NHVR/2 – Statistical Advice on Sample Sizes for the National Roadworthiness Baseline Survey

Data Analysis Australia recommended sample sizes for the National Roadworthiness Baseline Survey in January 2016[1]. This document discusses revisions of these sample sizes to reflect feedback and alterations requested by the Western Australian (WA), Northern Territory (NT), Tasmanian (TAS),Victorian (VIC) and South Australian jurisdictions.

Findings

There were originally four review tasks required, but they could be grouped into two key tasks as provided below. Additional requests were subsequently made by Victoria (labelled as Task 5 below) and South Australia (Task 6 below).

Tasks 1 and 4 – Consideration of Tasmania and Northern Territory at State/Territory Level, Rather than within Metro/Non-Metro Split

Under tasks 1 and 4, Data Analysis Australia was requested to advise if NT and TAS regional segmentation can be revised to be considered at the State level instead of separated into two regions.

Data Analysis Australia finds this a reasonable modification to the sample frame design considering the following for the two jurisdictions:

- For NT, while the geographical area is not small in comparison to the rest of the jurisdictions, we expect there to be less key routes that must be covered for NT.
- For TAS, the physical distances between the key sampling location is not great, therefore vehicles should be less restricted to a single area.

We can therefore treat NT and TAS as a whole and recalculate their sample sizes. **This will consequently reduce the overall sample size for the two states and hence reduce the precision of the survey estimates, but will not introduce sampling biases.** (Note that the original sample design already reduced the sample sizes for each stratum in NT and TAS, giving a precision of approximately 10% to each stratum. In the modified design this precision now applies to NT and TAS as a whole.)

Consideration needs to be given to the fact that the single target figure for each vehicle type must cover the entire state – **highlighting the importance of including as many different inspection points as feasible**.

[1] Data Analysis Australia (2016), National Roadworthiness Baseline Survey – Sampling Report, NHVR/1, Data Analysis Australia, Perth

Tasks 2 and 3 – Revisions of B-Double and Road Train Sample Sizes for Western Australia and Northern Territory

The WA jurisdiction indicated that their ratio of B-Double and Road Train should be roughly 1 to 7 (that is, about 14% should be B-Double). NT also indicated that their sample sizes for B-Double to Road Train do not reflect their ratio of B-Double and Road Train, but have not provided any evidence to support this claim.

The original sample sizes were derived using counts of heavy vehicles from the Australian Bureau of Statistics 2015 Motor Vehicle Census which formed the sampling frame. This data did not distinguish between B-Double and Road Trains. To provide recommended sample sizes to these two individual groups, Data Analysis Australia proportioned B-Double and Road Train based solely on the vehicle monitoring data from Queensland, as such information was not provided for the other states at the time work had been conducted. It is therefore appropriate to consider reallocation with more local information.

Upon inspection of the provided information, Data Analysis Australia finds the proportion of B-Double to Road Train for WA believable and in alignment with the Australian Bureau of Statistics 2014 Road Freight Movement Survey. Therefore we have revised the B-Double and Road Train sample allocation for both WA and NT to more closely reflect the newly reported WA figures while maintaining a sufficient sample size for analysis of B-Doubles (Table 1).

Task 5 – Reallocation of Victorian Sample Counts to B-Double Class

A request was made to advise if Victorian sample sizes for some of the vehicle categories could be modified, with the sample of Road Trains reduced to 10, buses and plant reduced to 200 each and the numbers lost made up in the sample of B-Double by increasing the sample size to 270, to better reflect the population numbers. Data Analysis Australia has reviewed this request and is satisfied to modify the sample sizes in this way. As with NT and WA (Tasks 2 and 3 above), we had limited information to derive the proportional divide from the overall sample in the original design and it is appropriate to take advice from Victoria. The sample size of 200 for Bus and Plant will still provide an adequate sample size, although with slightly reduced precision.

Task 6 – Reallocation of South Australian Plant Sample Counts

A request was made to advise if South Australian sample sizes for Plant vehicles could be modified, reallocating 15% (15) of the metropolitan Plant quota to metropolitan road trains and also reallocating 15% (15) of the non-metropolitan Plant quota to non-metropolitan B-Doubles. As with the other requests, limited information was available at the time of original sampling, and it is appropriate to now consider the additional advice provided. The original sampling regime had assigned zero sample size to metropolitan road trains nationally, on the advice that road trains would not travel in metropolitan areas and hence would not be available for sampling. With the advice from South Australia that this would be possible for their state, having road trains sampled in the metropolitan area does not contravene

the overall sampling principles and original design. The increased precision for B-Doubles and Road Trains in South Australia is likely to outweigh the reduced precision for Plants that will result from this reallocation.

Revised Sample Size

Data Analysis Australia's approach to determining sample sizes in light of the further information and requests made by each jurisdiction still follows the general principles outlined in our previous report, though some judgement calls had to be made when implementing the modifications. The revised sample sizes are provided in Table 1.

Table 1. Sample Sizes as at 13 July 2016. This table includes the original sampling counts adjusted for revised regional segmentation definition for NT and TAS (Tasks 1 and 2), and revised allocations for WA and NT (Tasks 3 and 4), VIC (Task 5) and SA (Task 6).

State	Region	Rigid Truck	Articulated	B-Double	Road Train	Bus / Coach	Plant	Total
NSW	Metropolitan	380	130	60	0	135	70	**775**
NSW	Non-Metropolitan	360	150	85	60	115	90	**860**
	NSW Total	**740**	**280**	**145**	**60**	**250**	**160**	**1,635**
VIC	Metropolitan	390	150	130	0	105	95	**870**
VIC	Non-Metropolitan	340	170	140	10	95	105	**860**
	VIC Total	**730**	**320**	**270**	**10**	**200**	**200**	**1,730**
QLD	Metropolitan	330	130	80	0	135	70	**745**
QLD	Non-Metropolitan	370	135	105	60	100	70	**840**
	QLD Total	**700**	**265**	**185**	**60**	**235**	**140**	**1,585**
SA	Metropolitan	205	70	50	15	85	85	**510**
SA	Non-Metropolitan	185	100	80	40	50	85	**540**
	SA Total	**390**	**170**	**130**	**55**	**135**	**170**	**1,050**
WA	Metropolitan	315	115	35	0	120	150	**735**
WA	Non-Metropolitan	290	105	35	145	70	160	**805**
	WA Total	**605**	**220**	**70**	**145**	**190**	**310**	**1,540**
NT	NT	115	30	10	40	30	30	**255**
	NT Total	**115**	**30**	**10**	**40**	**30**	**30**	**255**
ACT	ACT	75	20	10	0	40	25	**170**
	ACT Total	**75**	**20**	**10**	**0**	**40**	**25**	**170**
TAS	TAS	160	60	30	0	30	10	**290**
	TAS Total	**160**	**60**	**30**	**0**	**30**	**10**	**290**
TOTAL		**3,515**	**1,365**	**835**	**355**	**1,110**	**1,075**	**8,255**

Consultants:

Dr John Henstridge | Chief Consultant Statistician | john@daa.com.au

Anna Munday | Principal Managing Consultant Statistician | anna@daa.com.au

Yuichi Yano | Senior Consultant Statistician | yuichi@daa.com.au

Elyse Corless | Consultant Statistician | elyse@daa.com.au

Date of last update:

13 July 2016