NZ TRANSPORT AGENCY
WAKA KOTAHI

Annual Weigh-In-Motion (WiM) Report 2009

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1.0 DISCLAIMERS

1) The traffic data contained in this report is intended to be used as an approximate indication of traffic loading and vehicle weights at WiM sites. The limitations of the equipment and their installation, congestion effects and various analysis procedures contribute to a level of approximation in the data. These factors should be taken into account when using the data.
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2) The legal limits indicated in this report represent the highest legal gross for the axle groups depicted. In certain cases, a lower limit may apply.
3) TNZ Class 9, PAT Type 69, 6 axle artic and the TNZ Class 11, PAT Type 791, 7 axle artic are legally limited to below 44 Tonne Gross, but may be operating on overweight permits at 44 Tonne Gross.

2.0 INTRODUCTION

There are four Weigh in Motion (WiM) sites in New Zealand collecting axle loading data for use nationally in traffic monitoring. An additional source of WiM data is being developed in Auckland and this project will include the provision of loading data to the national system.

The current sites are as follows:

Table 1.0: WiM Site Locations

Region	SH	RS	Description
02 - Auckland	1N	461	DRURY -Telemetry Site 48 - (WiM Site 1205)
03 - Waikato	1N	625	TOKOROA - Telemetry Site 51 - (WiM Site 421)
03 - Bay of Plenty	2	171	TE PUKE - Telemetry Site 49 - (WiM Site 24)
11 - Canterbury	1S	284	WAIPARA - Telemetry Site 52 - (WiM Site 518)

All data used within this report was collected within the 2009 calendar year and is available to selected users, within the NZTA's State Highway Traffic Monitoring System (TMS). This report is proposed to provide insight into what is available for further, more detailed analysis to be undertaken by TMS users.

All listed sites use bending plate technology.

3.0 OTHER DOCUMENTS

The documents below will provide useful information relating to Traffic Monitoring practices used on State Highways by the NZ Transport Agency. They can be downloaded from our website. www.nzta.govt.nz

Traffic Monitoring for State Highways Manual SM052

State Highway Traffic Volumes Booklet

4.0 TECHNOLOGY

NZTA is using the PAT bending plate technology at a total of four TMS sites and two further sites at the Auckland Harbour Bridge for special studies with a total of 20 lanes. All sites are continuously collecting individual truck records and statistics downloaded weekly, or daily if vehicle by vehicle (VBV) data of all vehicles are recorded.

The first system was installed 1985 at Pukurua Bay near Wellington, relocated to Te Puke in the Bay of Plenty in 1997. Four of the original six bending plates there are still in operation.

5.0 DATA QUALITY

Readers of this report should take note of the accuracy tolerances required during the collection of data.

Accuracy or precision is as defined for high speed weigh in motion in ASTM E 1318 (or latest revision):

For 95% of conformity:

Gross Vehicle Weight: ± 10%

Axle group load: ± 15%

With good (new) pavement the above weight errors are reduced by a factor of 1.5

Requisite quality is determined by the final use of data, in simple terms:

- Pavement is periodically checked for level and rectified
- Calibration is carried out with vehicle of known axle weights and speed.
- Data is monitored for errors and deviation.

Current use of data:

- Average ESA's for pavement design.
- Load distributions for bridge design.
- Network loading analysis.
- Indicators for Police Enforcement.

Potential future use of data:

- Assessments of revenue from Road User Charges.

Other factors affecting data accuracy

- Pavement smoothness. Trucks bouncing onto scales will affect accuracy.
- Truck Driver Behavior
- Strong Winds etc

6.0 PERMITTED VEHICLES

Within this report, permitted vehicles were not identified separately. A small proportion of the vehicles identified as being overweight will be operating under a permit.

TNZ Class 9, PAT Type 69, 6 axle artic and the TNZ Class 11, PAT Type 791, 7 axle artic are legally limited to below 44 Tonne Gross, but may be operating on overweight permits at 44 Tonne Gross.

7.0 EXECUTIVE SUMMARY

All heavy vehicles are referred to as vehicles in this report.

Table 2.0: Vehicle Frequency by group type

Group Type	Total Vehicles	% Total Vehicles	Overweight Vehicles (Group Type)	% Overweight Vehicles (Group Type)
Rigid	1,078,099	40%	29,657	3%
T&T	989,079	37%	138,956	14%
Artic	372,507	14%	36,651	10%
A&B Train	250,432	9%	26,373	11%
	2,690,117	100%	231,637	9%

Vehicle Fleet

- PAT class 891, 21 and 31 as shown in table 6.0 represent the largest heavy vehicle frequencies reported (combined they account for approximately 50% of the heavy vehicle fleet).
- There has been a 3.1% increase in total vehicle frequencies from 2008 to 2009.

Vehicle Fleet Overweight

- PAT class 891, 751 and 851 (see figure 1.0, table 7.0) represent the largest frequencies of heavy vehicles recorded as overweight (combined approximately 65% of the total heavy vehicles recorded as overweight).
- PAT class 891 is reporting a long term increasing trend of vehicles being recorded as overweight from 2001 to 2009 (see chart 4.0).

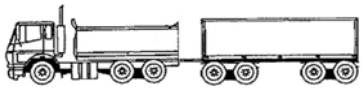
Figure 1.0: PAT type 21, 31, 891, 751 and 851

PAT type 21:

PAT type 31:

PAT type 891:

PAT type 751:



PAT type 851:

Vehicle Fleet > 44T

- PAT class 891, 751 and 851 (see table 8.0) represent the largest frequencies of heavy vehicles recorded at > 44T (combined they account for approximately 84% of the total heavy vehicles recorded at > 44T).

Time of Day

- Table 3.0 indicates the times overweight vehicle frequencies peak at each WiM site during an average day:

Table 3.0: Overweight Peak distribution times by WiM Site

WiM Site	Peak 1	Peak 2
Drury	06:00 – 06:59	13:00 – 13:59
Tokoroa	09:00 – 09.59	13:00 – 13:59
Te Puke	08:00 – 08:59	14:00 – 14:59
Waipara	07:00 – 07:59	13:00 – 13:59

- The peaks may represent long-hauls reported across two or more WiM Sites, the smaller peaks may represent local distribution (see section 10, Charts 3.0 - 3.3).

8.0 CLASSIFICATION SCHEME

Table 4.0: Heavy vehicle classification scheme

PEM Class	TNZ Class	PAT Class	Vehicle Type	Axles	Length Range (WiM data)	RUC Class	Group	Axle Group (Pave. Des.)
MCV	3	20	o-o	2	4m-11m	2	RIGID	
		21	o--o				RIGID	1s-1d
HCV1	4	31	o--oo	3	7m-12m	6	RIGID	1s-2
		34	oo--o			5	RIGID	1s-1s-1d
	5	30	o-o--o	3	6m-15m	2,24	T&T	1s-1d-1d
	6	45	oo--oo	4 (truck)	8m-11m	14	RIGID	1s-1s-2
		47	o--ooo			14	RIGID	1s-3
	7	40	o--o-o--o	4 (T&T)	11m-19m	2,30	T&T	1s-1d-1d-1d
		44	oo-o--o			5,24	T&T	1s-1s-1d-1d
		41	o-o--oo			2,29	T&T	1s-1d-2
		42	o-oo--o			6,24	T&T	1s-2-1d
HCV2	8	52	o--oo-o--o	5	11m-19m	6,30	T&T	1s-2-1d-1d
		53	o-oo--oo			6,29	ARTIC	1s-2-2
	9	69	o-oo--ooo	6	15m-18m	6,33	ARTIC	1s-2-3
		68	oo-oo--oo			14,29	T&T	1s-1s-2-2
	10	63	o--oo-o--oo	6 (T&T) (A-Train)	16m-20m	6,37	T&T	1s-2-1d-2
		66	oo--oo-o--o			14,30	T&T	1s-1s-2-1d-1d
		65	oo--o-o--oo			5,37	T&T	1s-1s-1d-1d-2
		61	o-o--o-o--oo			6,29,30	T&T	1s-2-1d-1d-1d
		621	o-oo--o-o--o			?		
	11	751	o-oo--oo--oo	7	18m-21m	6,29	T&T	1s-2-2-2
		74	o-oo--oo-o--o			6,29,30	A TRAIN	1s-2-2-1d-1d
		78	o--ooo-o--oo			?		
		731	o-oo--o-o--oo			?		
		747	o--ooo---ooo			14,33	ARTIC	1s-3-3
		791	o-oo-oooo			6,43	ARTIC	1s-2-4
	12	713	oo-oo--ooo	7-11	15m-21m	?	ARTIC	
		77	oo--oo-o--oo			14,37	T&T	1s-1s-2-1d-2
		891	oo--oo-oo--oo			14,43	T&T	1s-1s-2-2-2
		914	oo-oo--ooo-oo			14	T&T	1s-1s-2-2-3
		826	oo-oo--oooo			14,43	ARTIC	1s-1s-2-4
		915	oo-oo--oo-ooo			14,33,29	T&T	1s-1s-2-3-2
		1020	oo-oo-ooo-ooo			14,33,33	B TRAIN	1s-1s-2-3-3
		1133	oo-oo-ooo-oooo			14,33,43	B TRAIN	1s-1s-3-4
	13	851	o-oo--ooo--oo	8-10	19m-21m	6,33,29	B TRAIN	1s-2-3-2
		951	o-oo-ooo-ooo			6,33,33	B TRAIN	1s-2-3-3
		1032	o-oo-ooo-oooo			?	B TRAIN	1s-2-3-4
		85	o-oo--oo-o--oo			?		
		89	o-oo--ooo-o--o			?		
		847	o--ooo---oooo			14,43	ARTIC	1s-3-4
	14		Not Classified					

9.0 ANNUAL AVERAGE DAILY TRAFFIC BY SITE

AADT

AADT provides an estimation of the number of vehicles crossing a site on an average day.

% Heavy

The % Heavy column provides an estimate of the proportion of the AADT, which is deemed a heavy vehicle: i.e. greater than 3.5 tonnes for the current year.

Table 5.0: Annual average daily traffic by WiM site

WiM Site	SH	AADT (2009)	Number of Heavies per Day	% Heavy
Drury – Telemetry Site 48	1N	41,259	4,208	10.2
Tokoroa – Telemetry Site 51	1N	8,504	1,318	15.5
Te Puke – Telemetry Site 49	2	19,273	1,792	9.3
Waipara – Telemetry Site 52	1S	7,431	1,018	13.7

(Source: State Highway Traffic Data Booklet 2005-2009, to be published May 2010)

10.0 VEHICLE FLEET DISTRIBUTION

PAT Class
This is the code relating to the axle configuration.

Description
This illustrates the PAT type by providing an indication of the spacing between axles.

Total Volume
This indicates the number of heavy vehicles for each PAT class.

Table 6.0: Distribution by PAT class

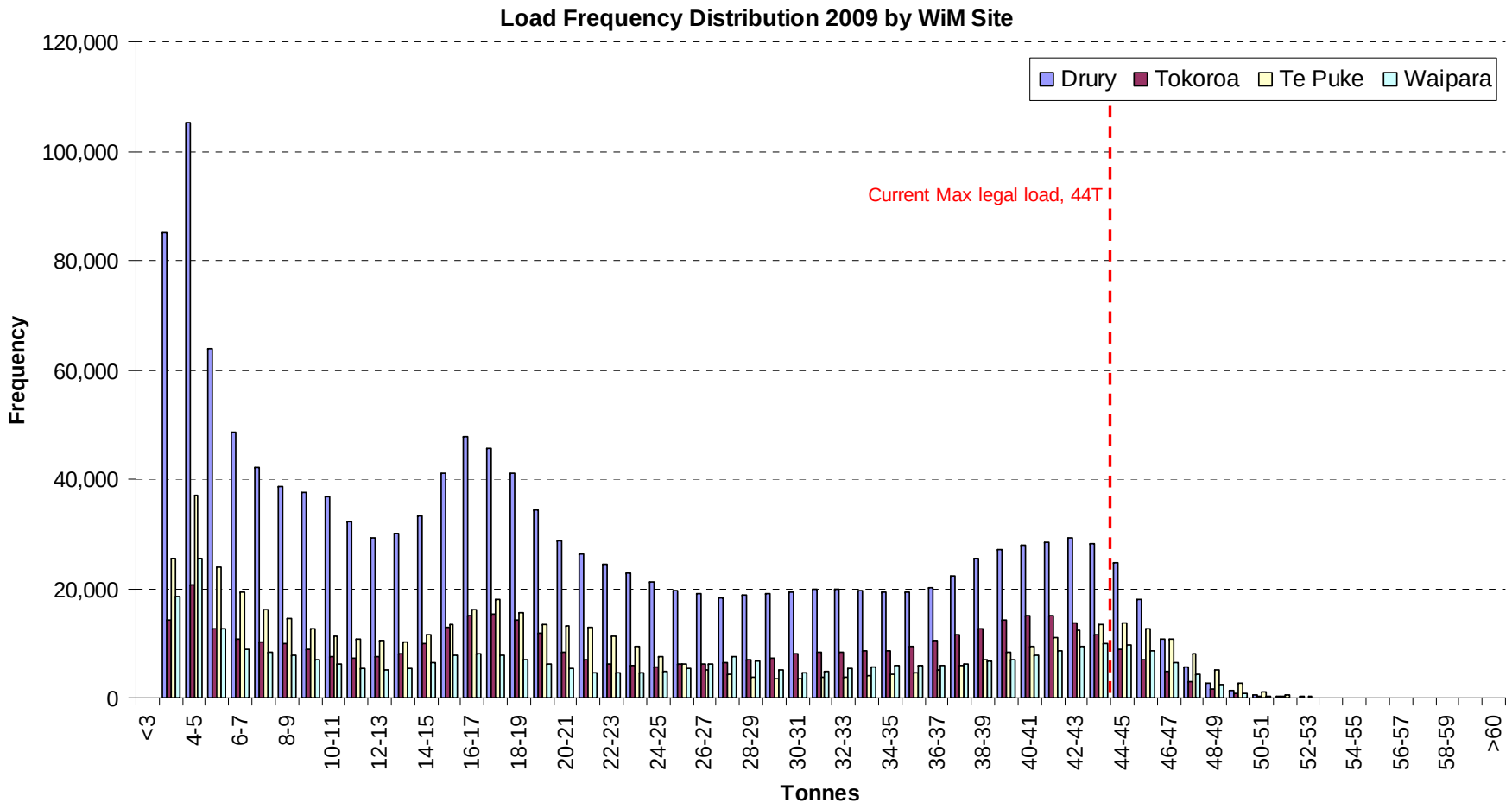
				Drury		Tokoroa		Te Puke		Waipara	
Group	PEM Class	PAT Class	Description	Total Volume	%	Total Volume	%	Total Volume	%	Total Volume	%
Rigid	MCV	20	o-o (wb 2.0-3.2m, gw >= 2.5t)	69343	4.9%	11388	2.6%	15806	3.1%	11016	3.3%
		21	o--o (wb >3.2m, gw >= 2.5t)	316092	22.6%	64275	14.4%	120266	23.7%	68943	20.6%
	HCV1	31	o--oo	135040	9.6%	29005	6.5%	42876	8.4%	20706	6.2%
		34	oo--o	267	0.0%	293	0.1%	971	0.2%	230	0.1%
		45	oo--oo	73216	5.2%	29403	6.6%	47313	9.3%	21274	6.3%
		47	o--ooo	25	0.0%	9	0.0%	66	0.0%	276	0.1%
T&T	HCV2	30	o-o--o	21350	1.5%	4826	1.1%	5250	1.0%	7729	2.3%
		40	o--o-o--o	8431	0.6%	1529	0.3%	1568	0.3%	1590	0.5%
		41	o-o--oo	26676	1.9%	7619	1.7%	6368	1.3%	7358	2.2%
		42	o-oo--o	1061	0.1%	303	0.1%	528	0.1%	209	0.1%
		44	oo-o--o	36	0.0%	11	0.0%	162	0.0%	41	0.0%
		52	o--oo-o--o T&T	3642	0.3%	976	0.2%	776	0.2%	994	0.3%
		53	o-oo--oo T&T	17073	1.2%	3354	0.8%	4395	0.9%	3149	0.9%
		61	o-o--o-o--oo T & T	998	0.1%	551	0.1%	460	0.1%	172	0.1%
		63	o--oo-o--oo T & T	8448	0.6%	3921	0.9%	3390	0.7%	2224	0.7%
		65	oo--o-o--oo T & T	1	0.0%	33	0.0%	51	0.0%	45	0.0%
		66	oo--oo-o--o T & T	1372	0.1%	488	0.1%	491	0.1%	279	0.1%
		68	oo-oo--oo T & T	12189	0.9%	5951	1.3%	1564	0.3%	2529	0.8%
		77	oo--oo-o--oo	14717	1.1%	7333	1.6%	5878	1.2%	9326	2.8%
		78	o--ooo-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		85	o-oo--oo-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		89	o-oo--ooo-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		621	o-oo--o-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		731	o-oo--o-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		751	o-oo--oo--oo T&T	111055	7.9%	25532	5.7%	43496	8.6%	14541	4.3%
		891	oo--oo-oo--oo T&T	237569	17.0%	137002	30.8%	112842	22.2%	84325	25.2%
		914	oo-oo--ooo-oo T&T	1481	0.1%	522	0.1%	935	0.2%	70	0.0%
		915	oo-oo--oo-ooo T&T	205	0.0%	61	0.0%	3	0.0%	25	0.0%
Artic	HCV2	69	o-oo--ooo	123991	8.8%	23567	5.3%	38042	7.5%	14321	4.3%
		713	oo-oo--ooo Tri Artic	1552	0.1%	260	0.1%	2125	0.4%	844	0.3%
		747	o--ooo---ooo Tri Artic	255	0.0%	155	0.0%	56	0.0%	21	0.0%
		791	o-oo-oooo Quad Artic	41514	3.0%	12680	2.8%	5304	1.0%	8615	2.6%
		826	oo-oo--oooo Quad Artic	53204	3.8%	16603	3.7%	16356	3.2%	9988	3.0%
		847	o--ooo---oooo Quad Artic	1422	0.1%	170	0.0%	1255	0.2%	207	0.1%
A&B Train	HCV2	74	o-oo--oo-o--o A Train	7	0.0%	12	0.0%	243	0.0%	2	0.0%
		851	o-oo--ooo--oo B Train	96336	6.9%	42973	9.7%	27886	5.5%	34071	10.2%
		951	o-oo-ooo-ooo B Train	22888	1.6%	14139	3.2%	1610	0.3%	10032	3.0%
		1020	oo-oo-ooo-ooo B Train	92	0.0%	74	0.0%	3	0.0%	64	0.0%
		1032	o-oo-ooo-oooo B Train	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		1133	oo-oo-ooo-oooo B Train	0	0.0%	0	0.0%	0	0.0%	0	0.0%
				1401548	100.0%	445018	100.0%	508335	100.0%	335216	100.0%

Interpretation: At the Tokoroa WiM site, 6.61% of all heavy vehicles were PAT type 45.

Note: 2009 reported PAT class 891, 21 and 31 (respectively) as having the largest portion of heavy vehicles across all four WiM sites.

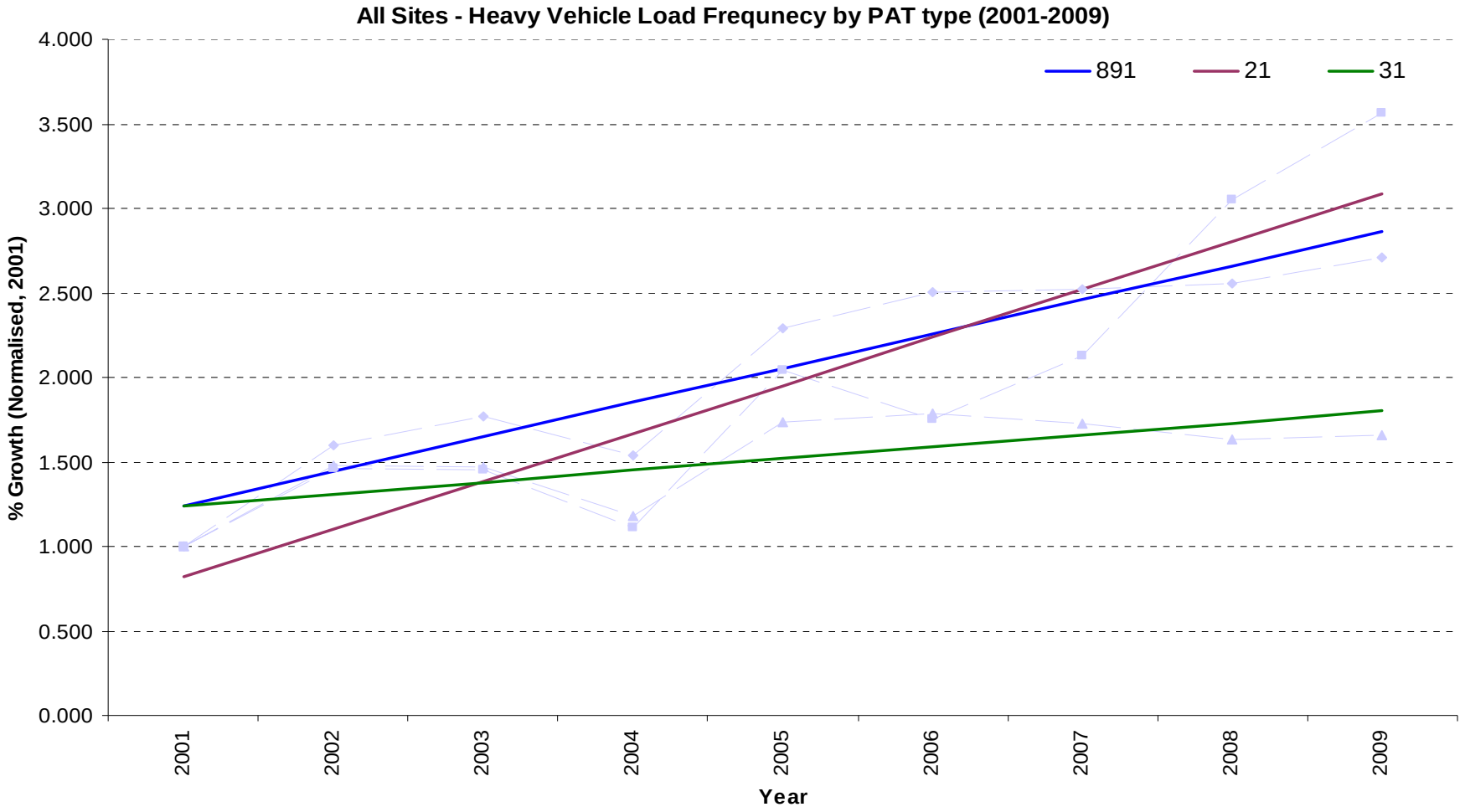
10.0 VEHICLE FLEET DISTRIBUTION (Continued)

Chart 1.0: Heavy vehicle load frequency distribution by PAT class.



Interpretation: Three heavy vehicle load distribution peaks are reported in 2009, the peaks occur approximately at 3-5, 15-18 and 42-44 tonnes.

Chart 2.0: Growth in vehicle load frequencies by PAT type (2001 – 2008) at all WiM sites – Trend Analysis



Interpretation: PAT class 891, 21 have experienced fairly consistent growth (largest frequencies across the four WiM sites). PAT class 31 has reported small long term growth and yet still represents significant volumes of the heavy vehicles in the fleet.

11.0 VEHCILE FLEET OVERWEIGHT

PAT Type
This is the code relating to the axle configuration

Description
This illustrates the PAT type by providing an indication of the spacing between axles.

Total Overweight
This indicates the number of heavy vehicles overweight for each PAT type.

Percentage %
This indicates the % of the total vehicles recorded as being overweight for each PAT type.

Table 7.0: % of total heavy vehicles overweight by WiM site

				Drury		Tokoroa		Te Puke		Waipara	
Group	PEM Class	PAT Class	Description	Total Volume	%	Total Volume	%	Total Volume	%	Total Volume	%
Rigid	MCV	20	o-o (wb 2.0-3.2m, gw >= 2.5t)	1	0.0%	9	0.0%	17	0.0%	2	0.0%
		21	o--o (wb >3.2m, gw >= 2.5t)	702	0.7%	128	0.4%	371	0.5%	232	0.6%
	HCV1	31	o--oo	5283	5.6%	633	2.0%	1777	2.6%	787	2.1%
		34	oo--o	17	0.0%	22	0.1%	54	0.1%	2	0.0%
		45	oo--oo	11537	12.3%	2088	6.5%	3900	5.7%	2064	5.5%
		47	o--ooo	6	0.0%	4	0.0%	19	0.0%	2	0.0%
T&T	HCV2	30	o-o--o	0	0.0%	0	0.0%	8	0.0%	0	0.0%
		40	o--o-o--o	6	0.0%	0	0.0%	10	0.0%	2	0.0%
		41	o-o--oo	38	0.0%	2	0.0%	5	0.0%	0	0.0%
		42	o-oo--o	4	0.0%	5	0.0%	119	0.2%	0	0.0%
		44	oo-o--o	7	0.0%	0	0.0%	6	0.0%	0	0.0%
		52	o--oo-o--o T&T	48	0.1%	2	0.0%	11	0.0%	5	0.0%
		53	o-oo--oo T&T	364	0.4%	114	0.4%	77	0.1%	16	0.0%
		61	o-o--o-o--oo T & T	114	0.1%	192	0.6%	106	0.2%	72	0.2%
		63	o--oo-o--oo T & T	431	0.5%	115	0.4%	237	0.3%	163	0.4%
		65	oo--o-o--oo T & T	0	0.0%	0	0.0%	0	0.0%	1	0.0%
		66	oo--oo-o--o T & T	3	0.0%	0	0.0%	3	0.0%	2	0.0%
		68	oo-oo--oo T & T	2	0.0%	4	0.0%	23	0.0%	6	0.0%
		77	oo--oo-o--oo	623	0.7%	738	2.3%	1062	1.6%	3993	10.7%
		78	o--ooo-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		85	o-oo--oo-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		89	o-oo--ooo-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		621	o-oo--o-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		731	o-oo--o-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		751	o-oo--oo--oo T&T	16763	17.8%	3790	11.8%	13130	19.2%	3950	10.6%
		891	oo--oo-oo--oo T&T	27245	29.0%	16230	50.7%	29976	43.9%	18495	49.4%
		914	oo-oo--ooo-oo T&T	270	0.3%	82	0.3%	221	0.3%	18	0.0%
		915	oo-oo--oo-ooo T&T	24	0.0%	13	0.0%	1	0.0%	9	0.0%
Artic	HCV2	69	o-oo--ooo	7784	8.3%	1078	3.4%	6520	9.6%	865	2.3%
		713	oo-oo--ooo Tri Artic	42	0.0%	14	0.0%	88	0.1%	10	0.0%
		747	o--ooo---ooo Tri Artic	12	0.0%	7	0.0%	4	0.0%	0	0.0%
		791	o-oo-oooo Quad Artic	4159	4.4%	752	2.3%	526	0.8%	566	1.5%
		826	oo-oo--oooo Quad Artic	7419	7.9%	1941	6.1%	3741	5.5%	723	1.9%
		847	o--ooo---oooo Quad Artic	94	0.1%	9	0.0%	275	0.4%	22	0.1%
A&B Train	HCV2	74	o-oo--oo-o--o A Train	1	0.0%	1	0.0%	22	0.0%	0	0.0%
		851	o-oo--ooo--oo B Train	8477	9.0%	2671	8.3%	5641	8.3%	4192	11.2%
		951	o-oo-ooo-ooo B Train	2501	2.7%	1372	4.3%	285	0.4%	1195	3.2%
		1020	oo-oo-ooo-ooo B Train	3	0.0%	2	0.0%	1	0.0%	9	0.0%
		1032	o-oo-ooo-oooo B Train	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		1133	oo-oo-ooo-oooo B Train	0	0.0%	0	0.0%	0	0.0%	0	0.0%
				93980	100.0%	32018	100.0%	68236	100.0%	37403	100.0%

Interpretation: 29% of all overweight vehicles crossing Drury WiM Site were of PAT class 891.

Note: 2008 reported PAT class 891, 751 and 851 as having the largest portions of vehicles recorded as overweight.

11.0 VEHICLE FLEET OVERWEIGHT (Continued)

The following charts depict the time distribution of the vehicle fleet that are deemed as overweight at each site.

Chart 3.0: Drury

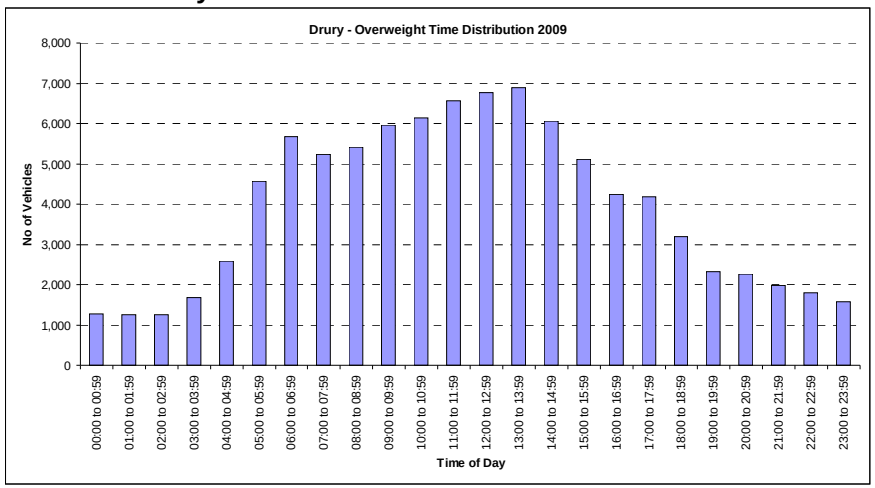


Chart 3.1: Tokoroa

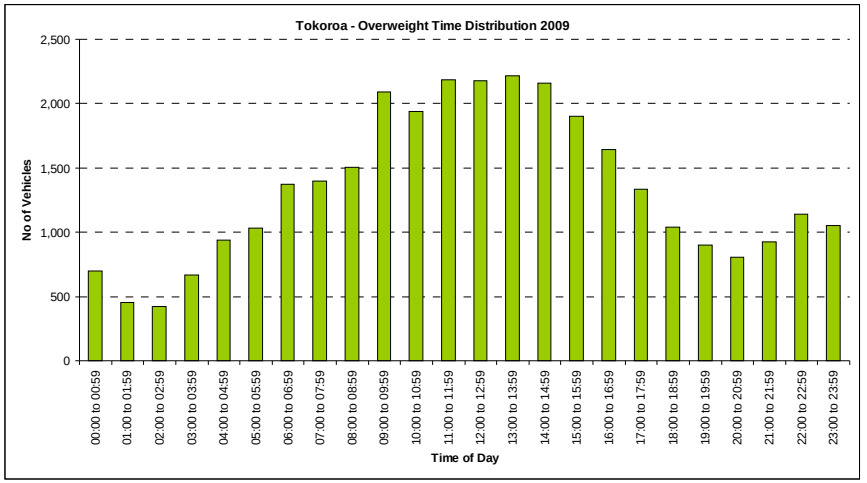


Chart 3.2: Te Puke

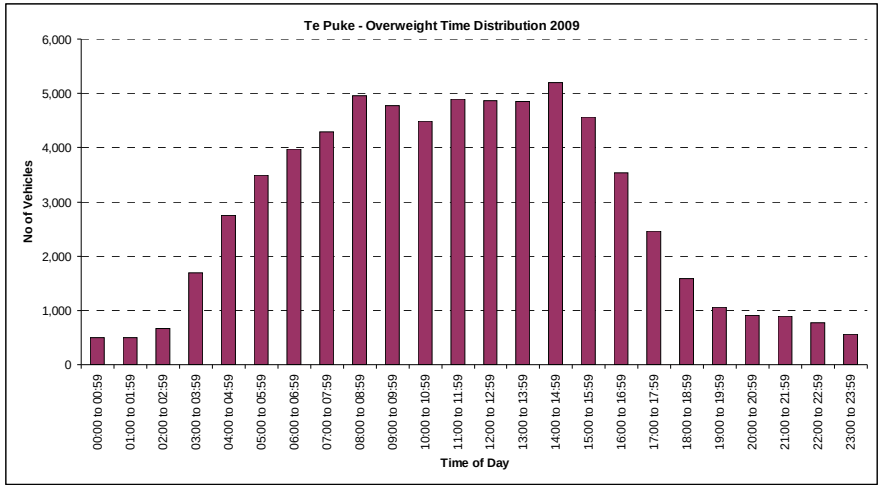
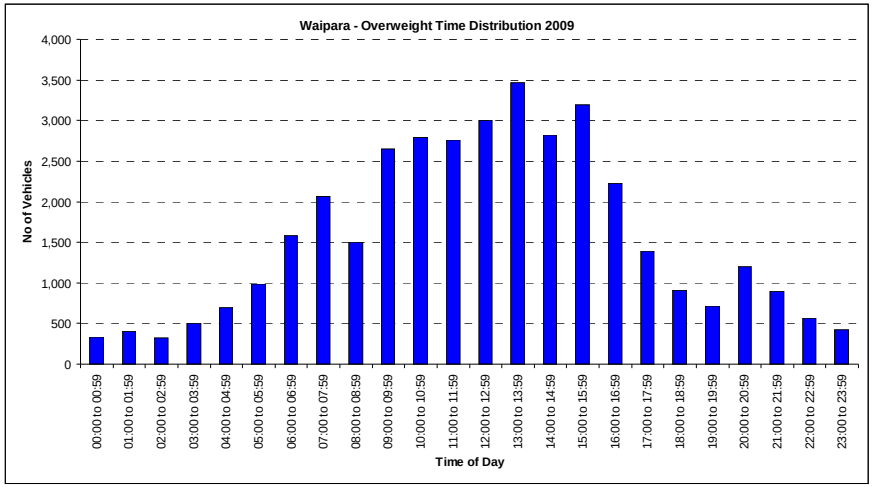


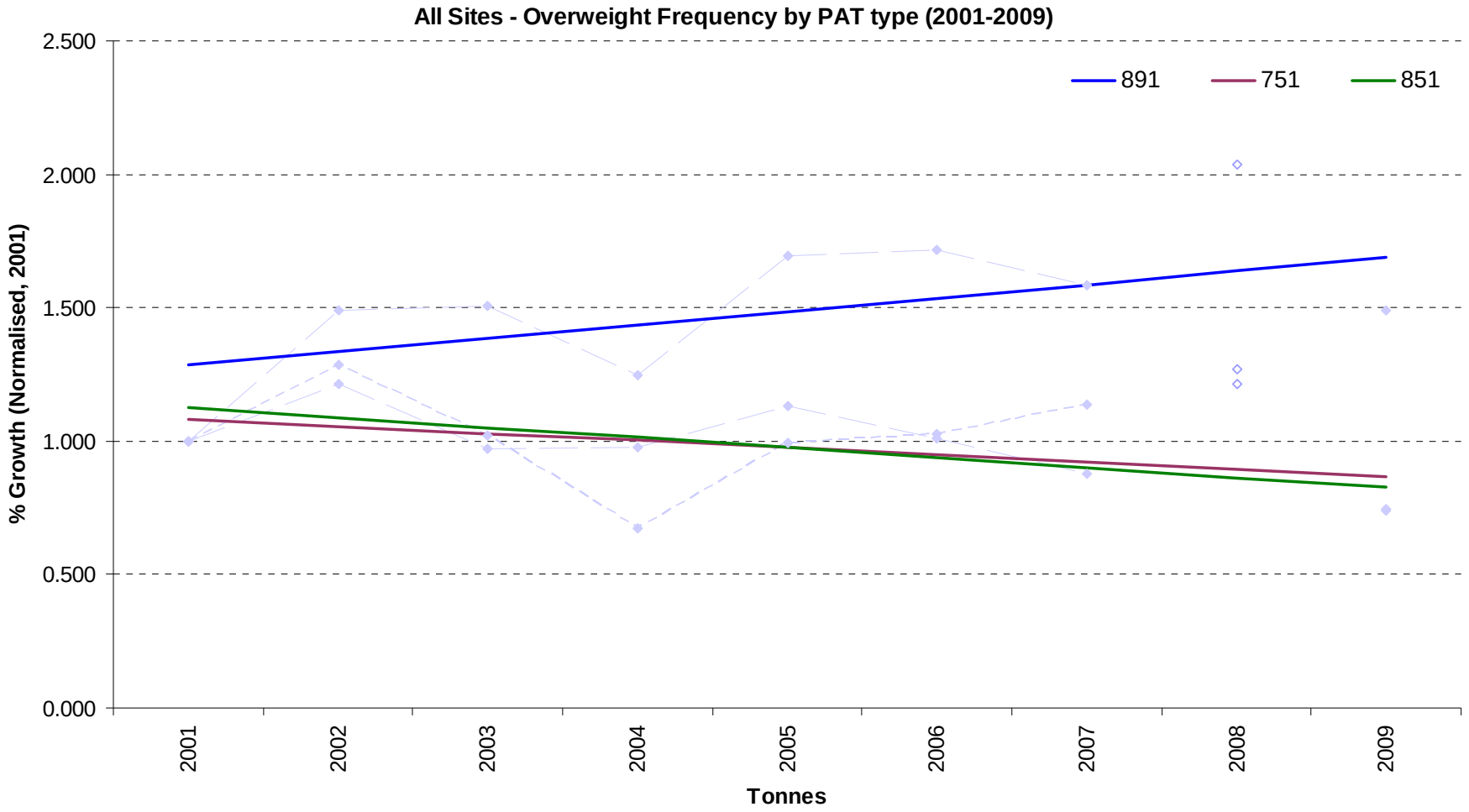
Chart 3.3: Waipara



Interpretation: Drury WiM site reported two peaks in frequency/time distribution of overweight vehicles. The peaks occur at approximately between 06:00 - 06:59 and between 13:00 - 13:59. The peak at Tokoroa may exist as a result of a long-haul from the peak in Drury.

11.0 VEHICLE FLEET OVERWEIGHT (Continued)

Chart 4.0: Growth in vehicles recorded as overweight (2001 – 2009) by PAT type at all WiM sites

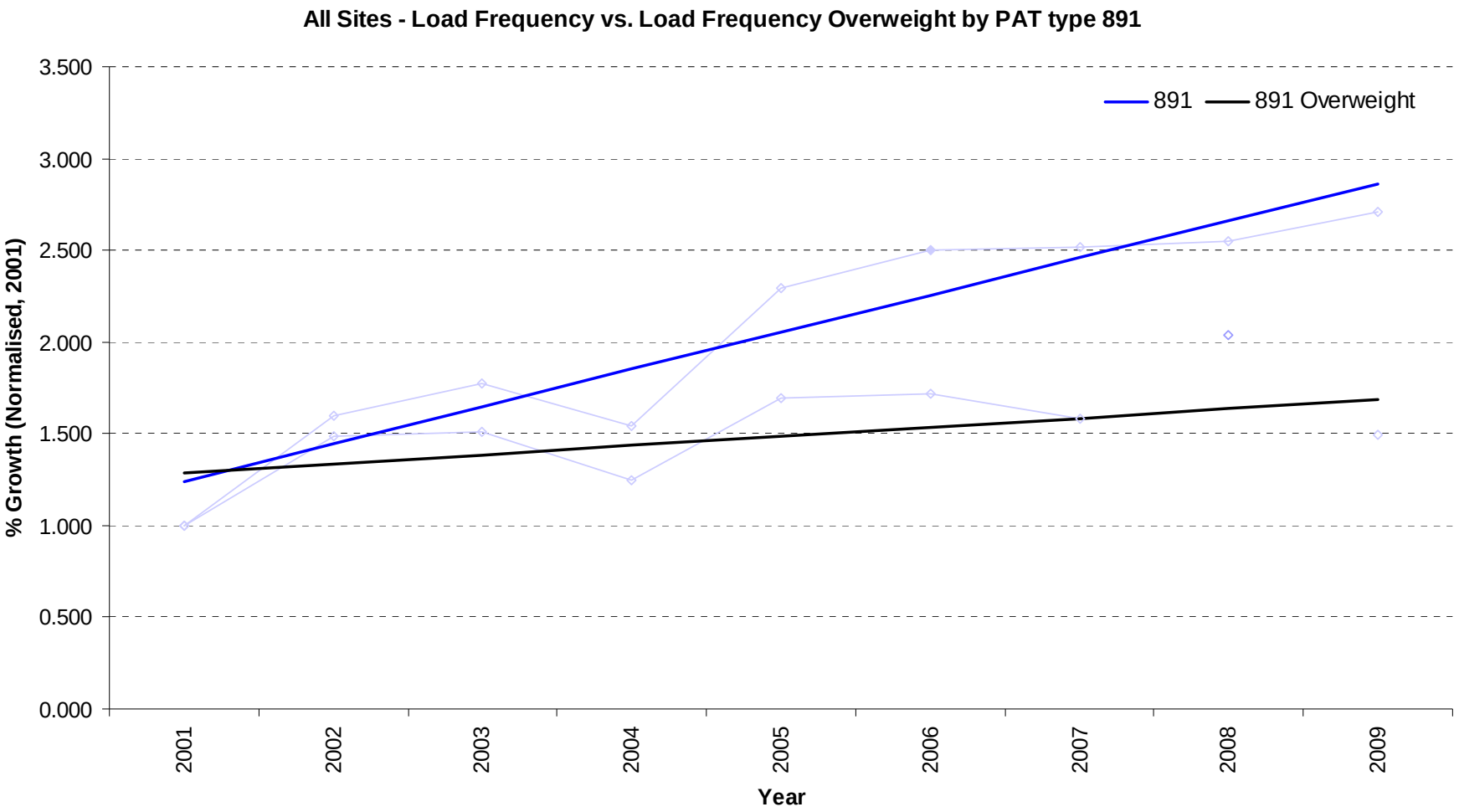


Interpretation: PAT class 891 continues to report an increasing overweight frequency trend, whereas both PAT class 751 and 851 report an overweight frequency that that indicates a possible decreasing trend.

Note: 2008 values were omitted from the trend line calculations.

11.0 VEHICLE FLEET OVERWEIGHT (Continued)

Chart 5.0: Vehicle load frequency vs. overweight frequency (2001 – 2009) Pat type 891 at all sites



Interpretation: There exists a possible correlation between the frequency of heavy vehicles and the frequency of heavy vehicles overweight. The two plots both indicate a long term increasing trend from 2001 – 2009. See Appendix A for PAT type 751 and 891, note: PAT type 891, 751 and 851 were reported as the most frequent overweight.

Note: 2008 overweight values were omitted from the trend line calculations.

12.0 VEHICLE FLEET > 44T

PAT Type
This is the code relating to the axle configuration.

Description
This illustrates the number of axles and an indication of the spacing between axles.

Percentage %
This indicates the % of the total heavy vehicles recorded as exceeding 44T for each PAT type.

Table 8.0: % of heavy vehicles > 44T by WiM site

				Drury		Tokoroa		Te Puke		Waipara	
Group	PEM Class	PAT Class	Description	Total Volume	%	Total Volume	%	Total Volume	%	Total Volume	%
Rigid	MCV	20	o-o (wb 2.0-3.2m, gw >= 2.5t)	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		21	o--o (wb >3.2m, gw >= 2.5t)	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	HCV1	31	o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		34	oo--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		45	oo--oo	1	0.0%	8	0.0%	1	0.0%	1	0.0%
		47	o--ooo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
T&T	HCV2	30	o-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		40	o--o-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		41	o-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		42	o-oo--o	0	0.0%	0	0.0%	2	0.0%	0	0.0%
		44	oo-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		52	o--oo-o--o T&T	0	0.0%	0	0.0%	3	0.0%	0	0.0%
		53	o-oo--oo T&T	0	0.0%	0	0.0%	2	0.0%	0	0.0%
		61	o-o--o-o--oo T & T	81	0.1%	170	0.6%	98	0.2%	63	0.2%
		63	o--oo-o--oo T & T	126	0.2%	40	0.1%	75	0.1%	68	0.2%
		65	oo--o-o--oo T & T	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		66	oo--oo-o--o T & T	0	0.0%	0	0.0%	1	0.0%	0	0.0%
		68	oo-oo--oo T & T	0	0.0%	4	0.0%	19	0.0%	6	0.0%
		77	oo--oo-o--oo	623	1.0%	738	2.7%	1062	1.9%	3993	12.1%
		78	o--ooo-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		85	o-oo--oo-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		89	o-oo--ooo-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		621	o-oo--o-o--o	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		731	o-oo--o-o--oo	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		751	o-oo--oo--oo T&T	16763	26.0%	3790	13.9%	13130	23.8%	3950	12.0%
		891	oo--oo-oo--oo T&T	27245	42.3%	16230	59.4%	29976	54.2%	18495	56.1%
		914	oo-oo--ooo-oo T&T	270	0.4%	82	0.3%	221	0.4%	18	0.1%
		915	oo-oo--oo-ooo T&T	24	0.0%	13	0.0%	1	0.0%	9	0.0%
Artic	HCV2	69	o-oo--ooo	196	0.3%	78	0.3%	422	0.8%	57	0.2%
		713	oo-oo--ooo Tri Artic	42	0.1%	14	0.1%	88	0.2%	10	0.0%
		747	o--ooo---ooo Tri Artic	5	0.0%	1	0.0%	2	0.0%	0	0.0%
		791	o-oo-oooo Quad Artic	487	0.8%	172	0.6%	218	0.4%	150	0.5%
		826	oo-oo--oooo Quad Artic	7419	11.5%	1941	7.1%	3741	6.8%	723	2.2%
		847	o--ooo---oooo Quad Artic	94	0.1%	9	0.0%	275	0.5%	22	0.1%
A&B Train	HCV2	74	o-oo--oo-o--o A Train	0	0.0%	0	0.0%	5	0.0%	0	0.0%
		851	o-oo--ooo--oo B Train	8477	13.2%	2671	9.8%	5641	10.2%	4192	12.7%
		951	o-oo-ooo-ooo B Train	2501	3.9%	1372	5.0%	285	0.5%	1195	3.6%
		1020	oo-oo-ooo-ooo B Train	3	0.0%	2	0.0%	1	0.0%	9	0.0%
		1032	o-oo-ooo-oooo B Train	0	0.0%	0	0.0%	0	0.0%	0	0.0%
		1133	oo-oo-ooo-oooo B Train	0	0.0%	0	0.0%	0	0.0%	0	0.0%
				64357	100.0%	27335	100.0%	55269	100.0%	32961	100.0%

Interpretation: At Tokoroa WiM site, PAT class 851 reported 2,671 heavily vehicles > 44T.

13.0 AXLE GROUP DISTRIBUTIONS

Load (kN)
This is the load imposed by each axle type.

Axle Groups
SAST – Single Axle Single Tyre
SADT - Single Axle Dual Tyre
TADT – Tandem Axle Dual Tyre
TSST – Twin Steer Single Tyre
TRDT – Triple Axle Dual Tyre
QADT - Quad Axle Dual Tyre

It is important to note that the weigh-in-motion (WiM) data from which the following table is derived, cannot distinguish between single and dual tyres. It is assumed that steer axles are single tyred and all others are dual tyred. From observation, there is an increase in the utilisation of 'super single' type tyres in the SADT, TADT, TAST and TRDT groups, however, the impact or significance can not be measured or derived from this technology. Despite the QADT description, 80-90% of Quad Axles are single tyred. The highlighted sections indicate the peaks in load per axle group.

Table 9.0: Site: 01N00463 (Drury)

Load (kN)	SAST	SADT	TADT	TSST	TRDT	QADT
10	0%	2%	-	-	-	-
20	13%	14%	1%	0%	0%	-
30	17%	24%	5%	0%	1%	0%
40	17%	22%	9%	0%	2%	0%
50	34%	21%	8%	1%	5%	2%
60	18%	9%	9%	6%	7%	5%
70	2%	4%	8%	19%	9%	8%
80	0%	2%	8%	26%	8%	9%
90	0%	1%	8%	26%	7%	8%
100	-	0%	9%	16%	7%	6%
110	-	0%	10%	5%	7%	5%
120	-	0%	9%	1%	7%	4%
130	-	0%	7%	0%	6%	4%
140	-	0%	5%	0%	6%	4%
150	-	-	4%	0%	6%	4%
160	-	-	2%	0%	6%	4%
170	-	-	1%	0%	5%	4%
180	-	-	0%	-	5%	5%
190	-	-	0%	0%	3%	7%
200	-	-	0%	0%	2%	8%
210	-	-	0%	0%	1%	7%
220	-	-	0%	-	0%	3%
230	-	-	0%	-	0%	1%
240	-	-	-	-	0%	0%
250	-	-	0%	0%	0%	0%
260	-	-	0%	-	0%	0%
270	-	-	-	-	0%	0%
280	-	-	0%	-	0%	0%
290	-	-	-	-	0%	0%
300	-	-	-	-	0%	0%
310	-	-	-	-	-	-
320	-	-	-	-	-	-

13.0 AXLE GROUP DISTRIBUTIONS (Continued)

Table 9.1: Site: 01N00628 (Tokoroa)

Load (kN)	SAST	SADT	TADT	TSST	TRDT	QADT
10	0%	2%	-	-	-	-
20	9%	12%	1%	-	0%	-
30	13%	19%	6%	0%	1%	-
40	14%	21%	8%	0%	3%	0%
50	32%	25%	8%	0%	4%	1%
60	28%	13%	6%	2%	6%	3%
70	3%	5%	7%	10%	6%	5%
80	0%	3%	8%	25%	6%	6%
90	0%	1%	10%	26%	7%	5%
100	0%	0%	11%	26%	8%	5%
110	-	0%	10%	10%	8%	6%
120	-	0%	9%	1%	9%	5%
130	-	0%	7%	0%	9%	6%
140	-	0%	4%	0%	8%	6%
150	-	0%	2%	0%	8%	6%
160	-	0%	1%	0%	6%	6%
170	-	-	0%	0%	5%	6%
180	-	-	0%	0%	4%	7%
190	-	-	0%	0%	2%	7%
200	-	-	0%	0%	1%	7%
210	-	-	0%	-	0%	6%
220	-	-	0%	-	0%	4%
230	-	-	0%	-	0%	1%
240	-	-	0%	-	0%	1%
250	-	-	0%	-	0%	0%
260	-	-	0%	-	0%	0%
270	-	-	0%	-	0%	0%
280	-	-	0%	-	0%	0%
290	-	-	-	-	0%	0%
300	-	-	-	-	0%	0%
310	-	-	-	-	0%	0%
320	-	-	-	-	0%	
330	-	-	-	-		0%
340	-	-	-	-		
350	-	-	-	-	0%	

13.0 AXLE GROUP DISTRIBUTIONS (Continued)

Table 9.2: Site: 00200176 (Te Puke)

Load (kN)	SAST	SADT	TADT	TSST	TRDT	QADT
10	0%	1%	-	-	-	-
20	14%	11%	1%	0%	0%	-
30	17%	25%	3%	0%	1%	0%
40	18%	21%	8%	1%	3%	1%
50	31%	22%	9%	1%	6%	4%
60	18%	10%	7%	4%	8%	9%
70	2%	5%	6%	14%	13%	8%
80	0%	3%	6%	28%	11%	7%
90	0%	1%	7%	25%	6%	8%
100	0%	0%	9%	18%	4%	9%
110	-	0%	11%	7%	4%	5%
120	-	0%	11%	1%	4%	3%
130	-	0%	8%	0%	3%	2%
140	-	0%	6%	0%	3%	3%
150	-	0%	4%	0%	4%	3%
160	-	-	2%	0%	5%	3%
170	-	-	1%	0%	6%	3%
180	-	-	0%	0%	6%	4%
190	-	-	0%	0%	6%	4%
200	-	0%	0%	0%	5%	6%
210	-	0%	0%	0%	2%	7%
220	-	-	0%	0%	1%	7%
230	-	-	0%	0%	0%	3%
240	-	-	0%	0%	0%	1%
250	-	0%	-	0%	0%	0%
260	-	0%	0%	0%	0%	0%
270	-	0%	-	-	0%	0%
280	-	0%	0%	-	0%	0%
290	-	0%	0%	-	-	0%
300	-	0%	0%	-	0%	0%
310	-	0%	0%	-	0%	-
320	-	0%	-	-	-	-

13.0 AXLE GROUP DISTRIBUTIONS (Continued)

Table 9.3: Site: 01S00285 (Waipara)

Load (kN)	SAST	SADT	TADT	TSST	TRDT	QADT
10	0%	2%	-	-	-	-
20	16%	12%	1%	0%	-	-
30	13%	21%	3%	0%	0%	-
40	17%	19%	5%	1%	0%	0%
50	35%	27%	7%	2%	1%	0%
60	18%	9%	8%	3%	4%	0%
70	1%	5%	6%	15%	6%	2%
80	0%	4%	7%	26%	6%	3%
90	0%	1%	10%	27%	7%	5%
100	-	0%	11%	22%	7%	6%
110	-	0%	12%	5%	8%	7%
120	-	0%	11%	0%	8%	6%
130	-	0%	8%	0%	10%	7%
140	-	0%	5%	0%	10%	8%
150	-	0%	3%	0%	10%	8%
160	-	-	2%	0%	9%	8%
170	-	-	1%	0%	8%	8%
180	-	-	0%	0%	5%	8%
190	-	-	0%	-	2%	8%
200	-	-	0%	-	1%	7%
210	-	-	0%	-	0%	5%
220	-	-	0%	-	0%	3%
230	-	-	0%	-	0%	1%
240	-	-	0%	-	0%	1%
250	-	-	-	-	0%	0%
260	-	-	0%	-	0%	0%
270	-	-	-	-	-	0%
280	-	-	-	-	0%	0%
290	-	-	-	-	-	0%
300	-	-	0%	-	-	0%
310	-	-	-	-	-	0%
320	-	-	-	-	-	0%

14.0 APPENDIX A

Chart 6.0: Vehicle load frequency vs. overweight frequency (2001 – 2009) Pat type 751 at all sites

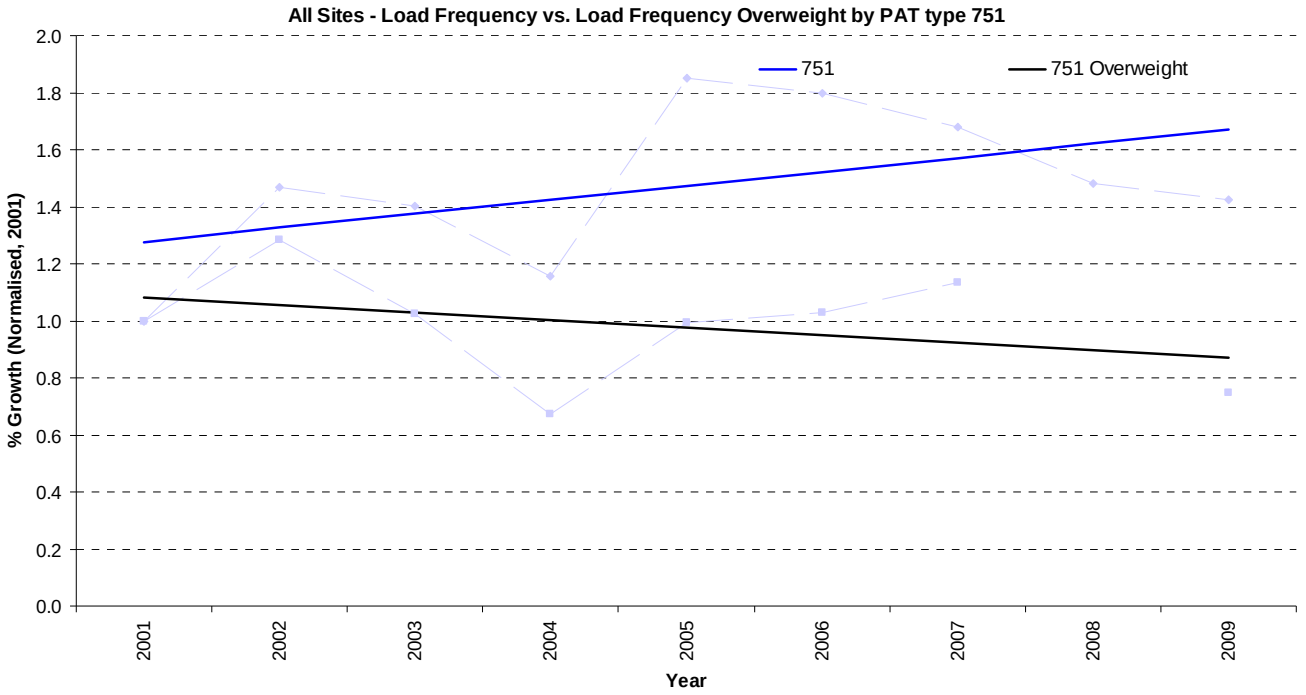


Chart 6.1: Vehicle load frequency vs. overweight frequency (2001 – 2009) Pat type 851 at all sites