State	Sample (million)	Truck		Vehicle Average
		TAST	TADT	
NSW	0.04	4.51	3.45	7.96
VIC	0.19	2.12	1.85	3.97
QLD	0.03	5.07	4.34	9.41
SA	0.00	4.46	3.64	8.10
WA	0.02	6.28	5.07	11.35
TAS	0.00	2.93	2.43	5.36
ACT	0.04	2.37	2.20	4.56
AUST	0.32	4.47	3.69	8.16
SE	n/a	2.96E-03	2.69E-03	5.05E-03

The national average ESA value of 0.157 is significantly lower than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 5.18: CATEGORY 15: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Vehicle Average
		TAST	TADT	
NSW	0.04	0.146	0.012	0.158
VIC	0.19	0.027	0.004	0.032
QLD	0.03	0.137	0.015	0.152
SA	0.00	0.164	0.017	0.181
WA	0.02	0.289	0.029	0.318
TAS	0.00	0.068	0.008	0.076
ACT	0.04	0.006	0.001	0.007
AUST	0.32	0.142	0.015	0.157
SE	n/a	2.18E-04	4.22E-05	2.31E-04

Figure 5.9 presents a more varied set of results between States, although the AGM values for the TADT Truck are similar to the corresponding TAST values.

Figure 5.9: CATEGORY 15: AGM BY STATE AND AXLE GROUP


5.10 Category 16 (Rigid trucks: 4 axles: no trailer: GVM > 25.0t)

These vehicles correspond to Austroads class 5, with an axle configuration of 22 and a GVM >25.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.19 and Table 5.20 respectively, while Figure 5.10 plots the distribution in AGM by state and axle group.

Table 5.19: CATEGORY 16: WEIGHTED AVERAGE AGM (tonnes)

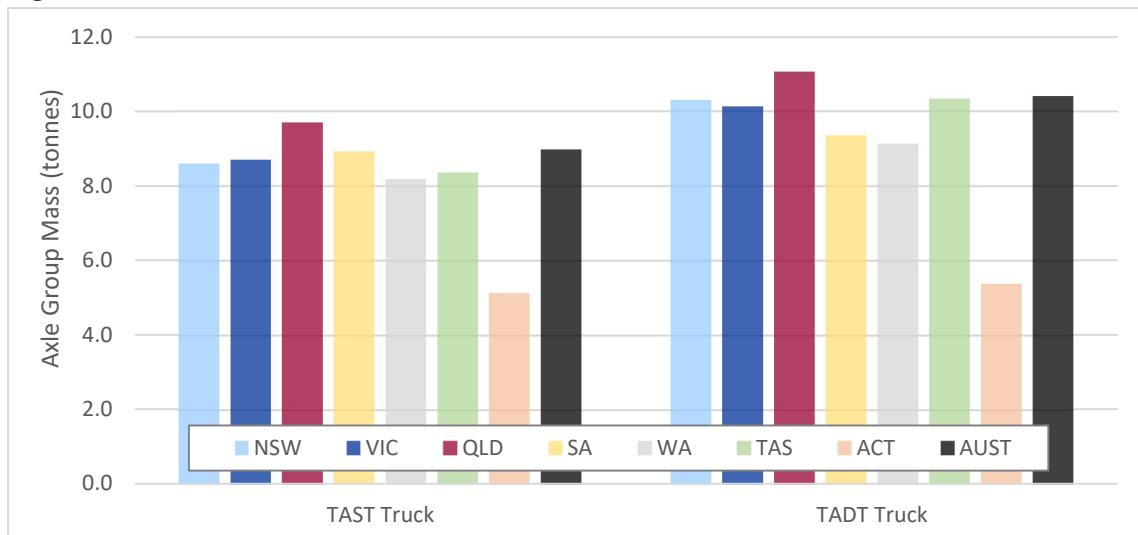
State	Sample (million)	Truck		Vehicle Average
		TAST	TADT	
NSW	2.06	8.59	10.31	18.90
VIC	2.93	8.69	10.13	18.83
QLD	0.84	9.69	11.07	20.76
SA	0.12	8.92	9.35	18.27
WA	0.22	8.18	9.13	17.30
TAS	0.06	8.35	10.34	18.69
ACT	0.05	5.13	5.38	10.50
AUST	6.28	8.97	10.40	19.37
SE	n/a	1.05E-03	1.93E-03	2.71E-03

The national average ESA value of 2.625 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 5.20: CATEGORY 16: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Vehicle Average
		TAST	TADT	
NSW	2.06	1.247	0.760	2.007
VIC	2.93	1.474	0.807	2.281
QLD	0.84	2.374	1.366	3.741
SA	0.12	1.184	0.486	1.670
WA	0.22	0.831	0.410	1.242
TAS	0.06	0.937	0.635	1.572
ACT	0.05	0.371	0.182	0.552
AUST	6.28	1.670	0.955	2.625
SE	n/a	1.41E-03	8.41E-04	1.98E-03

Figure 5.10 indicates a consistent pattern in AGM across states, with the TADT values being significantly higher than the corresponding TAST values. The AGM values for the ACT are also significantly lower than the other States.

Figure 5.10: CATEGORY 16: AGM BY STATE AND AXLE GROUP


5.11 Category 17 (Rigid trucks: 4 axles: with trailer: GCM \leq 42.5t)

As per the redistribution process detailed in Section 2.4 (Table 2.5) these vehicles correspond to:

- all vehicles with an axle configuration of 221, 222, 223 or 2211
- a share of vehicles with an axle configuration of 2212 or 2222

The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.21 and Table 5.22 respectively, while Figure 5.11 plots the distribution in AGM by state and axle group.

Table 5.21: CATEGORY 17: WEIGHTED AVERAGE AGM (tonnes)

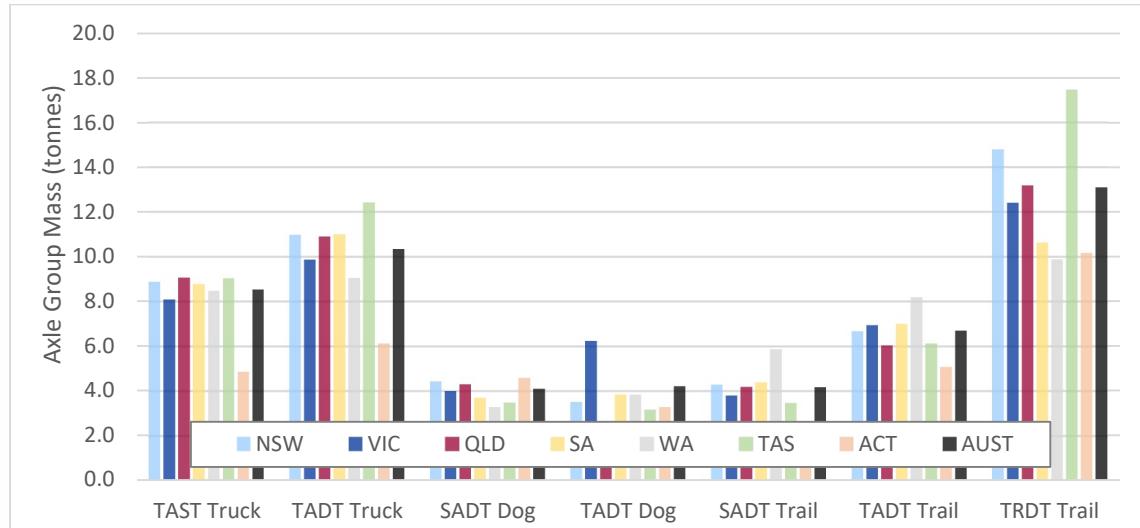
State	Sample (million)	Truck		Dog		Trail			Vehicle Average
		TAST	TADT	SADT	TADT	SADT	TADT	TRDT	
NSW	0.10	8.87	10.96	4.41	3.50	4.27	6.65	14.78	29.30
VIC	0.25	8.07	9.85	3.99	6.23	3.79	6.93	12.41	26.45
QLD	0.05	9.05	10.89	4.29	2.59	4.18	6.03	13.19	28.59
SA	0.00	8.76	11.00	3.69	3.83	4.38	6.99	10.61	27.52
WA	0.07	8.46	9.04	3.27	3.83	5.85	8.18	9.88	26.52
TAS	0.03	9.03	12.40	3.48	3.16	3.46	6.11	17.45	35.02
ACT	0.00	4.86	6.12	4.58	3.27	1.73	5.07	10.16	16.01
AUST	0.51	8.52	10.32	4.09	4.21	4.15	6.69	13.08	27.80
SE	n/a	3.92E-03	6.61E-03	8.34E-03	1.25E-01	3.81E-02	2.13E-02	3.97E-02	1.63E-02

The national average ESA value of 3.055 significantly higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 50.8% confidence, the lowest confidence interval reported in this study.

Table 5.22: CATEGORY 17: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Dog		Trail			Vehicle Average
		TAST	TADT	SADT	TADT	SADT	TADT	TRDT	
NSW	0.10	1.326	0.776	0.246	0.007	0.271	0.300	0.892	2.633
VIC	0.25	1.785	0.962	0.227	0.414	0.276	0.756	0.737	3.427
QLD	0.05	1.958	1.130	0.296	0.002	0.307	0.278	0.958	3.646
SA	0.00	1.208	0.840	0.165	0.007	0.282	0.236	0.306	2.337
WA	0.07	0.891	0.491	0.085	0.007	0.501	0.322	0.356	1.735
TAS	0.03	1.183	1.303	0.151	0.004	0.106	0.188	1.430	3.503
ACT	0.00	0.396	0.304	0.274	0.006	0.080	0.251	0.329	0.910
AUST	0.51	1.567	0.908	0.233	0.143	0.294	0.445	0.808	3.055
SE	n/a	1.32E-02	1.89E-02	2.63E-03	3.43E-02	5.99E-02	3.58E-02	5.68E-02	4.45E-02

Figure 5.11 indicates that the axle group masses are generally consistent between States for a given axle group type and significantly higher for TAST Truck, TADT Truck and TRDT Trail axles.

Figure 5.11: CATEGORY 17: AGM BY STATE AND AXLE GROUP


5.12 Category 18 (Rigid trucks: 3 & 4+ axles: with trailer: GCM > 42.5t)

As per the redistribution process detailed in Section 2.4 (Table 2.5) these vehicles correspond to:

- all vehicles with an axle configuration of 1223, 1233, 2223 or 2233
- a share of vehicles with an axle configuration of 1212, 1222, 2212 or 2222

The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 5.23 and Table 5.24 respectively, while Figure 5.12 plots the distribution in AGM by state and axle group.

Table 5.23: CATEGORY 18: WEIGHTED AVERAGE AGM (tonnes)

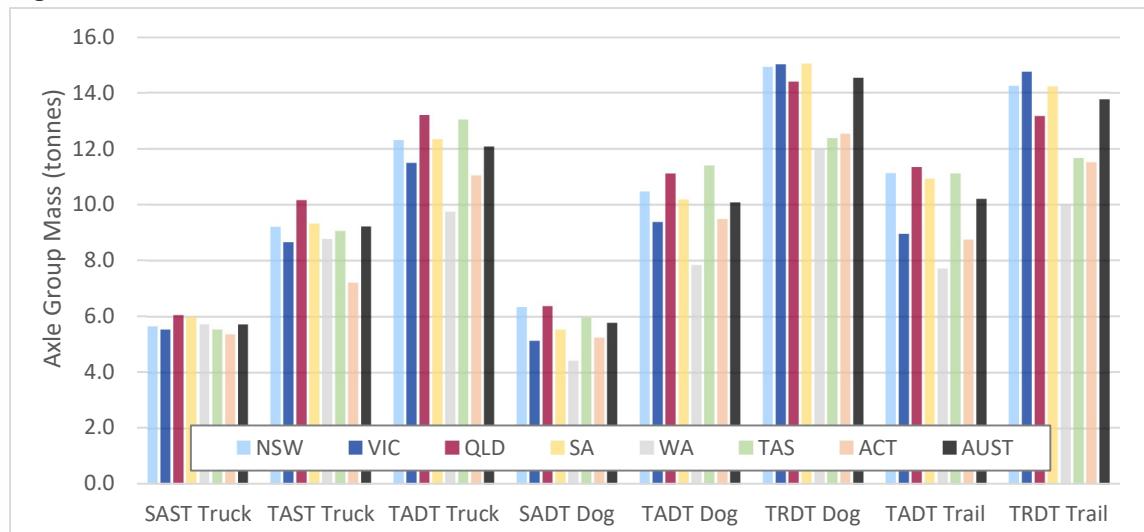
State	Sample (million)	Truck			Dog			Trail		Vehicle Average
		SAST	TAST	TADT	SADT	TADT	TRDT	TADT	TRDT	
NSW	3.06	5.64	9.20	12.30	6.32	10.46	14.92	11.11	14.23	39.54
VIC	2.90	5.53	8.65	11.48	5.13	9.37	15.01	8.95	14.74	38.99
QLD	0.86	6.04	10.15	13.19	6.36	11.10	14.39	11.33	13.16	43.11
SA	0.14	5.97	9.31	12.33	5.53	10.18	15.02	10.92	14.22	43.80
WA	0.43	5.71	8.76	9.74	4.42	7.83	11.99	7.71	10.02	36.71
TAS	0.08	5.52	9.05	13.04	5.94	11.39	12.37	11.10	11.65	39.88
ACT	0.01	5.35	7.20	11.04	5.24	9.47	12.53	8.74	11.50	31.79
AUST	7.48	5.71	9.21	12.07	5.76	10.07	14.53	10.19	13.75	40.13
SE	n/a	1.52E-03	2.88E-02	2.57E-03	8.75E-03	9.23E-03	8.48E-03	4.11E-03	7.42E-03	8.84E-03

The national average ESA value of 4.655 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 5.24: CATEGORY 18: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck			Dog			Trail		Vehicle Average
		SAST	TAST	TADT	SADT	TADT	TRDT	TADT	TRDT	
NSW	3.06	1.350	1.428	1.183	0.732	0.788	0.821	1.062	0.824	4.306
VIC	2.90	1.380	1.527	1.058	0.451	0.604	0.992	0.632	1.070	3.993
QLD	0.86	2.263	2.982	2.044	1.004	1.170	1.141	1.443	1.021	6.745
SA	0.14	1.627	1.351	1.164	0.387	0.681	1.004	0.838	0.989	4.540
WA	0.43	1.405	0.990	0.510	0.220	0.382	0.407	0.316	0.262	2.437
TAS	0.08	1.239	1.185	1.417	0.579	1.010	0.511	0.992	0.515	4.330
ACT	0.01	1.056	0.686	0.918	0.339	0.506	0.534	0.520	0.485	2.836
AUST	7.48	1.589	1.791	1.304	0.652	0.791	0.920	0.948	0.906	4.655
SE	n/a	3.84E-03	7.57E-02	1.24E-03	2.61E-03	3.98E-03	2.77E-03	1.23E-03	2.20E-03	5.51E-03

Figure 5.12 indicates that the AGM is generally consistent between States for a given axle group type, however they are significantly higher for TADT Truck, TRDT Dog and TRDT Trail axles.

Figure 5.12: CATEGORY 18: AGM BY STATE AND AXLE GROUP


6.0 ARTICULATED TRUCKS

6.1 Category 19 (Articulated trucks: single trailer: 3 axle rig)

These vehicles correspond to Austroads class 6, with an axle configuration of 111. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 6.1 and Table 6.2 respectively, while Figure 6.1 plots the distribution in AGM by state and axle group.

Table 6.1: CATEGORY 19: WEIGHTED AVERAGE AGM (tonnes)

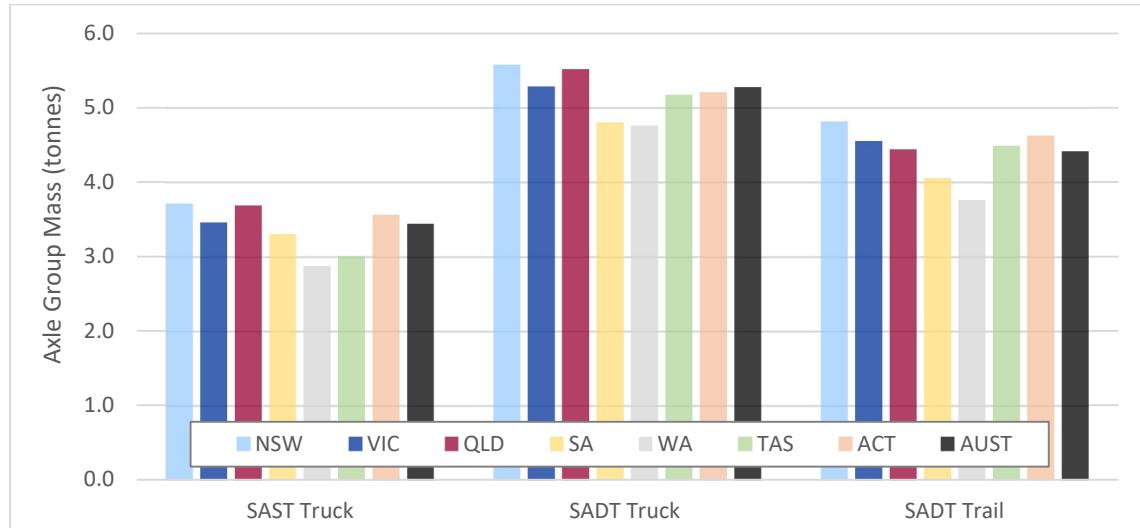
State	Sample (million)	Truck		Trail	Vehicle Average
		SAST	SADT		
NSW	0.14	3.71	5.58	4.81	14.11
VIC	0.20	3.46	5.28	4.55	13.29
QLD	0.13	3.69	5.52	4.44	13.64
SA	0.03	3.30	4.81	4.05	12.17
WA	0.02	2.88	4.76	3.76	11.40
TAS	0.00	3.01	5.18	4.49	12.67
ACT	0.00	3.56	5.21	4.63	13.40
AUST	0.52	3.44	5.28	4.42	13.13
SE	n/a	1.57E-03	2.50E-03	2.59E-03	5.65E-03

The national average ESA value of 0.947 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 93.1% confidence, which is the third lowest confidence interval for this study.

Table 6.2: CATEGORY 19: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Trail	Vehicle Average
		SAST	SADT		
NSW	0.14	0.433	0.389	0.313	1.136
VIC	0.20	0.488	0.369	0.261	1.118
QLD	0.13	0.460	0.494	0.267	1.221
SA	0.03	0.216	0.209	0.118	0.544
WA	0.02	0.116	0.183	0.087	0.386
TAS	0.00	0.125	0.220	0.147	0.492
ACT	0.00	0.277	0.228	0.211	0.715
AUST	0.52	0.368	0.347	0.231	0.947
SE	n/a	3.72E-03	1.75E-03	1.39E-03	5.20E-03

Figure 6.1 indicates a consistent pattern in AGM across states, with the SADT Truck values being the highest, followed by the values for SADT Trail axles.

Figure 6.1: CATEGORY 19: AGM BY STATE AND AXLE GROUP


6.2 Category 20 (Articulated trucks: single trailer: 4 axle rig)

These vehicles correspond to Austroads class 5, 7 or 8, with an axle configuration of 112 or 121. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 6.3 and Table 6.4 respectively, while Figure 6.1 indicates a consistent pattern in AGM across states, with the TADT Trail values being the highest, followed by the values for SADT Truck axles.

Figure 6.2 plots the distribution in AGM by state and axle group.

Table 6.3: CATEGORY 20: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Truck			Trail		Vehicle Average
		SAST	SADT	TADT ⁽¹⁾	SADT ⁽¹⁾	TADT	
NSW	0.38	4.96	5.73	0.00	0.00	7.69	18.37
VIC	0.74	4.86	6.31	0.00	0.00	7.75	18.93
QLD	0.18	5.27	6.66	0.00	0.00	7.90	19.84
SA	0.02	5.23	6.14	0.00	0.00	7.72	19.09
WA	0.02	4.75	6.14	0.00	0.00	6.94	17.82
TAS	0.01	4.14	4.51	0.00	0.00	4.55	13.19
ACT	0.00	4.35	5.60	0.00	0.00	7.10	17.04
AUST	1.35	4.99	6.20	0.00	0.00	7.57	18.76
SE	n/a	1.16E-03	1.70E-03	0.00E+00	0.00E+00	3.12E-03	5.14E-03

(1) While this axle group type is valid for Category 20 vehicles, no WIM data was recorded for this particular axle group type

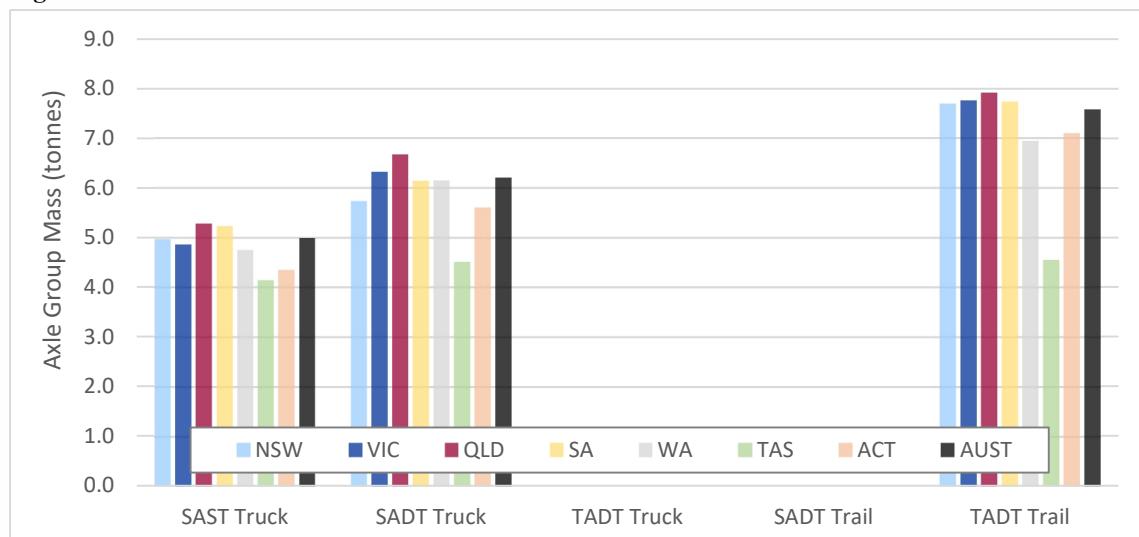
The national average ESA value of 1.969 is marginally higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 6.4: CATEGORY 20: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck			Trail		Vehicle Average
		SAST	SADT	TADT ⁽¹⁾	SADT ⁽¹⁾	TADT	
NSW	0.38	0.913	0.392	0.000	0.000	0.341	1.646
VIC	0.74	0.883	0.582	0.000	0.000	0.252	1.717
QLD	0.18	1.629	0.882	0.000	0.000	0.344	2.856
SA	0.02	1.098	0.444	0.000	0.000	0.201	1.743
WA	0.02	0.845	0.489	0.000	0.000	0.155	1.490
TAS	0.01	0.607	0.164	0.000	0.000	0.040	0.811
ACT	0.00	0.664	0.384	0.000	0.000	0.232	1.280
AUST	1.35	1.105	0.595	0.000	0.000	0.270	1.969
SE	n/a	1.31E-03	7.96E-04	0.00E+00	0.00E+00	5.61E-04	2.09E-03

(1) While this axle group type is valid for Category 20 vehicles, no WIM data was recorded for this particular axle group type

Figure 6.1 indicates a consistent pattern in AGM across states, with the TADT Trail values being the highest, followed by the values for SADT Truck axles.

Figure 6.2: CATEGORY 20: AGM BY STATE AND AXLE GROUP


6.3 Category 21 (Articulated trucks: single 3 axle trailer: 5 axle rig)

These vehicles correspond to Austroads class 8, with an axle configuration of 113. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 6.5 and Table 6.6 respectively, while Figure 6.3 plots the distribution in AGM by state and axle group.

Table 6.5: CATEGORY 21: WEIGHTED AVERAGE AGM (tonnes)

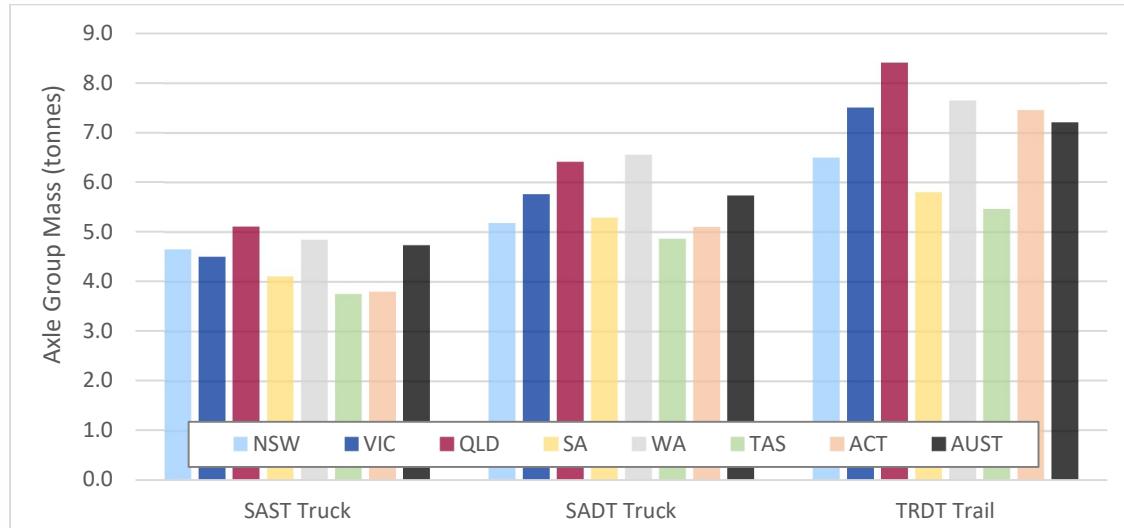
State	Sample (million)	Truck		Trail	Vehicle Average
		SAST	SADT		
NSW	0.20	4.65	5.18	6.50	16.33
VIC	0.30	4.50	5.76	7.50	17.75
QLD	0.08	5.11	6.41	8.41	19.93
SA	0.01	4.11	5.29	5.80	15.19
WA	0.01	4.84	6.55	7.65	19.04
TAS	0.00	3.75	4.86	5.47	14.08
ACT	0.00	3.79	5.10	7.45	16.35
AUST	0.61	4.73	5.73	7.21	17.68
SE	n/a	1.90E-03	2.84E-03	5.65E-03	9.16E-03

The national average ESA value of 1.741 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 6.6: CATEGORY 21: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Trail	Vehicle Average
		SAST	SADT		
NSW	0.20	0.828	0.359	0.085	1.273
VIC	0.30	0.836	0.476	0.158	1.470
QLD	0.08	1.687	0.853	0.203	2.743
SA	0.01	0.585	0.298	0.056	0.939
WA	0.01	0.725	0.582	0.049	1.356
TAS	0.00	0.420	0.242	0.033	0.694
ACT	0.00	0.515	0.321	0.124	0.960
AUST	0.61	1.077	0.540	0.125	1.741
SE	n/a	3.07E-03	1.37E-03	7.23E-04	4.18E-03

Figure 6.3 indicates a consistent pattern in AGM across states, with the TRDT Trail values being the highest, followed by the values for SADT Truck axles.

Figure 6.3: CATEGORY 21: AGM BY STATE AND AXLE GROUP


6.4 Category 22 (Articulated trucks: single 2 axle trailer: 5 axle rig)

These vehicles correspond to Austroads class 8, with an axle configuration of 122. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 6.7 and Table 6.8 respectively, while Figure 6.4 plots the distribution in AGM by state and axle group.

Table 6.7: CATEGORY 22: WEIGHTED AVERAGE AGM (tonnes)

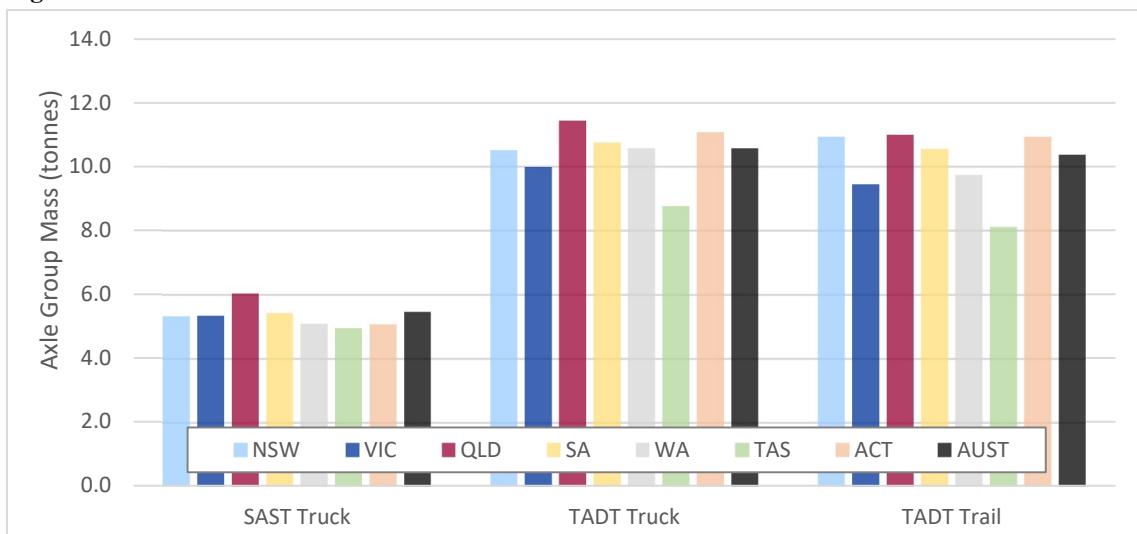
State	Sample (million)	Truck		Trail	Vehicle Average
		SAST	TADT		
NSW	0.91	5.31	10.50	10.94	26.75
VIC	1.42	5.33	9.98	9.44	24.76
QLD	0.30	6.02	11.44	10.99	28.45
SA	0.10	5.41	10.75	10.55	26.71
WA	0.00	5.08	10.57	9.73	25.39
TAS	0.05	4.94	8.75	8.10	21.80
ACT	0.01	5.07	11.08	10.92	27.07
AUST	2.79	5.46	10.58	10.36	26.40
SE	n/a	6.98E-04	1.82E-03	2.33E-03	4.10E-03

The national average ESA value of 2.785 is marginally higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 6.8: CATEGORY 22: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Trail	Vehicle Average
		SAST	TADT	TADT	
NSW	0.91	1.050	0.476	0.751	2.277
VIC	1.42	1.167	0.438	0.442	2.047
QLD	0.30	3.179	0.977	1.005	5.161
SA	0.10	1.151	0.485	0.559	2.195
WA	0.00	0.915	0.484	0.418	1.817
TAS	0.05	0.883	0.256	0.236	1.375
ACT	0.01	0.876	0.570	0.641	2.087
AUST	2.79	1.543	0.574	0.668	2.785
SE	n/a	1.15E-03	5.07E-04	6.28E-04	1.74E-03

Figure 6.4 indicates a consistent pattern in AGM across states, with the value for TADT Truck and TADT Trail axles being significantly higher than for SAST Truck axles. The AGM values for TAS are also marginally lower than the other States.

Figure 6.4: CATEGORY 22: AGM BY STATE AND AXLE GROUP


6.5 Category 23 (Articulated trucks: single trailer: 6 axle rig)

These vehicles correspond to Austroads class 9, with an axle configuration of 123. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 6.9 and Table 6.10 respectively, while Figure 6.5 plots the distribution in AGM by state and axle group.

Table 6.9: CATEGORY 23: WEIGHTED AVERAGE AGM (tonnes)

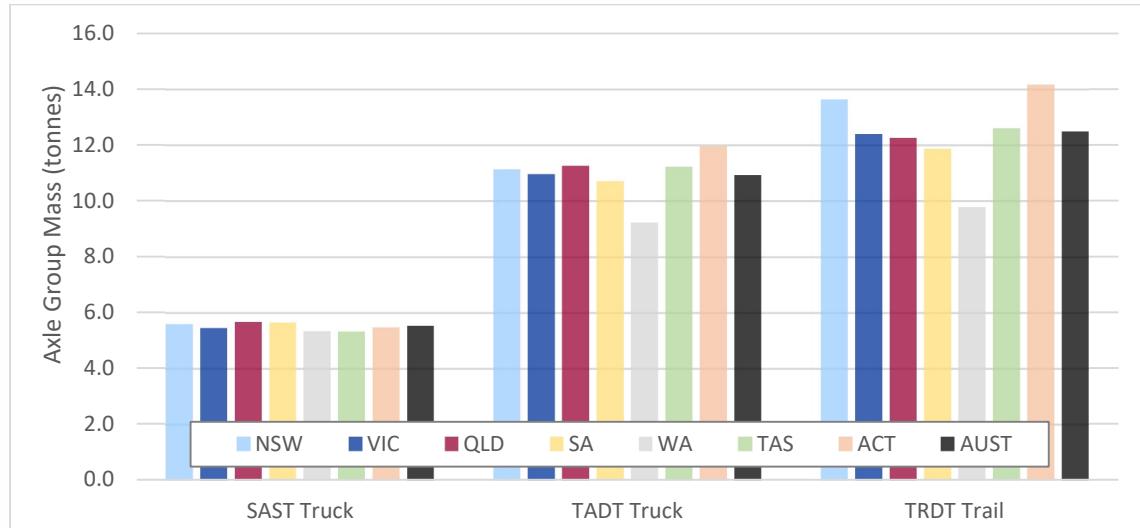
State	Sample (million)	Truck		Trail	Vehicle Average
		SAST	TADT		
NSW	13.34	5.59	11.13	13.63	30.34
VIC	21.53	5.44	10.95	12.39	28.79
QLD	5.27	5.67	11.25	12.26	29.19
SA	1.05	5.64	10.70	11.88	28.22
WA	0.84	5.33	9.23	9.78	24.34
TAS	0.47	5.32	11.22	12.60	29.14
ACT	0.06	5.48	11.96	14.16	31.60
AUST	42.56	5.53	10.92	12.49	28.94
SE	n/a	1.49E-04	6.02E-04	8.90E-04	1.47E-03

The national average ESA value of 2.707 is marginally higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 6.10: CATEGORY 23: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Trail	Vehicle Average
		SAST	TADT		
NSW	13.34	1.244	0.735	0.692	2.671
VIC	21.53	1.227	0.734	0.497	2.458
QLD	5.27	1.904	1.113	0.686	3.703
SA	1.05	1.295	0.623	0.393	2.311
WA	0.84	1.063	0.346	0.199	1.607
TAS	0.47	1.066	0.812	0.546	2.424
ACT	0.06	1.140	0.930	0.660	2.730
AUST	42.56	1.363	0.780	0.565	2.707
SE	n/a	2.19E-04	1.94E-04	1.72E-04	4.61E-04

Figure 6.5 indicates a consistent pattern in AGM across states, with the value for TADT Truck and TRDT Trail axles being significantly higher than for SAST Truck axles. The AGM values for WA are also marginally lower than the other States.

Figure 6.5: CATEGORY 23: AGM BY STATE AND AXLE GROUP


6.6 Category 29 (Articulated trucks: single trailer: > 6 axle rig)

These vehicles correspond to Austroads class 9 or 10, with an axle configuration of 124 or 133. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 6.11 and Table 6.12 respectively, while Figure 6.6 plots the distribution in AGM by state and axle group.

Table 6.11: CATEGORY 29: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Truck			Trail		Vehicle Average
		SAST	TADT	TRDT	TRDT	QADT	
NSW	0.19	5.81	13.72	14.38 ⁽¹⁾	15.16 ⁽¹⁾	20.86	40.39
VIC	0.23	5.64	12.26	14.59	18.83	18.04	35.94
QLD	0.03	5.61	12.35	14.16	11.49	18.45	36.39
SA	0.00	5.91	12.41	14.38 ⁽¹⁾	15.16 ⁽¹⁾	17.85	36.17
WA	0.00	4.98	8.92	14.38 ⁽¹⁾	15.16 ⁽¹⁾	13.89	27.79
TAS	0.00	5.54	10.60	14.38 ⁽¹⁾	15.16 ⁽¹⁾	16.67	32.82
ACT	0.00	5.11	9.70	14.38 ⁽¹⁾	15.16 ⁽¹⁾	12.52	27.33
AUST	0.46	5.39	11.03	14.37	15.06	16.71	33.12
SE	n/a	1.46E-03	5.11E-03	7.80E+00	1.30E+01	9.89E-03	1.50E-02

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

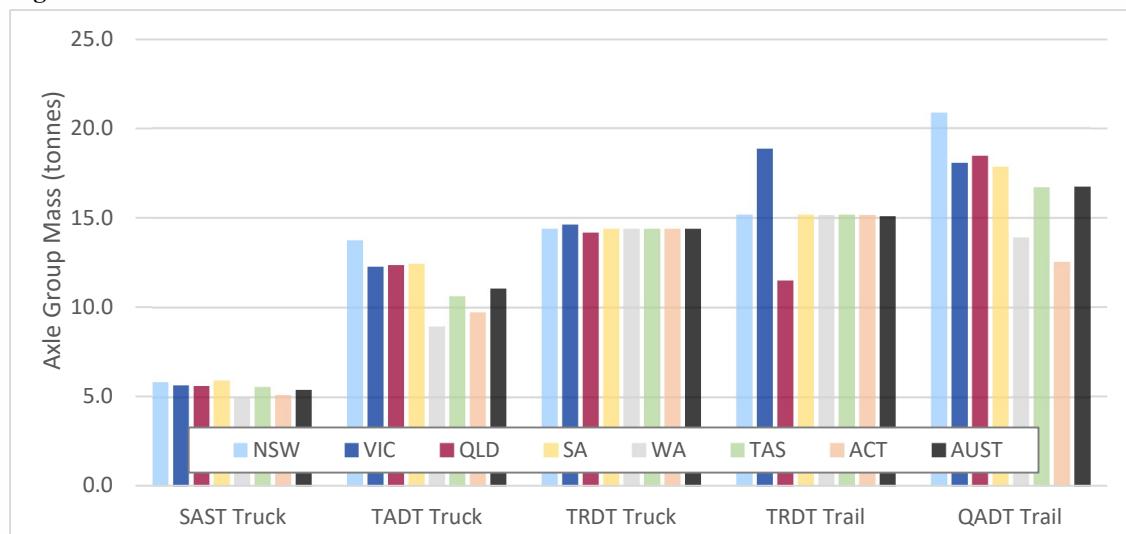
The national average ESA value of 2.785 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 6.12: CATEGORY 29: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck			Trail		Vehicle Average
		SAST	TADT	TRDT	TRDT	QADT	
NSW	0.19	1.475	1.351	0.704 ⁽¹⁾	1.165 ⁽¹⁾	1.076	3.902
VIC	0.23	1.490	1.030	0.664	1.744	0.760	3.280
QLD	0.03	2.027	1.448	0.744	0.586	1.059	4.530
SA	0.00	1.577	0.974	0.704 ⁽¹⁾	1.165 ⁽¹⁾	0.675	3.226
WA	0.00	0.800	0.276	0.704 ⁽¹⁾	1.165 ⁽¹⁾	0.302	1.378
TAS	0.00	1.200	0.709	0.704 ⁽¹⁾	1.165 ⁽¹⁾	0.578	2.488
ACT	0.00	1.084	0.590	0.704 ⁽¹⁾	1.165 ⁽¹⁾	0.263	1.937
AUST	0.46	1.298	0.828	0.705	1.150	0.661	2.785
SE	n/a	2.25E-03	1.98E-03	3.28E+00	2.93E+00	1.66E-03	4.56E-03

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

Figure 6.6 shows that the AGM values are generally consistent between States, with the values for TADT Truck, TRDT Truck, TRDT Trail and QADT Trail axles being significantly higher.

Figure 6.6: CATEGORY 29: AGM BY STATE AND AXLE GROUP


7.0 B-DOUBLES & B-TRIPLES

7.1 Category 24 (Articulated trucks: B-double: < 9 axle rig)

These vehicles correspond to Austroads class 9 or 10, with an axle configuration of 1122, 1221, 1222, 1223 or 1232. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 7.1 and Table 7.2 respectively, while Figure 7.1 plots the distribution in AGM by state and axle group.

Table 7.1: CATEGORY 24: WEIGHTED AVERAGE AGM (tonnes)

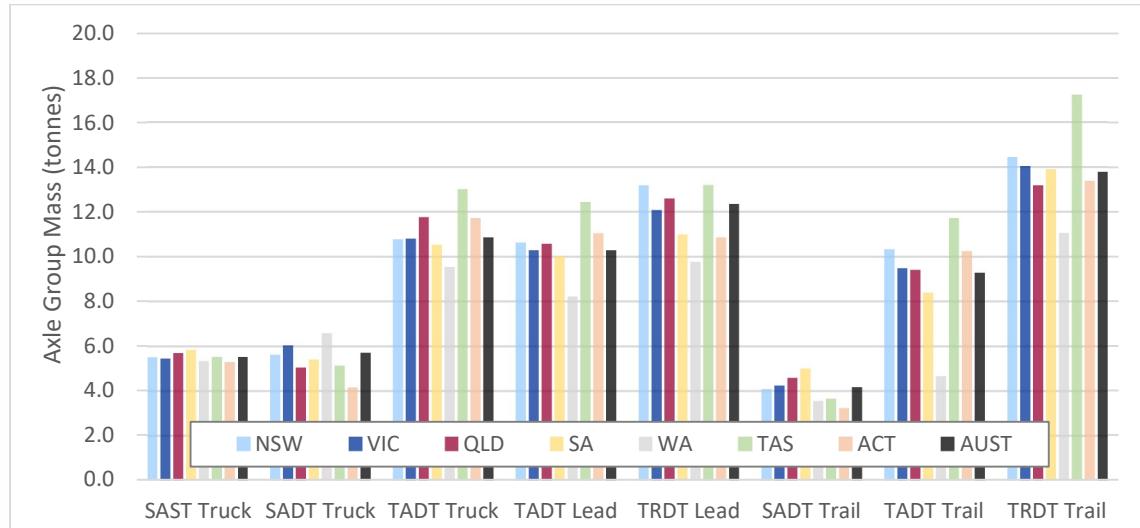
State	Sample (million)	Truck			Lead		Trail			Vehicle Average
		SAST	SADT	TADT	TADT	TRDT	SADT	TADT	TRDT	
NSW	3.63	5.49	5.61	10.75	10.61	13.16	4.07	10.31	14.42	37.43
VIC	3.51	5.43	6.02	10.78	10.28	12.07	4.22	9.47	14.04	36.72
QLD	1.08	5.68	5.03	11.74	10.56	12.58	4.58	9.39	13.17	37.76
SA	0.19	5.82	5.39	10.51	10.00	10.97	4.98	8.38	13.90	35.62
WA	0.07	5.32	6.56	9.52	8.20	9.75	3.54	4.65	11.04	29.89
TAS	0.16	5.50	5.12	13.00	12.41	13.19	3.64	11.70	17.22	43.08
ACT	0.01	5.27	4.14	11.70	11.03	10.84	3.23	10.23	13.38	38.14
AUST	8.66	5.50	5.69	10.84	10.27	12.33	4.15	9.26	13.77	36.53
SE	n/a	4.87E-04	7.03E-02	2.85E-03	2.07E-03	1.57E-02	1.06E-01	2.31E-03	2.76E-02	7.20E-03

The national average ESA value of 3.937 is marginally higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 7.2: CATEGORY 24: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck			Lead		Trail			Vehicle Average
		SAST	SADT	TADT	TADT	TRDT	SADT	TADT	TRDT	
NSW	3.63	1.244	0.545	0.824	0.826	0.544	0.241	0.966	1.123	3.830
VIC	3.51	1.259	0.612	0.829	0.768	0.613	0.318	0.754	1.078	3.614
QLD	1.08	1.976	0.437	1.615	1.315	0.645	0.331	1.189	1.169	5.992
SA	0.19	1.481	0.542	0.632	0.563	0.306	0.250	0.388	0.838	3.087
WA	0.07	1.053	0.573	0.385	0.242	0.202	0.098	0.084	0.385	1.801
TAS	0.16	1.208	0.353	1.390	1.243	0.569	0.105	1.165	1.208	4.935
ACT	0.01	1.039	0.250	1.141	1.032	0.423	0.153	0.934	0.761	4.055
AUST	8.66	1.363	0.540	0.925	0.835	0.532	0.255	0.841	1.028	3.937
SE	n/a	3.67E-03	2.22E-02	9.66E-04	7.34E-04	5.79E-03	4.49E-02	1.35E-03	1.42E-02	5.40E-03

Figure 7.1 shows that the AGM values are generally consistent between States (except for WA which are generally lower), with the values for TADT Truck, TADT Lead, TRDT Lead and TRDT Trail axles being significantly higher.

Figure 7.1: CATEGORY 24: AGM BY STATE AND AXLE GROUP


7.2 Category 25 (Articulated trucks: B-double: ≥ 9 axle rig)

These vehicles correspond to Austroads class 10, with an axle configuration of 1233, 1243 or 1244. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 7.3 and Table 7.4 respectively, while Figure 7.2 plots the distribution in AGM by state and axle group.

Table 7.3: CATEGORY 25: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Truck		Lead		Trail		Vehicle Average
		SAST	TADT	TRDT	QADT	TRDT	QADT	
NSW	9.30	5.69	12.31	15.95	17.25	15.45	18.40	49.40
VIC	13.67	5.53	12.21	15.05	16.94	14.02	15.13	46.82
QLD	2.50	5.89	12.54	15.02	21.28	13.96	19.06	47.42
SA	1.21	5.86	12.37	15.07	16.06	13.64	9.00	46.94
WA	0.00	5.45	8.35	10.40	9.60	9.59	7.14	33.79
TAS	0.19	5.47	11.19	13.62	11.86	11.77	13.48 ⁽¹⁾	42.04
ACT	0.02	5.56	12.90	16.85	14.02	14.95	12.13	50.10
AUST	26.89	5.70	12.16	15.05	17.57	14.09	15.67	47.00
SE	n/a	1.94E-04	7.53E-04	1.05E-03	4.69E-01	1.17E-03	2.37E+00	2.90E-03

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

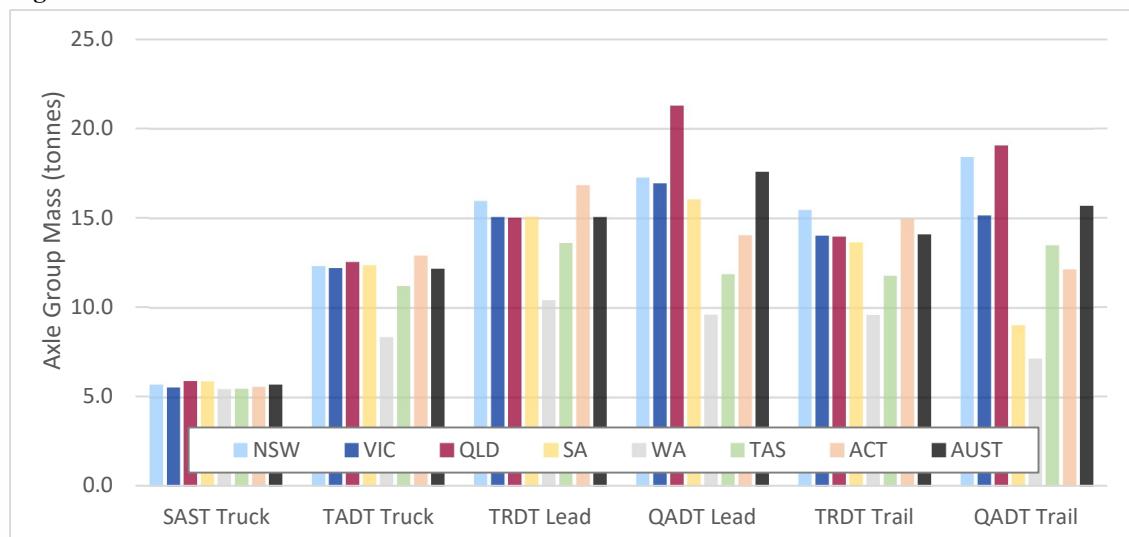
The national average ESA value of 4.202 is marginally higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than ±1% with 99.9% confidence.

Table 7.4: CATEGORY 25: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Lead		Trail		Vehicle Average
		SAST	TADT	TRDT	QADT	TRDT	QADT	
NSW	9.30	1.340	0.910	0.785	0.555	0.875	0.658	3.909
VIC	13.67	1.290	0.961	0.754	0.800	0.683	0.815	3.687
QLD	2.50	2.212	1.559	1.127	1.154	1.014	0.886	5.913
SA	1.21	1.497	0.975	0.746	0.488	0.610	0.027	3.828
WA	0.00	1.121	0.215	0.202	0.042	0.158	0.010	1.695
TAS	0.19	1.141	0.701	0.525	0.070	0.385	0.425 ⁽¹⁾	2.752
ACT	0.02	1.218	1.116	1.052	0.277	0.762	0.156	4.108
AUST	26.89	1.543	1.060	0.825	0.743	0.774	0.648	4.202
SE	n/a	3.44E-04	3.08E-04	2.48E-04	8.89E-02	2.64E-04	3.59E-01	9.53E-04

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

Figure 7.2 presents a more varied set of results between States, although the AGM values for SAST Truck are significantly lower than the other axle types.

Figure 7.2: CATEGORY 25: AGM BY STATE AND AXLE GROUP


7.3 Category 26 (Articulated trucks: B-triple)

These vehicles correspond to Austroads class 11, with an axle configuration of 12222, 12332, 12333, 22333 or 122222. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 7.5 and Table 7.6 respectively, while Figure 7.3 plots the distribution in AGM by state and axle group.

The axle configurations used in this analysis for Category 26 vehicles comprise of a steer axle group, drive axle group, two lead axle groups and a trail axle group. The results presented below for the lead axle group has been calculated as a weighted average of the two lead axle groups.

A standard B-triple vehicle does not contain a dolly axle group. However, there are some vehicle combinations that are a mixture of a B-triple and road train that are referred to as B-triples. These

vehicles contain a dolly axle group. One of these such vehicles has been included in this analysis, the 122222 axle configuration, hence the dolly axle group results presented below.

Table 7.5: CATEGORY 26: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Truck			Lead		Dolly	Trail		Vehicle Average
		SAST	TAST	TADT	TADT	TRDT	TADT	TADT	TRDT	
NSW	0.06	5.71	6.44	11.69	11.22	13.24	9.35	11.08	12.66	52.68
VIC	0.09	5.36	7.74	11.15	10.26	13.22	8.83	9.63	14.40	46.77
QLD	0.05	6.12	9.50	12.77	12.27	15.36	8.67	11.58	14.42	60.44
SA	0.03	5.96	8.79	12.51	11.47	15.23	6.65	10.82	14.92	60.71
WA	0.17	5.02	8.48	9.37	8.31	11.31	6.89	8.05	11.00	49.13
TAS	0.00	5.58	8.19 ⁽¹⁾	13.49	13.13	12.71 ⁽¹⁾	6.89 ⁽¹⁾	13.47	11.54 ⁽¹⁾	58.79
ACT	0.00	5.35	8.19 ⁽¹⁾	11.76	12.45	7.87	0.95	12.07	1.85	52.64
AUST	0.41	5.44	8.46	10.77	9.90	12.89	7.61	9.50	12.52	52.94
SE	n/a	8.29E-03	1.89E-01	6.64E-03	3.03E-02	2.28E-02	8.37E-02	3.06E-02	2.72E-02	3.63E-02

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

The national average ESA value of 4.465 is marginally higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

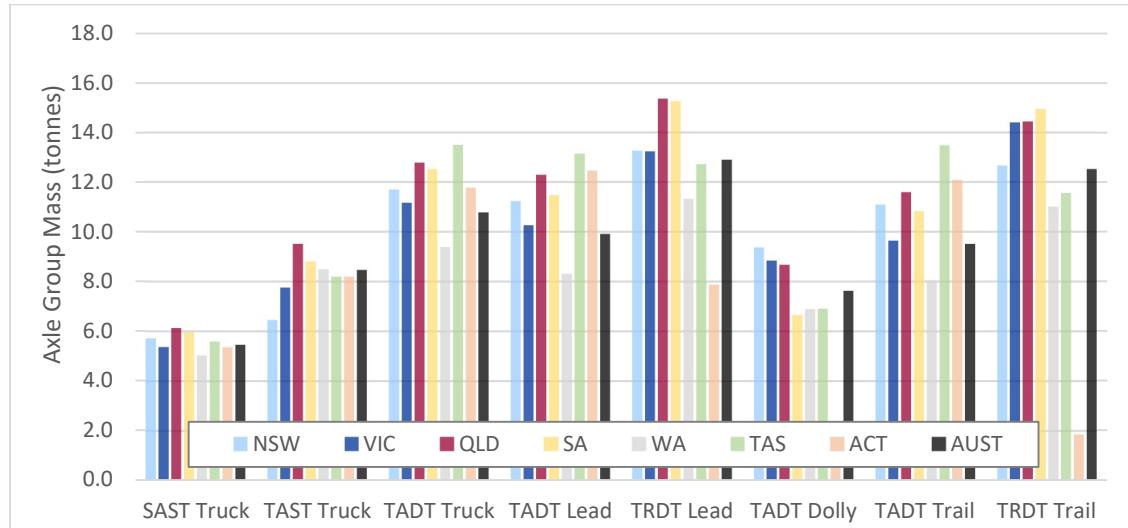
Table 7.6: CATEGORY 26: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck			Lead		Dolly	Trail		Vehicle Average
		SAST	TAST	TADT	TADT	TRDT	TADT	TADT	TRDT	
NSW	0.06	1.381	0.503	1.011	1.246	0.656	0.826	1.312	0.606	5.685
VIC	0.09	1.108	0.902	0.777	0.778	0.518	0.666	0.714	0.630	4.148
QLD	0.05	2.385	1.520	1.431	1.611	1.255	1.002	1.496	1.071	7.884
SA	0.03	1.578	0.934	0.977	0.901	0.724	0.081	0.839	0.716	4.848
WA	0.17	0.821	0.855	0.506	0.237	0.532	0.089	0.221	0.564	2.811
TAS	0.00	1.216	0.943 ⁽¹⁾	1.318	1.366	0.622 ⁽¹⁾	0.444 ⁽¹⁾	1.413	0.598 ⁽¹⁾	6.680
ACT	0.00	1.393	0.943 ⁽¹⁾	0.950	1.089	0.043	0.000	1.064	0.000	5.330
AUST	0.41	1.302	0.965	0.818	0.733	0.714	0.390	0.698	0.693	4.465
SE	n/a	2.64E-03	1.45E-01	1.61E-03	4.86E-03	4.59E-03	1.69E-02	4.67E-03	4.89E-03	7.27E-03

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

As above, Figure 7.3 presents are more varied set of results between States, although the AGM values for SAST Truck and TADT Dolly are significantly lower than the other axle types.

Figure 7.3: CATEGORY 26: AGM BY STATE AND AXLE GROUP



8.0 ROAD TRAINS

8.1 Category 27 (Articulated trucks: Road train: 2 trailers)

These vehicles correspond to Austroads class 10 or 11, with an axle configuration of 12222, 12223, 12322, 12323 or 12333. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 8.1 and Table 8.2 respectively, while Figure 8.1 plots the distribution in AGM by state and axle group.

Table 8.1: CATEGORY 27: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Truck		Lead		Dolly		Trail		Vehicle Average
		SAST	TADT	TADT	TRDT	TADT	TRDT	TADT	TRDT	
NSW	0.19	5.68	12.00	12.19	12.84	9.96	11.21	8.54	12.53	53.38
VIC	0.33	5.41	10.47	7.05	11.59	8.57	13.54	7.55	10.42	46.48
QLD	0.51	5.80	11.67	8.04	12.49	9.22	11.61	8.57	11.94	51.57
SA	0.29	5.98	12.39	8.25	13.80	10.20	12.10	8.67	13.11	55.74
WA	0.62	5.26	10.09	7.07	10.76	7.90	10.60	8.57	10.05	44.71
TAS	0.00	5.59	8.98	8.52 ⁽¹⁾	8.96	7.11	11.81 ⁽¹⁾	8.38 ⁽¹⁾	8.72	39.37
ACT	0.00	4.61	14.17	8.52 ⁽¹⁾	15.95	2.27	11.81 ⁽¹⁾	8.38 ⁽¹⁾	3.13	40.13
AUST	1.93	5.50	10.89	7.94	11.72	8.68	11.22	8.52	11.06	48.35
SE	n/a	5.72E-04	2.83E-03	7.19E-01	4.21E-03	4.30E-03	2.19E-02	1.84E-01	4.46E-03	1.40E-02

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

The national average ESA value of 3.306 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

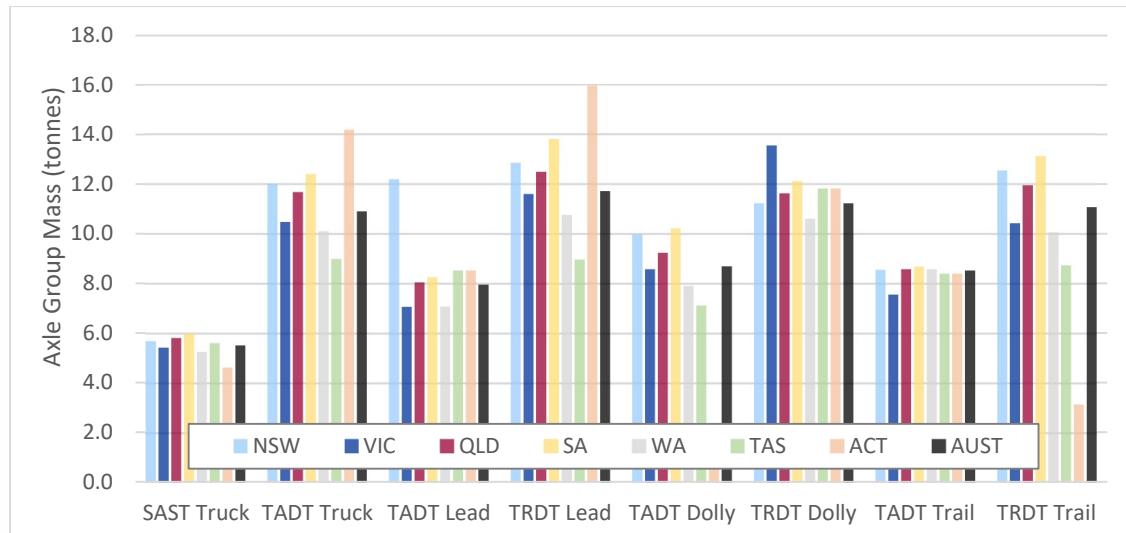
Table 8.2: CATEGORY 27: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Lead		Dolly		Trail		Vehicle Average
		SAST	TADT	TADT	TRDT	TADT	TRDT	TADT	TRDT	
NSW	0.19	1.297	1.073	0.991	0.574	0.616	0.361	0.548	0.587	4.055
VIC	0.33	1.189	0.766	0.220	0.463	0.472	0.567	0.328	0.352	3.241
QLD	0.51	1.799	1.031	0.435	0.579	0.553	0.463	0.541	0.558	4.502
SA	0.29	1.612	1.067	0.307	0.660	0.595	0.522	0.299	0.625	4.542
WA	0.62	0.980	0.518	0.157	0.320	0.260	0.360	0.526	0.296	2.425
TAS	0.00	1.215	0.528	0.422 ⁽¹⁾	0.333	0.340	0.455 ⁽¹⁾	0.448 ⁽¹⁾	0.308	2.723
ACT	0.00	0.532	1.124	0.422 ⁽¹⁾	0.546	0.001	0.455 ⁽¹⁾	0.448 ⁽¹⁾	0.001	2.204
AUST	1.93	1.263	0.758	0.324	0.446	0.408	0.411	0.495	0.420	3.306
SE	n/a	6.09E-04	6.30E-04	6.25E-02	4.30E-04	5.32E-04	2.57E-03	1.94E-02	4.79E-04	1.94E-03

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

Figure 8.1 presents a more varied set of results between States, although the AGM values for SAST Truck are significantly lower than the other axle types.

Figure 8.1: CATEGORY 27: AGM BY STATE AND AXLE GROUP



8.2 Category 28 (Articulated trucks: Road train: 3 trailers)

These vehicles correspond to Austroads class 11 or 12, with an axle configuration of 123333, 123233, 1232323, 1233323 or 1233333. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 8.3 and Table 8.4 respectively, while Figure 8.2 plots the distribution in AGM by state and axle group.

The axle configurations used in this analysis for Category 28 vehicles comprise of a steer axle group, drive axle group, two lead axle groups, two dolly axle groups and a trail axle group. The results presented below for the lead and dolly axle groups has been calculated as a weighted average of the two lead / dolly axle groups.

Table 8.3: CATEGORY 28: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Truck		Lead	Dolly		Vehicle Average	
		SAST	TADT		TADT	TRDT		
NSW	0.01	5.76	10.80	11.77	9.31	10.30	10.72	60.64
VIC	0.00	4.52	9.34	11.78	10.36	6.10	10.98	58.12
QLD	0.21	5.82	12.55	12.75	9.97	11.73	12.13	75.40
SA	0.10	6.04	13.29	14.28	10.68	14.90	13.66	77.30
WA	0.05	5.24	10.62	10.87	8.68	9.82	10.02	65.20
TAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUST	0.36	5.40	11.20	11.68	9.28	10.42	10.89	67.88
SE	n/a	1.39E-03	6.49E-03	9.88E-03	1.79E-02	1.82E-02	1.04E-02	4.78E-02

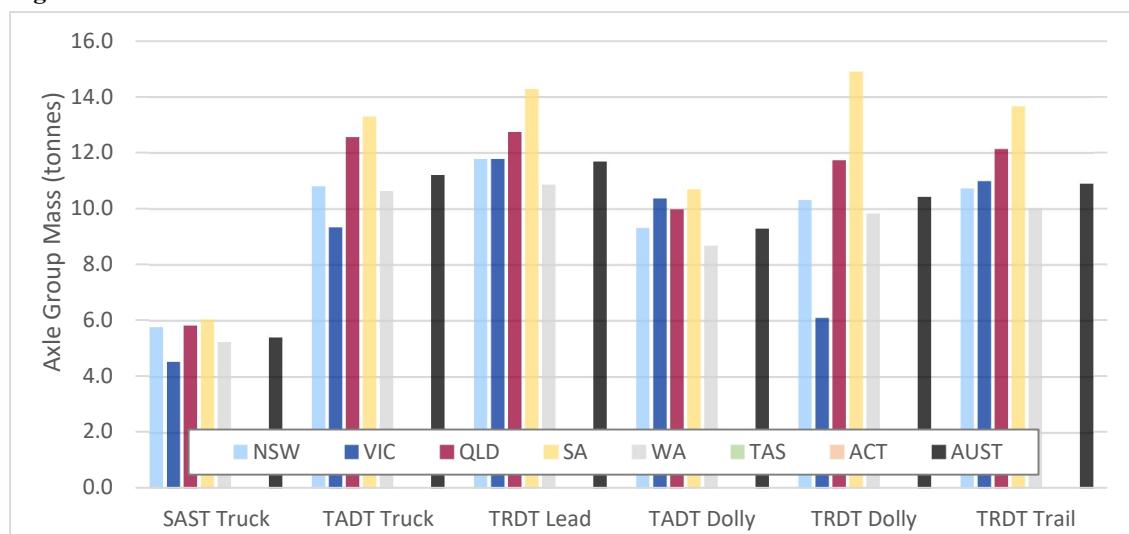
The national average ESA value of 4.065 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 8.4: CATEGORY 28: WEIGHTED AVERAGE ESA

State	Sample (million)	Truck		Lead	Dolly		Trail	Vehicle Average
		SAST	TADT	TRDT	TADT	TRDT	TRDT	
NSW	0.01	1.365	0.800	0.522	0.525	0.304	0.434	4.058
VIC	0.00	0.876	0.500	0.549	0.820	0.194	0.412	3.613
QLD	0.21	1.829	1.204	0.572	0.555	0.473	0.513	5.632
SA	0.10	1.661	1.470	0.905	0.843	0.978	0.872	6.953
WA	0.05	0.948	0.602	0.340	0.291	0.313	0.299	3.103
TAS	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ACT	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AUST	0.36	1.216	0.810	0.460	0.443	0.396	0.408	4.065
SE	n/a	1.48E-03	1.43E-03	1.05E-03	1.98E-03	2.29E-03	1.04E-03	5.76E-03

Figure 8.2 presents a more varied set of results between States, except for SA, which is generally higher, while the AGM values for SAST Truck are significantly lower than the other axle types.

Figure 8.2: CATEGORY 28: AGM BY STATE AND AXLE GROUP



9.0 OTHER (NON-FREIGHT CARRYING) TRUCKS

9.1 Category 30 (Other trucks (non-freight))

These vehicles correspond to Austroads class 3, with an axle configuration of 11 and a GVM of 3.5-4.5t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 9.1 and Table 9.2 respectively, while Figure 9.1 plots the distribution in AGM by state and axle group.

Table 9.1: CATEGORY 30: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (thousand)	Truck				Vehicle Average
		SAST	TAST	SADT	TADT	
NSW	3.26	3.72	14.7	4.70	15.6	9.17
VIC	6.47	5.22	14.9	6.81	14.2	13.3
QLD	5.40	4.56	15.0	5.18	16.4	13.1
SA	1.69	4.38	13.0	5.55	15.4	11.1
WA	4.75	3.39	16.7	4.20	17.2	10.2
TAS	0.852	3.33	11.0	4.17	13.7	8.34
ACT	0.152	4.00	12.4	5.24	16.5	9.85
AUST	22.6	4.39	14.9	5.48	15.5	11.6
SE	n/a	4.65E-03	6.00E-02	6.52E-03	2.31E-02	1.25E-02

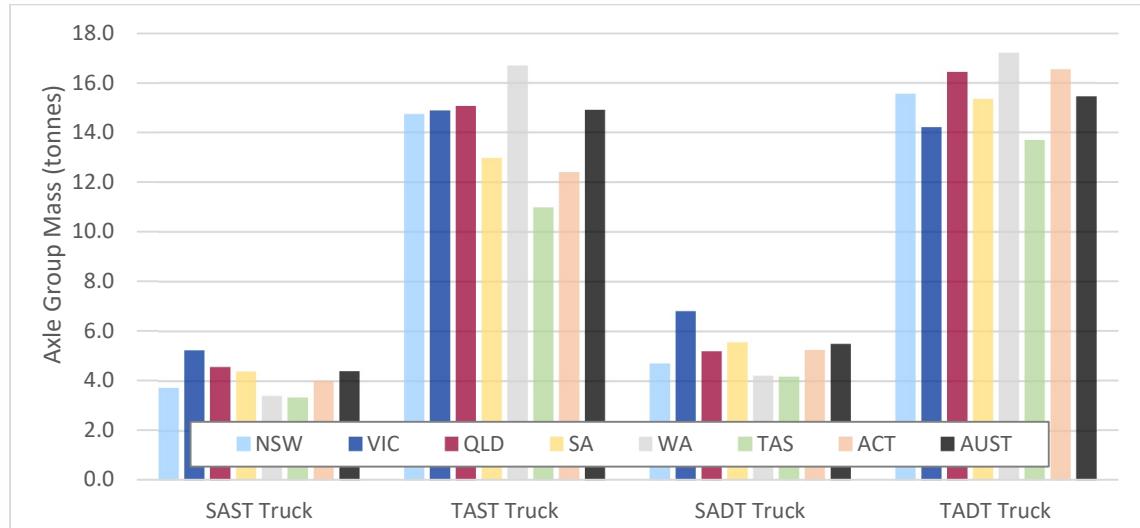
Table 9.2: CATEGORY 30: WEIGHTED AVERAGE ESA

State	Sample (thousand)	Truck				Vehicle Average
		SAST	TAST	SADT	TADT	
NSW	3.26	0.419	6.96	0.110	1.68	0.682
VIC	6.47	0.942	7.23	0.485	1.32	1.73
QLD	5.40	1.09	7.57	0.163	2.12	2.18
SA	1.69	0.645	4.17	0.214	1.55	1.10
WA	4.75	0.325	11.4	0.070	2.98	1.54
TAS	0.852	0.290	2.14	0.068	0.977	0.460
ACT	0.152	0.457	3.48	0.171	2.18	0.767
AUST	22.6	0.732	7.57	0.253	1.84	1.51
SE	n/a	2.12E-03	9.72E-02	1.03E-03	1.19E-02	4.19E-03

The national average ESA value of 1.51 is similar to the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.3% confidence.

Figure 9.1 indicates a generally consistent pattern in AGM across States, with the TAST Truck and TADT Truck values being significantly higher than the other axle types.

Figure 9.1: CATEGORY 30: AGM BY STATE AND AXLE GROUP



10.0 BUSES

This is the first time that buses (PAYGO Category 31-35) have been incorporated fully into an analysis of ESA values using WIM data.

10.1 Category 31 (Buses: 2 axles: $3.5 < \text{GVM} \leq 4.5\text{t}$)

These buses correspond to Austroads class 3, with an axle configuration of 11 and a GVM of 3.5-4.5t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 10.1 and Table 10.2 respectively, while Figure 10.1 plots the distribution in AGM by state and axle group.

Table 10.1: CATEGORY 31: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Bus		Vehicle Average
		SAST	SAST	
NSW	0.38	1.89	2.06	3.95
VIC	0.95	1.87	2.03	3.90
QLD	0.00	2.17	2.33	4.50
SA	0.04	2.00	1.88	3.88
WA	0.03	1.70	2.17	3.87
TAS	0.02	1.91	1.96	3.87
ACT	0.03	1.94	1.88	3.82
AUST	1.45	1.91	2.05	3.96
SE	n/a	2.08E-04	2.21E-04	2.03E-04

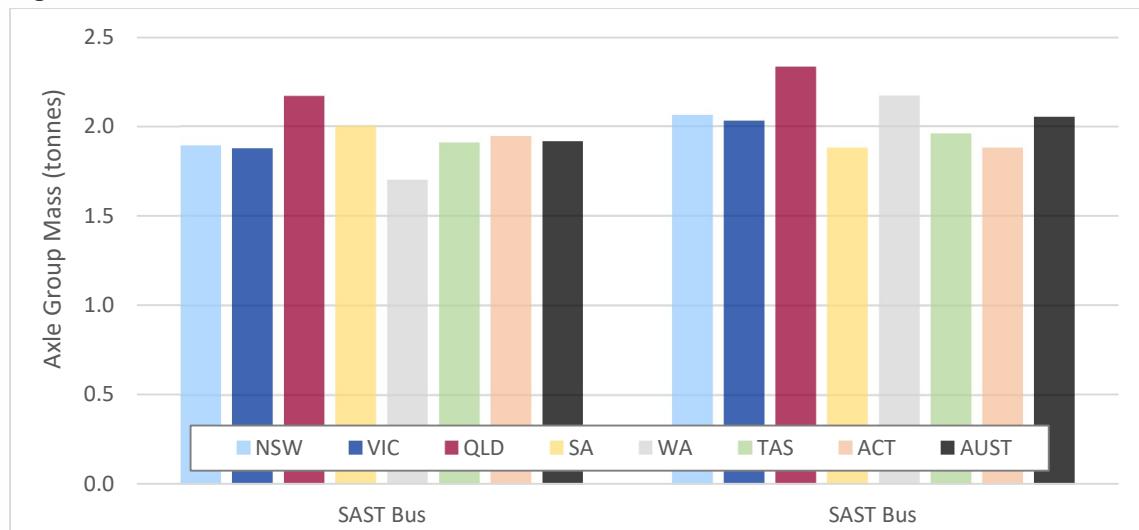
The national average ESA value of 0.041 is significantly higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 10.2: CATEGORY 31: WEIGHTED AVERAGE ESA

State	Sample (million)	Bus		Vehicle Average
		SAST	SAST	
NSW	0.38	0.017	0.023	0.040
VIC	0.95	0.016	0.022	0.038
QLD	0.00	0.029	0.038	0.066
SA	0.04	0.020	0.016	0.037
WA	0.03	0.012	0.027	0.039
TAS	0.02	0.017	0.019	0.037
ACT	0.03	0.018	0.016	0.033
AUST	1.45	0.018	0.023	0.041
SE	n/a	7.56E-06	1.01E-05	9.37E-06

Figure 10.1 indicates a consistent pattern in AGM across states, with the SAST values being about the same as the corresponding SAST values.

Figure 10.1: CATEGORY 31: AGM BY STATE AND AXLE GROUP



10.2 Category 32 (Buses: 2 axles: $4.5 < \text{GVM} \leq 10.0\text{t}$)

These buses correspond to Austroads class 3, with an axle configuration of 11 and a GVM of 4.5-10.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 10.3 and Table 10.4 respectively, while Figure 10.2 plots the distribution in AGM by state and axle group.

Table 10.3: CATEGORY 32: WEIGHTED AVERAGE AGM (tonnes)

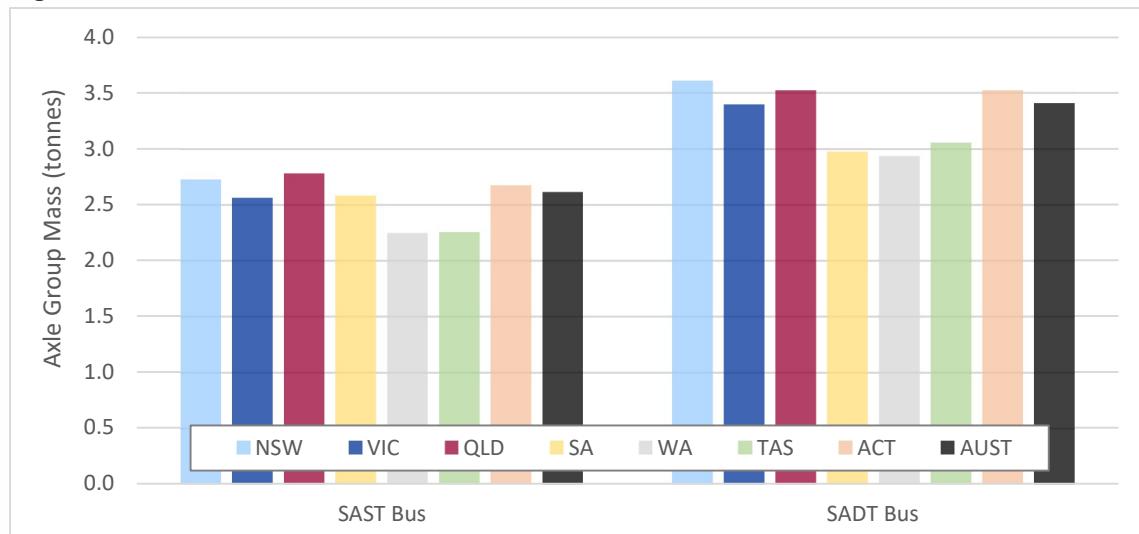
State	Sample (million)	Bus		Vehicle Average
		SAST	SADT	
NSW	0.09	2.72	3.61	6.33
VIC	0.18	2.56	3.40	5.95
QLD	0.06	2.78	3.52	6.30
SA	0.01	2.58	2.97	5.55
WA	0.02	2.24	2.93	5.18
TAS	0.01	2.25	3.05	5.31
ACT	0.00	2.67	3.52	6.19
AUST	0.37	2.61	3.41	6.02
SE	n/a	8.14E-04	1.38E-03	1.86E-03

The national average ESA value of 0.115 is significantly higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 10.4: CATEGORY 32: WEIGHTED AVERAGE ESA

State	Sample (million)	Bus		Vehicle Average
		SAST	SADT	
NSW	0.09	0.081	0.058	0.138
VIC	0.18	0.063	0.043	0.107
QLD	0.06	0.090	0.051	0.141
SA	0.01	0.060	0.022	0.083
WA	0.02	0.032	0.019	0.052
TAS	0.01	0.035	0.024	0.059
ACT	0.00	0.073	0.055	0.128
AUST	0.37	0.070	0.045	0.115
SE	n/a	9.48E-05	8.69E-05	1.48E-04

Figure 10.2 indicates a consistent pattern in AGM across states, with the SADT values being higher than the corresponding SAST values.

Figure 10.2: CATEGORY 32: AGM BY STATE AND AXLE GROUP


10.3 Category 33 (Buses: 2 axles: GVM > 10.0t)

These buses correspond to Austroads class 3, with an axle configuration of 11 and a GVM > 10.0t. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 10.5 and Table 10.6 respectively, while Figure 10.3 plots the distribution in AGM by state and axle group.

Table 10.5: CATEGORY 33: WEIGHTED AVERAGE AGM (tonnes)

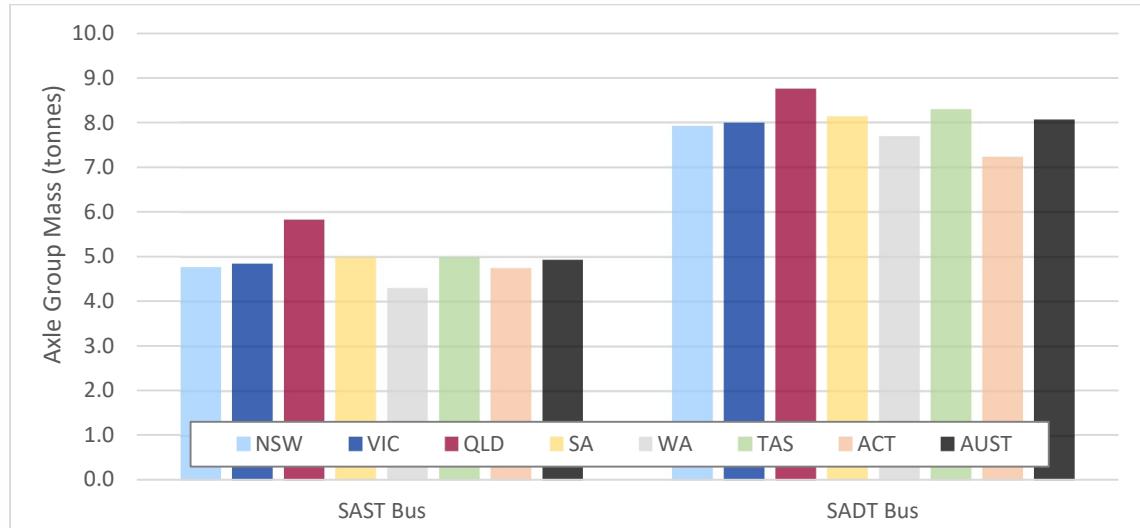
State	Sample (million)	Bus		Vehicle Average
		SAST	SADT	
NSW	0.11	4.76	7.92	12.68
VIC	0.14	4.84	7.99	12.83
QLD	0.02	5.82	8.76	14.58
SA	0.00	4.99	8.14	13.12
WA	0.01	4.29	7.69	11.98
TAS	0.00	4.98	8.29	13.28
ACT	0.00	4.74	7.23	11.96
AUST	0.29	4.92	8.06	12.99
SE	n/a	1.90E-03	3.17E-03	4.22E-03

The national average ESA value of 2.378 is significantly higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.9% confidence.

Table 10.6: CATEGORY 33: WEIGHTED ESA

State	Sample (million)	Bus		Vehicle Average
		SAST	SADT	
NSW	0.11	0.711	1.094	1.805
VIC	0.14	0.907	1.194	2.101
QLD	0.02	2.319	2.558	4.877
SA	0.00	0.855	1.169	2.025
WA	0.01	0.476	0.859	1.334
TAS	0.00	0.849	1.235	2.085
ACT	0.00	0.705	0.773	1.478
AUST	0.29	1.027	1.351	2.378
SE	n/a	3.67E-03	3.17E-03	5.95E-03

Figure 10.3 indicates a consistent pattern in AGM across states, with the SADT values being significantly higher than the corresponding SAST values.

Figure 10.3: CATEGORY 33: AGM BY STATE AND AXLE GROUP


10.4 Category 34 (Buses: ≥ 3 axles)

These buses correspond to Austroads class 4 or 5, with an axle configuration of 12 or 22. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 10.7 and Table 10.8 respectively, while Figure 10.4 plots the distribution in AGM by state and axle group.

Table 10.7: CATEGORY 34: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Steer		Drive		Vehicle Average
		SAST	TAST	TADT	TAG	
NSW	0.03	5.31	6.96	7.20	11.13	16.43
VIC	0.05	5.11	3.88	3.83	11.23	16.18
QLD	0.01	5.97	8.82	7.05	12.73	18.68
SA	0.00	6.10	4.81 ⁽¹⁾	5.33 ⁽¹⁾	9.97	16.07
WA	0.00	5.31	0.57	1.13	9.64	14.95
TAS	0.00	4.74	0.44	0.40	10.31	14.85
ACT	0.00	5.11	8.20	12.36	11.91	17.12
AUST	0.09	5.62	6.33	5.91	11.48	17.08
SE	n/a	5.02E-03	9.62E-01	2.14E+00	1.15E-02	1.40E-02

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

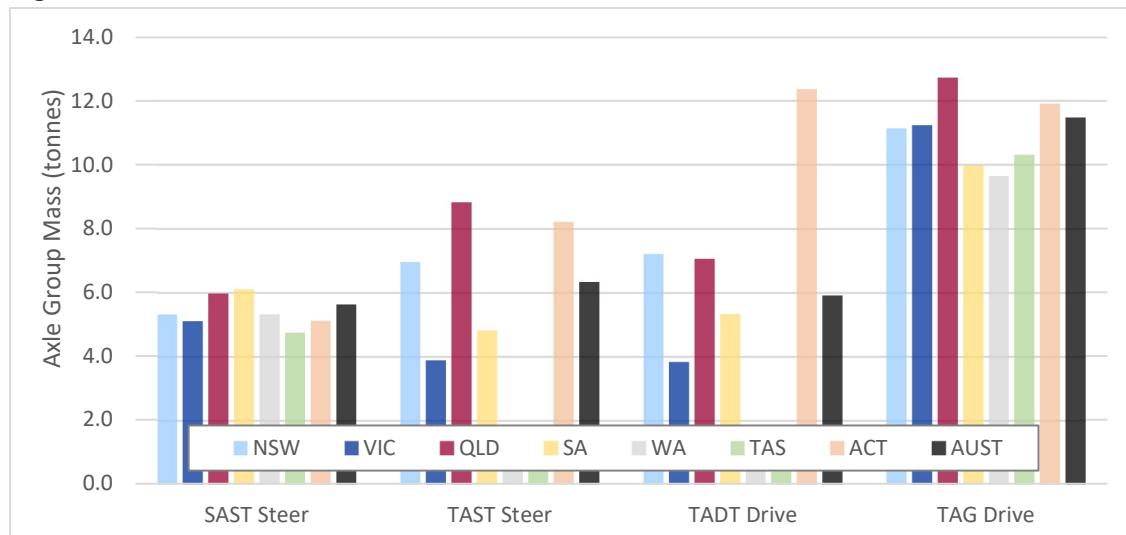
The national average ESA value of 3.854 is significantly higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than ±1% with 98.6% confidence, the second lowest confidence interval reported in this study.

Table 10.8: CATEGORY 34: WEIGHTED AVERAGE ESA

State	Sample (million)	Steer		Drive		Vehicle Average
		SAST	TAST	TADT	TAG	
NSW	0.03	1.155	0.855	0.308	1.297	2.449
VIC	0.05	1.119	0.902	0.320	1.367	2.479
QLD	0.01	3.209	1.871	0.151	2.929	6.120
SA	0.00	1.938	1.045 ⁽¹⁾	0.269 ⁽¹⁾	0.880	2.818
WA	0.00	1.031	0.000	0.000	0.646	1.677
TAS	0.00	0.701	0.000	0.000	0.835	1.514
ACT	0.00	0.989	1.731	0.833	1.462	2.455
AUST	0.09	2.030	1.283	0.213	1.832	3.854
SE	n/a	1.06E-02	1.29E+00	1.22E+00	8.59E-03	1.57E-02

(1) No WIM data was recorded for this particular axle group type, value derived from the states with available data

Figure 10.4 indicates a more varied set of results across States, although the AGM values for TAG Drive axles are significantly higher than the other axle types.

Figure 10.4: CATEGORY 34: AGM BY STATE AND AXLE GROUP


10.5 Category 35 (Buses: articulated)

These buses correspond to Austroads class 6, with an axle configuration of 111. The state and national AGM and ESA values are tabulated for each axle group and the overall vehicle in Table 10.9 and Table 10.10 respectively, while Figure 10.5 plots the distribution in AGM by state and axle group.

Table 10.9: CATEGORY 35: WEIGHTED AVERAGE AGM (tonnes)

State	Sample (million)	Bus		Trail	Vehicle Average
		SAST	SADT	SADT	
NSW	0.01	5.14	4.84	9.35	19.33
VIC	0.01	5.10	6.46	7.34	18.91
QLD	0.00	5.22	8.05	6.51	19.78
SA	0.00	4.79	7.28	7.60	19.65
WA	0.00	5.10	6.94	6.63	18.67
TAS	0.00	0.00	0.00	0.00	0.00
ACT	0.00	4.46	6.62	7.53	18.62
AUST	0.02	4.80	6.37	7.21	18.38
SE	n/a	5.73E-03	1.15E-02	1.10E-02	1.32E-02

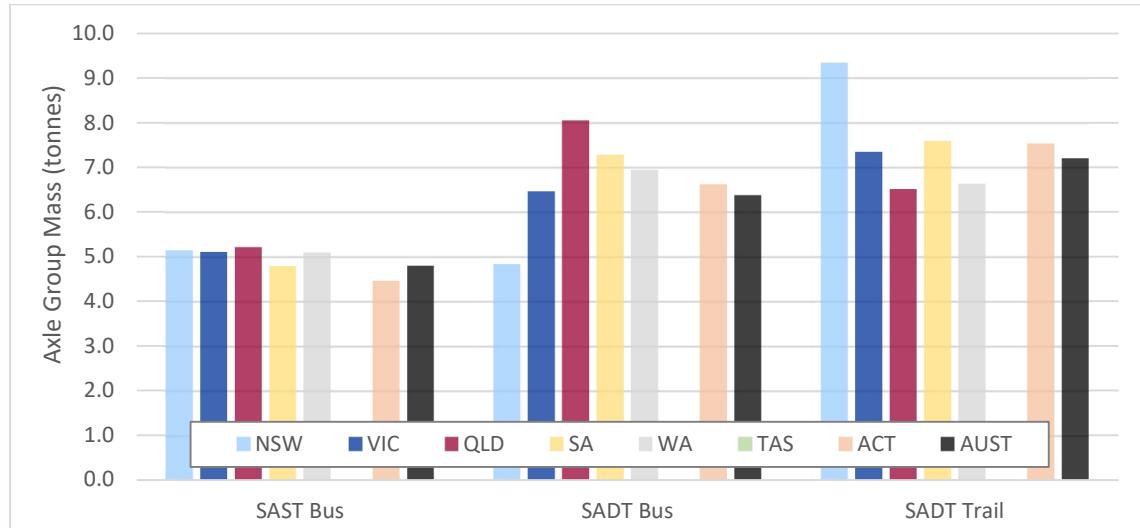
The national average ESA value of 2.528 is significantly higher than the value currently used in the NTC's PAYGO model. It is estimated that the error associated with this value is less than $\pm 1\%$ with 99.6% confidence.

Table 10.10: CATEGORY 35: WEIGHTED AVERAGE ESA

State	Sample (million)	Bus		Trail	Vehicle Average
		SAST	SADT	SADT	
NSW	0.01	0.910	0.235	2.084	3.229
VIC	0.01	0.923	0.587	0.953	2.462
QLD	0.00	1.058	1.185	0.525	2.768
SA	0.00	0.730	0.913	0.844	2.487
WA	0.00	0.879	0.633	0.591	2.102
TAS	0.00	0.000	0.000	0.000	0.000
ACT	0.00	0.577	0.563	0.926	2.065
AUST	0.02	0.850	0.683	0.994	2.528
SE	n/a	4.34E-03	4.94E-03	5.61E-03	8.87E-03

Figure 10.5 indicates a generally consistent pattern in AGM across states, with the SADT Bus and SADT Trail values being similar for all States except NSW.

Figure 10.5: CATEGORY 35: AGM BY STATE AND AXLE GROUP



11.0 CONCLUSIONS & RECOMMENDATIONS

11.1 Conclusions

PTT was commissioned by the NTC to calculate new AGM and ESA values for use in its PAYGO model, for the upcoming 2021 Heavy Vehicle Charges Determination. The aim of this project was to:

- calculate new ESA and AGM values to be used in NTC's PAYGO model for all vehicle categories (except motorcycles);
- calculate new ESA and AGM values using an appropriate methodology and the most recently available Weigh in Motion (WIM) data (where possible); and
- document the latest estimates of AGM and ESA values by state, vehicle category and axle configuration.

National estimates of the AGM and ESA values for PAYGO Categories 2 to 6 were prepared using a "first principles" approach, based on the kerb weight of the more popular make and models.

National estimates of the AGM and ESA values for PAYGO Categories 7 to 35 (excluding Category 30) were estimated from WIM data for the period covering 2017 to 2019, for all States and Territories, except NT. A total of 268 million "clean" WIM records were used during this phase of the work.

A series of "rules" for allocating individual WIM records to a particular PAYGO Category were developed and applied. These rules are reproduced in Appendix B.

National estimates of the AGM and ESA values for PAYGO Category 30 were prepared based on the number of registered vehicles by number of axles and GVM, as reported in the 2019 ABS Motor Vehicle Census.

The resulting national estimates of AGM and ESA for each PAYGO Category are presented in Table 11.1 below, together with the ESA value currently used in the NTC's PAYGO model. Major differences between the former and the latter are highlighted.

Relative to the current ESA values used in the NTC's PAYGO model, the latest data suggest that the national average ESA values for the following vehicle categories are significantly (>50%) higher:

- Category 2: Passenger cars
- Category 3: Passenger vans and Light buses
- Category 4: 4WDs: passenger
- Category 10: Rigid trucks: 2 axles: no trailer: GVM > 12.0 t
- Category 14: Rigid trucks: 3 axles: with trailer: GCM ≤ 42.5 t
- Category 17: Rigid trucks: 4 axles: with trailer: GCM ≤ 42.5 t
- Category 31: Buses: 2 axles: 3.5 < GVM ≤ 4.5 t
- Category 32: Buses: 2 axles: 4.5 < GVM ≤ 10.0 t
- Category 33: Buses: 2 axles: GVM > 10.0 t
- Category 34: Buses ≥ 3 axles
- Category 35: Buses articulated

Table 11.1: RESULTS

PAYGO Category	Description	New AGM Value (t)	Current ESA Value	New ESA Value	ESA Difference	Scale of Difference ⁽¹⁾
2	Passenger cars	1.63	0.000	0.001	0.001	**
3	Passenger vans and Light buses	2.11	0.000	0.003	0.003	**
4	4WDs: passenger	2.37	0.000	0.005	0.005	**
5	4WDs: light commercial	2.55	0.044	0.006	-0.038	**
6	Light commercials & Other light vehicles	2.27	0.042	0.004	-0.038	**
7	Light rigid trucks	2.78	0.047	0.014	-0.033	**
8	Rigid trucks: 2 axles: no trailer: $4.5 < GVM \leq 7.0$ t	3.97	0.116	0.028	-0.088	**
9	Rigid trucks: 2 axles: no trailer: $7.0 < GVM \leq 12.0$ t	6.00	0.610	0.203	-0.407	**
10	Rigid trucks: 2 axles: no trailer: $GVM > 12.0$ t	11.76	1.562	2.347	0.785	**
11	Rigid trucks: 2 axles: with trailer: $GCM \leq 42.5$ t	8.44	1.142	0.429	-0.713	**
12	Rigid trucks: 3 axles: no trailer: $4.5 < GVM \leq 18.0$ t	6.21	0.966	0.184	-0.782	**
13	Rigid trucks: 3 axles: no trailer: $GVM > 18.0$ t	14.75	2.064	2.091	0.027	
14	Rigid trucks: 3 axles: with trailer: $GCM \leq 42.5$ t	26.31	1.666	2.725	1.059	**
15	Rigid trucks: 4 axles: no trailer: $4.5 < GVM \leq 25.0$ t	8.16	1.176	0.157	-1.020	**
16	Rigid trucks: 4 axles: no trailer: $GVM > 25.0$ t	19.37	2.469	2.625	0.156	
17	Rigid trucks: 4 axles: with trailer: $GCM \leq 42.5$ t	27.80	1.878	3.055	1.176	**
18	Rigid trucks: 3,4+ axles: with trailer: $GCM > 42.5$ t	40.13	4.512	4.655	0.143	
19	Articulated trucks: single trailer: 3 axle rig	13.13	1.262	0.947	-0.314	
20	Articulated trucks: single trailer: 4 axle rig	18.76	1.449	1.969	0.521	*
21	Articulated trucks: single 3 axle trailer: 5 axle rig	17.68	1.514	1.741	0.228	
22	Articulated trucks: single 2 axle trailer: 5 axle rig	26.40	1.988	2.785	0.798	*
23	Articulated trucks: single trailer: 6 axle rig	28.94	2.104	2.707	0.604	*
24	Articulated trucks: B-double: < 9 axle rig	36.53	2.810	3.937	1.127	*
25	Articulated trucks: B-double: ≥ 9 axle rig	47.00	2.945	4.202	1.256	*
26	Articulated trucks: B-triple	52.94	3.524	4.465	0.941	*
27	Articulated trucks: Road train: 2 trailers	48.35	3.275	3.306	0.031	
28	Articulated trucks: Road train: 3 trailers	67.88	4.120	4.065	-0.055	
29	Articulated trucks: single trailer: > 6 axle rig	33.12	2.299	2.785	0.486	
30	Other trucks (non-freight)	11.63	1.546	1.512	-0.034	
31	Buses: 2 axles: $3.5 < GVM \leq 4.5$ t	3.96	0.020	0.041	0.021	**
32	Buses: 2 axles: $4.5 < GVM \leq 10.0$ t	6.02	0.050	0.115	0.065	**
33	Buses: 2 axles: $GVM > 10.0$ t	12.99	1.080	2.378	1.298	**
34	Buses: ≥ 3 axles	17.08	0.910	3.854	2.944	**
35	Buses: articulated	18.38	1.325	2.528	1.203	**

(1) ** = difference $> \pm 50\%$, * = difference $> \pm 25\%$, blank = difference $\leq \pm 25\%$

By comparison, the latest ESA estimates for the following vehicles categories are significantly (>50%) lower than the current ESA values used by the NTC:

- Category 5: 4WDs: light commercial
- Category 6: Light commercials & Other light vehicles
- Category 7: Light rigid trucks
- Category 8: Rigid trucks: 2 axles: no trailer: $4.5 < GVM \leq 7.0$ t
- Category 9: Rigid trucks: 2 axles: no trailer: $7.0 < GVM \leq 12.0$ t
- Category 11: Rigid trucks: 2 axles: with trailer: $GCM \leq 42.5$ t
- Category 12: Rigid trucks: 3 axles: no trailer: $4.5 < GVM \leq 18.0$ t
- Category 15: Rigid trucks: 4 axles: no trailer: $4.5 < GVM \leq 25.0$ t

The differences between the NTC's current PAYGO values and the latest estimates output highlighted in Table 11.1 confirms the NTC's decision to implement this review.

11.2 Recommendations

It is recommended that the NTC:

- (a) update the AGM and ESA values used in its PAYGO model based on the values reported in Table 11.1 above;
- (b) use the rules provided in Appendix B to allocate individual WIM records to a particular PAYGO Category; and
- (c) monitor the ongoing change in AGM and ESA values used in its PAYGO model on a regular basis (eg every 3-5 years) review to ensure that the latter:
 - is based on the most up-to-date data available; and
 - captures industry trends with respect to changing vehicle combinations, axle configurations and mass limits

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- Pekol Traffic and Transport (2013) "Bus and Coach Average Gross Mass and Equivalent Standard Axle Values", Brisbane
- Pekol Traffic and Transport (2019) "Review of Equivalent Standard Axle Values for a Sample of Heavy Vehicle Types", Brisbane

APPENDIX A: WIM SITE LOCATIONS

Locations				
Site ID	Loc ID	Area	Latitude	Longitude
NSW				
316	3	Rural	-28.512	153.5296
317	3	Rural	-28.512	153.5296
318	3	Rural	-28.512	153.5296
319	3	Rural	-28.512	153.5296
283	3	Rural	-28.512	153.5296
439	3	Rural	-28.567	150.3214
440	3	Rural	-28.567	150.3214
2600	3	Rural	-28.567	150.3214
381	3	Rural	-30.721	151.4530
459	3	Rural	-30.721	151.453
ARN	3	Rural	-30.721	151.453
ARS	3	Rural	-30.721	151.453
332	3	Rural	-31.861	152.5497
333	3	Rural	-31.861	152.5497
334	3	Rural	-31.861	152.5497
335	3	Rural	-31.861	152.5497
400	3	Rural	-31.861	152.5497
SHE	3	Rural	-32.340	150.5790
SHW	3	Rural	-32.340	150.5790
700	3	Rural	-32.653	151.2735
395	2	Provincial Urban	-32.659	151.8474
251	2	Provincial Urban	-32.659	151.8474
431	1	Capital City	-33.455	151.2053
457	1	Capital City	-33.455	151.2053
271	1	Capital City	-33.455	151.2053
275	1	Capital City	-33.455	151.2053
313	1	Capital City	-33.457	150.8132
314	1	Capital City	-33.457	150.8132
1900	1	Capital City	-33.457	150.8132
343	1	Capital City	-33.568	150.7047
344	1	Capital City	-33.568	150.7047
202	1	Capital City	-33.568	150.7047
346	1	Capital City	-33.600	151.1701
347	1	Capital City	-33.600	151.1701
348	1	Capital City	-33.600	151.1701
349	1	Capital City	-33.600	151.1701
350	1	Capital City	-33.600	151.1701
351	1	Capital City	-33.600	151.1701
300	1	Capital City	-33.600	151.1701
408	1	Capital City	-33.616	150.2727
486	1	Capital City	-33.616	150.2727
260	1	Capital City	-33.616	150.2727
261	1	Capital City	-33.616	150.2727
426	1	Capital City	-33.736	150.8986
427	1	Capital City	-33.736	150.8986
428	1	Capital City	-33.736	150.8986
429	1	Capital City	-33.736	150.8986

Locations				
Site ID	Loc ID	Area	Latitude	Longitude
130	1	Capital City	-33.736	150.8986
259	1	Capital City	-33.755	151.2219
260	1	Capital City	-33.755	151.2219
261	1	Capital City	-33.755	151.2219
262	1	Capital City	-33.755	151.2219
263	1	Capital City	-33.755	151.2219
264	1	Capital City	-33.755	151.2219
600	1	Capital City	-33.755	151.2219
362	3	Rural	-33.761	147.5216
363	3	Rural	-33.761	147.5216
3800	3	Rural	-33.761	147.5216
274	1	Capital City	-33.789	151.0241
275	1	Capital City	-33.789	151.0241
276	1	Capital City	-33.789	151.0241
277	1	Capital City	-33.789	151.0241
203	1	Capital City	-33.789	151.0241
284	1	Capital City	-33.801	150.8691
285	1	Capital City	-33.801	150.8691
286	1	Capital City	-33.801	150.8691
287	1	Capital City	-33.801	150.8691
288	1	Capital City	-33.801	150.8691
289	1	Capital City	-33.801	150.8691
900	1	Capital City	-33.801	150.8691
365	1	Capital City	-33.806	150.8528
366	1	Capital City	-33.806	150.8528
367	1	Capital City	-33.806	150.8528
368	1	Capital City	-33.806	150.8528
120	1	Capital City	-33.806	150.8528
401	1	Capital City	-33.811	151.0232
402	1	Capital City	-33.811	151.0232
403	1	Capital City	-33.811	151.0232
404	1	Capital City	-33.811	151.0232
405	1	Capital City	-33.811	151.0232
406	1	Capital City	-33.811	151.0232
500	1	Capital City	-33.811	151.0232
323	1	Capital City	-33.938	151.1013
324	1	Capital City	-33.938	151.1013
292	1	Capital City	-33.938	151.1013
291	1	Capital City	-33.941	151.0830
353	1	Capital City	-33.943	150.8784
354	1	Capital City	-33.943	150.8784
355	1	Capital City	-33.943	150.8784
356	1	Capital City	-33.943	150.8784
110	1	Capital City	-33.943	150.8784
291	1	Capital City	-33.952	151.1926
292	1	Capital City	-33.952	151.1926
850	1	Capital City	-33.952	151.1926
490	1	Capital City	-33.959	151.2026

Locations				
Site ID	Loc ID	Area	Latitude	Longitude
491	1	Capital City	-33.959	151.2026
800	1	Capital City	-33.959	151.2026
255	4	VIC	-34.216	142.0236
337	4	VIC	-34.216	142.0236
270	3	Rural	-34.706	150.0131
433	3	Rural	-34.706	150.0131
220	3	Rural	-34.706	150.0131
222	3	Rural	-34.706	150.0131
463	2	Provincial Urban	-34.960	150.5991
464	2	Provincial Urban	-34.960	150.5991
465	2	Provincial Urban	-34.960	150.5991
466	2	Provincial Urban	-34.960	150.5991
4000	2	Provincial Urban	-34.960	150.5991
412	4	ACT	-35.214	149.1875
413	4	ACT	-35.214	149.1875
414	4	ACT	-35.214	149.1875
415	4	ACT	-35.214	149.1875
416	4	ACT	-35.214	149.1875
253	3	Rural	-35.357	145.7472
360	3	Rural	-35.357	145.7472
JEN	3	Rural	-35.357	145.7472
JES	3	Rural	-35.357	145.7472
455	3	Rural	-35.634	144.9085
482	3	Rural	-35.634	144.9085
DEN	3	Rural	-35.634	144.9085
DES	3	Rural	-35.634	144.9085
282	3	Rural	-35.739	147.0200
418	3	Rural	-35.739	147.0200
CUN	3	Rural	-35.739	147.0200
CUS	3	Rural	-35.739	147.0200
477	3	Rural	-35.751	147.2961
478	3	Rural	-35.751	147.2961
479	3	Rural	-35.751	147.2961
480	3	Rural	-35.751	147.2961
4300	3	Rural	-35.751	147.2961
305	4	VIC	-35.817	145.5574
377	4	VIC	-35.817	145.5574
249	4	VIC	-36.109	146.8779
272	4	VIC	-36.109	146.8779
294	4	VIC	-36.109	146.8777
393	4	VIC	-36.109	146.8777
VIC				
225	2	Provincial Urban	-34.216	142.0236
227	2	Provincial Urban	-34.216	142.0236
421	4	NSW	-35.354	145.7515
423	4	NSW	-35.354	145.7515
415	4	NSW	-35.696	144.9080
417	4	NSW	-35.696	144.9080

Locations				
Site ID	Loc ID	Area	Latitude	Longitude
279	3	Rural	-35.817	145.5572
281	3	Rural	-35.817	145.5574
307	2	Provincial Urban	-36.109	146.8779
309	2	Provincial Urban	-36.109	146.8779
313	2	Provincial Urban	-36.109	146.8778
311	2	Provincial Urban	-36.109	146.8777
207	3	Rural	-36.166	146.5436
1656	3	Rural	-36.166	146.5436
273	3	Rural	-36.628	145.2978
3702	3	Rural	-36.628	145.2978
3704	3	Rural	-36.628	145.2982
275	3	Rural	-36.628	145.2982
197	3	Rural	-36.665	144.0419
199	3	Rural	-36.665	144.0417
209	3	Rural	-37.263	144.4728
581	3	Rural	-37.263	144.4728
3712	3	Rural	-37.378	143.2124
3714	3	Rural	-37.378	143.2124
237	3	Rural	-37.393	143.2673
3710	3	Rural	-37.393	143.2673
235	3	Rural	-37.417	144.9956
231	3	Rural	-37.417	144.9958
301	3	Rural	-37.417	144.9960
233	3	Rural	-37.417	144.9963
3706	3	Rural	-37.478	144.6007
3708	3	Rural	-37.478	144.6007
201	3	Rural	-37.478	144.6001
3698	3	Rural	-37.478	144.6001
3716	3	Rural	-37.591	144.1821
583	1	Capital City	-37.693	144.9368
585	1	Capital City	-37.693	144.9368
587	1	Capital City	-37.693	144.9368
589	1	Capital City	-37.693	144.9368
591	1	Capital City	-37.693	144.9368
593	1	Capital City	-37.693	144.9368
595	1	Capital City	-37.693	144.9368
597	1	Capital City	-37.693	144.9368
532	1	Capital City	-37.783	144.9395
533	1	Capital City	-37.783	144.9395
534	1	Capital City	-37.783	144.9395
535	1	Capital City	-37.783	144.9395
536	1	Capital City	-37.783	144.9395
538	1	Capital City	-37.783	144.9395
539	1	Capital City	-37.783	144.9395
540	1	Capital City	-37.783	144.9395
541	1	Capital City	-37.783	144.9395
542	1	Capital City	-37.783	144.9395
3752	1	Capital City	-37.783	144.9395

Locations				
Site ID	Loc ID	Area	Latitude	Longitude
3753	1	Capital City	-37.783	144.9395
3754	1	Capital City	-37.783	144.9395
3755	1	Capital City	-37.783	144.9395
3759	1	Capital City	-37.783	144.9395
3760	1	Capital City	-37.783	144.9395
3761	1	Capital City	-37.783	144.9395
3762	1	Capital City	-37.783	144.9395
3763	1	Capital City	-37.783	144.9395
396	1	Capital City	-37.809	144.8077
397	1	Capital City	-37.809	144.8077
398	1	Capital City	-37.809	144.8077
399	1	Capital City	-37.809	144.8077
401	1	Capital City	-37.809	144.8077
402	1	Capital City	-37.809	144.8077
403	1	Capital City	-37.809	144.8077
514	1	Capital City	-37.820	144.8781
515	1	Capital City	-37.820	144.8781
516	1	Capital City	-37.820	144.8781
517	1	Capital City	-37.820	144.8781
509	1	Capital City	-37.821	144.8860
510	1	Capital City	-37.821	144.8860
511	1	Capital City	-37.821	144.8860
512	1	Capital City	-37.821	144.8860
3718	1	Capital City	-37.825	144.9369
3719	1	Capital City	-37.825	144.9369
3720	1	Capital City	-37.825	144.9369
3721	1	Capital City	-37.825	144.9369
3722	1	Capital City	-37.825	144.9369
3723	1	Capital City	-37.825	144.9369
3724	1	Capital City	-37.825	144.9369
519	1	Capital City	-37.830	145.0154
520	1	Capital City	-37.830	145.0154
521	1	Capital City	-37.830	145.0154
522	1	Capital City	-37.830	145.0154
525	1	Capital City	-37.830	145.0154
526	1	Capital City	-37.830	145.0154
527	1	Capital City	-37.830	145.0154
528	1	Capital City	-37.830	145.0154
874	1	Capital City	-37.831	144.9005
875	1	Capital City	-37.831	144.9005
876	1	Capital City	-37.831	144.9005
877	1	Capital City	-37.831	144.9005
878	1	Capital City	-37.831	144.9005
880	1	Capital City	-37.831	144.9005
881	1	Capital City	-37.831	144.9005
882	1	Capital City	-37.831	144.9005
883	1	Capital City	-37.831	144.9005
884	1	Capital City	-37.831	144.9005

Locations				
Site ID	Loc ID	Area	Latitude	Longitude
259	1	Capital City	-37.949	144.5931
261	1	Capital City	-37.949	144.5931
253	1	Capital City	-37.949	144.5935
255	1	Capital City	-37.949	144.5935
287	1	Capital City	-37.964	145.2313
289	1	Capital City	-37.964	145.2313
291	1	Capital City	-37.964	145.2313
303	1	Capital City	-37.964	145.2313
293	1	Capital City	-37.964	145.2309
295	1	Capital City	-37.964	145.2309
297	1	Capital City	-37.964	145.2309
305	1	Capital City	-37.964	145.2309
366	1	Capital City	-37.975	145.1936
367	1	Capital City	-37.975	145.1936
368	1	Capital City	-37.975	145.1936
544	1	Capital City	-37.975	145.1936
546	1	Capital City	-37.975	145.1936
217	3	Rural	-38.085	145.7622
3700	3	Rural	-38.085	145.7622
215	3	Rural	-38.201	146.0456
3696	3	Rural	-38.201	146.0456
576	1	Capital City	-38.275	145.1896
577	1	Capital City	-38.275	145.1896
QLD				
111684	3	Rural	-16.825	145.6514
111606	3	Rural	-16.930	145.5472
92206	2	Provincial Urban	-19.282	146.8412
91389	3	Rural	-19.641	146.8365
91705	3	Rural	-20.059	148.1720
91701	3	Rural	-20.126	146.2411
100088	3	Rural	-20.623	139.4851
100021	3	Rural	-20.718	140.4438
100053	3	Rural	-20.936	140.8889
159598	3	Rural	-23.136	148.0388
70164	3	Rural	-23.551	145.2646
159532	3	Rural	-23.599	148.6341
23917	1	Capital City	-27.200	152.9886
131830	1	Capital City	-27.362	153.0950
136238	1	Capital City	-27.424	153.1586
32559	3	Rural	-27.428	151.6940
136237	1	Capital City	-27.445	153.1329
130000	1	Capital City	-27.490	153.1226
136161	1	Capital City	-27.490	153.1226
30041	3	Rural	-27.542	152.3002
30042	3	Rural	-27.630	151.7535
10036	2	Provincial Urban	-27.814	153.2768
11643	2	Provincial Urban	-27.891	153.3149
51601	3	Rural	-28.109	152.1020

Locations				
Site ID	Loc ID	Area	Latitude	Longitude
12058	2	Provincial Urban	-28.160	153.4951
55469	4	NSW	-28.579	150.3394
SA				
PIN	3	Rural	-31.292	136.8345
PIS	3	Rural	-31.292	136.8345
IKE	3	Rural	-32.623	137.4807
IKW	3	Rural	-32.623	137.4807
OWN	3	Rural	-32.860	139.1187
OWS	3	Rural	-32.860	139.1187
DUE	3	Rural	-34.403	139.2411
DUW	3	Rural	-34.403	139.2411
WI1	1	Capital City	-34.834	138.5382
WI2	1	Capital City	-34.834	138.5382
WI3	1	Capital City	-34.834	138.5382
WI4	1	Capital City	-34.834	138.5382
MOE	3	Rural	-35.144	139.1548
MOW	3	Rural	-35.144	139.1548
BTE	3	Rural	-36.292	140.7485
BTW	3	Rural	-36.292	140.7485
NAN	3	Rural	-36.760	140.6344
NAS	3	Rural	-36.760	140.6344
WA				
51619	3	Rural	-20.364	118.5963
50825	1	Capital City	-31.755	115.7644
50794	1	Capital City	-31.864	116.0017
51979	1	Capital City	-31.899	116.2152
30081	1	Capital City	-32.082	115.8750
50164	2	Provincial Urban	-32.454	115.7986
50165	2	Provincial Urban	-32.548	115.8143
TAS				
539	2	Provincial Urban	-41.142	146.1162
540	2	Provincial Urban	-41.142	146.1162
541	2	Provincial Urban	-41.142	146.1162
542	2	Provincial Urban	-41.142	146.1162
1386	2	Provincial Urban	-41.325	147.0711
1387	2	Provincial Urban	-41.325	147.0711
174	3	Rural	-41.879	147.4641
175	3	Rural	-41.879	147.4641
ACT				
172272	1	Capital City	-35.214	149.1875

APPENDIX B: VEHICLE CLASSIFICATION RULES

WIM Categorisation Rules					
Category	Rule Number (RN)	Austroads Class	Axle Configuration	Gross Vehicle Mass (t)	Axle Spacing (m)
Category 31					
	311	3	1,1	$3.5 < \text{GVM} \leq 4.5$	$3.287 < A1 < 3.317$
	312	3	1,1	$3.5 < \text{GVM} \leq 4.5$	$3.65 < A1 < 3.68$
	313	3	1,1	$3.5 < \text{GVM} \leq 4.5$	$3.744 < A1 < 3.774$
	314	3	1,1	$3.5 < \text{GVM} \leq 4.5$	$3.235 < A1 < 3.265$
	315	3	1,1	$3.5 < \text{GVM} \leq 4.5$	$4.31 < A1 < 4.34$
Category 32					
	321	3	1,1	$4.5 < \text{GVM} \leq 10.0$	$4.535 < A1 < 4.565$
	322	3	1,1	$4.5 < \text{GVM} \leq 10.0$	$3.92 < A1 < 3.95$
Category 33					
	331	3	1,1	> 10.0	$6.31 < A1 < 6.34$
	332	3	1,1	> 10.0	$6.335 < A1 < 6.365$
Category 34					
	341	4	1,2	n/a	$7.7 < A1 < 7.73$
	342	4	1,2	n/a	$6.955 < A1 < 6.985$
	343	4	1,2	n/a	$6.63 < A1 < 6.66$
	344	5	2,2	n/a	$7.7 < A2 < 7.73$
	345	5	2,2	n/a	$6.955 < A2 < 6.985$
	346	5	2,2	n/a	$6.63 < A2 < 6.66$
Category 35					
	351	6	1,1,1	$17.126 < \text{GVM} \leq 28.0$	$5.095 < A1 < 5.125$
	352	6	1,1,1	$17.126 < \text{GVM} \leq 28.0$	$5.235 < A1 < 5.265$
	352	6	1,1,1	$17.126 < \text{GVM} \leq 28.0$	$5.485 < A1 < 5.515$
Category 7					
	71	3	1,1	≤ 4.5	n/a
Category 8					
	81	3	1,1	$4.5 < \text{GVM} \leq 7.0$	n/a
Category 9					
	91	3	1,1	$7.0 < \text{GVM} \leq 12.0$	n/a
Category 10					
	101	3	1,1	> 12.0	n/a
Category 11					
	111	7	1,1,1,1	≤ 42.5	n/a
	112	6	1,1,1	≤ 42.5	$A2 \leq 9.1$
	113	7	1,1,2	≤ 42.5	$A2 \leq 7.9$
	114	5	1,1,2	≤ 42.5	$A2 \leq 7.9$
	115	8	1,1,1,2	≤ 42.5	n/a
	116	8	1,1,3	≤ 42.5	$A2 \leq 6.8$
Category 12					
	121	4	1,2	≤ 18.0	n/a

WIM Categorisation Rules					
Category	Rule Number (RN)	Austroads Class	Axle Configuration	Gross Vehicle Mass (t)	Axle Spacing (m)
Category 13					
	131	4	1,2	> 18.0	n/a
Category 14					
	141	8	1,2,2	≤ 42.5	A3 ≤ 7.7
	142	8	1,2,1,1	≤ 42.5	n/a
	143	9	1,2,3	≤ 42.5	A3 ≤ 6.4
	144	9	1,2,1,2	≤ 42.5	n/a
	145	10	1,2,2,2	≤ 42.5	A5 ≤ 4.0
	146	8	1,2,1	≤ 42.5	A3 ≤ 9.0
Category 15					
	151	5	2,2	≤ 25.0	n/a
Category 16					
	161	5	2,2	> 25.0	n/a
Category 17					
	171	10	2,2,3	≤ 42.5	n/a
	172	10	2,2,1,2	≤ 42.5	n/a
	173	10	2,2,2,2	≤ 42.5	n/a
	174	9	2,2,2	≤ 42.5	n/a
	175	9	2,2,1,1	≤ 42.5	n/a
	176	9	2,2,3	≤ 42.5	n/a
	177	8	2,2,1	≤ 42.5	n/a
Category 18					
	181	9	1,2,1,2	> 42.5	n/a
	182	10	1,2,2,2	> 42.5	A5 ≤ 4.0
	183	10	1,2,2,3	> 42.5	A5 ≤ 2.5
	184	10	1,2,3,3	> 42.5	A6 ≤ 5.6
	185	10	2,2,1,2	> 42.5	n/a
	186	10	2,2,2,2	> 42.5	n/a
	187	10	2,2,2,3	> 42.5	n/a
	188	10	2,2,3,3	> 42.5	n/a
Category 19					
	191	6	1,1,1	n/a	A2 > 9.1
Category 20					
	201	7	1,1,2	n/a	A2 > 7.9
	202	5	1,1,2	n/a	A2 > 7.9
	203	8	1,2,1	n/a	A3 > 9.0
Category 21					
	211	8	1,1,3	n/a	A2 > 6.8
Category 22					
	221	8	1,2,2	n/a	A3 > 7.7

WIM Categorisation Rules					
Category	Rule Number (RN)	Austroads Class	Axle Configuration	Gross Vehicle Mass (t)	Axle Spacing (m)
Category 23					
	231	9	1,2,3	n/a	A3 > 6.4
Category 24					
	241	10	1,2,2,2	n/a	A5 > 4.0
	242	10	1,2,2,3	n/a	A5 > 2.5
	243	10	1,2,3,2	n/a	n/a
	244	9	1,2,2,1	n/a	n/a
	245	9	1,1,2,2	n/a	n/a
Category 25					
	251	10	1,2,3,3	n/a	A6 > 5.6
	252	10	1,2,4,3	n/a	n/a
	253	10	1,2,4,4	n/a	n/a
Category 26					
	261	11	1,2,2,2,2	n/a	n/a
	262	11	1,2,3,3,2	n/a	n/a
	263	11	1,2,3,3,3	n/a	A6 > 4.7
	264	11	2,2,3,3,3	n/a	n/a
	265	11	1,2,2,2,2,2	n/a	n/a
Category 27					
	271	11	1,2,3,2,3	n/a	n/a
	272	11	1,2,3,3,3	n/a	A6 ≤ 4.7
	273	10	1,2,2,2,2	n/a	n/a
	274	11	1,2,3,2,2	n/a	n/a
	275	11	1,2,2,2,3	n/a	n/a
Category 28					
	281	12	1,2,3,2,3,2,3	n/a	n/a
	282	12	1,2,3,3,3,3,3	n/a	n/a
	283	11	1,2,3,3,3,3	n/a	n/a
	284	11	1,2,3,2,3,3	n/a	n/a
	285	12	1,2,3,3,3,2,3	n/a	n/a
Category 29					
	291	10	1,2,4	n/a	n/a
	292	10	1,3,3	n/a	n/a
	293	9	1,2,4	n/a	n/a

APPENDIX C: DATA WEIGHTING

Step 1: Count Number of Records by Area

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST			National Total
		Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	
7	2017	6,561,567	306,520	676,635	7,544,176	231,303	663,958	36,389	2,082	1,360	133,676	0	82,933	764,824	56,763	15,954	0	233,952	56,052	253,419	0	0	15,294,051	830,620	1,496,892	50,943,462
	2018	516,427	1,039	67,484	9,165,683	258,543	1,018,435	431,271	799,245	247,222	198,908	0	126,002	1,231,916	306,292	9,498	0	213,767	58,708	149,765	0	0	11,693,970	1,578,886	1,527,349	
	2019	3,198,422	326,646	429,595	8,286,283	276,863	1,362,145	1,597,992	1,299,616	439,405	210,936	0	133,144	310,627	83,913	5,940	0	48,289	63,682	448,196	0	0	14,052,456	2,035,327	2,433,911	
8	2017	1,288,255	44,192	128,845	1,689,397	42,036	175,390	59,624	3,219	2,150	31,300	0	16,205	284,111	13,587	11,657	0	40,603	13,182	104,522	0	0	3,457,209	143,637	347,429	11,014,584
	2018	112,943	909	19,711	1,903,991	49,120	297,980	248,466	93,750	67,625	44,735	0	19,567	425,032	72,043	6,345	0	37,105	13,218	53,634	0	0	2,788,801	252,927	424,446	
	2019	798,139	45,612	79,732	1,629,080	61,079	192,514	361,600	79,988	89,480	46,184	0	20,700	113,771	17,274	4,198	0	17,297	13,707	29,780	0	0	2,978,554	221,250	400,331	
9	2017	3,823,720	135,095	553,666	5,008,993	133,323	417,026	218,034	10,582	5,400	100,693	0	47,764	673,990	41,367	20,748	0	127,881	44,407	278,860	0	0	10,104,290	448,248	1,089,011	33,087,080
	2018	509,688	31,096	211,805	6,194,648	144,990	602,019	778,553	322,497	111,459	136,938	0	61,058	1,038,459	222,264	11,904	0	106,831	46,301	120,817	0	0	8,779,103	827,678	1,044,546	
	2019	2,337,297	127,240	392,010	4,795,692	161,003	585,111	1,161,460	303,048	192,982	139,931	0	62,704	242,543	57,252	7,710	0	41,286	50,075	136,860	0	0	8,813,783	689,829	1,290,592	
10	2017	1,685,328	62,615	317,076	2,322,283	78,082	193,960	94,962	5,864	2,982	54,613	0	25,186	366,301	13,104	9,024	0	60,362	30,322	162,309	0	0	4,685,796	220,027	578,550	16,984,761
	2018	267,425	21,462	310,753	3,442,409	82,300	269,542	595,401	350,682	59,042	71,157	0	29,338	543,718	79,592	5,822	0	48,274	28,963	68,691	0	0	4,988,801	582,310	703,460	
	2019	1,168,144	57,613	224,049	2,456,960	86,452	234,423	430,087	166,654	73,191	72,437	0	28,168	101,479	16,602	4,397	0	17,428	28,662	59,071	0	0	4,288,178	344,749	592,890	
11	2017	517,935	57,177	153,846	1,726,028	67,548	227,614	48,640	1,670	4,123	38,093	0	43,134	141,122	15,503	5,834	0	35,007	17,987	45,769	0	0	2,517,587	176,905	452,538	9,676,106
	2018	108,610	7,103	96,382	1,738,573	74,424	349,690	280,192	88,762	51,064	54,885	0	68,044	209,337	82,887	2,443	0	32,391	18,378	14,904	0	0	2,406,501	285,567	586,001	
	2019	356,093	44,520	143,087	1,537,063	81,231	344,926	363,046	57,443	88,406	55,503	0	69,024	48,950	20,933	2,038	0	8,570	19,528	10,646	0	0	2,371,301	212,697	667,009	
12	2017	159,067	4,603	7,808	176,144	2,255	6,863	304	21	23	3,460	0	1,380	4,520	384	499	0	3,406	444	53,122	0	0	396,617	10,669	17,017	853,198
	2018	15,109	227	1,310	108,413	2,423	7,658	1,508	123	197	4,320	0	1,857	6,684	1,966	365	0	4,292	403	48,392	0	0	184,426	9,031	11,790	
	2019	64,297	1,310	5,244	119,024	2,002	7,311	3,390	330	1,252	4,762	0	1,858	803	495	330	0	678	377	10,185	0	0	202,461	4,815	16,372	
13	2017	3,526,379	85,130	274,619	4,142,653	119,975	199,669	266,620	13,711	5,421	94,554	0	25,554	324,662	15,641	20,841	0	67,716	15,720	52,736	0	0	8,407,604	302,173	541,824	25,242,321
	2018	508,121	25,457	116,486	4,799,122	124,691	281,822	867,822	227,154	66,672	114,912	0	32,561	499,557	91,093	11,535	0	62,238	15,889	24,687	0	0	6,814,221	530,633	524,965	
	2019	2,122,834	70,554	196,336	3,591,597	125,755	282,541	1,106,835	155,989	147,890	115,789	0	32,845	79,136	21,249	6,595	0	16,454	16,937	31,565	0	0	7,047,756	390,001	683,144	
14	2017	2,617,866	56,373	314,435	1,998,659	76,938	222,622	334,017	11,853	3,294	131,218	0	39,853	384,175	24,075	6,756	0	72,387	21,387	10,937	0	0	5,476,872	241,626	608,347	17,286,044
	2018	916,361	22,709	118,892	2,070,688	75,934	265,914	921,657	139,302	52,757	143,827	0	49,423	561,795	136,014	3,800	0	68,414	20,337	4,009	0	0	4,618,337	442,373	511,123	
	2019	1,607,361	37,900	207,013	1,650,107	80,414	248,510	1,028,244	79,428	119,761																

Step 1: Count Number of Records by Area

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST			National Total
		Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	
21	2017	61,672	474	9,253	95,473	3,049	7,277	9,779	158	162	2,180	0	1,923	1,584	222	27	0	1,106	775	723	0	0	171,411	5,009	19,417	611,300
	2018	36,236	724	4,058	90,626	2,679	9,770	28,367	5,025	1,162	2,162	0	1,741	3,035	1,386	3	0	918	629	194	0	0	160,620	10,732	17,363	
	2019	79,907	1,561	8,735	82,379	2,551	9,243	29,217	2,346	4,811	2,712	0	1,715	322	297	3	0	98	710	141	0	0	194,678	6,853	25,217	
22	2017	337,745	11,817	100,284	391,178	31,681	73,855	42,558	575	1,319	10,052	0	22,909	194	13	7	0	9,757	10,061	5,856	0	0	787,583	53,843	208,435	2,788,696
	2018	73,788	10,597	46,055	392,735	32,437	89,547	74,713	24,329	7,458	10,929	0	25,851	329	102	15	0	7,859	11,065	1,260	0	0	553,754	75,324	179,991	
	2019	221,195	14,589	92,519	292,885	34,174	81,335	117,937	9,918	19,663	9,164	0	23,920	45	24	4	0	571	11,002	821	0	0	642,047	59,276	228,443	
23	2017	5,489,134	142,295	1,190,272	6,051,342	362,638	833,843	788,883	28,509	9,484	194,933	0	113,894	236,220	15,868	10,780	0	116,558	65,092	46,956	0	0	12,807,468	665,868	2,223,365	42,562,040
	2018	1,476,898	113,916	497,934	6,546,713	379,759	1,062,075	1,523,083	358,518	129,289	243,541	0	139,124	398,303	90,905	7,035	0	116,333	65,573	9,216	0	0	10,197,754	1,059,431	1,901,030	
	2019	3,310,666	145,321	975,710	4,966,626	382,221	946,204	1,928,344	146,782	357,061	232,297	0	128,216	53,062	21,805	4,039	0	29,009	73,156	6,605	0	0	10,497,600	725,138	2,484,386	
24	2017	1,469,738	45,236	307,026	896,102	51,115	160,542	113,124	6,222	2,243	27,487	0	27,603	28,862	839	983	0	35,784	26,938	7,524	0	0	2,542,837	139,196	525,335	8,662,524
	2018	352,710	43,357	142,980	1,011,280	52,390	194,879	271,997	86,797	37,703	31,366	0	38,245	30,621	4,657	483	0	30,265	22,533	2,049	0	0	1,700,023	217,466	436,823	
	2019	963,559	49,713	258,053	892,573	58,859	197,045	411,966	43,466	111,251	29,981	0	36,550	3,666	1,115	236	0	12,990	28,489	1,332	0	0	2,303,077	166,143	631,624	
25	2017	2,332,170	145,524	1,898,467	2,671,380	587,243	1,196,200	238,354	17,635	12,436	71,482	0	263,461	256	47	4	0	41,243	37,503	17,332	0	0	5,330,974	791,692	3,408,071	26,891,388
	2018	523,893	166,692	824,763	2,922,855	600,839	1,453,165	608,137	133,774	135,969	75,556	0	371,269	288	271	2	0	32,691	40,048	2,356	0	0	4,133,085	934,267	2,825,216	
	2019	1,637,706	167,524	1,600,108	2,339,899	620,951	1,278,011	804,169	108,043	437,661	65,417	0	363,173	89	54	0	0	3,512	39,999	1,767	0	0	4,849,047	900,084	3,718,952	
26	2017	14,323	169	8,335	13,913	2,759	3,505	858	1,695	918	1,454	0	3,598	29,414	9,597	2,812	0	2,005	96	21	0	0	59,983	16,225	19,264	409,665
	2018	3,733	174	2,096	17,324	2,554	9,173	403	4,096	16,394	1,529	0	12,437	50,475	57,876	1,931	0	2,310	77	12	0	0	73,476	67,010	42,108	
	2019	19,089	204	12,276	20,534	3,787	12,448	2,671	1,151	24,010	1,237	0	13,940	4,371	14,081	1,379	0	189	226	6	0	0	47,908	19,412	64,279	
27	2017	10,529	6	64,225	74,451	821	1,663	91,951	16,388	4,105	26,860	0	22,510	118,570	28,298	17,676	0	0	0	1	0	0	322,362	45,513	110,179	1,931,697
	2018	8,726	20	4,776	118,464	4,180	8,622	63,585	32,420	63,254	45,143	0	71,951	206,769	168,665	7,964	0	0	1	0	0	0	442,687	205,285	156,568	
	2019	54,625	2	49,924	99,345	10,065	12,385	77,815	17,108	139,541	50,002	0	69,828	21,723	40,840	4,881	0	460	559	0	0	0	303,510	68,475	277,118	
28	2017	0	0	4,011	8	0	0	0	14,906	8,444	9,876	0	10,568	180	99	21,635	0	0	0	0	0	0	10,064	15,005	44,658	358,778
	2018	0	0	50	3	5	0	0	44,953	50,987	13,104	0	23,525	1,138	692	12,855	0	0	0	0	0	0	14,245	45,650	87,417	
	2019	0	0	3,528	2	210	3	0	30,139	55,823	17,779	0	24,973	155	287	8,840	0	0	0	0	0	0	17,936	30,636	93,167	
29	2017	57,375	280	13,299	37,096	3,992	7,961	3,694	54	42	108	0	87	1,074	79	445	0	146	73	1,251	0	0	100,598	4,551	21,907	456,244
	2018	13,637	657	6,872	66,651	5,313	20,436	9,527	2,301	868	152	0	286	934	179	258										

Step 2: Calculate Proportion of Records by Area

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST			National Total
		Capital City	Provincial Urban	Rural																						
7	2017	0.12880	0.00602	0.01328	0.14809	0.00454	0.01303	0.00071	0.00004	0.00003	0.00262	0.00000	0.00163	0.01501	0.00111	0.00031	0.00000	0.00459	0.00110	0.00497	0.00000	0.00000	0.30022	0.01630	0.02938	1.00000
	2018	0.01014	0.00002	0.00132	0.17992	0.00508	0.01999	0.00847	0.01569	0.00485	0.00390	0.00000	0.00247	0.02418	0.00601	0.00019	0.00000	0.00420	0.00115	0.00294	0.00000	0.00000	0.22955	0.03099	0.02998	
	2019	0.06278	0.00641	0.00843	0.16266	0.00543	0.02674	0.03137	0.02551	0.00863	0.00414	0.00000	0.00261	0.00610	0.00165	0.00012	0.00000	0.00095	0.00125	0.00880	0.00000	0.00000	0.27584	0.03995	0.04778	
8	2017	0.11696	0.00401	0.01170	0.15338	0.00382	0.01592	0.00541	0.00029	0.00020	0.00284	0.00000	0.00147	0.02579	0.00123	0.00106	0.00000	0.00369	0.00120	0.00949	0.00000	0.00000	0.31388	0.01304	0.03154	1.00000
	2018	0.01025	0.00008	0.00179	0.17286	0.00446	0.02705	0.02256	0.00851	0.00614	0.00406	0.00000	0.00178	0.03859	0.00654	0.00058	0.00000	0.00337	0.00120	0.00487	0.00000	0.00000	0.25319	0.02296	0.03853	
	2019	0.07246	0.00414	0.00724	0.14790	0.00555	0.01748	0.03283	0.00726	0.00812	0.00419	0.00000	0.00188	0.01033	0.00157	0.00038	0.00000	0.00157	0.00124	0.00270	0.00000	0.00000	0.27042	0.02009	0.03635	
9	2017	0.11557	0.00408	0.01673	0.15139	0.00403	0.01260	0.00659	0.00032	0.00016	0.00304	0.00000	0.00144	0.02037	0.00125	0.00063	0.00000	0.00386	0.00134	0.00843	0.00000	0.00000	0.30538	0.01355	0.03291	1.00000
	2018	0.01540	0.00094	0.00640	0.18722	0.00438	0.01819	0.02353	0.00975	0.00337	0.00414	0.00000	0.00185	0.03139	0.00672	0.00036	0.00000	0.00323	0.00140	0.00365	0.00000	0.00000	0.26533	0.02502	0.03157	
	2019	0.07064	0.00385	0.01185	0.14494	0.00487	0.01768	0.03510	0.00916	0.00583	0.00423	0.00000	0.00190	0.00733	0.00173	0.00023	0.00000	0.00125	0.00151	0.00414	0.00000	0.00000	0.26638	0.02085	0.03901	
10	2017	0.09923	0.00369	0.01867	0.13673	0.00460	0.01142	0.00559	0.00035	0.00018	0.00322	0.00000	0.00148	0.02157	0.00077	0.00053	0.00000	0.00355	0.00179	0.00956	0.00000	0.00000	0.27588	0.01295	0.03406	1.00000
	2018	0.01574	0.00126	0.01830	0.20268	0.00485	0.01587	0.03506	0.02065	0.00348	0.00419	0.00000	0.00173	0.03201	0.00469	0.00034	0.00000	0.00284	0.00171	0.00404	0.00000	0.00000	0.29372	0.03428	0.04142	
	2019	0.06878	0.00339	0.01319	0.14466	0.00509	0.01380	0.02532	0.00981	0.00431	0.00426	0.00000	0.00166	0.00597	0.00098	0.00026	0.00000	0.00103	0.00169	0.00348	0.00000	0.00000	0.25247	0.02030	0.03491	
11	2017	0.05353	0.00591	0.01590	0.17838	0.00698	0.02352	0.00503	0.00017	0.00043	0.00394	0.00000	0.00446	0.01458	0.00160	0.00060	0.00000	0.00362	0.00186	0.00473	0.00000	0.00000	0.26019	0.01828	0.04677	1.00000
	2018	0.01122	0.00073	0.00996	0.17968	0.00769	0.03614	0.02896	0.00917	0.00528	0.00567	0.00000	0.00703	0.02163	0.00857	0.00025	0.00000	0.00335	0.00190	0.00154	0.00000	0.00000	0.24871	0.02951	0.06056	
	2019	0.03680	0.00460	0.01479	0.15885	0.00840	0.03565	0.03752	0.00594	0.00914	0.00574	0.00000	0.00713	0.00506	0.00216	0.00021	0.00000	0.00089	0.00202	0.00110	0.00000	0.00000	0.24507	0.02198	0.06893	
12	2017	0.18644	0.00539	0.00915	0.20645	0.00264	0.00804	0.00036	0.00002	0.00003	0.00406	0.00000	0.00162	0.00530	0.00045	0.00058	0.00000	0.00399	0.00052	0.06226	0.00000	0.00000	0.46486	0.01250	0.01994	1.00000
	2018	0.01771	0.00027	0.00154	0.12707	0.00284	0.00898	0.00177	0.00014	0.00023	0.00506	0.00000	0.00218	0.00783	0.00230	0.00043	0.00000	0.00503	0.00047	0.05672	0.00000	0.00000	0.21616	0.01058	0.01382	
	2019	0.07536	0.00154	0.00615	0.13950	0.00235	0.00857	0.00397	0.00039	0.00147	0.00558	0.00000	0.00218	0.00094	0.00058	0.00039	0.00000	0.00079	0.00044	0.01194	0.00000	0.00000	0.23730	0.00564	0.01919	
13	2017	0.13970	0.00337	0.01088	0.16412	0.00475	0.00791	0.01056	0.00054	0.00021	0.00375	0.00000	0.00101	0.01286	0.00062	0.00083	0.00000	0.00268	0.00062	0.00209	0.00000	0.00000	0.33308	0.01197	0.02146	1.00000
	2018	0.02013	0.00101	0.00461	0.19012	0.00494	0.01116	0.03438	0.00900	0.00264	0.00455	0.00000	0.00129	0.01979	0.00361	0.00046	0.00000	0.00247	0.00063	0.00098	0.00000	0.00000	0.26995	0.02102	0.02080	
	2019	0.08410	0.00280	0.00778	0.14228	0.00498	0.01119	0.04385	0.00618	0.00586	0.00459	0.00000	0.00130	0.00314	0.00084	0.00026	0.00000	0.00065	0.00067	0.00125	0.00000	0.00000	0.27920	0.01545	0.02706	
14	2017	0.15144																								

Step 2: Calculate Proportion of Records by Area

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST			National Total
		Capital City	Provincial Urban	Rural																						
21	2017	0.10089	0.00078	0.01514	0.15618	0.00499	0.01190	0.01600	0.00026	0.00027	0.00357	0.00000	0.00315	0.00259	0.00036	0.00004	0.00000	0.00181	0.00127	0.00118	0.00000	0.00000	0.28040	0.00819	0.03176	1.00000
	2018	0.05928	0.00118	0.00664	0.14825	0.00438	0.01598	0.04640	0.00822	0.00190	0.00354	0.00000	0.00285	0.00496	0.00227	0.00000	0.00000	0.00150	0.00103	0.00032	0.00000	0.00000	0.26275	0.01756	0.02840	
	2019	0.13072	0.00255	0.01429	0.13476	0.00417	0.01512	0.04779	0.00384	0.00787	0.00444	0.00000	0.00281	0.00053	0.00049	0.00000	0.00000	0.00016	0.00116	0.00023	0.00000	0.00000	0.31847	0.01121	0.04125	
22	2017	0.12111	0.00424	0.03596	0.14027	0.01136	0.02648	0.01526	0.00021	0.00047	0.00360	0.00000	0.00821	0.00007	0.00000	0.00000	0.00000	0.00350	0.00361	0.00210	0.00000	0.00000	0.28242	0.01931	0.07474	1.00000
	2018	0.02646	0.00380	0.01651	0.14083	0.01163	0.03211	0.02679	0.00872	0.00267	0.00392	0.00000	0.00927	0.00012	0.00004	0.00001	0.00000	0.00282	0.00397	0.00045	0.00000	0.00000	0.19857	0.02701	0.06454	
	2019	0.07932	0.00523	0.03318	0.10503	0.01225	0.02917	0.04229	0.00356	0.00705	0.00329	0.00000	0.00858	0.00002	0.00001	0.00000	0.00000	0.00020	0.00395	0.00029	0.00000	0.00000	0.23023	0.02126	0.08192	
23	2017	0.12897	0.00334	0.02797	0.14218	0.00852	0.01959	0.01853	0.00067	0.00022	0.00458	0.00000	0.00268	0.00555	0.00037	0.00025	0.00000	0.00274	0.00153	0.00110	0.00000	0.00000	0.30091	0.01564	0.05224	1.00000
	2018	0.03470	0.00268	0.01170	0.15382	0.00892	0.02495	0.03579	0.00842	0.00304	0.00572	0.00000	0.00327	0.00936	0.00214	0.00017	0.00000	0.00273	0.00154	0.00022	0.00000	0.00000	0.23960	0.02489	0.04466	
	2019	0.07778	0.00341	0.02292	0.11669	0.00898	0.02223	0.04531	0.00345	0.00839	0.00546	0.00000	0.00301	0.00125	0.00051	0.00009	0.00000	0.00068	0.00172	0.00016	0.00000	0.00000	0.24664	0.01704	0.05837	
24	2017	0.16967	0.00522	0.03544	0.10345	0.00590	0.01853	0.01306	0.00072	0.00026	0.00317	0.00000	0.00319	0.00333	0.00010	0.00011	0.00000	0.00413	0.00311	0.00087	0.00000	0.00000	0.29354	0.01607	0.06064	1.00000
	2018	0.04072	0.00501	0.01651	0.11674	0.00605	0.02250	0.03140	0.01002	0.00435	0.00362	0.00000	0.00441	0.00353	0.00054	0.00006	0.00000	0.00349	0.00260	0.00024	0.00000	0.00000	0.19625	0.02510	0.05043	
	2019	0.11123	0.00574	0.02979	0.10304	0.00679	0.02275	0.04756	0.00502	0.01284	0.00346	0.00000	0.00422	0.00042	0.00013	0.00003	0.00000	0.00150	0.00329	0.00015	0.00000	0.00000	0.26587	0.01918	0.07291	
25	2017	0.08673	0.00541	0.07060	0.09934	0.02184	0.04448	0.00886	0.00066	0.00046	0.00266	0.00000	0.00980	0.00001	0.00000	0.00000	0.00000	0.00153	0.00139	0.00064	0.00000	0.00000	0.19824	0.02944	0.12673	1.00000
	2018	0.01948	0.00620	0.03067	0.10869	0.02234	0.05404	0.02261	0.00497	0.00506	0.00281	0.00000	0.01381	0.00001	0.00001	0.00000	0.00000	0.00122	0.00149	0.00009	0.00000	0.00000	0.15370	0.03474	0.10506	
	2019	0.06090	0.00623	0.05950	0.08701	0.02309	0.04752	0.02990	0.00402	0.01628	0.00243	0.00000	0.01351	0.00000	0.00000	0.00000	0.00000	0.00013	0.00149	0.00007	0.00000	0.00000	0.18032	0.03347	0.13830	
26	2017	0.03496	0.00041	0.02035	0.03396	0.00673	0.00856	0.00209	0.00414	0.00224	0.00355	0.00000	0.00878	0.07180	0.02343	0.00686	0.00000	0.00489	0.00023	0.00005	0.00000	0.00000	0.14642	0.03961	0.04702	1.00000
	2018	0.00911	0.00042	0.00512	0.04229	0.00623	0.02239	0.00098	0.01000	0.00402	0.00373	0.00000	0.03036	0.12321	0.14128	0.00471	0.00000	0.00564	0.00019	0.00003	0.00000	0.00000	0.17936	0.16357	0.10279	
	2019	0.04660	0.00050	0.02997	0.05012	0.00924	0.03039	0.00652	0.00281	0.05861	0.00302	0.00000	0.03403	0.01067	0.03437	0.00337	0.00000	0.00046	0.00055	0.00001	0.00000	0.00000	0.11694	0.04739	0.15691	
27	2017	0.00545	0.00000	0.03325	0.03854	0.00043	0.00086	0.04760	0.00848	0.00213	0.01390	0.00000	0.01165	0.06138	0.01465	0.00915	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.16688	0.02356	0.05704	1.00000
	2018	0.00452	0.00001	0.00247	0.06133	0.00216	0.00446	0.03292	0.01678	0.03275	0.02337	0.00000	0.03725	0.10704	0.08731	0.00412	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.22917	0.10627	0.08105	
	2019	0.02828	0.00000	0.02584	0.05143	0.00521	0.00641	0.04028	0.00886	0.07224	0.02589	0.00000	0.03615	0.01125	0.02114	0.00253	0.00000	0.00024	0.00029	0.00000	0.00000	0.00000	0.15712	0.03545	0.14346	
28	2017	0.00000																								

Step 3: Calculate VKT by Area

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST			National Total
		Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	
7	2017	626,459	190,749	187,124	409,412	84,137	104,394	331,875	237,768	170,674	79,248	0	51,148	147,390	40,045	121,060	15,861	10,185	10,024	19,778	0	0	1,630,024	562,885	644,422	8,807,073
	2018	660,388	201,100	175,882	425,766	97,038	89,811	334,372	269,639	178,383	79,226	0	56,259	148,329	45,635	114,943	16,785	10,429	9,884	21,822	0	0	1,686,688	623,841	625,162	
	2019	695,166	211,710	163,531	442,421	110,457	74,408	335,108	303,485	185,878	78,970	0	61,605	149,270	51,239	108,809	17,736	10,670	9,721	23,866	0	0	1,742,537	687,562	603,952	
8	2017	36,959	52,261	41,907	149,746	14,648	59,273	47,145	47,855	36,872	28,943	0	17,123	55,911	11,667	51,977	9,348	6,933	8,114	3,085	0	0	331,137	133,364	215,267	2,027,612
	2018	27,842	53,881	37,561	150,341	16,750	73,586	47,101	38,104	33,404	32,013	0	18,753	54,486	8,865	55,491	9,336	7,330	8,144	2,883	0	0	324,002	124,930	226,938	
	2019	19,872	54,242	33,326	149,410	18,991	89,284	46,006	29,457	29,882	35,106	0	20,361	53,074	6,096	58,958	9,319	7,738	8,170	2,680	0	0	315,468	116,523	239,982	
9	2017	324,854	138,268	191,549	282,920	83,440	71,446	143,666	143,617	217,732	72,246	0	36,743	131,884	20,189	49,266	17,414	9,727	22,353	13,690	0	0	986,674	395,241	589,089	5,869,204
	2018	304,170	146,309	205,985	274,482	80,098	55,279	128,763	151,365	237,775	72,522	0	32,404	140,780	16,401	43,519	18,739	9,041	25,051	13,718	0	0	953,174	403,214	600,013	
	2019	283,368	154,392	220,496	264,730	76,485	40,695	112,937	159,315	258,540	72,568	0	28,296	149,617	12,636	37,807	20,083	8,186	27,899	13,746	0	0	917,049	411,015	613,733	
10	2017	190,076	95,908	102,698	224,530	53,461	58,545	71,883	86,562	96,555	32,025	0	29,366	91,745	21,243	58,924	8,650	3,158	14,204	5,888	0	0	624,797	260,332	360,291	3,796,749
	2018	197,924	115,471	114,235	226,648	56,492	51,199	64,127	85,589	95,196	28,999	0	28,701	91,527	20,405	58,242	8,394	2,468	13,537	6,430	0	0	624,048	280,425	361,110	
	2019	203,731	136,847	125,998	228,718	59,478	43,944	56,776	84,414	93,635	26,115	0	27,895	91,294	19,579	57,563	8,100	1,844	12,843	6,972	0	0	621,706	302,162	361,877	
11	2017	32,687	12,082	23,158	75,089	28,478	19,130	20,788	17,944	30,282	11,358	0	13,109	19,456	7,964	30,360	594	870	2,243	1,169	0	0	161,141	67,338	118,282	1,076,338
	2018	34,625	11,777	23,468	79,666	33,320	21,180	19,294	15,984	30,388	11,601	0	13,483	20,301	8,201	31,174	582	803	1,760	1,172	0	0	167,242	70,085	121,452	
	2019	36,618	11,436	23,758	83,826	38,535	23,275	17,850	14,135	30,333	11,843	0	13,859	21,159	8,436	31,976	542	714	1,327	1,176	0	0	173,014	73,256	124,529	
12	2017	6,285	1,153	1,355	3,156	388	1,571	9,015	3,056	11,464	2,833	0	2,114	3,222	280	1,814	716	422	486	312	0	0	25,538	5,299	18,803	161,107
	2018	6,492	1,191	1,399	3,376	415	1,680	9,732	3,299	12,376	3,003	0	2,191	3,886	338	2,188	874	354	595	312	0	0	27,675	5,597	20,430	
	2019	6,699	1,229	1,444	3,595	442	1,789	10,449	3,542	13,288	3,176	0	2,266	4,551	396	2,562	1,047	260	716	312	0	0	29,830	5,869	22,065	
13	2017	236,439	96,015	124,785	258,409	47,968	52,296	147,832	130,512	126,902	47,053	0	31,486	95,721	18,378	73,340	9,843	7,486	18,493	8,353	0	0	803,649	300,359	427,302	4,636,065
	2018	245,209	100,839	133,778	273,175	50,765	44,776	143,938	134,497	122,792	42,581	0	29,642	91,935	18,843	67,418	9,466	6,775	20,341	8,585	0	0	814,889	311,719	418,747	
	2019	253,704	105,670	143,037	288,351	53,641	36,766	140,094	138,375	118,739	38,228	0	27,678	88,053	19,167	61,736	9,064	6,029	22,250	8,817	0	0	826,312	322,882	410,205	
14	2017	19,373	15,503	7,278	20,302	7,199	13,985	14,855	21,981	13,401	6,675	0	5,430	5,564	1,284	21,336	200	1,000	1,670	978	0	0	67,946	46,967	63,099	547,398
	2018	24,718	9,990	7,223	17,935	8,941	17,820	14,613	28,082	13,695	4,872	0	3,198	5,582	1,598	20,384	146	961	1,812	896	0	0	68,763	49,571	64,133	
	2019	30,004	4,534	7,169	15,003	10,852	22,051	13,921	34,927	13,695	2,648	0	1,388	5,594	1,896	19,455	91									

Step 3: Calculate VKT by Area

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST			National Total
		Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural													
21	2017	11,237	2,906	12,870	3,638	4,275	1,051	12,018	3,827	7,053	1,445	0	4,993	2,827	231	1,881	13	834	338	4	0	0	31,183	12,073	28,188	238,503
	2018	13,597	2,954	15,447	2,339	4,226	609	14,250	5,171	6,886	1,068	0	6,689	2,657	238	2,182	13	834	338	4	0	0	33,926	13,422	32,152	
	2019	16,045	2,849	18,087	1,326	3,775	283	16,596	6,716	6,403	461	0	8,614	2,473	244	2,497	13	834	338	4	0	0	36,917	14,418	36,223	
22	2017	38,735	7,926	55,342	57,961	11,673	19,114	14,649	16,074	35,484	14,320	0	16,113	10,930	2,499	14,356	368	2,222	2,341	1,225	0	0	138,189	40,394	142,749	1,021,261
	2018	41,057	7,483	56,087	64,263	12,706	15,625	16,492	19,496	38,399	15,182	0	19,223	11,675	2,389	14,462	319	2,124	1,960	1,478	0	0	150,466	44,199	145,756	
	2019	43,445	7,007	56,798	70,880	13,782	11,778	18,342	23,235	40,991	15,811	0	22,567	12,443	2,271	14,553	272	1,993	1,610	1,731	0	0	162,924	48,287	148,297	
23	2017	292,717	136,354	440,144	433,174	96,187	436,664	217,669	127,486	313,539	59,929	0	136,744	116,801	25,281	111,241	10,966	17,999	58,493	7,071	0	0	1,138,327	403,307	1,496,824	9,047,327
	2018	297,945	146,751	426,546	465,466	100,550	396,917	222,640	121,838	302,230	59,453	0	132,001	105,092	28,042	112,618	11,930	18,198	61,426	6,132	0	0	1,168,658	415,379	1,431,739	
	2019	303,195	157,195	412,881	497,541	104,883	357,417	227,280	116,313	291,128	58,917	0	127,319	93,889	30,586	113,706	12,934	18,340	64,376	5,193	0	0	1,198,949	427,317	1,366,827	
24	2017	21,251	15,539	79,292	16,778	7,941	49,309	11,182	13,393	42,767	1,313	0	12,460	8,386	1,798	23,784	767	1,782	5,966	160	0	0	59,839	40,454	213,577	942,087
	2018	19,814	18,319	91,108	16,487	7,886	49,142	9,389	12,552	34,598	749	0	8,806	9,075	1,204	26,603	848	1,608	5,738	102	0	0	56,465	41,570	215,994	
	2019	17,594	21,307	103,500	16,199	7,831	48,972	7,596	11,211	26,929	328	0	5,009	9,759	492	29,545	920	1,442	5,510	45	0	0	52,440	42,284	219,465	
25	2017	67,234	72,527	487,207	149,990	59,296	649,104	71,031	97,729	490,394	43,161	0	311,772	13,995	4,230	95,464	2,875	3,101	17,964	5,210	0	0	353,496	236,883	2,051,905	8,365,045
	2018	63,862	81,602	531,148	156,622	61,032	694,282	67,986	101,328	502,301	45,783	0	330,834	15,405	4,829	101,858	3,281	3,082	17,461	5,653	0	0	358,592	251,872	2,177,884	
	2019	59,214	91,165	575,876	162,935	62,537	740,010	64,778	104,991	514,306	48,404	0	349,898	16,867	5,468	108,160	3,683	3,063	16,963	6,095	0	0	361,975	267,223	2,305,213	
26	2017	3,428	3,212	48,918	6,231	1,040	30,263	2,304	12,379	116,698	6,820	0	57,897	37,747	13,630	255,033	38	6	183	1	0	0	56,568	30,268	508,991	1,750,338
	2018	3,863	3,620	55,131	6,231	465	29,202	924	12,913	106,039	7,019	0	56,012	38,521	12,871	250,430	35	3	165	1	0	0	56,594	29,872	496,979	
	2019	4,298	4,028	61,343	6,206	1,202	26,855	2,433	13,136	92,802	7,199	0	54,147	39,254	12,128	245,851	33	6	143	1	0	0	59,424	30,501	481,141	
27	2017	2,052	672	52,835	6,231	1,930	29,372	3,954	12,379	115,048	6,820	0	57,897	37,747	13,630	255,033	38	12	178	1	0	0	56,843	28,623	510,362	1,750,338
	2018	1,538	2,189	58,888	6,231	1,549	28,118	2,645	12,913	104,318	7,019	0	56,012	38,521	12,871	250,430	35	9	159	1	0	0	55,990	29,530	497,925	
	2019	849	2,435	66,386	6,206	1,195	26,861	1,520	13,136	93,715	7,199	0	54,147	39,254	12,128	245,851	33	6	143	1	0	0	55,061	28,901	487,103	
28	2017	278	91	7,148	3,641	553	23,230	3,820	3,237	76,107	3,089	0	24,058	8,329	3,556	177,651	0	0	0	0	0	0	19,156	7,437	308,194	953,629
	2018	239	339	9,133	3,048	463	19,447	3,481	2,345	66,828	3,454	0	22,842	7,538	3,574	175,146	0	0	0	0	0	0	17,760	6,721	293,395	
	2019	145	416	11,344	2,455	373	15,664	3,101	1,593	57,450	3,789	0	21,656	6,771	3,588	172,621	0	0	0	0	0	0	16,260	5,970	278,735	
29	2017	8,976	11,102	30,116	22,564	7,769	34,255	15,192	14,149	43,742	1,964	0	11,488	12,653	2,633	141,671	892	130	5,626	128	0	0	62,369	35,783	266,897	1,205,938
	2018	9,485	14,153</td																							

Step 4: Calculate Proportion of VKT by Area

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST			National Total
		Capital City	Provincial Urban	Rural																						
7	2017	0.07113	0.02166	0.02125	0.04649	0.00955	0.01185	0.03768	0.02700	0.01938	0.00900	0.00000	0.00581	0.01674	0.00455	0.01375	0.00180	0.00116	0.00114	0.00225	0.00000	0.00000	0.18508	0.06391	0.07317	1.00000
	2018	0.07498	0.02283	0.01997	0.04834	0.01102	0.01020	0.03797	0.03062	0.02025	0.00900	0.00000	0.00639	0.01684	0.00518	0.01305	0.00191	0.00118	0.00112	0.00248	0.00000	0.00000	0.19152	0.07083	0.07098	
	2019	0.07893	0.02404	0.01857	0.05023	0.01254	0.00845	0.03805	0.03446	0.02111	0.00897	0.00000	0.00699	0.01695	0.00582	0.01235	0.00201	0.00121	0.00110	0.00271	0.00000	0.00000	0.19786	0.07807	0.06858	
8	2017	0.01823	0.02577	0.02067	0.07385	0.00722	0.02923	0.02325	0.02360	0.01819	0.01427	0.00000	0.00845	0.02757	0.00575	0.02563	0.00461	0.00342	0.00400	0.00152	0.00000	0.00000	0.16331	0.06577	0.10617	1.00000
	2018	0.01373	0.02657	0.01852	0.07415	0.00826	0.03629	0.02323	0.01879	0.01647	0.01579	0.00000	0.00925	0.02687	0.00437	0.02737	0.00460	0.00362	0.00402	0.00142	0.00000	0.00000	0.15980	0.06161	0.11192	
	2019	0.00980	0.02675	0.01644	0.07369	0.00937	0.04403	0.02269	0.01453	0.01474	0.01731	0.00000	0.01004	0.02618	0.00301	0.02908	0.00460	0.00382	0.00403	0.00132	0.00000	0.00000	0.15559	0.05747	0.11836	
9	2017	0.05535	0.02356	0.03264	0.04820	0.01422	0.01217	0.02448	0.02447	0.03710	0.01231	0.00000	0.00626	0.02247	0.00344	0.00839	0.00297	0.00166	0.00381	0.00233	0.00000	0.00000	0.16811	0.06734	0.10037	1.00000
	2018	0.05182	0.02493	0.03510	0.04677	0.01365	0.00942	0.02194	0.02579	0.04051	0.01236	0.00000	0.00552	0.02399	0.00279	0.00741	0.00319	0.00154	0.00427	0.00234	0.00000	0.00000	0.16240	0.06870	0.10223	
	2019	0.04828	0.02631	0.03757	0.04510	0.01303	0.00693	0.01924	0.02714	0.04405	0.01236	0.00000	0.00482	0.02549	0.00215	0.00644	0.00342	0.00139	0.00475	0.00234	0.00000	0.00000	0.15625	0.07003	0.10457	
10	2017	0.05006	0.02526	0.02705	0.05914	0.01408	0.01542	0.01893	0.02280	0.02543	0.00843	0.00000	0.00773	0.02416	0.00560	0.01552	0.00228	0.00083	0.00374	0.00155	0.00000	0.00000	0.16456	0.06857	0.09489	1.00000
	2018	0.05213	0.03041	0.03009	0.05970	0.01488	0.01348	0.01689	0.02254	0.02507	0.00764	0.00000	0.00756	0.02411	0.00537	0.01534	0.00221	0.00065	0.00357	0.00169	0.00000	0.00000	0.16436	0.07386	0.09511	
	2019	0.05366	0.03604	0.03319	0.06024	0.01567	0.01157	0.01495	0.02223	0.02466	0.00688	0.00000	0.00735	0.02405	0.00516	0.01516	0.00213	0.00049	0.00338	0.00184	0.00000	0.00000	0.16375	0.07958	0.09531	
11	2017	0.03037	0.01123	0.02152	0.06976	0.02646	0.01777	0.01931	0.01667	0.02813	0.01055	0.00000	0.01218	0.01808	0.00740	0.02821	0.00055	0.00081	0.00208	0.00109	0.00000	0.00000	0.14971	0.06256	0.10989	1.00000
	2018	0.03217	0.01094	0.02180	0.07402	0.03096	0.01968	0.01793	0.01485	0.02823	0.01078	0.00000	0.01253	0.01886	0.00762	0.02896	0.00054	0.00075	0.00163	0.00109	0.00000	0.00000	0.15538	0.06511	0.11284	
	2019	0.03402	0.01063	0.02207	0.07788	0.03580	0.02162	0.01658	0.01313	0.02818	0.01100	0.00000	0.01288	0.01966	0.00784	0.02971	0.00050	0.00066	0.00123	0.00109	0.00000	0.00000	0.16074	0.06806	0.11570	
12	2017	0.03901	0.00716	0.00841	0.01959	0.00241	0.00975	0.05595	0.01897	0.07116	0.01758	0.00000	0.01312	0.02000	0.00174	0.01126	0.00444	0.00262	0.00302	0.00194	0.00000	0.00000	0.15852	0.03289	0.11671	1.00000
	2018	0.04030	0.00739	0.00869	0.02095	0.00257	0.01043	0.06041	0.02048	0.07682	0.01864	0.00000	0.01360	0.02412	0.00210	0.01358	0.00542	0.00220	0.00370	0.00194	0.00000	0.00000	0.17178	0.03474	0.12681	
	2019	0.04158	0.00763	0.00896	0.02231	0.00274	0.01111	0.06486	0.02199	0.08248	0.01971	0.00000	0.01407	0.02825	0.00246	0.01590	0.00650	0.00162	0.00444	0.00194	0.00000	0.00000	0.18516	0.03643	0.13696	
13	2017	0.05100	0.02071	0.02692	0.05574	0.01035	0.01128	0.03189	0.02815	0.02737	0.01015	0.00000	0.00679	0.02065	0.00396	0.01582	0.00212	0.00161	0.00399	0.00180	0.00000	0.00000	0.17335	0.06479	0.09217	1.00000
	2018	0.05289	0.02175	0.02886	0.05892	0.01095	0.00966	0.03105	0.02901	0.02649	0.00918	0.00000	0.00639	0.01983	0.00406	0.01454	0.00204	0.00146	0.00439	0.00185	0.00000	0.00000	0.17577	0.06724	0.09032	
	2019	0.05472	0.02279	0.03085	0.06220	0.01157	0.00793	0.03022	0.02985	0.02561	0.00825	0.00000	0.00597	0.01899	0.00413	0.01332	0.00196	0.00130	0.004							

Step 4: Calculate Proportion of VKT by Area

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST			National Total
		Capital City	Provincial Urban	Rural																						
21	2017	0.04712	0.01219	0.05396	0.01526	0.01793	0.00441	0.05039	0.01605	0.02957	0.00606	0.00000	0.02094	0.01185	0.00097	0.00789	0.00005	0.00350	0.00142	0.00002	0.00000	0.00000	0.13074	0.05062	0.11819	1.00000
	2018	0.05701	0.01238	0.06477	0.00981	0.01772	0.00255	0.05975	0.02168	0.02887	0.00448	0.00000	0.02805	0.01114	0.00100	0.00915	0.00005	0.00350	0.00142	0.00002	0.00000	0.00000	0.14225	0.05628	0.13481	
	2019	0.06727	0.01194	0.07584	0.00556	0.01583	0.00119	0.06958	0.02816	0.02685	0.00193	0.00000	0.03612	0.01037	0.00102	0.01047	0.00005	0.00350	0.00142	0.00002	0.00000	0.00000	0.15479	0.06045	0.15188	
22	2017	0.03793	0.00776	0.05419	0.05675	0.01143	0.01872	0.01434	0.01574	0.03474	0.01402	0.00000	0.01578	0.01070	0.00245	0.01406	0.00036	0.00218	0.00229	0.00120	0.00000	0.00000	0.13531	0.03955	0.13978	1.00000
	2018	0.04020	0.00733	0.05492	0.06293	0.01244	0.01530	0.01615	0.01909	0.03760	0.01487	0.00000	0.01882	0.01143	0.00234	0.01416	0.00031	0.00208	0.00192	0.00145	0.00000	0.00000	0.14733	0.04328	0.14272	
	2019	0.04254	0.00686	0.05562	0.06940	0.01349	0.01153	0.01796	0.02275	0.04014	0.01548	0.00000	0.02210	0.01218	0.00222	0.01425	0.00027	0.00195	0.00158	0.00170	0.00000	0.00000	0.15953	0.04728	0.14521	
23	2017	0.03235	0.01507	0.04865	0.04788	0.01063	0.04826	0.02406	0.01409	0.03466	0.00662	0.00000	0.01511	0.01291	0.00279	0.01230	0.00121	0.00199	0.00647	0.00078	0.00000	0.00000	0.12582	0.04458	0.16544	1.00000
	2018	0.03293	0.01622	0.04715	0.05145	0.01111	0.04387	0.02461	0.01347	0.03341	0.00657	0.00000	0.01459	0.01162	0.00310	0.01245	0.00132	0.00201	0.00679	0.00068	0.00000	0.00000	0.12917	0.04591	0.15825	
	2019	0.03351	0.01737	0.04564	0.05499	0.01159	0.03951	0.02512	0.01286	0.03218	0.00651	0.00000	0.01407	0.01038	0.00338	0.01257	0.00143	0.00203	0.00712	0.00057	0.00000	0.00000	0.13252	0.04723	0.15108	
24	2017	0.02256	0.01649	0.08417	0.01781	0.00843	0.05234	0.01187	0.01422	0.04540	0.00139	0.00000	0.01323	0.00890	0.00191	0.02525	0.00081	0.00189	0.00633	0.00017	0.00000	0.00000	0.06352	0.04294	0.22671	1.00000
	2018	0.02103	0.01945	0.09671	0.01750	0.00837	0.05216	0.00997	0.01332	0.03672	0.00079	0.00000	0.00935	0.00963	0.00128	0.02824	0.00090	0.00171	0.00609	0.00011	0.00000	0.00000	0.05994	0.04413	0.22927	
	2019	0.01868	0.02262	0.10986	0.01719	0.00831	0.05198	0.00806	0.01190	0.02858	0.00035	0.00000	0.00532	0.01036	0.00052	0.03136	0.00098	0.00153	0.00585	0.00005	0.00000	0.00000	0.05566	0.04488	0.23296	
25	2017	0.00804	0.00867	0.05824	0.01793	0.00709	0.07760	0.00849	0.01168	0.05862	0.00516	0.00000	0.03727	0.00167	0.00051	0.01141	0.00034	0.00037	0.00215	0.00062	0.00000	0.00000	0.04226	0.02832	0.24530	1.00000
	2018	0.00763	0.00976	0.06350	0.01872	0.00730	0.08300	0.00813	0.01211	0.06005	0.00547	0.00000	0.03955	0.00184	0.00058	0.01218	0.00039	0.00037	0.00209	0.00068	0.00000	0.00000	0.04287	0.03011	0.26036	
	2019	0.00708	0.01090	0.06884	0.01948	0.00748	0.08846	0.00774	0.01255	0.06148	0.00579	0.00000	0.04183	0.00202	0.00065	0.01293	0.00044	0.00037	0.00203	0.00073	0.00000	0.00000	0.04327	0.03195	0.27558	
26	2017	0.00196	0.00184	0.02795	0.00356	0.00059	0.01729	0.00132	0.00707	0.06667	0.00390	0.00000	0.03308	0.02157	0.00779	0.14570	0.00002	0.00000	0.00010	0.00000	0.00000	0.00000	0.03232	0.01729	0.29080	1.00000
	2018	0.00221	0.00207	0.03150	0.00356	0.00027	0.01668	0.00053	0.00738	0.06058	0.00401	0.00000	0.03200	0.02201	0.00735	0.14308	0.00002	0.00000	0.00009	0.00000	0.00000	0.00000	0.03233	0.01707	0.28393	
	2019	0.00246	0.00230	0.03505	0.00355	0.00069	0.01534	0.00139	0.00750	0.05302	0.00411	0.00000	0.03094	0.02243	0.00693	0.14046	0.00002	0.00000	0.00008	0.00000	0.00000	0.00000	0.03395	0.01743	0.27488	
27	2017	0.00117	0.00038	0.03019	0.00356	0.00110	0.01678	0.00226	0.00707	0.06573	0.00390	0.00000	0.03308	0.02157	0.00779	0.14570	0.00002	0.00001	0.00010	0.00000	0.00000	0.00000	0.03248	0.01635	0.29158	1.00000
	2018	0.00088	0.00125	0.03364	0.00356	0.00089	0.01606	0.00151	0.00738	0.05960	0.00401	0.00000	0.03200	0.02201	0.00735	0.14308	0.00002	0.00001	0.00009	0.00000	0.00000	0.00000	0.03199	0.01687	0.28447	
	2019	0.00048	0.00139	0.03793	0.00355	0.00068	0.01535	0.00087	0.00750	0.05354	0.00411	0.00000	0.03094	0.02243	0.00693	0.14046	0.00002	0.00000	0.00008	0.00000	0.00000	0.00000	0.03146	0.01651	0.27829	
28	2017	0.0002																								

Step 5: Calculate Data Weights

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST		
		Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural
7	2017	0.55	3.60	1.60	0.31	2.10	0.91	52.75	660.59	725.91	3.43	0.00	3.57	1.11	4.08	43.89	0.00	0.25	1.03	0.45	0.00	0.00	0.62	3.92	2.49
	2018	7.40	1,119.57	15.08	0.27	2.17	0.51	4.48	1.95	4.17	2.30	0.00	2.58	0.70	0.86	70.00	0.00	0.28	0.97	0.84	0.00	0.00	0.83	2.29	2.37
	2019	1.26	3.75	2.20	0.31	2.31	0.32	1.21	1.35	2.45	2.17	0.00	2.68	2.78	3.53	105.96	0.00	1.28	0.88	0.31	0.00	0.00	0.72	1.95	1.44
8	2017	0.16	6.42	1.77	0.48	1.89	1.84	4.30	80.76	93.16	5.02	0.00	5.74	1.07	4.66	24.22	0.00	0.93	3.34	0.16	0.00	0.00	0.52	5.04	3.37
	2018	1.34	322.00	10.35	0.43	1.85	1.34	1.03	2.21	2.68	3.89	0.00	5.21	0.70	0.67	47.51	0.00	1.07	3.35	0.29	0.00	0.00	0.63	2.68	2.90
	2019	0.14	6.46	2.27	0.50	1.69	2.52	0.69	2.00	1.81	4.13	0.00	5.34	2.53	1.92	76.29	0.00	2.43	3.24	0.49	0.00	0.00	0.58	2.86	3.26
9	2017	0.48	5.77	1.95	0.32	3.53	0.97	3.71	76.51	227.30	4.04	0.00	4.34	1.10	2.75	13.39	0.00	0.43	2.84	0.28	0.00	0.00	0.55	4.97	3.05
	2018	3.36	26.52	5.48	0.25	3.11	0.52	0.93	2.65	12.03	2.99	0.00	2.99	0.76	0.42	20.61	0.00	0.48	3.05	0.64	0.00	0.00	0.61	2.75	3.24
	2019	0.68	6.84	3.17	0.31	2.68	0.39	0.55	2.96	7.55	2.92	0.00	2.54	3.48	1.24	27.64	0.00	1.12	3.14	0.57	0.00	0.00	0.59	3.36	2.68
10	2017	0.50	6.85	1.45	0.43	3.06	1.35	3.39	66.04	144.85	2.62	0.00	5.22	1.12	7.25	29.21	0.00	0.23	2.10	0.16	0.00	0.00	0.60	5.29	2.79
	2018	3.31	24.07	1.64	0.29	3.07	0.85	0.48	1.09	7.21	1.82	0.00	4.38	0.75	1.15	44.75	0.00	0.23	2.09	0.42	0.00	0.00	0.56	2.15	2.30
	2019	0.78	10.63	2.52	0.42	3.08	0.84	0.59	2.27	5.72	1.61	0.00	4.43	4.02	5.28	58.56	0.00	0.47	2.00	0.53	0.00	0.00	0.65	3.92	2.73
11	2017	0.57	1.90	1.35	0.39	3.79	0.76	3.84	96.60	66.03	2.68	0.00	2.73	1.24	4.62	46.78	0.00	0.22	1.12	0.23	0.00	0.00	0.58	3.42	2.35
	2018	2.87	14.91	2.19	0.41	4.02	0.54	0.62	1.62	5.35	1.90	0.00	1.78	0.87	0.89	114.71	0.00	0.22	0.86	0.71	0.00	0.00	0.62	2.21	1.86
	2019	0.92	2.31	1.49	0.49	4.26	0.61	0.44	2.21	3.08	1.92	0.00	1.81	3.89	3.62	141.05	0.00	0.75	0.61	0.99	0.00	0.00	0.66	3.10	1.68
12	2017	0.21	1.33	0.92	0.09	0.91	1.21	157.04	770.73	2,639.62	4.34	0.00	8.11	3.77	3.87	19.25	0.00	0.66	5.79	0.03	0.00	0.00	0.34	2.63	5.85
	2018	2.28	27.78	5.66	0.16	0.91	1.16	34.18	142.05	332.69	3.68	0.00	6.25	3.08	0.91	31.75	0.00	0.44	7.82	0.03	0.00	0.00	0.79	3.28	9.18
	2019	0.55	4.97	1.46	0.16	1.17	1.30	16.32	56.85	56.21	3.53	0.00	6.46	30.02	4.24	41.12	0.00	2.03	10.05	0.16	0.00	0.00	0.78	6.46	7.14
13	2017	0.37	6.14	2.47	0.34	2.18	1.43	3.02	51.83	127.46	2.71	0.00	6.71	1.61	6.40	19.16	0.00	0.60	6.41	0.86	0.00	0.00	0.52	5.41	4.29
	2018	2.63	21.57	6.25	0.31	2.22	0.87	0.90	3.22	10.03	2.02	0.00	4.96	1.00	1.13	31.82	0.00	0.59	6.97	1.89	0.00	0.00	0.65	3.20	4.34
	2019	0.65	8.15	3.97	0.44	2.32	0.71	0.69	4.83	4.37	1.80	0.00	4.59	6.06	4.91	50.97	0.00	2.00	7.15	1.52	0.00	0.00	0.64	4.51	3.27
14	2017	0.23	8.68	0.73	0.32	2.95	1.98	1.40	58.56	128.47	1.61	0.00	4.30	0.46	1.68	99.73	0.00	0.44	2.47	2.82	0.00	0.00	0.39	6.14	3.28
	2018	0.85	13.89	1.92	0.27	3.72	2.12	0.50	6.37	8.20	1.07	0.00	2.04	0.31	0.37	169.40	0.00	0.44	2.81	7.06	0.00	0.00	0.47	3.54	3.96
	2019	0.59	3.78	1.09	0.29	4.26	2.80	0.43	13.89	3.61	0.68	0.00	0.93	2.12	1.81	280.78	0.00	2.01	2.64	10.47	0.00	0.00	0.48	6.84	3.20
15	2017	0.45	3.28	3.95	0.21	1.07	1.48	8.68	195.54	4.31	1.15	0.00	7.97	2.63	1.32	10.60	0.00	0.40	3.73	0.05	0.00	0.00	0.53	9.08	2.54
	2018	5.07	101.29	24.49	0.16	0.72	3.77	2.61	26.69	0.24	0.42	0.00	3.13	1.67	0.23	17.19	0.00	0.22	3.20	0.04	0.00	0.00	0.52	5.54	5.55
	2019	1.01	14.81	12.77	0.20	0.86	4.85	1.14	17.75	0.07	0.12	0.00	0.79	10.25	0.94	25.43	0.00	0.97	3.22	0.05	0.00	0.00	0.58	9.71	4.94
16	2017	0.31	5.82	2.63	0.33	2.18	1.93	3.02	40.50	199.00	1.72	0.00</td													

Step 5: Calculate Data Weights

Category	Year	NSW			VIC			QLD			SA			WA			TAS			ACT			AUST		
		Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural	Capital City	Provincial Urban	Rural
21	2017	0.47	15.71	3.57	0.10	3.59	0.37	3.15	62.08	111.59	1.70	0.00	6.66	4.57	2.67	178.53	0.00	1.93	1.12	0.01	0.00	0.00	0.47	6.18	3.72
	2018	0.96	10.46	9.76	0.07	4.04	0.16	1.29	2.64	15.19	1.27	0.00	9.85	2.24	0.44	1,864.22	0.00	2.33	1.38	0.05	0.00	0.00	0.54	3.21	4.75
	2019	0.51	4.68	5.31	0.04	3.79	0.08	1.46	7.34	3.41	0.44	0.00	12.87	19.69	2.11	2,133.17	0.00	21.81	1.22	0.07	0.00	0.00	0.49	5.39	3.68
22	2017	0.31	1.83	1.51	0.40	1.01	0.71	0.94	76.33	73.46	3.89	0.00	1.92	153.85	524.85	5,600.20	0.00	0.62	0.64	0.57	0.00	0.00	0.48	2.05	1.87
	2018	1.52	1.93	3.33	0.45	1.07	0.48	0.60	2.19	14.06	3.79	0.00	2.03	96.90	63.97	2,632.69	0.00	0.74	0.48	3.20	0.00	0.00	0.74	1.60	2.21
	2019	0.54	1.31	1.68	0.66	1.10	0.40	0.42	6.40	5.69	4.71	0.00	2.58	755.04	258.39	9,935.04	0.00	9.53	0.40	5.76	0.00	0.00	0.69	2.22	1.77
23	2017	0.25	4.51	1.74	0.34	1.25	2.46	1.30	21.04	155.53	1.45	0.00	5.65	2.33	7.50	48.55	0.00	0.73	4.23	0.71	0.00	0.00	0.42	2.85	3.17
	2018	0.95	6.06	4.03	0.33	1.25	1.76	0.69	1.60	11.00	1.15	0.00	4.46	1.24	1.45	75.31	0.00	0.74	4.41	3.13	0.00	0.00	0.54	1.84	3.54
	2019	0.43	5.09	1.99	0.47	1.29	1.78	0.55	3.73	3.84	1.19	0.00	4.67	8.32	6.60	132.44	0.00	2.97	4.14	3.70	0.00	0.00	0.54	2.77	2.59
24	2017	0.13	3.16	2.37	0.17	1.43	2.82	0.91	19.79	175.32	0.44	0.00	4.15	2.67	19.71	222.47	0.00	0.46	2.04	0.19	0.00	0.00	0.22	2.67	3.74
	2018	0.52	3.89	5.86	0.15	1.38	2.32	0.32	1.33	8.44	0.22	0.00	2.12	2.73	2.38	506.45	0.00	0.49	2.34	0.46	0.00	0.00	0.31	1.76	4.55
	2019	0.17	3.94	3.69	0.17	1.22	2.29	0.17	2.37	2.23	0.10	0.00	1.26	24.48	4.06	1,151.13	0.00	1.02	1.78	0.31	0.00	0.00	0.21	2.34	3.19
25	2017	0.09	1.60	0.83	0.18	0.32	1.74	0.96	17.82	126.77	1.94	0.00	3.80	175.74	289.32	76,722.68	0.00	0.24	1.54	0.97	0.00	0.00	0.21	0.96	1.94
	2018	0.39	1.57	2.07	0.17	0.33	1.54	0.36	2.44	11.88	1.95	0.00	2.86	171.96	57.28	163,722.45	0.00	0.30	1.40	7.71	0.00	0.00	0.28	0.87	2.48
	2019	0.12	1.75	1.16	0.22	0.32	1.86	0.26	3.12	3.78	2.38	0.00	3.10	609.25	325.50	0.00	0.00	2.80	1.36	11.09	0.00	0.00	0.24	0.95	1.99
26	2017	0.06	4.45	1.37	0.10	0.09	2.02	0.63	1.71	29.75	1.10	0.00	3.77	0.30	0.33	21.23	0.00	0.00	0.45	0.01	0.00	0.00	0.22	0.44	6.18
	2018	0.24	4.87	6.16	0.08	0.04	0.75	0.54	0.74	1.51	1.07	0.00	1.05	0.18	0.05	30.35	0.00	0.00	0.50	0.02	0.00	0.00	0.18	0.10	2.76
	2019	0.05	4.62	1.17	0.07	0.07	0.50	0.21	2.67	0.90	1.36	0.00	0.91	2.10	0.20	41.73	0.00	0.01	0.15	0.05	0.00	0.00	0.29	0.37	1.75
27	2017	0.22	123.53	0.91	0.09	2.59	19.49	0.05	0.83	30.93	0.28	0.00	2.84	0.35	0.53	15.92	0.00	0.00	0.00	1.14	0.00	0.00	0.19	0.69	5.11
	2018	0.19	120.77	13.61	0.06	0.41	3.60	0.05	0.44	1.82	0.17	0.00	0.86	0.21	0.08	34.70	0.00	0.00	175.67	0.00	0.00	0.00	0.14	0.16	3.51
	2019	0.02	1,343.80	1.47	0.07	0.13	2.39	0.02	0.85	0.74	0.16	0.00	0.86	1.99	0.33	55.59	0.00	0.02	0.28	0.00	0.00	0.00	0.20	0.47	1.94
28	2017	0.00	0.00	0.67	171.23	0.00	0.00	0.00	0.08	3.39	0.12	0.00	0.86	17.41	13.51	3.09	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.19	2.60
	2018	0.00	0.00	68.72	382.26	34.80	0.00	0.00	0.02	0.49	0.10	0.00	0.37	2.49	1.94	5.13	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.06	1.26
	2019	0.00	0.00	1.21	461.86	0.67	1,964.38	0.00	0.02	0.39	0.08	0.00	0.33	16.43	4.70	7.35	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.07	1.13
29	2017	0.06	15.00	0.86	0.23	0.74	1.63	1.56	99.13	394.02	6.88	0.00	49.96	4.46	12.61	120.45	0.00	0.34	29.16	0.04	0.00	0.00	0.23	2.97	4.61
	2018	0.26	8.15	1.82	0.12	0.62	0.73	0.67	2.70	20.37	6.11	0.00	17.74	5.78	6.85	227.12	0.00	0.24	29.75	0.06	0.00	0.00	0.27	1.88	3.85
	2019	0.05	3.39	0.72	0.13	0.50	0.89	0.56	4.07	7.33	5.88	0.00	15.22	41.93	32.86	262.60	0.00	0.06	21.59	0.14	0.00	0.00	0.18	1.67	2.95
31	2017	0.36	11.69	0.25	0.42	2.46	0.59	419.61	155.06	4,359.94	4.89	0.00	6.												

APPENDIX D: UNWEIGHTED AVERAGE ESA BY STATE AND YEAR

		Unweighted ESA Values by State and Year																		
PAYGO Category	Description	NSW			VIC			QLD			SA			WA			TAS			AUST All Years
		2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019	
Cat 7	Light rigid trucks	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Cat 8	Rigid trucks: 2 axles: no trailer: 4.5 < GVM ≤ 7.0 t	0.03	0.03	0.03	0.02	0.01	0.01	0.07	0.06	0.06	0.03	0.03	0.03	0.01	0.01	0.01	0.03	0.03	0.03	0.03
Cat 9	Rigid trucks: 2 axles: no trailer: 7.0 < GVM ≤ 12.0 t	0.22	0.34	0.23	0.11	0.13	0.10	0.33	0.30	0.24	0.08	0.08	0.07	0.04	0.04	0.03	0.02	0.03	0.02	0.11
Cat 10	Rigid trucks: 2 axles: no trailer: GVM > 12.0 t	2.10	1.83	1.98	3.15	2.09	3.04	2.75	7.16	4.53	1.42	1.42	1.43	0.78	0.77	0.77	1.10	1.09	1.27	2.04
Cat 11	Rigid trucks: 2 axles: with trailer: GCM ≤ 42.5 t	0.84	1.27	0.88	0.27	0.36	0.28	0.70	0.76	0.48	0.11	0.09	0.09	0.16	0.16	0.13	0.07	0.06	0.06	0.32
Cat 12	Rigid trucks: 3 axles: no trailer: 4.5 < GVM ≤ 18.0 t	0.26	0.31	0.25	0.10	0.16	0.13	0.10	0.07	0.10	0.60	0.59	0.61	0.20	0.21	0.20	0.06	0.07	0.01	0.19
Cat 13	Rigid trucks: 3 axles: no trailer: GVM > 18.0 t	1.63	1.51	1.66	1.73	1.71	1.96	1.56	3.73	2.65	1.86	1.84	1.79	1.39	1.32	1.33	1.27	1.22	1.68	1.39
Cat 14	Rigid trucks: 3 axles: with trailer: GCM ≤ 42.5 t	2.02	2.37	2.18	2.41	2.62	2.84	2.36	3.41	2.86	2.41	2.31	2.32	2.20	2.11	2.17	1.98	1.86	2.64	2.07
Cat 15	Rigid trucks: 4 axles: no trailer: 4.5 < GVM ≤ 25.0 t	0.13	0.17	0.17	0.02	0.03	0.03	0.20	0.18	0.13	0.23	0.26	0.26	0.35	0.34	0.33	0.07	0.07	0.07	0.14
Cat 16	Rigid trucks: 4 axles: no trailer: GVM > 25.0 t	1.93	2.19	1.76	2.22	2.37	2.55	2.37	3.92	2.89	1.66	1.67	1.60	1.46	1.42	1.39	1.54	1.61	2.06	0.71
Cat 17	Rigid trucks: 4 axles: with trailer: GCM ≤ 42.5 t	2.41	3.12	2.24	2.94	3.05	3.71	2.64	4.58	3.58	2.21	2.53	2.41	1.86	1.76	1.82	3.81	3.81	3.96	0.73
Cat 18	Rigid trucks: 3,4+ axles: with trailer: GCM > 42.5 t	4.11	4.56	4.11	3.75	3.84	4.32	4.24	7.28	5.69	4.64	4.51	4.55	2.69	2.49	2.40	4.61	4.48	4.94	3.33
Cat 19	Articulated trucks: single trailer: 3 axle rig	1.01	1.33	0.84	1.02	1.20	1.31	0.52	2.29	1.16	0.47	0.44	0.45	0.42	0.41	0.39	0.42	0.36	0.47	0.64
Cat 20	Articulated trucks: single trailer: 4 axle rig	1.55	1.61	1.71	1.61	1.80	1.96	1.99	3.08	2.39	1.65	1.62	1.61	1.49	1.33	1.17	0.82	0.71	0.84	1.47
Cat 21	Articulated trucks: single 3 axle trailer: 5 axle rig	1.43	1.57	1.47	1.84	1.95	2.16	1.53	3.30	2.24	1.12	0.86	0.80	1.56	1.45	1.40	0.84	0.79	0.97	0.95
Cat 22	Articulated trucks: single 2 axle trailer: 5 axle rig	1.99	2.28	2.08	1.83	2.00	2.25	2.08	6.78	3.96	2.20	2.23	2.32	1.85	1.91	1.74	1.28	1.25	1.59	1.71
Cat 23	Articulated trucks: single trailer: 6 axle rig	2.42	2.55	2.49	2.33	2.47	2.68	2.35	3.84	3.22	2.24	2.22	2.21	2.05	1.93	1.85	2.34	2.08	2.60	2.16
Cat 24	Articulated trucks: B-double: < 9 axle rig	4.16	4.53	4.18	3.84	4.17	4.48	4.32	7.30	5.28	3.29	3.21	3.13	2.80	2.74	2.58	4.86	4.40	5.14	3.14
Cat 25	Articulated trucks: B-double: ≥ 9 axle rig	3.60	4.01	3.56	3.62	3.74	4.14	3.68	7.26	4.96	3.76	3.85	3.84	2.87	2.31	2.75	2.57	2.38	2.78	2.69
Cat 26	Articulated trucks: B-triple	5.70	5.80	5.04	4.05	4.02	4.36	5.54	9.03	8.23	5.21	4.80	4.50	3.91	3.84	3.61	4.82	3.70	6.49	5.33
Cat 27	Articulated trucks: Road train: 2 trailers	3.69	3.63	3.25	3.28	3.71	3.67	3.63	4.85	5.03	4.71	4.48	4.31	3.49	3.39	3.08	(1)	1.03	4.74	2.20
Cat 28	Articulated trucks: Road train: 3 trailers	4.64	3.41	4.21	9.68	2.34	3.22	4.68	4.41	5.92	6.81	6.86	6.67	3.26	3.10	2.92	(1)	(1)	(1)	3.26
Cat 29	Articulated trucks: single trailer: > 6 axle rig	3.70	4.82	3.77	3.04	3.10	3.34	2.77	3.98	3.55	3.04	3.39	3.09	2.29	2.30	1.75	2.62	2.36	3.13	1.42
Cat 31	Buses: 2 axles: 3.5 < GVM ≤ 4.5 t	0.04	0.04	0.04	0.04	0.04	0.04	0.07	0.07	0.07	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04
Cat 32	Buses: 2 axles: 4.5 < GVM ≤ 10.0 t	0.13	0.16	0.14	0.10	0.12	0.11	0.13	0.17	0.15	0.08	0.08	0.08	0.06	0.06	0.06	0.08	0.08	0.07	0.14
Cat 33	Buses: 2 axles: GVM > 10.0 t	1.84	1.67	1.97	2.10	2.09	2.42	1.90	7.88	4.63	1.94	1.99	2.02	1.30	1.41	1.33	2.09	1.92	2.07	1.38
Cat 34	Buses: ≥ 3 axles	2.37	2.56	2.28	2.15	2.22	2.63	2.59	10.59	4.53	2.59	2.70	2.71	1.80	1.59	1.62	1.50	1.04	1.78	2.41
Cat 35	Buses: articulated	3.12	2.68	3.63	2.22	2.61	2.48	1.57	3.91	3.78	2.65	2.37	2.36	2.14	2.04	2.14	2.14	1.95	1.96	1.98

Notes:

(1) No data for this vehicle category and year combination