University of Southern Queensland
Faculty of Engineering and Surveying

Toowoomba Road Network Review

A dissertation submitted by

David Thomas Dugdell

In fulfilment of the requirements of

Courses ENG4111 and 4112 Research Project

towards the degree of

Bachelor of Engineering (Civil)

Submitted: November, 2007

Abstract

The Department of Main Roads controlled roads constitute less than 10% of the total length of roads within the Toowoomba Local Government Area, yet approximately 30% of all reported accidents within the last 15 years has occur on these roads. This research project will seek to determine whether road crashes on the State and Federal highways in Toowoomba are over represented in overall Toowoomba Crash Statistics by comparing the rate of crashes on the declared roads against the different hierarchy levels of Toowoomba City Council controlled roads.

All reported accidents use a coded system for ease of use when describing the movements of road users at the time of road crashes occurring. An analysis of crashes according to the coding method used by Toowoomba City Council was also carried out to gain an understanding of how crash types in the Toowoomba area are changing through time.

University of Southern Queensland

Faculty of Engineering and Surveying

ENG4111 Research Project Part 1 &
ENG4112 Research Project Part 2

Limitations of Use

Professor Frank Bullen
Dean
Faculty of Engineering and Surveying

Certification

I certify that the ideas, designs and experimental work, results, analyses and conclusions set out in this dissertation are entirely my own effort, except where otherwise indicated and acknowledged.

I further certify that the work is original and has not been previously submitted for assessment in any other course or institution, except where specifically stated.

David Dugdell

Student Number: Q1122129

____

Signature

____

Date

Acknowledgements

I would like to thank the following people for their support, patience, guidance and assistance during the course of this project:

Associate Professor Ron Ayers
University of Southern Queensland, (Project Supervisor)

Adam Currie
Department of Main Roads, Toowoomba

Matthew Andrettea
Toowoomba City Council

And of course my parents who supported and encouraged me through the duration of my time at university.

David Dugdell

Table of Contents

List of Appendices

List of Figures

List of Tables

Abbreviations

AADT	Annual Average Daily Traffic
ABS	Anti-lock Braking System
BRTE	Bureau of Transport and Regional Economics
DCA	Definition for Coding Accidents
DMR	Department of Main Roads
ESC	Electronic Stability Control
GIS	Geographic Information System
Km	Kilometre
km/h	Kilometres per hour
m	Metre
NDLERF	National Drug Law Enforcement Research Funds
NRMA	National Roads and Motorists' Association
OECD	Organisation for Economic Co-Operation and Development
QT	Queensland Department of Transport
RUM	Road User Movement
TCC	Toowoomba City Council

1 Introduction

Australia has an extensive road network system that totals some 811,000km in length of which only about 40 percent of which is sealed. Private motorcar is the favoured method of transport, reflected by the fact that Australia has the second highest rates of vehicle ownership with approximately 1 motor vehicle for every licensed driver, despite being one of the most highly urbanized countries in the world. Since record keeping began in Australia in 1925, there have been over 171,000 fatalities on Australian roads and in 2002, the road crash was the tenth leading cause of death to Australians and contributed to 22 percent of deaths caused by "external causes" (accidents, violence, etc).

Using the "human capital" approach, the Bureau of Transport and Regional Economics (BTRE) estimated that in 1996 the cost of road crashes in Australia was $15 billion. In order to reduce road crash numbers and the economic costs borne by society, several government initiatives have been implemented. However, while the road system involves a human component, the road crash is unlikely to be eliminated.

Of the 811,000km of national road, 18,620km is national highway, some of which is built through urban areas. Having such high order roads in an urban setting results in a conflict of road use and, along with the high number of vehicles per day, leads to an increase in accidents along such highways.

1.1 Aim

The aim of this research project is to investigate the rate of crash types within the Toowoomba City Council Local Government Area, and where possible, determine whether any type of crash is increasing. The study will also look at the crash rates and frequencies along the National and State highways in the Toowoomba area and compare them with the rates of crashes on Toowoomba City Council controlled roads to determine if the State and Federal controlled roads are over-represented in Toowoomba road crash statistics.

1.2 Dissertation Overview

The second chapter of this dissertation consists of a literature review of previous studies into road crash, crash types, crash causal factors and road hierarchies, as well as background information pertinent to road crashes.

The third chapter gives a description of the study area of the Toowoomba City Council Local Government Area and includes information relating to the size, population and history of Toowoomba City.

The fourth chapter relates to the different data sets that were obtained and required to be manipulated in order to carry out further data analysis for this project.

The fifth chapter reports on the analysis of the crash types according to the R.U.M. Codes used in Council's database. The number of crashes, time of day and day of week were found and compared against traffic volumes. This chapter also includes the methodology used for this particular analysis and discussion of results.

The sixth chapter will look at a selection of roads that make up the higher levels of the hierarchy according to the Toowoomba City Council Planning Scheme. It will then compare relevant road crash statistics according to the road hierarchy, with a focus on the difference between the local authority roads and Department of Main Roads controlled roads. This chapter also includes the methodology used for this analysis.

Chapter seven will contain a discussion of the results and observations from chapters five and six.

Chapter eight will include conclusions drawn from the data analysis recommendation and areas of further study that may provide useful as a result of this study.

2 Background and Literature Review

2.1 Introduction

This chapter gives a background of the project undertaken and includes a literature review. The literature review identifies information and methodologies obtained from previous studies relating to crash data analysis.

2.2 Background

As part of a review conducted by the Toowoomba City Council regarding crashes within its jurisdiction, it was identified a need for further study into the difference between local roads under authority of the Toowoomba City Council and the State and Federal highways under the authority of the Department of Main Roads. Another study area identified in the review was to look at the long term crash rate in Toowoomba, and as an extension of this whether certain types of crashes were increasing with time.

2.3 Literature Review

Before work commenced on data analysis a literature review was required, focusing on two primary areas: the collection and analysis of road crash data and the aspects of road hierarchies.

2.3.1 Road Crashes

In 1997 Austroads published *A Minimum Common Dataset for Reporting of Crashes on Australian Roads* which has the goal of ensuring that reported crashes in each state have a consistency that increases the potential to analyse the road crash data in a meaningful fashion. The document was written to include insurance companies, motoring organisations and others involved in data collection and analysis.

This Austroads document defines what constitutes a road crash:

> A road crash is an apparently unpremeditated event which results in death or injury to a person or property damage and is attributable to the movement of a road vehicle on a public road (including vehicles entering or leaving a public road). This definition specifically excludes:
>
> - Crashes on private property or on a public road that as temporarily been closed;
> - A crash where no moving road vehicle is involved (for example, a pedestrian walks into a parked car or another pedestrian), or
> - A crash involving deliberate intent (such as murder or suicide)

It also defines the parameters of a fatal crash:

> A fatal crash is one where a person is killed outright or dies within 30 days of crash from injuries attributable to the crash, excluding:
>
> - A person who dies within 30 days where factors other than injuries sustained in the crash are deemed to be the primary cause of death (for example, driver of a road vehicle who dies from a condition such as cerebral haemorrhage , heart attack or diabetic coma);
> - A person not directly involved in a road vehicle accident who dies as a result of witnessing a crash;
> - A person is killed where deliberate intent is clearly established (for example, driver who suicides, person killed as a result of homicidal intent) and;
> - A person killed or injured where vehicle movement is not deemed to be the primary factor contributing to the death or injury.

All Australian states and territories have agreed to work towards the implementation of the minimum dataset, though in some jurisdictions collect data in greater detail to facilitate further understanding of the road crash.

2.3.2 Limitations of Reported Crash Data

In spite of the effort to effect a minimum dataset for each reported road crash there are inaccuracies and inconsistencies in the data recorded. These explanations are set out in Austroads Manual 2004, Guide to Traffic Engineering Practice Series Part 4, *Treatment of Crash Locations*:

1. **Random Reporting and Reporting Errors**
    - Crashes involving children, pedestrians, cyclists and minor injuries, as well as crashes involving illegal activities such as driving under the influence of drugs or alcohol are substantially underreported.
    - Information obtained by police is usually in difficult circumstances, accident may not fit any into the standard form, a coding error may be made or location may be misreported.

2. **Inconsistencies in Data**
    - Delays in processing may lead to incomplete dataset being used for analysis, sometimes resulting in any countermeasures undertaken using out of date information.
    - Collection of crash data before and after road upgrades may result in discontinuities in the data, as can a change in the data collection process.

2.4 Road Safety Indicators

The Organisation for Economic Co-Operation and Development (OECD) has set out 3 indicators that can be used to define road safety:

- Absolute – Giving total numbers of fatalities, casualties and property damage gives an insight into the magnitude of the road crash problem.

- Fatalities to Population – This ratio is known as the mortality rate and can be used to compare countries and different transport modes.

- Casualties to distance travelled – This can be used to indicate the safety of a defined road network/jurisdiction. Number of vehicles registered can also be used.

(OECD 1994)

Of course, any attempt to create road safety indicators requires accurate and complete datasets so that comparisons can be made and the correct outcomes achieved, especially in terms of remedial works.

2.4.1 Crash Factors

A transport network may be considered to comprise of three components:

- the human (driver);
- the vehicle; and
- the road.

A crash may be considered to be a failure of one or more of these components (Austroads 2004). Figure 2.1 below shows the how each component contributes to a road crash.

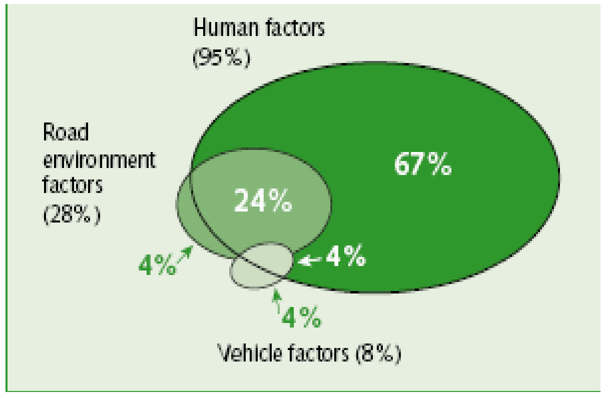


Figure 2.1 The three factors that contribute to road crashes
Source: Austroads 2004

2.4.2 The Human

The safe operation of a motor vehicle, through which the user interacts with the road, depends on the driver (user) making a series of sequential decisions based predominantly on visual information from the road and layout design. Factors that influence the decision-making process include expectancy, memory, reaction times, and visual aspects including head and eye movement and illumination. Inexperience, stress, poor motivation, insufficient or too much information and extreme or uncommon events all contribute to poor decision making (Austroads 2004).

There are other contributing factors to road crashes and to the fatalities and injuries that result. Road traffic authorities in both Australia and New Zealand concentrate on the “fatal four”: speeding, drink-driving, fatigue and the non-wearing of seatbelts. Drug driving is also a problem, with drugs other than alcohol found in up to 40% of fatal road crashes and 10% of non-fatal crashes (NDLERF 2007).

Driver inattention is another contributing factor to road crashes. In Queensland in 2000, it accounted for more fatalities, serious and non-serious injuries than any of the “fatal four” and had the greatest economic cost, as shown in Table 1.1 below.

Factors	Fatal	Serious Injury	Minor Injury	Non-Injury	Cost (A$)
Inattention	38	933	2679	2559	495,237,018
Alcohol/Drug	94	475	491	666	359,808,830
Speed	48	239	257	402	182,728,570
Fatigue	28	295	347	479	174,203,186

Table 2.1: Major Contributors to Crashes - Queensland 2000
Source: “Driver Inattention: More Risky than the Fatal Four?”

The main reasons for the inattentiveness include eating, drinking, using mobile phone, handling stereo system, reading, writing and looking at scenery and attractive pedestrians. Despite social assumptions, mobile phone use contributed very little to the cause of inattentiveness. Violanti (1998) found that only 4.2% of fatal crashes had a phone present in the vehicle and of the fatalities with a phone present, only 7.7% were reported using the phone at the time of collision. However, given the proliferation of mobile phones with in the community in the last few years, this number is likely to be higher.

2.4.3 The vehicle

Road design for vehicles needs to consider manoeuvrability, visibility, cornering capability and braking characteristics. All these factors are influenced by size and weight of the vehicle.

The addition of safety devices has been attributed to a decrease in fatalities and extent of injuries (NRMA). Such safety devices include seat belts, crumple zones, Anti-lock Braking Systems (ABS), Electronic Stability Control (ESC) and side and frontal SRS airbags. Technologies such as ABS and ESC have not only lessened the severity of road crashes but allowed drivers to avoid them altogether.

2.4.4 The Road

A safe road is one which recognizes the realities and limitations of human decision making. The road should hold no surprises and provide controlled and repeated release of relevant information to the user. Austroads (2004) outline several design principles that 'safe' intersections should have including separated conflict points through space and time, delineate major movements through alignment, delineation and traffic control, and that 'safe' mid-block (non-intersections) should have consistent standards of vertical and horizontal alignment, have cross sections that suit traffic function and volumes, delineate vehicle paths, minimise road hazards and control access from abutting uses.

2.5 Crash Types

Every reported crash that occurs is classified by type in order to allow for further analysis as a means to determine prospective remedial works. The standard currently used by Austroads Associates and DMR for this purpose is the Definition of Coding of Accidents (DCA). The TCC however, uses a slightly different coding system call the Coding of Road User Movements or 'RUM' codes. As opposed to the DCA method where three digits are used to specify road movements, the TCC RUM codes use just two, plus a letter to define the direction the vehicle was travelling. This is shown below in Figure 2.2 with both the RUM Code 00 Pedestrian Head Side and the equivalent DCA 001 Pedestrian Headside:

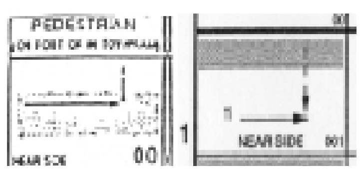


Figure 2.2: RUM 00 and DCA 001
Source: TCC 2006 and Austroads 2004

The full RUM Code table is shown below in Figure 2.3, while the complete DCA table is reproduced in Appendix B.

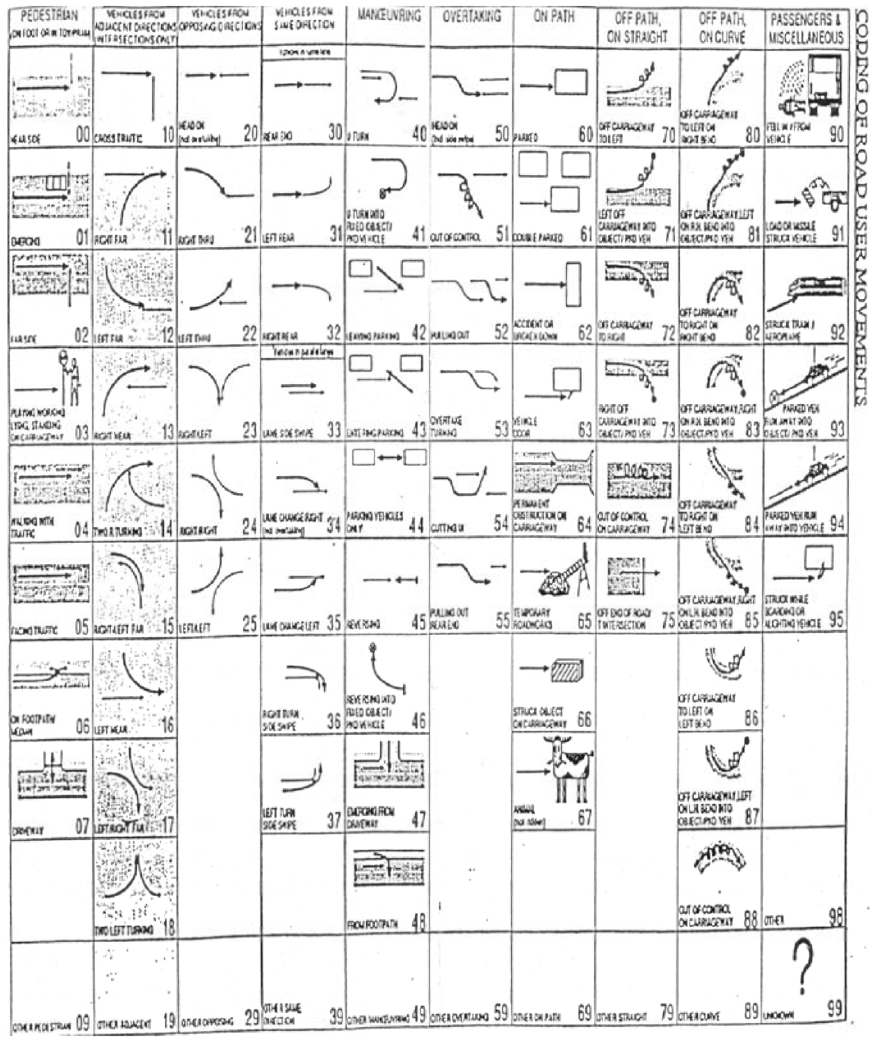


Figure 2.3: Road User Movement table

The table is defined by 10 columns, each containing crashes with similar factors such as overtaking, pedestrian, intersection, and on path movements. There are 86 RUM codes in total, including 10 defined as ‘other’ and one defined as ‘unknown’. The system of classification is older than that used by DMR and Austroads, being introduced in Victoria in 1968 (Austroads 2004).

With such a coding system, it allows for quicker identification of crash patterns at a location or stretch of roadway, which could indicate common factors.

When determining the RUM code, the traffic movements leading up to the crash situation are used. Movements may also include intended movements as well as actual. No significance on the how and why the crash occurred or any relative blame is used in deducing the code (Andreassen 1994).

Andreassen (1994) also recommends that in crashes were multiple ‘events’ or collisions occur, then the primary crash type is coded and then others are coded as subsequent or prior events. In the cases of multiple events care should be taken when considering whether the crash was separate incidents or not.

2.6 Road Hierarchies

A road hierarchy is a classification system and a means of defining each roadway type in terms of its function such that appropriate objectives for that roadway can be set and appropriate design criteria can be implemented. These objectives and design criteria are aimed at achieving an efficient road system whereby conflicts between the roadway and the adjacent land use are minimised and the appropriate level of interaction between the roadway and land use is permitted. The Toowoomba Planning Scheme sets out the design criteria for all new roads in the Toowoomba Local Government Area including reserve and carriageway widths, anticipated vehicle capacity, cross-falls, sight distances and design speeds.

It its purest form, a classification system is composed of only two types of roads:

- Arterial roads – the main function of which is to provide efficient mobility of major region and inter regional freight and commercial through traffic.

- Local roads – the main function being to provide direct access to abutting land uses and contribute to the overall functioning of the area.

(Austroads 1988)

In practice there are intermediate streets which may have been designed as local streets but now serve additional traffic functions to varying degrees, such as providing for some non-local traffic movements. To this end Eppell (2001) devised a four level road hierarchy based functional objectives and arranged by increasing order of detail, beginning with purpose, function, management and design. From these four levels a detail hierarchy can be derived which contains 10 levels of road or street. Categorising the road network by its functional basis gives a simple four level hierarchy:

1. Arterial roads, designed for through traffic movements of long distance and primary freight and dangerous goods route as well as line haul public transport;

2. Sub-arterial roads, designed for the connection between local areas and arterial roads with access to public transport and some pedestrian movements;

3. Collector streets, designed for local cycle and pedestrian movements, direct access to property, access to public transport and carrying traffic with trip end in the local area; and

4. Local streets, designed for direct property access and local pedestrian and cycle movements.

(Eppell, 2001)

The road hierarchy for Toowoomba is published in the Toowoomba Planning Scheme and is available online. While it has a four level system, only the first three fall under the control of the Toowoomba City Council. The graphical representation of the hierarchy in Toowoomba can be seen in Figure 2.4 along with the associated legend.

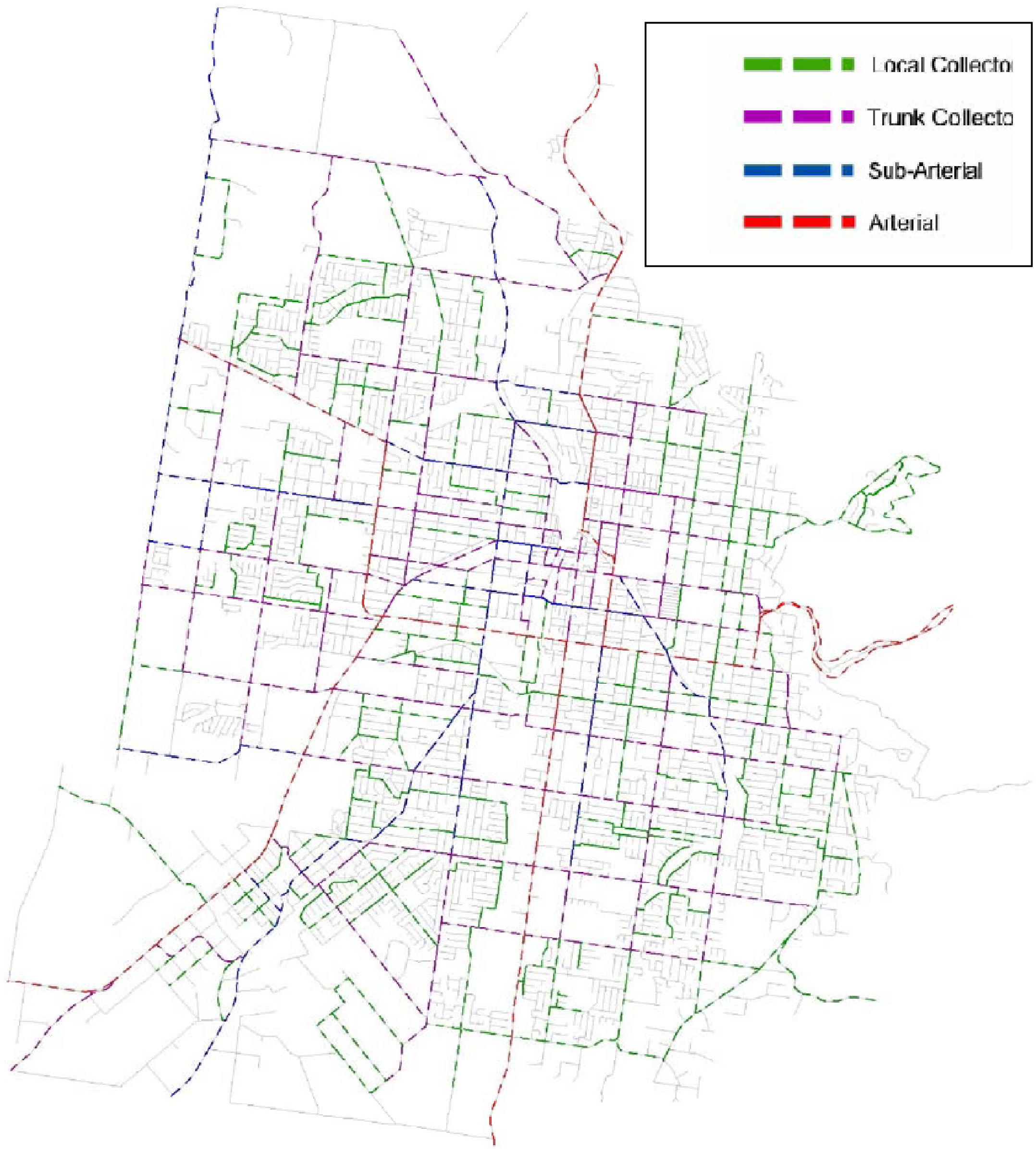


Figure 2.4 Toowoomba Road Network Hierarchy
(Source: Toowoomba Planning Scheme Online)

2.7 Conclusion

This chapter has given background information regarding road crash data, road crash classification types and road hierarchies. From the literature review it was seen that there has been significant work done towards standardising the collection of crash data and on the functional classification of roads.

3 Study Area - Toowoomba City

3.1 Introduction

This chapter gives a brief description of the study area of this project. It also includes some general crash statistics to put the study area into context with the rest of Queensland.

3.2 Toowoomba City

Toowoomba City has an area of approximately 117km^2 and is located at the top of the Great Dividing Range, approximately 130kms west of the Queensland State capital, Brisbane.

Toowoomba is Australia's second largest inland city with a population estimate for 2006 of 97,284, a growth of approximately 1.1% on the revised 2005 figure. The Queensland Department of Local Government estimates the population for Toowoomba in 2011 as between 100,600 and 104,900, and between 107,200 and 124,800 in 2026 (Queensland Government 2006). Toowoomba is the economic and commercial hub of the Darling Downs region and services an array of primary and secondary industries, though the residential areas are characterized by low density levels with ample recreation areas.

The Toowoomba City Council Local Government Area is bounded by the Gatton, Cambooya, Jondaryan, Rosalie and Crow's Nest Shire Councils, along with the 21 suburbs that comprise the Council, as shown below in Figure 3.1.

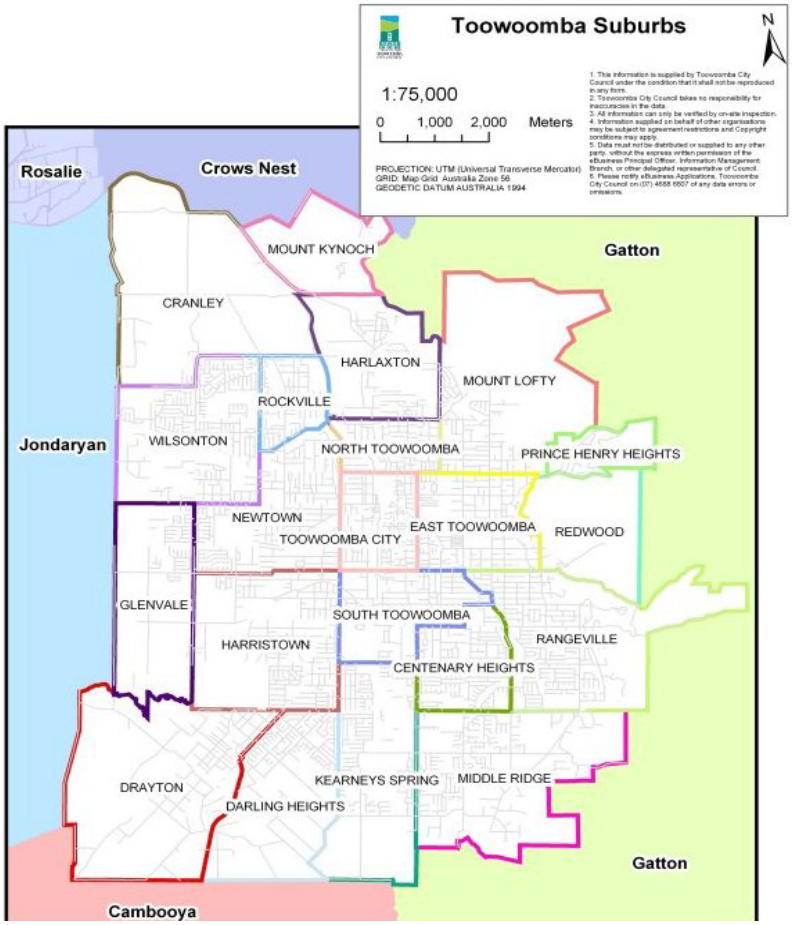


Figure 3.1 Toowoomba Suburbs and Surrounding Shires
Source:http://www.toowoomba.qld.gov.au/index.php?option=com_content&task=view&id=429&Itemid=2

"Toowoomba's climate is characterised by a dry winter and wet summer with four distinct seasons. Much less humidity is experienced in Toowoomba when compared with its coastal neighbours. Summer day averages range from 16.6 to 27.6 (degrees Celsius), and winter day averages range from 5.3 to 16.3 (degrees Celsius)".
<http://www.toowoombanow.com.au/content/view/18/24/>.

Through the colder months of the year Toowoomba also experiences thick fog, especially in the escarpment region, that substantially reduces sight distances and traction, adding to the risk of crash.

'Toowoomba has a pivotal role in the region as a transport hub for the Darling Downs and beyond and is an important focal point for interstate and intrastate freight movement, being at the confluence of the Warrego, New England and Gore Highways. The city itself also generates major freight traffic', (Maunsell 1997).

The state and federal highways running through Toowoomba are the responsibility of the Queensland Department of Main Roads Southern Queensland Region. These highways are part of a national highway system that links the national ports of Brisbane, Sydney and Gladstone and the Northern Territory capital of Darwin. All other local roads and streets within Toowoomba's boundaries are under the authority of the Toowoomba City Council.

3.3 Toowoomba Network Statistics

Toowoomba City Council is responsible for some 93% of the total road length in Toowoomba, with State and Federal highways comprising 3.6% and 3.1% of the total road length respectively.

Road Network Statistics	Council Road Network	State (DMR) Road Network	Federal Road Network	Total
Approx Length of Sealed Roads	632.4 km	21.3 km	24.1 km	677.8 km
Approx Length of Unsealed Roads	39.5 km	-	-	39.5 km
Signalised Intersections	44	16	18	78
Give Way Signed Intersections	235	40	26	301
Stop Signed Intersections	134	29	37	200
Uncontrolled Intersections	1974	35	2	2011

Table 3.0.1 Toowoomba Road Network Statistics
(Source: Toowoomba City Council EngineeringGIS)

As can be seen from Table 3.1 above, a majority of the Toowoomba City Council roads are either uncontrolled or sign controlled, while nearly half the signalised intersection are under the authority of the Department of Main Roads.

3.4 Toowoomba Crash Statistics

The Toowoomba crash rate has generally been higher than the State crash rate since 1993 (Figure 3.2). It can be seen that while there has been a slight downward trend in the rate of crashes in Toowoomba, albeit with a slight cyclic trend of increase and decrease in approximately 5 year intervals.

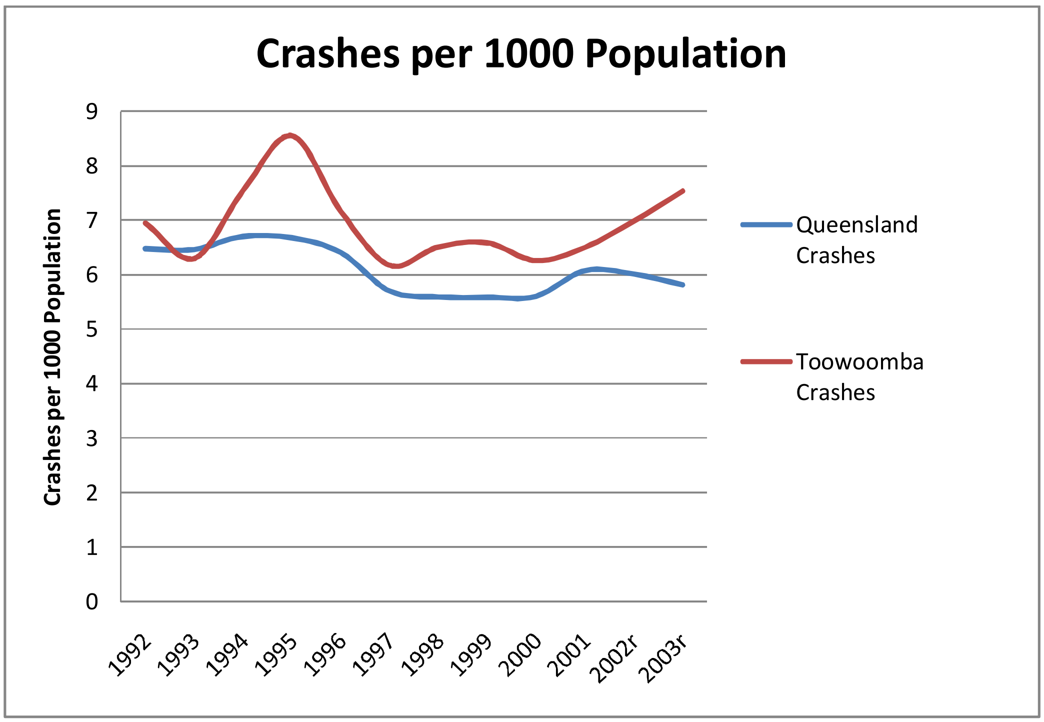


Figure 3.2 Total Crashes per 1000 population - Queensland and Toowoomba
(Sources: TCC Crash Data, ABS and Office of Economic and Statistical Research)

However, the casualty crash rate and fatal crash rate have both been lower than the State rate as shown below in Figure 3.3 and Figure 3.4. This can be attributed to the fact that Toowoomba crashes occur in a lower speed, urban environment.

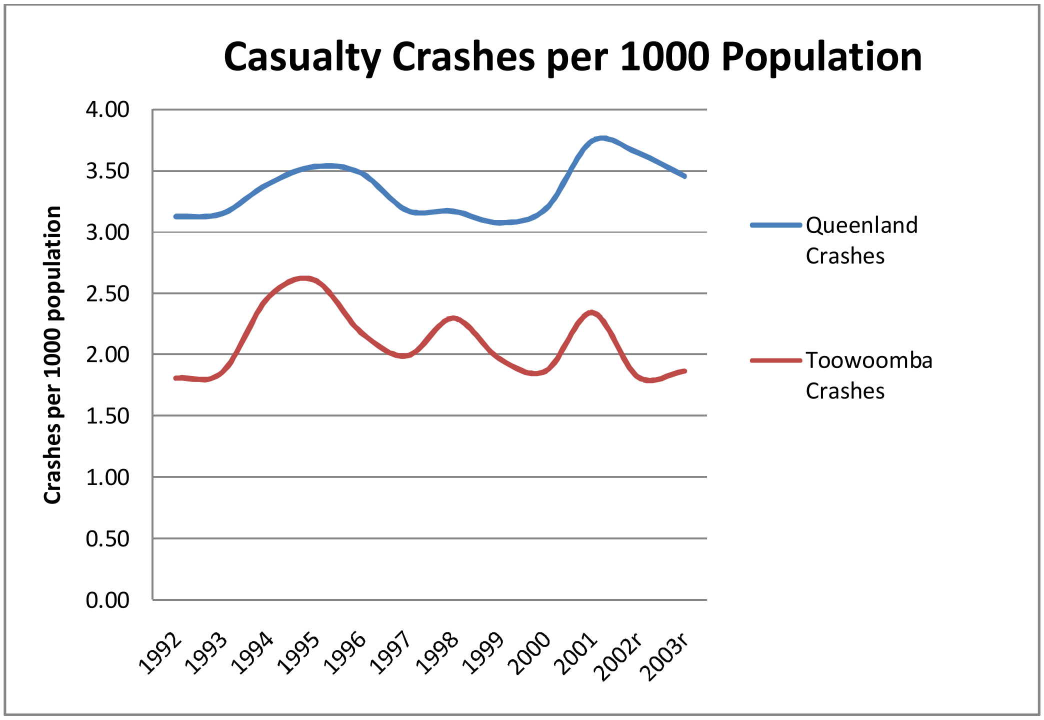


Figure 3.3 Casualty Crashes per 1000 population - Queensland and Toowoomba
(Sources: TCC Crash Data, ABS and Office of Economic and Statistical Research)

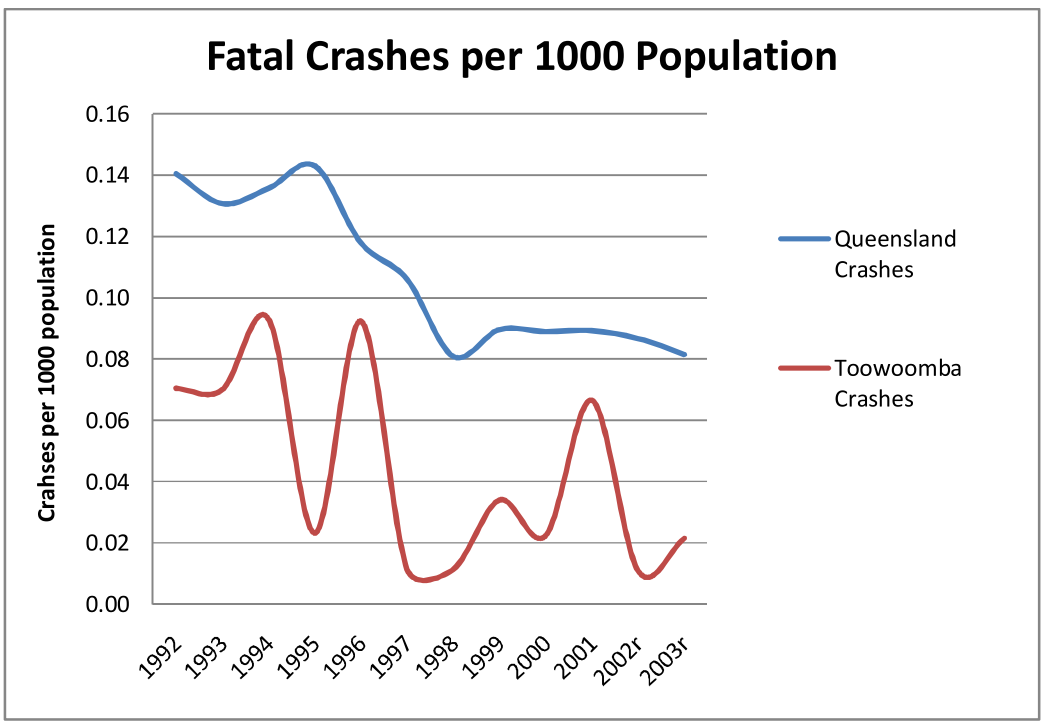


Figure 3.4 Fatal Crashes per 1000 population - Queensland and Toowoomba
(Sources: TCC Crash Data, ABS and Office of Economic and Statistical Research)

In terms of crashes according to road authority, a majority of crashes occur on Toowoomba City Council roads, as shown by Figure 3.5. Given the differences in the length of road controlled by the different levels of government this in not unexpected.

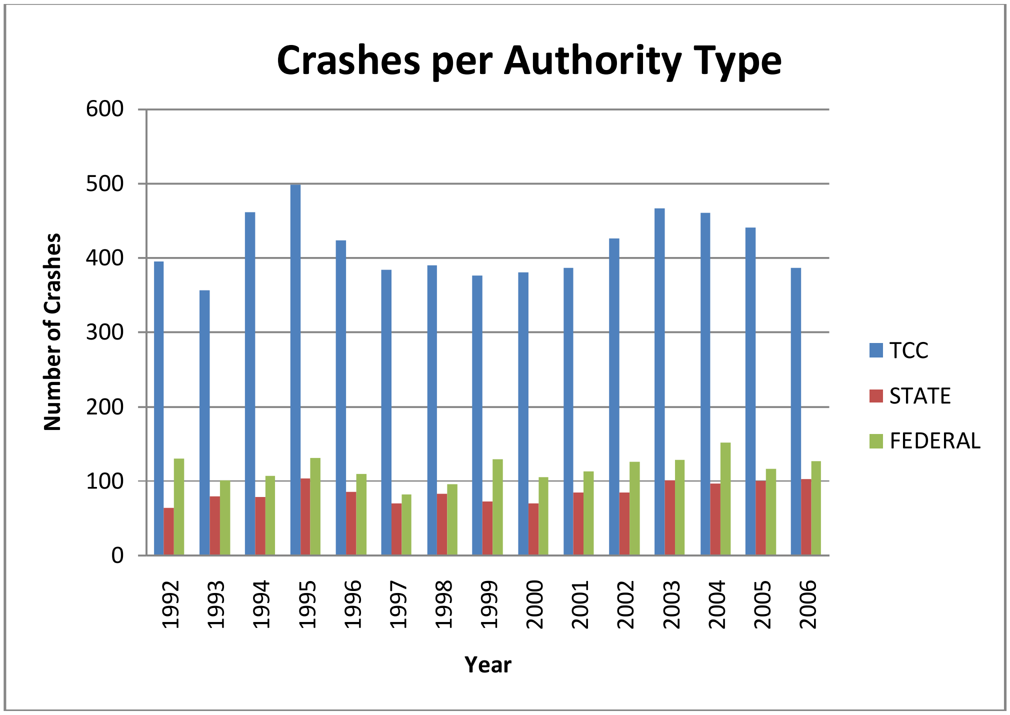


Figure 3.5 Crashes per Authority

3.5 Conclusion

This chapter has given a brief description of the study area, including the size and population of the area as well as an overview of some of the crash statistics of Toowoomba compared to the state average.

4 Data and Methodology

4.1 Introduction

This chapter describes the types of data needed to undertake analysis in this project. This chapter describes where the data was sourced, how it was collated and how the data was refined, as well as the methodology used in the analysis of the data.

4.2 Data

Several sets of data from several sources were required to undertake this project, with both local and state government departments supplying requested data and both were happy to respond to any enquires relating to the data. Other related information used was freely available and sourced from either government internet sites or the University of Southern Queensland library.

4.2.1 Crash Data

The primary crash data was sourced from the GIS Engineering section of the Toowoomba City Council on 5 June 2007. This data was received in the form of a database file which can be viewed as it appears in Microsoft Access 2007 in Appendix B.

Toowoomba City Council received a majority of their crash data in the form of the first page of the police report concerning a crash. The data from the police report is then encoded into the database by TCC officers. While this enables the Toowoomba City Council timely access to the general information pertaining to crashes occurring within the Toowoomba LGA, it also means that the data is not as comprehensive as that compiled from the full Queensland Police report. This results in data that is useful for a general network analysis, as carried out in this project, but unsuitable for specific site analysis such as is needed when developing a remedial treatment for an intersection, for example. The data contained in the TCC Crash database include factors such as:

- Time, Date and Location
- RUM and DCA codes
- Fatal, Killed Seriously Injured and Injury numbers
- Road Authority
- Control Type

The data originally contained 13,643 separate entries. The number of entries was reduced to 9,276 by means which will be described in the methodology. This includes entries not recorded by police but reported to TCC officers by selected reliable sources.

Crash data was also obtained from the Southern District of the Department of Main Roads which encompasses the TCC LGA. This data was obtained in the form of a Microsoft Excel spreadsheet file and electronic text file. The electronic text file was subsequently read into Microsoft Access and a database created from this file.

The Department of Main Roads also receives their crash data from the Queensland Police, by means of a database that is administered by the Queensland Department of Transport, and contains data from the full police report not found in the TCC crash database such as severity of injuries, suspected causal factors such as fatigue, alcohol or weather, and the type of vehicle involved such as car/utility, bus, truck or motorcycle. A sample of the DMR supplied data can be viewed in Appendix C.

4.2.2 Traffic Count Data

Traffic count data was obtained from both the TCC and the DMR. Traffic count data on DMR controlled roads is quite comprehensive, with reasonably accurate AADT data obtained from permanent counters located at significant locations along both the Federal and State highway networks back to 1988.

Traffic Count data on TCC controlled roads was obtained in the form of several Microsoft Excel spreadsheets, which can be viewed in Appendix B. This data is less reliable and less comprehensive, especially at mid block locations throughout the LGA, with single recent counts or several years between counts common. Intersection counts are more widely available and more reliable but do not always suit the purposes of this project.

4.3 Methodology

This section covers the methods applied to verify the accuracy of the data and organise the data obtained from the various sources. The different methodologies used to analyse the data will be covered in the relevant sections.

4.3.1 Data Collection

Data was obtained from Matthew Andreatta (Senior GIS Analyst) and Greg Smith (Co-ordinator, Traffic and Lights) of Toowoomba City Council's Design and Survey branch. The relevant computer files received from TCC included:

- Accident.mdb;
- Top 100 Intersections Analysis.xls;
- Traffic_Counts.xls; and
- Accident History.xls

These files contained records of reported accidents Toowoomba to the Toowoomba City Council, as well as traffic count data recorded along Toowoomba City Council roads. Also received from the TCC were ArcMap 9.1 files necessary to create a visual representation of the road network within the TCC LGA.

Data relating to the State and Federal highways was obtained from Adam Currie and Selwyn Leslie of the Network Performance section of DMR. The relevant computer files received from DMR include:

- Road Crash Data.xls;
- c2gis.txt; and
- AADT's 88 to 06.xls

These files included crash records from the Road Crash 2 system used by the department of Main Roads, as well as traffic count data from all roads under the authority of Main Roads within the Southern District.

4.3.2 Initial Data Preparation

Before a final determination about which set of crash data could be analysed it was necessary to convert either or both obtained into a common data type for comparison. The decision was made to convert the DMR data into a database file using the "import" function in Microsoft Access 2007. This was done as it was believed that the Structured Query Language function would enable easier manipulation of the bulk data. On inspection of both datasets it was decided that the despite the higher level of data provided in the DMR database, the TCC database was most suited to the type of analysis to be carried out.

Once the dataset had been selected, the next step was to remove any unnecessary data from the database. As previously mentioned, the initial record count in the database was 13, 683. To begin with, all data outside the nominated time frame of 1992 to 2006 was removed, and then records outside of the Toowoomba Local Government Area boundaries were removed as well as data entries that were not crash records but instead were records of remedial works carried out on certain locations within the network.

The next step was to remove duplicate entries from the database. This was done using the "INCID_NO" as a unique identifier and a simple "Count" function within Microsoft Access which revealed those incident numbers which occurred more than once in the database and the excess crash records removed from the database. Not all those incident numbers returned were evidence of multiple entries of the same data, as it appears that on more than one occasion that human error had led to incomplete or incorrect incident numbers attributed to some crash records even though the crashes had occurred on a different date at a different location with a different crash type coding. For the records where this occurred, the incident number was changed by simply adding a lower case letter to the end on the number. This not only created unique identifiers, but also identified those that had previously a common incident number.

Then next step was to do a visual inspection on those records that did not contain an incident number to determine whether there were any duplicate entries. As approximately 30 percent of the remaining records did not have this incident number, this was a slow and laborious task, but necessary to ensure the accuracy of the analysis.

This completed the initial data collection and verification. Further manipulation and data build is described in the relevant future sections.

5 RUM Codes

5.1 Introduction

This chapter is concerned with the analysis of crash types and the discussion of results derived from the aforementioned analysis, with data presented in both graphical and tabular forms.

5.2 Crash Type Methodology

The analysis was conducted by grouping together similar crash types as determined by the columns of the R.U.M. Coding table. Each group was then analysed according to the time of day the crashes took place, grouped in two hour intervals and the day of the week the crash occurred. The crash numbers were then grouped into five year sections, 1992-1996, 1997-2001 and 2002-2006.

The original intention was to compare the changes in the recorded crash statistics over time. However, in the absence of having a suitable base for comparison (i.e. million vehicle kilometres, vehicles per day) that was representative of the whole of the Toowoomba road network, crash figures have been group in five year timeframes and compared against weekly traffic and AADT distributions.

The traffic distributions are calculated from over 20 different locations around Toowoomba and include traffic counts on local, state and federal roads, giving a network overview of traffic distribution. This data was obtained from Toowoomba City Council as ready to use data, and though the figures are based on recent traffic count data, it has been assumed that though the actual volume of traffic may have increased, the relative distribution through the hours of the day and the days of the week has not changed significantly.

To determine the number of each crash type occurring each year, a Microsoft Access "count" function was used to tally the number of crashes within a RUM grouping or column, for each year of the 15 year time period and for each day of week and hour of day period. The number of casualty and fatal crashes were also determined using the "count" function. The extracted data was then collated into the 5 year groupings and graphed.

5.3 R.U.M. Codes

The following series of figures and tables shows the crashes according to the R.U.M. Code assigned to them by the TCC as each record is entered into the Toowoomba City Council crash database.

5.3.1 RUM 00-09

The first column of the R.U.M. table is R.U.M 00-09, which is the Pedestrian grouping (on foot or in toy/pram), and deals with crashes involving pedestrians within the road reserve, including those undertaking road works, and those struck while in a driveway. This class of crash comprises 3.8% of all recorded crashes but 23% of fatal crashes.

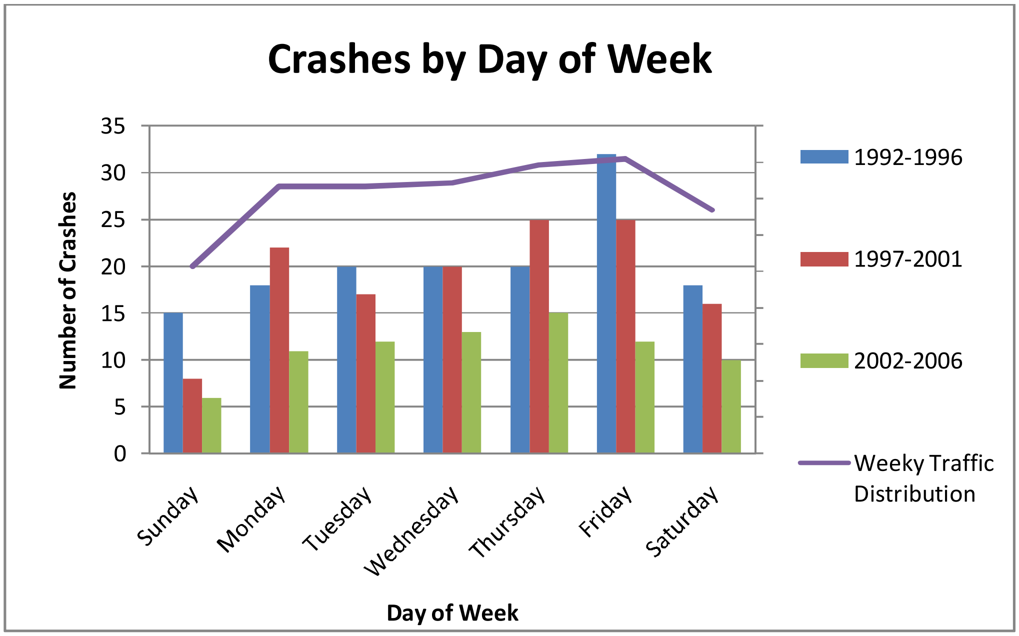


Figure 5.1 Crashes by Day of Week RUM Code 00-09

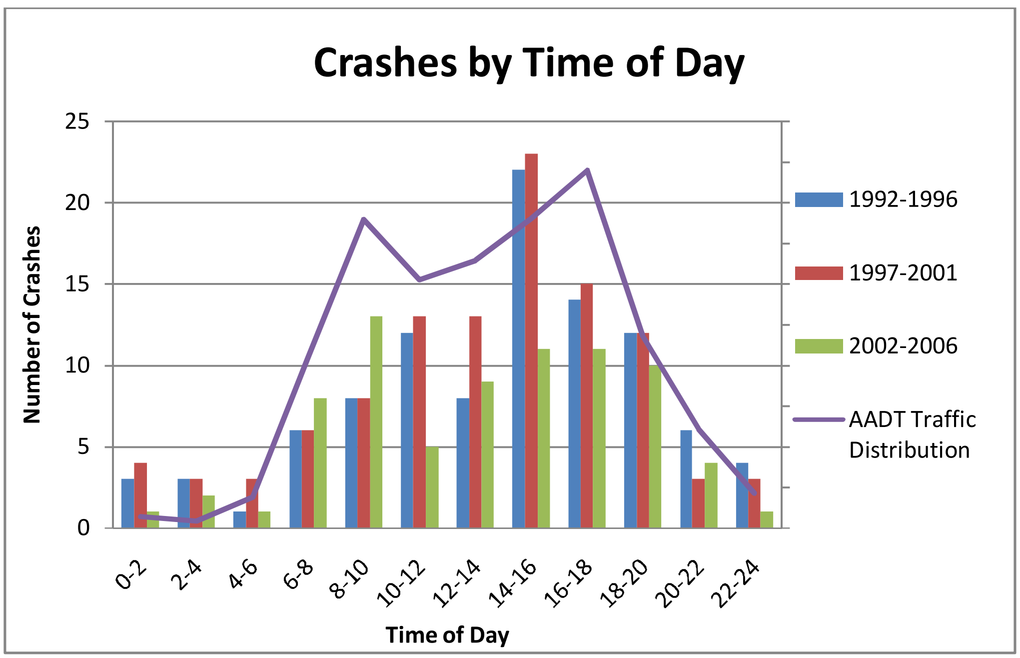


Figure 5.2 Crashes by Time of Day RUM Code 00-09

From Figure 5.1 above, it can be seen that the Day of the Week graph is fairly typical of an AADT graph despite concerning pedestrians with crash occurrences relatively flat through the working week, a noticeable peak on Friday and declining over the weekend. Figure 5.2 representing crashes by Time of Day shows that the crash occurrences are relatively indicative of the typical morning and evening traffic except for a noticeable peak in the 14-16 hours time period that may be caused be the pedestrian traffic related to the release of children from school during these hours.

The number of crash occurrences has generally decreased over the time period with a significant reduction in total accidents in the last 5 years (2002-2006), the rate of crashes causing a casualty have slightly decreased and the rate of crash events causing fatalities and crashes causing property damage significantly increased compared to the preceding 5 years, as shown below in Table 5.1:

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	143	124	7	12	28.6	86.713	4.90
1997-2001	133	112	3	18	26.6	84.211	2.26
2002-2006	79	60	5	15	15.8	75.949	6.33
TOTAL	355	296	15	45	23.67	82.29	4.49

Table 5.1 RUM Code 00-09 Crashes

5.3.2 RUM 10-19

The next column contains R.U.M Codes 10-19 and involves crashes of vehicles coming from adjacent directions. It is the most numerous of the categories looked at and contains approximately 29.3% of all recorded crashes.

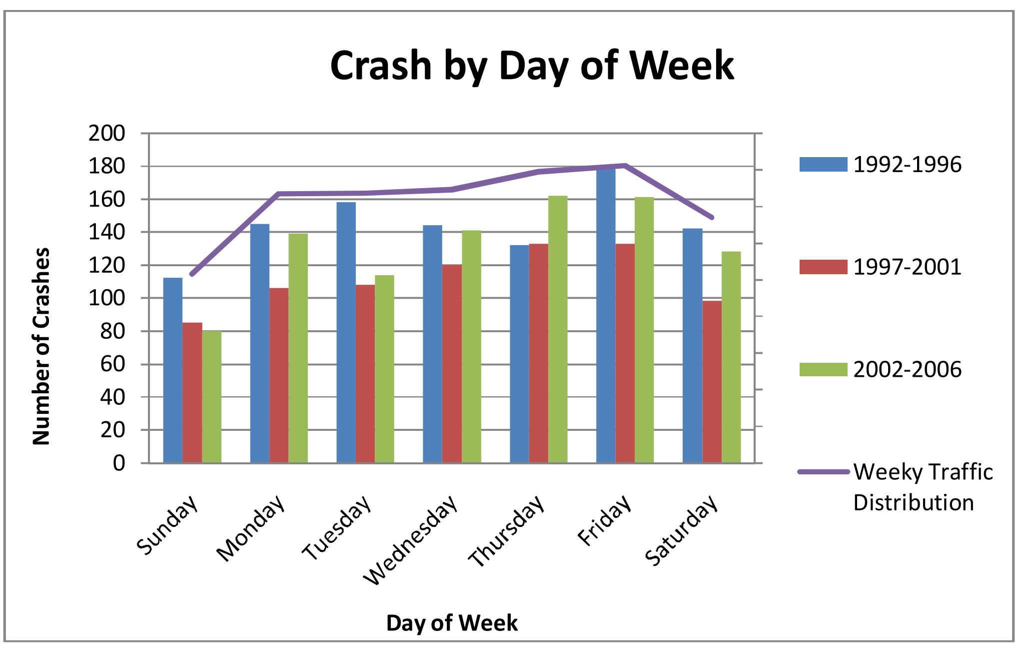


Figure 5.3 Crashes by Day of Week RUM Code 10-19

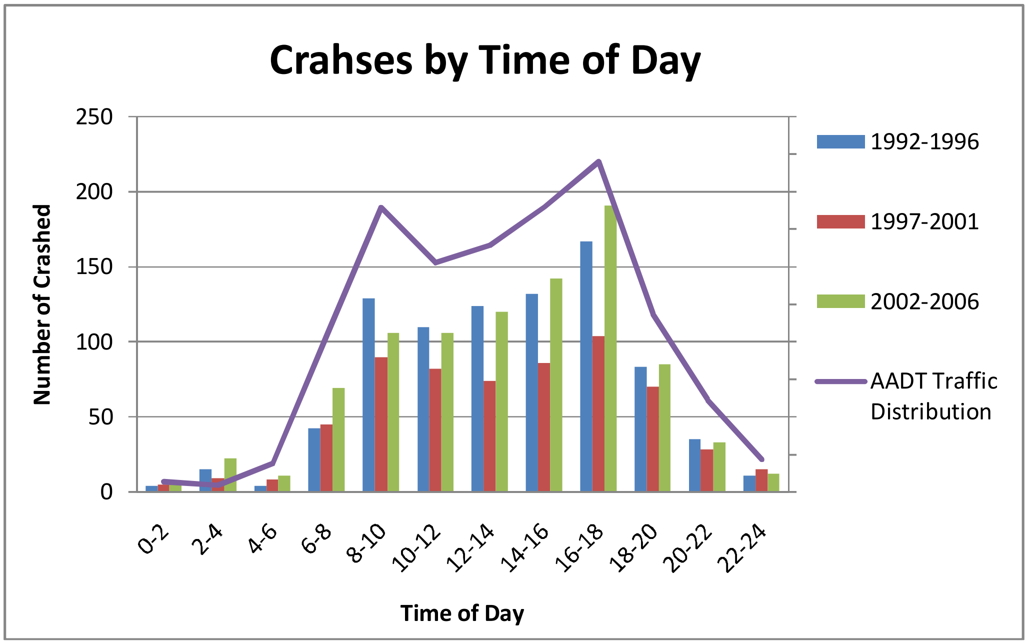


Figure 5.4 Crashes by Time of Day RUM Code 10-19

From Figures 5.3 above it can be seen that the crashes generally follow the traffic distribution trend by the Day of the Week with the week days fairly flat and a late week peak on Thursday/Friday. Figure 5.4 shows the Time of Day distribution of crash events, which follows the expected trend of a typical work day with a morning commuter peak, building towards the evening rush hour maximum.

From Table 5.2 it can be seen that though crashes of all types decreased from 1992-1996 levels, in the last five year period (2001-2006) they have increased again, except for the casualty rate which has decreased approximately 25% on the level set in the 1997-2001 time period.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	1011	450	8	690	202.2	44.510	0.79
1997-2001	783	377	4	521	156.6	48.148	0.51
2002-2006	925	334	6	671	185	36.108	0.65
TOTAL	2719	1161	18	1882	181.27	42.92	0.65

Table 5.2 RUM Code 10-19 Crashes

5.3.3 RUM 20-29

The next set of graphs involves vehicles travelling in opposite directions and are designated R.U.M Code 20-29 and though it only has 6 sections, consists of 18.2% of all crashes recorded in the nominated time period.

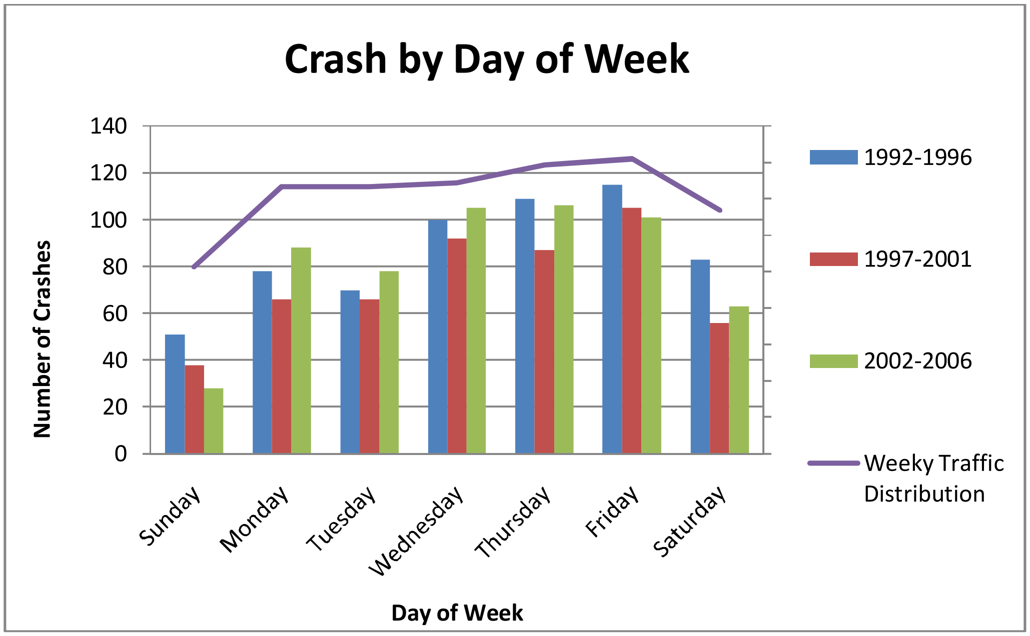


Figure 5.5 Crashes by Day of Week RUM Code 20-29

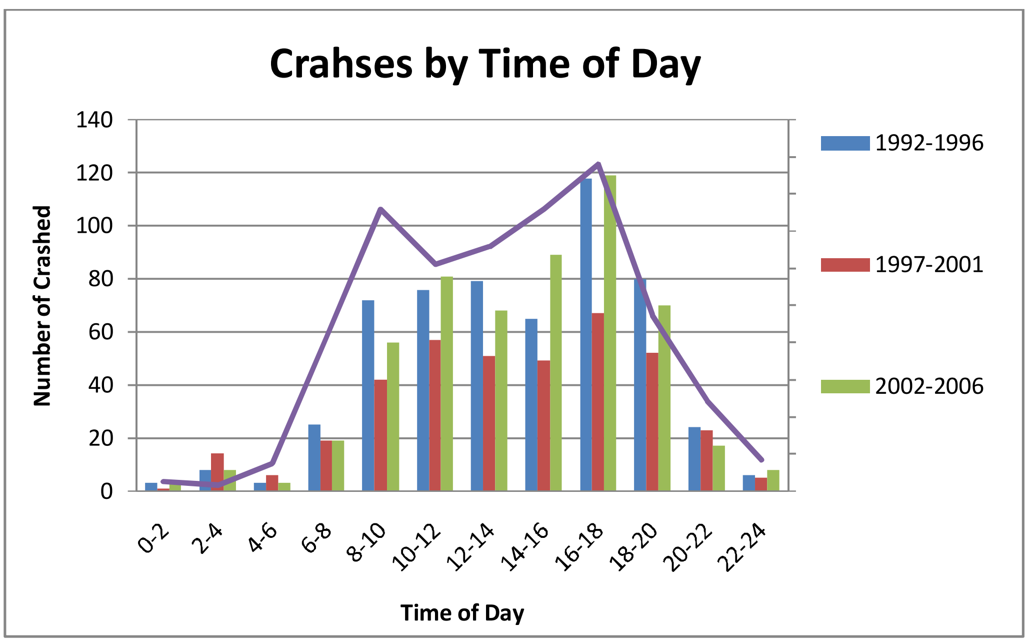


Figure 5.6 Crashes by Time of Day RUM Code 20-29

From Figure 5.5 above, it can be seen that the crashes by day of the week follows the typical distribution of the traffic, with a flat work week building to a Friday peak, with a significant decrease across the weekend. Crashes occurrences based on the hour of the day generally follow the expected pattern represented by the daily traffic distribution trend, though the early morning peak is not as pronounced as in some other cases.

From Table 5.3 below, it can be seen that RUM codes 20-29 follow a similar pattern to RUM codes 10-19, with decrease then an increase in crash occurrences and rates except for casualty crashes which increased through the middle years then decreased nearly 40% from the 1997-2001 rate.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	606	241	6	418	121.2	39.769	0.99
1997-2001	510	256	2	325	102	50.196	0.39
2002-2006	569	181	6	424	113.8	31.810	1.05
TOTAL	1685	678	14	1167	112.33	40.59	0.81

Table 5.3 RUM Code 20-29 Crashes

5.3.4 RUM 30-39

R.U.M. Codes 30-39 are used to describe crashes where the vehicles involved were travelling in the same directions and includes sideswipes and rear end collisions. This class constitutes 24.3% of total recorded crashes within the Toowoomba LGA but only accounts for 4.6% of fatal crashes.

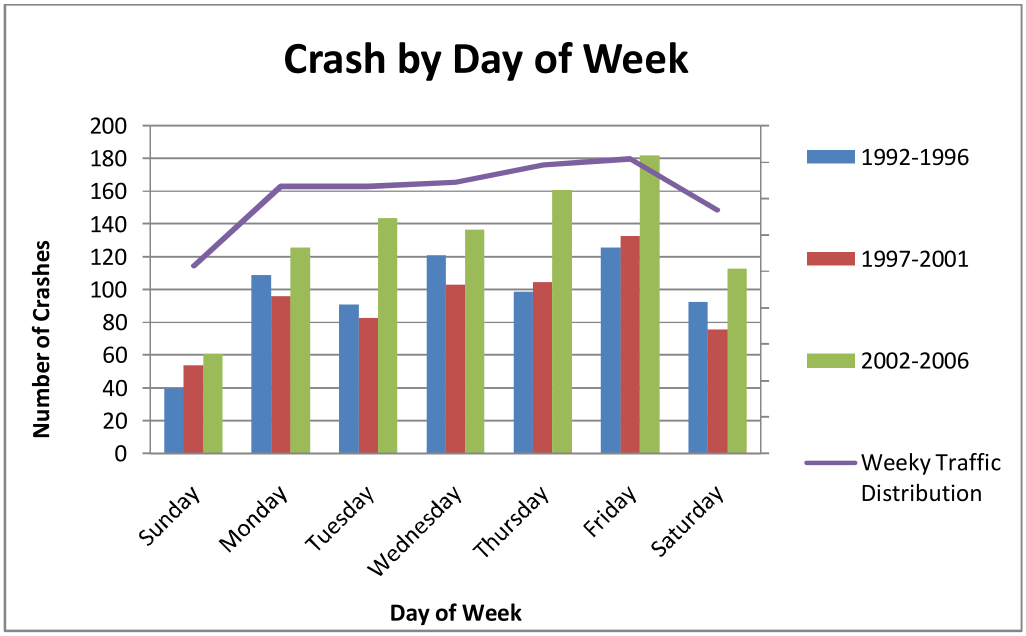


Figure 5.7 Crashes by Day of Week RUM Code 30-39

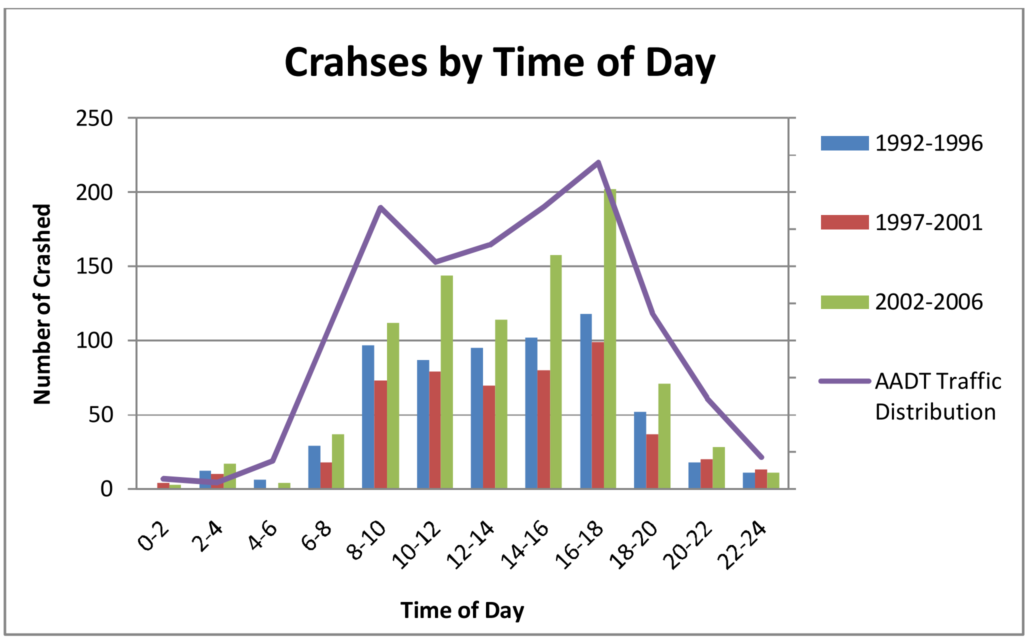


Figure 5.8 Crashes by Time of Day RUM Code 30-39

From Figure 5.7 above it can be seen that crashes follow the general weekly distribution of traffic numbers with a flat working week building to a Friday peak and decreasing across the weekend. Figure 5.8 shows crashes by time of day and again the crash data follows the distribution of traffic with a morning peak, flat through the day before peaking again in the early evening.

Table 5.4 shows that crashes and rates largely decreased from 1992-1996 to 1997-2001, but increased again in the 2002-2006 time period except for the casualty crash rate which increased then decreased.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	679	168	2	539	135.8	24.742	0.29
1997-2001	650	251	0	460	130	38.615	0.00
2002-2006	924	271	1	701	184.8	29.329	0.11
TOTAL	2253	690	3	1700	150.20	30.90	0.13

Table 5.4 RUM Code 30-39 Crashes

5.3.5 RUM 40-49

R.U.M Codes 40-49 are used to describe crashes are the result of a vehicle manoeuvring, such as U-turns, parking and emerging from driveways. Such crashes constitute approximately 5% of all crashes and no fatal crashes.

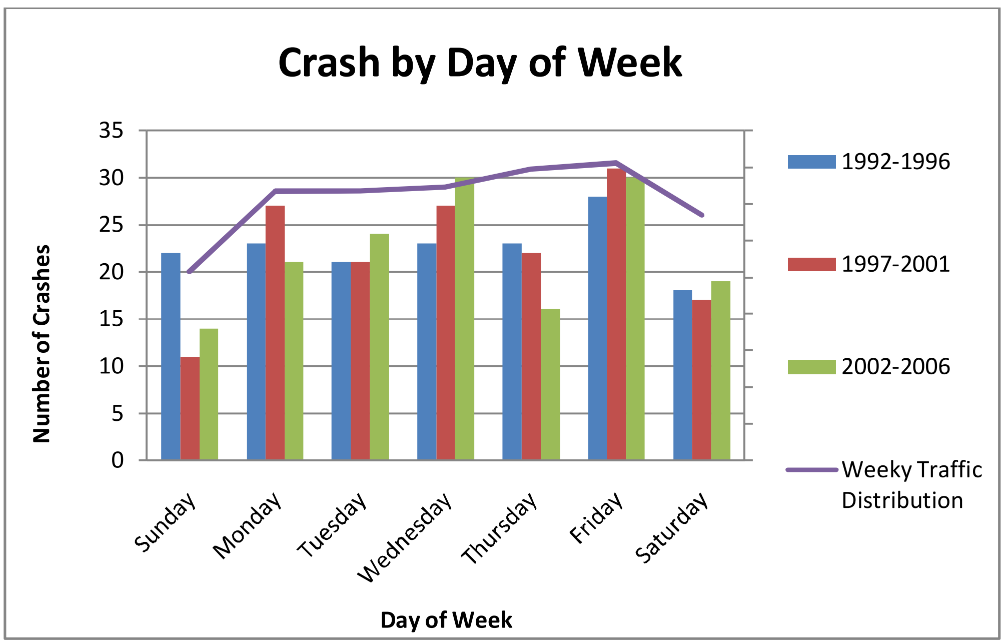


Figure 5.9 Crashes by Day of Week RUM Code 40-49

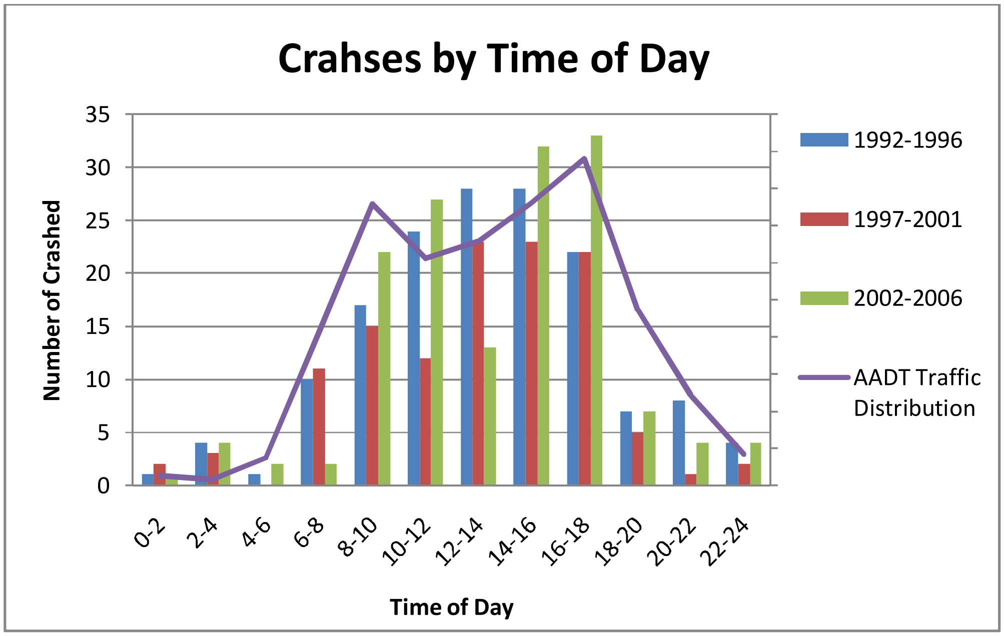


Figure 5.10 Crashes by Time of Day RUM Code 40-49

From Figure 5.9 is can be seen that crash occurrences follow the weekly traffic distribution of a flat working week with a small peak on Friday and decreasing across the weekend. Figure 5.10 indicates that the crash events generally are in accordance with the hourly distribution of traffic, though there is not the pronounced early morning commuter peak that is in evidence in some of the other RUM codes, rather a steady increase from the morning to about midday, from which it flattens until the afternoon before dropping off dramatically in the evening.

From Table 5.5 it can be seen that the number of crash occurrences for this RUM grouping has remained relatively constant throughout the study time period with a slight decrease in casualty crashes and corresponding increase in property damage crashes.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	158	58	0	117	31.6	36.709	0.00
1997-2001	156	45	0	115	31.2	28.846	0.00
2002-2006	154	41	0	121	30.8	26.623	0.00
TOTAL	468	144	0	353	31.20	30.73	0.00

Table 5.5 RUM Code 40-49 Crashes

5.3.6 RUM 50-59

R.U.M. Codes 50-59 are concerned with crashes occurring while vehicles are overtaking. Crashes of this kind make up the smallest number of accidents with just 1.0% of all recorded crashes.

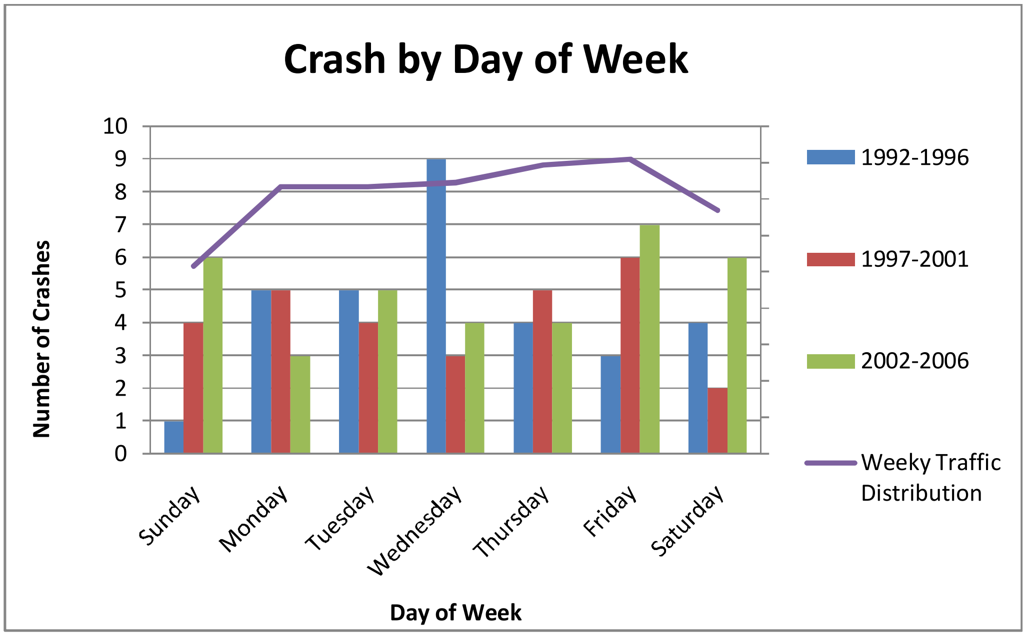


Figure 5.11 Crashes by Day of Week RUM Code 50-59

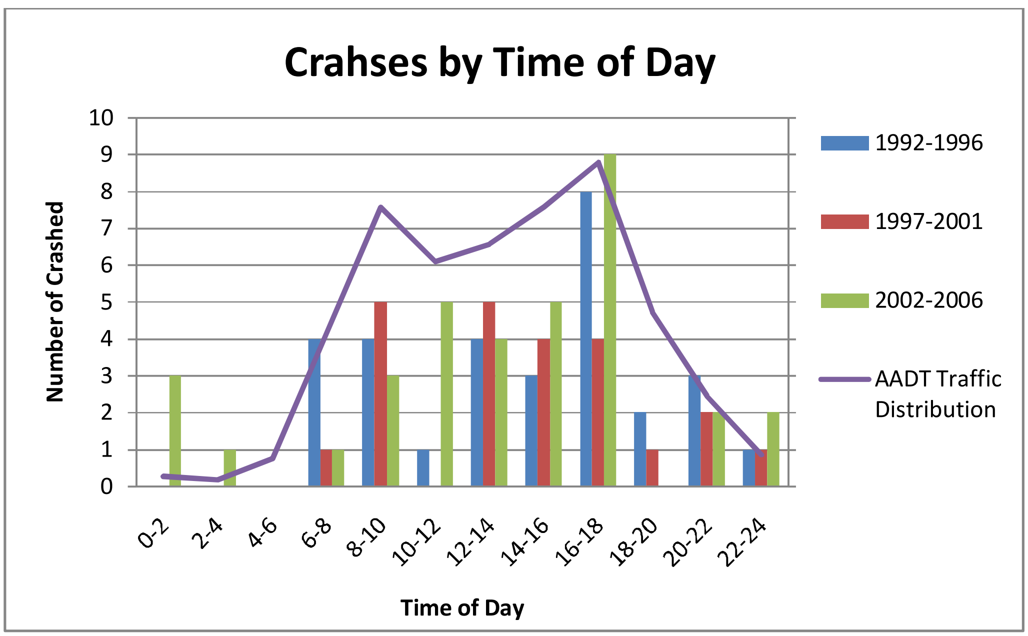


Figure 5.12 Crashes by Time of Day RUM Code 50-59

As demonstrated in Figures 5.11 and 5.12 and Table 5.6, the lack of crash events in this RUM code grouping means that it is impossible to make a reasonable assessment of any underlining trends within the data. The lack of data is likely a result of the highly urbanised investigation area with a lack of overtaking opportunities.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	31	5	0	26	6.2	16.129	0.00
1997-2001	29	12	1	17	5.8	41.379	3.45
2002-2006	35	7	0	29	7	20.000	0.00
TOTAL	95	24	1	72	6.33	25.84	1.15

Table 5.6 RUM Code 50-59 Crashes

5.3.7 RUM 60-69

R.U.M. Codes 60-69 are concerned with crashes involving vehicles colliding with stationary objects on the carriageway including temporary road works, parked cars and livestock or other animals. Such crashes comprise 5.3% of total crashes.

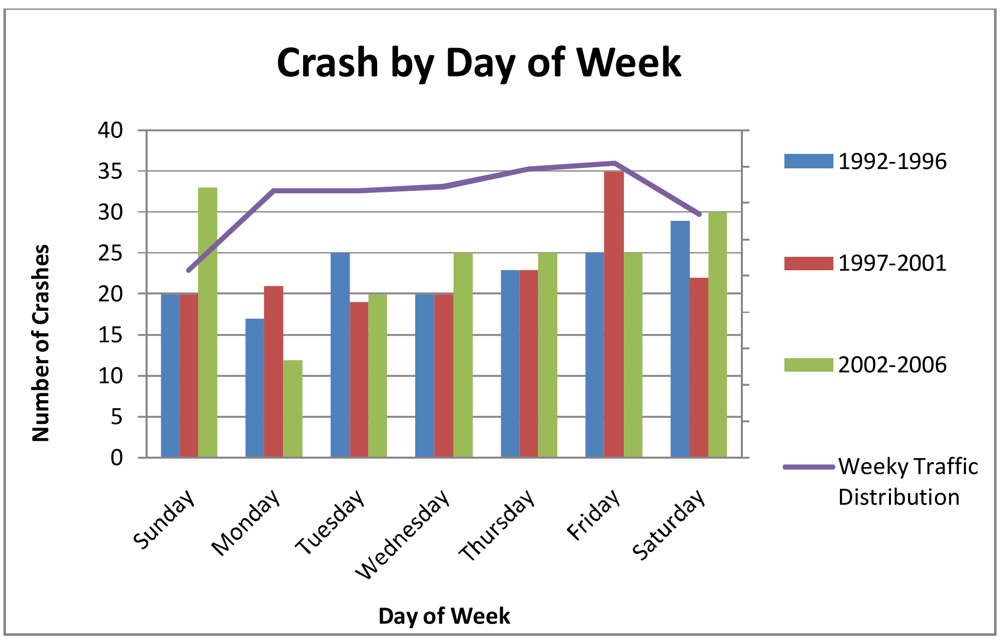


Figure 5.13 Crashes by Day of Week RUM Code 60-69

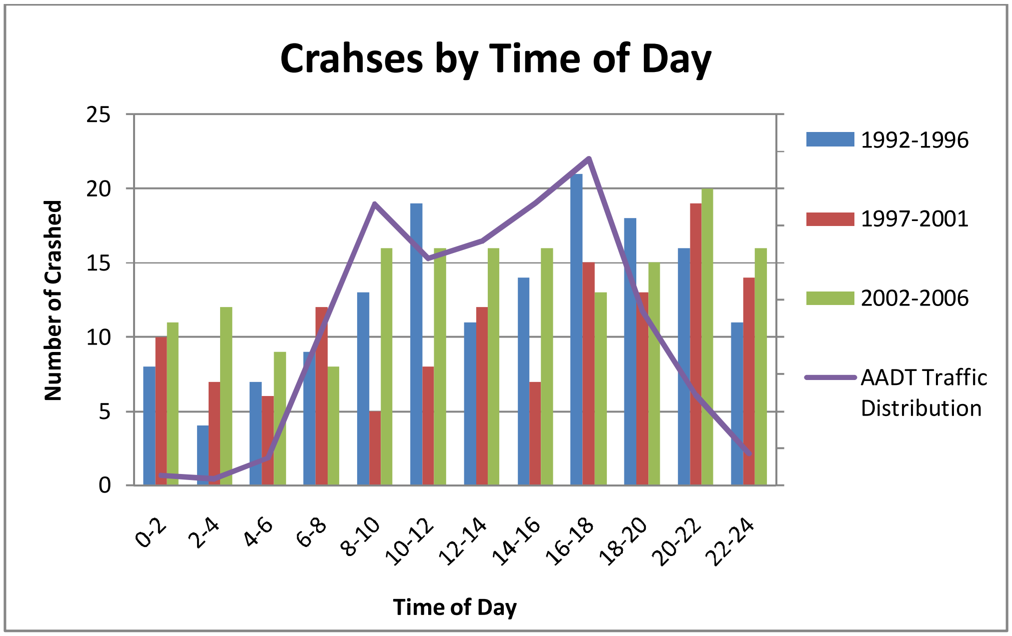


Figure 5.14 Crashes by Time of Day RUM Code 60-69

From Figure 5.13 it can be seen that generally crash occurrences grouped by days of the week are flat across the whole week, as opposed to a flat week and decline over the weekend, with just a slight peak on Friday. Figure 5.14 also shows that the crash occurrences do not match the profile of the daily traffic distributions, with a relatively high number of accidents occurring during the very early morning and early morning time periods. The graph then follows the anticipated trend being flat through the day and building towards an afternoon peak. However the peak only slightly decreases with crash events occurring right through to the late hours of the night.

From Table 5.7 it can be seen that there is a slight upward trend in the number of crash occurrences as time progress, though there is a decrease in the casualty and fatality rates, with a corresponding increase in property damage crashes.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	159	42	2	119	31.8	26.415	1.26
1997-2001	160	31	1	132	32	19.375	0.63
2002-2006	170	24	0	149	34	14.118	0.00
TOTAL	489	97	3	400	32.60	19.97	0.63

Table 5.7 RUM Code 60-69 Crashes

5.3.8 RUM 70-79

R.U.M. Codes 70-79 are use to code crashes that involve the movement of vehicles that leave a straight section of roadway (i.e. loss of control). Such crashes comprise 7.23% of total crashes.

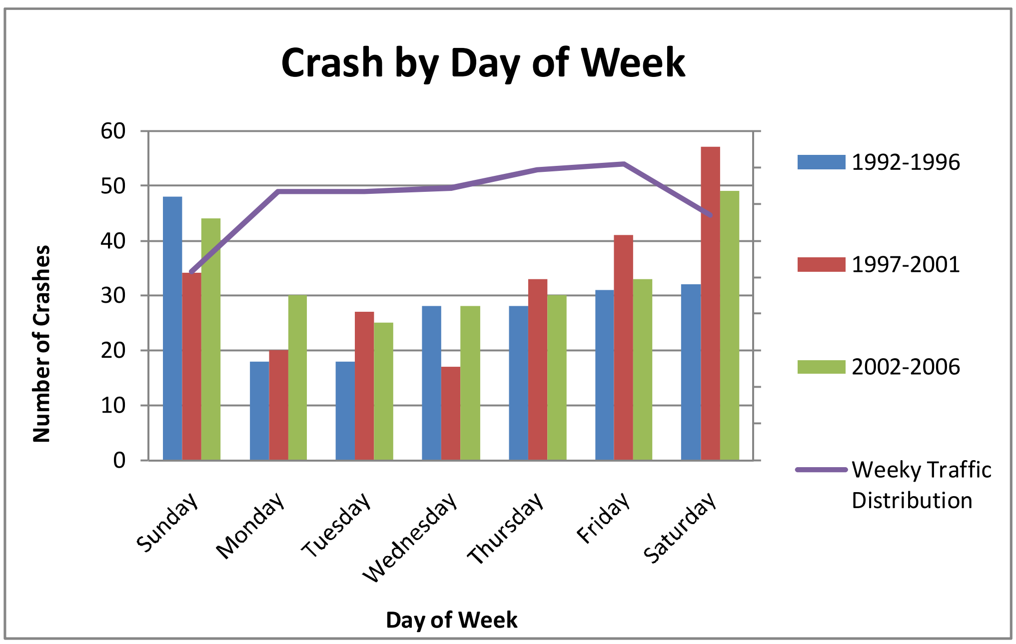


Figure 5.15 Crashes by Day of Week RUM Code 70-79

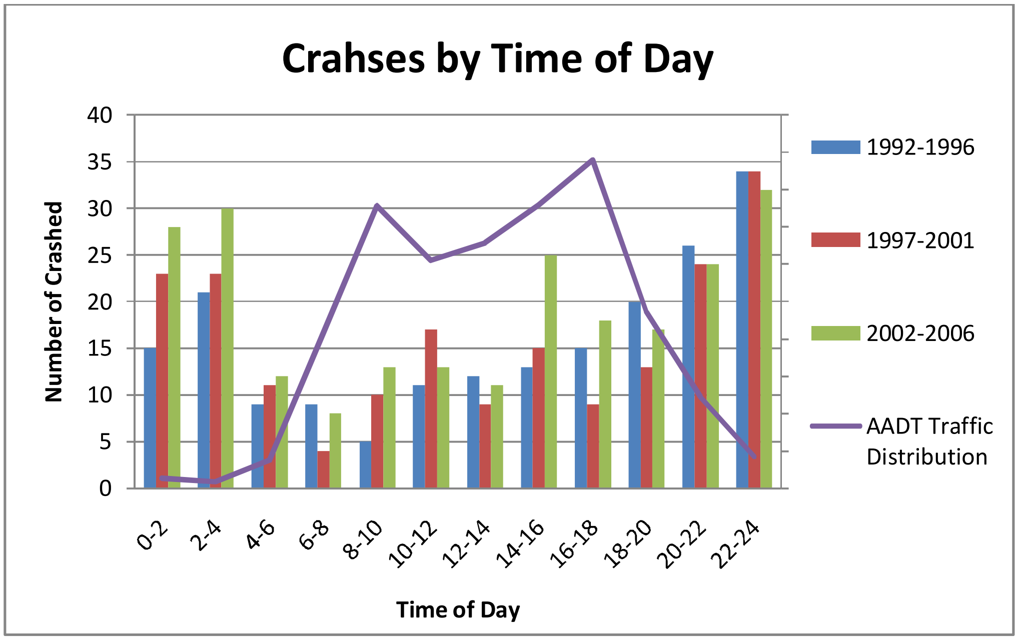


Figure 5.16 Crashes by Time of Day RUM Code 70-79

From Figure 5.15, it can be seen that crashes generally flat through the working week before peaking on the weekend, particularly on Saturday. From Figure 5.16, the hourly crash distribution is generally flat during the daylight hours before noticeably peaking in the late night-early morning period between 8:00p.m. and 4:00a.m. This suggests that traffic volume is not entirely related to crashes of this nature. Rather, driver behaviour such as drinking, speeding or fatigue, or environmental factors such as carriageway lighting may be to blame.

As shown in Table 5.8, crashes of this RUM grouping are increasing through time the casualty rate appears to be in decline, with a corresponding increase in property damage crashes. The fatality rate is harder to assess, with the rate returning to 1992-1996 levels after decreasing to almost nil in the 1997-2001 time period.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	203	73	7	140	40.6	35.961	3.45
1997-2001	229	82	1	161	45.8	35.808	0.44
2002-2006	239	79	8	174	47.8	33.054	3.35
TOTAL	671	234	16	475	44.73	34.94	2.41

Table 5.8 RUM Code 70-79 Crashes

5.3.9 RUM 80-89

R.U.M. Codes 80-89 are similar to 70-79 but involve leaving a curved carriageway or path. Such crashes make up 4.6% of total recorded crashes.

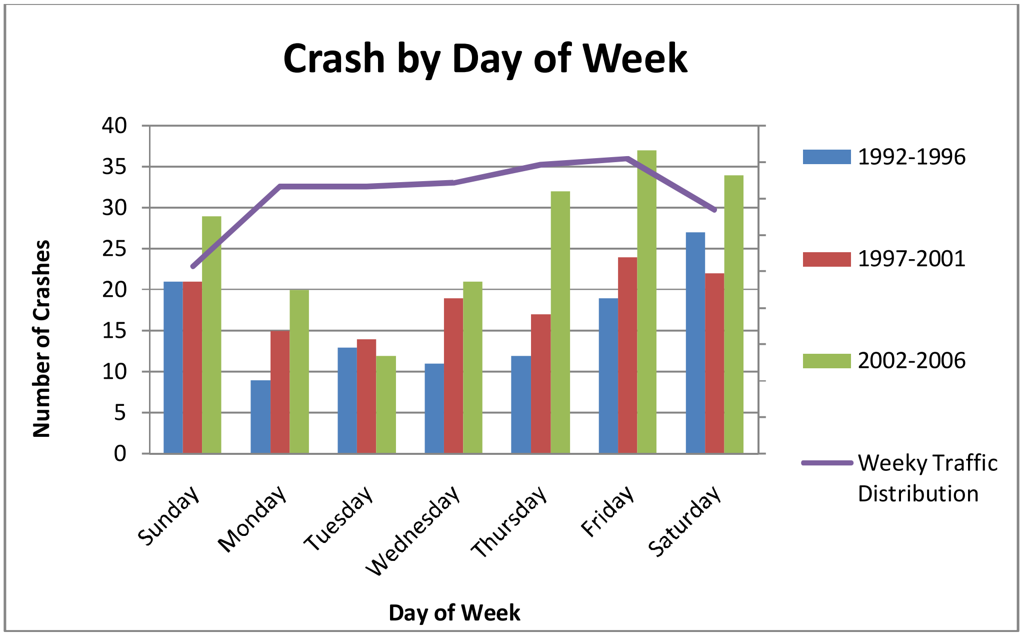


Figure 5.17 Crashes by Day of Week RUM Code 80-89

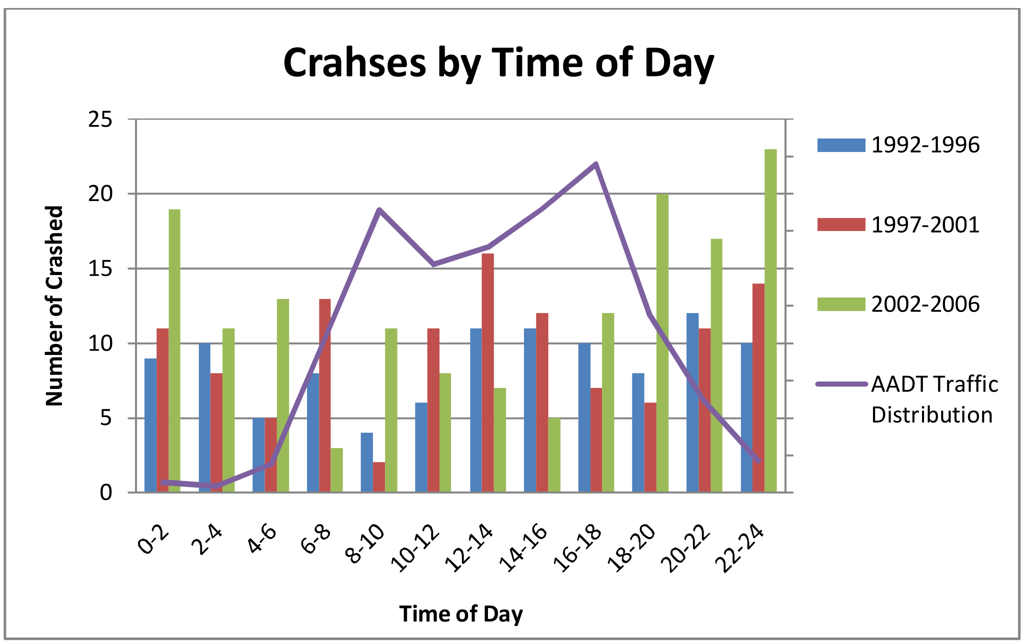


Figure 5.18 Crashes by Time of Day RUM Code 80-89

While not as pronounced as RUM Codes 70-79, there is still an indication from the Day of week graph, shown above as Figure 5.17, that the weekend has a different shape compared to a corresponding traffic volume graph, indicating again that traffic volume is not an overriding contributor to the crash class and that environmental factors contribute to this type of class. While the Time of day graph, shown above as Figure 5.18, appears more random then previous graphs and is less easy to interpret.

From Table 5.9 it can be seen that crash occurrences are increasing through time, thought the casualty rate decreases from the 1992-1996 level by almost half in the 1997-2001 period, it has again increased in the 2002-2006 timeframe.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	112	37	0	84	22.4	33.036	0.00
1997-2001	132	24	0	110	26.4	18.182	0.00
2002-2006	185	41	1	152	37	22.162	0.54
TOTAL	429	102	1	346	28.60	24.46	0.18

Table 5.9 RUM Code 80-89 Crashes

5.3.10 RUM 90-99

R.U.M. Codes 90-99 include both an “Other” user movement as well as an “Unknown” user movement that is used to describe any crash where complete uncertainty exists about the movements preceding the crash. The 90-99 class comprises just 1.2% of total crashes.

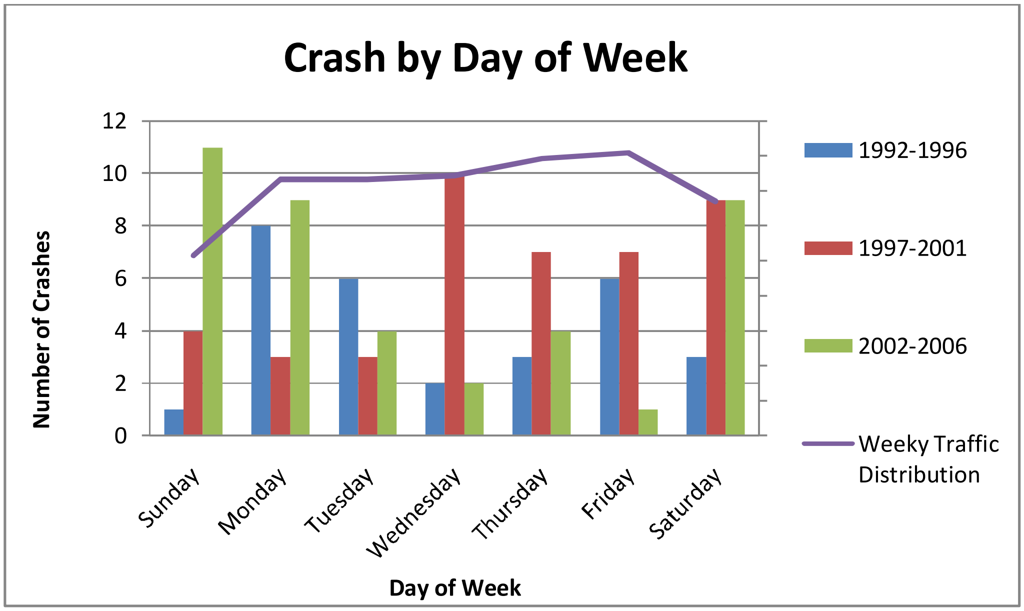


Figure 5.19 Crashes by Day of Week RUM Code 90-99

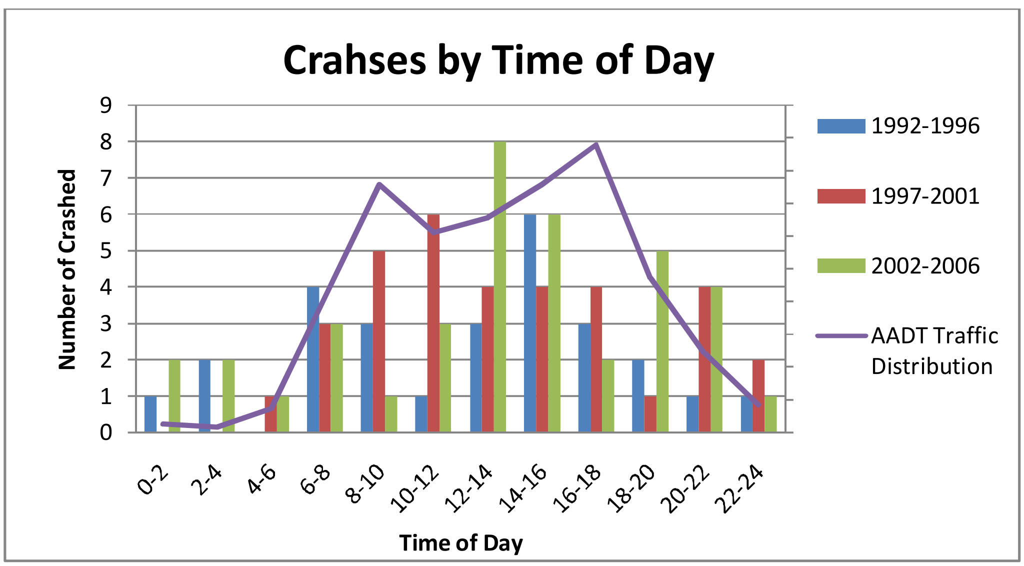


Figure 5.20 Crashes by Time of Day RUM Code 90-99

As with RUM Codes 50-59, there is insufficient data across the time period to draw any reasonable and relevant conclusions. Again, Figures 5.20 and 5.21 are included for completeness of information.

Statistics concerning crash severity are also reproduced here in Table 5.10, but as previously mentioned, the lack of crashes of this type results in data that is statistically unreliable.

Time Period	Total Crashes	Casualty	Fatal	Property Damage	Crash Frequency	Casualty Rate	Fatal Rate
1992-1996	29	13	0	18	5.8	44.828	0.00
1997-2001	43	14	1	29	8.6	32.558	2.33
2002-2006	40	19	0	21	8	47.500	0.00
TOTAL	112	46	1	68	7.47	41.63	0.78

Table 5.10 RUM Code 90-99 Crashes

6 Hierarchical Analyses

6.1 Introduction

As there was insufficient traffic count data to directly compare TCC roads and declared roads within the study area, it was decided that a selection of roads would be analysed.

The TCC streets selected were those which representative of the functionality objectives according to the hierarchical designation, and for which there was traffic volume and crash data to make a practical analysis possible. Though the TCC hierarchy consists of 4 levels only two of highest order road types were selected, those being Sub-Arterial and Trunk Collector classified roads.

6.2 Data Analysis Methodology

To begin the analysis it was necessary to select the streets from each of the hierarchy levels to be analysed. The criteria used for selection of the roads for each of the classes depended upon the accuracy and validity of recorded crash data, the accuracy and validity of traffic counts, and whether the road served the functionality of its level described in Chapter 4.

The crash data was sourced from the same crash database used in Chapter 5. Separate databases where created for each classification type. For sub-arterial and trunk collector roads under the control of the Toowoomba City Council, this involved selection using the "STREET1" column and inputting the selected streets for each of the road class. Only the "STREET1" was used as a means of attributing crashes to a specific street as to remove the possibility of a single crash being assigned to more than one street, especially at intersections of selected streets. It was then a matter of removing crash events that did not happen along the section of the roadway designated as the relevant hierarchy by the Toowoomba City Council Planning Scheme regulatory maps. These crashes where eliminated using the "STREET2" column, with reference being made to TCC's online mapping service, ATLIS. This was a particularly slow process but appeared to be the only way to verify that only crashes occurring along the appropriately designated sections were included in the analysis.

Traffic counts for the sub-arterial and trunk collector roads were obtained from the Toowoomba City Council, though due to resource limitations, a count was not available for every year on each of the selected roads. To enable a comparison based on AADT counts, a traffic growth of 3% per annum was used for sub-arterial roads and an growth of 2.4% used for trunk collectors.

For the State and Federal highways, the separation of the required data was much easier, with the dataset for each authority created using the values found in the "S1AUTH" column. While this resulted in the amalgamation of non-contiguous road sections of the same authority, such as Taylor Street and the New England Highway and the Warrego Highway with the Gore Highway, it was considered acceptable.

6.2.1 Sub-Arterial Roads

With the exceptions of Taylor Street west of Tor Street and Brisbane Street which are both declared roads, all other sub-arterial roads within the TCC LGA are TCC controlled roads. The roads selected as part of the analysis are:

- West Street, from Stenner Street to Mort Street. It is predominately a four lane undivided roadway, with the exception of the 2km section between Stenner Street and Drayton Road. It has major intersections with James Street, Herries Street, Anzac Avenue and Russell Street, and with Bridge Street;

- Herries Street, from Anzac Avenue to Kitchener Street. It is four lanes the length that is designated sub-arterial, with major intersections with Kitchener

Street, Hume Street, Ruthven Street, Neil Street, West Street and Anzac Avenue;

- Kitchener Street, which has a four land carriageway apart from a section between Herries and Margaret Street. It has major intersections with Margaret Street, Herries Street, James Street and Ramsay Street. A section of Perth Street and Mackenzie Street classified as sub-arterial has also been included as part of this analysis. ; and

- Drayton Road, which is a single lane each way, and has significant intersections with West Street, South Street, Alderley Street and West Street.

Other roads designated as sub-arterial include, but are not limited to, Hume Street between Stenner and James Street, Russell Street between West Street and Victoria Street, Clifford Street between Herries and Russell Streets, Bridge Street between Ruthven and Tor Street, Jellicoe Street between Ruthven Street and the West/Mort Street intersection and Boundary Street between Hursley Road and Willims Road. Maps displaying all roads with a Sub-Arterial designation may be obtained from the Toowoomba City Council website (http//:www.toowoomba.qld.gov.au).

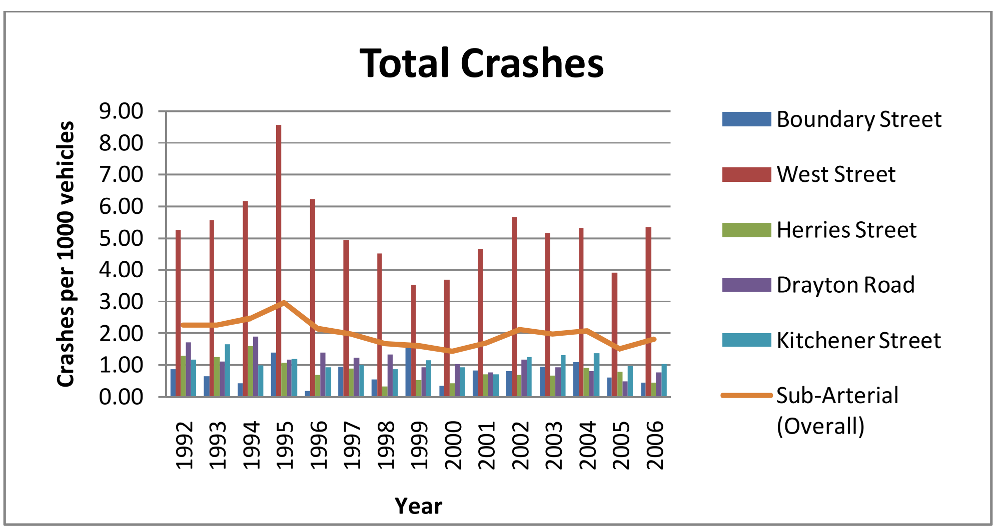


Figure 6.1: Total crash rates on sub-arterial streets

From figure 6.1 above, it can be seen that in terms of total crashes per 1000 AADT vehicles, West Street generally has a rate nearly three times greater than the next highest rate and over twice the overall rate of total crashes on the selected roads. The frequency of the crashes is generally in keeping with the cyclic nature seen in the overall Toowoomba City frequencies discussed in Chapter 5, with peaks at 1994/1995 and 2002/2003 and a trough around 2000. However in the instance it appears that there is a downward trend in the number of crashes.

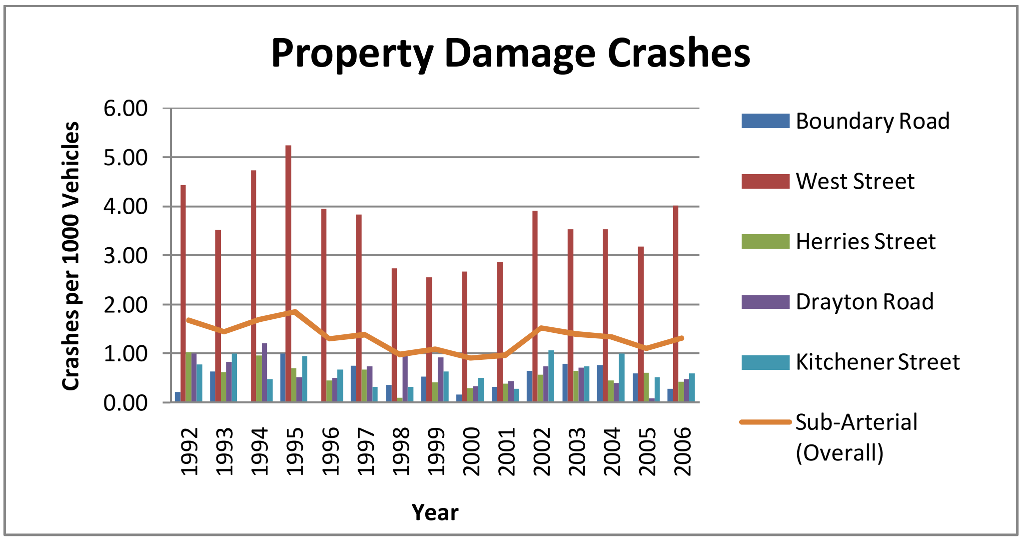


Figure 6.2: Property Damage crashes on sub-arterial streets

The high rate on West Street is again evident, this time in terms of crashes causing property damage as shown by figure 6.2. Again, the rate along West Street is generally greater than 3 times the next highest rate and twice the rate of overall property damage crashes. Again the cyclic nature through the years is present but not to the extent exhibited in the total crashes.

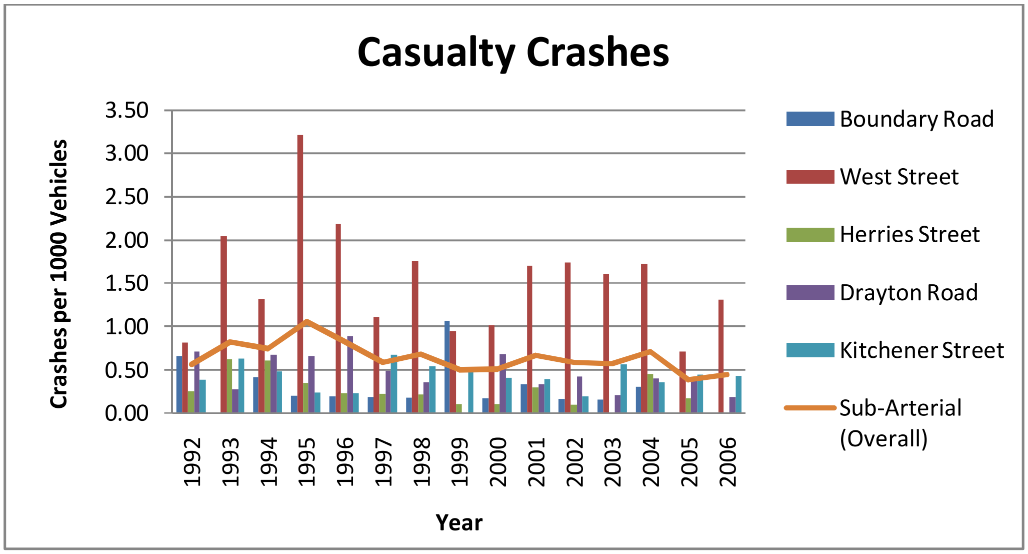


Figure 6.3: Casualty crashes on sub-arterial streets

In figure 6.3, it can be observed that in terms of casualty crashes, West Street has a rate generally higher than that of the overall crash rate. However, in years 1992, 1994, 1999 and 2005 the difference is not as pronounced compared to total and property damage crash rates and in 1999, Boundary Road had the highest casualty crash rate. The frequency of the casualty crashes appears to have a downward trend through time.

Fatal crashes and the rates and frequencies at which they occur are can be seen in Table 6.1 below. Due to the lack of fatal crash occurrences there is no discernable trend able to be observed from the data. It is merely presented below in Table 6.1 for completeness of information.

Time Period	1992-1996	1997-2001	2002-2006
AADT	37745	43757	50726
Fatalities	4	2	3
Rate per 1000 AADT	0.10597404	0.0457071	0.059141

Table 6.1 Fatal Crashes on Sub-arterial Roads

6.2.2 Trunk Collector Roads

Only three of the trunk collector designated roads throughout the Toowoomba road network were deemed to have sufficient traffic count and crash data to make a representative analysis of the road class. The roads are:

- Stenner Street, from Luck Street to Rowbotham Street, with significant intersections with Hume Street, Ruthven Street, West Street and Drayton Road;

- Alderley Street, from Anzac Avenue to High Street, with significant intersections with Hume Street, Ruthven Street, West Street, Drayton Road and Anzac Avenue; and

- South Street, from MacDougall Street to Rowbotham Street, with significant intersections with Mackenzie Street, Hume Street, Ruthven Street, West Street and Anzac Avenue.

Maps displaying all roads with a Trunk Collector designation may be obtained from the Toowoomba City Council website (http//:www.toowoomba.qld.gov.au).

As with the Sub-arterial roads, each of the selected roads is graphed according to total crash occurrences, casualty crash occurrences and property damage crash occurrences as well as the overall rate of the crash severities.

There were even less traffic count data obtained from the Toowoomba City Council available for trunk collector roads than sub-arterial roads, and again due to resource limitations, a count was not available for every year on each of the selected roads. To enable a comparison based on AADT counts, a traffic growth of 2.4% per annum was used for trunk collector roads.

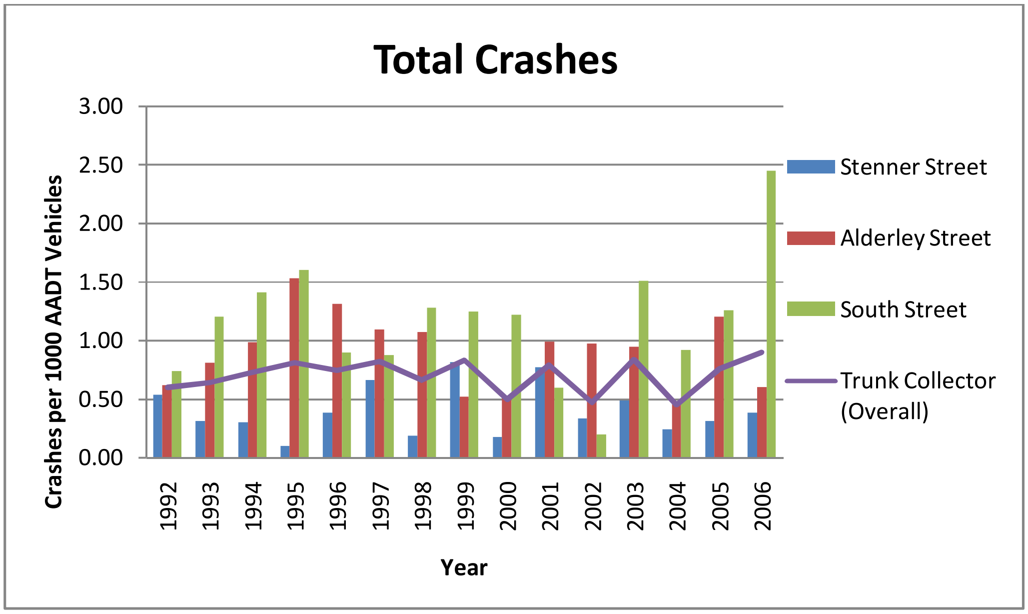


Figure 6.4 Total crashes on trunk collector streets

From Figure 6.4, it can be seen that due to the low volume of crash occurrences, the overall rate of crashes along the select trunk collector streets is highly variable. This variability in the overall rate is also common to property damage crashes and casualty crashes of the trunk collector hierarchy as illustrated below by figure 6.5 and 6.6 respectively.

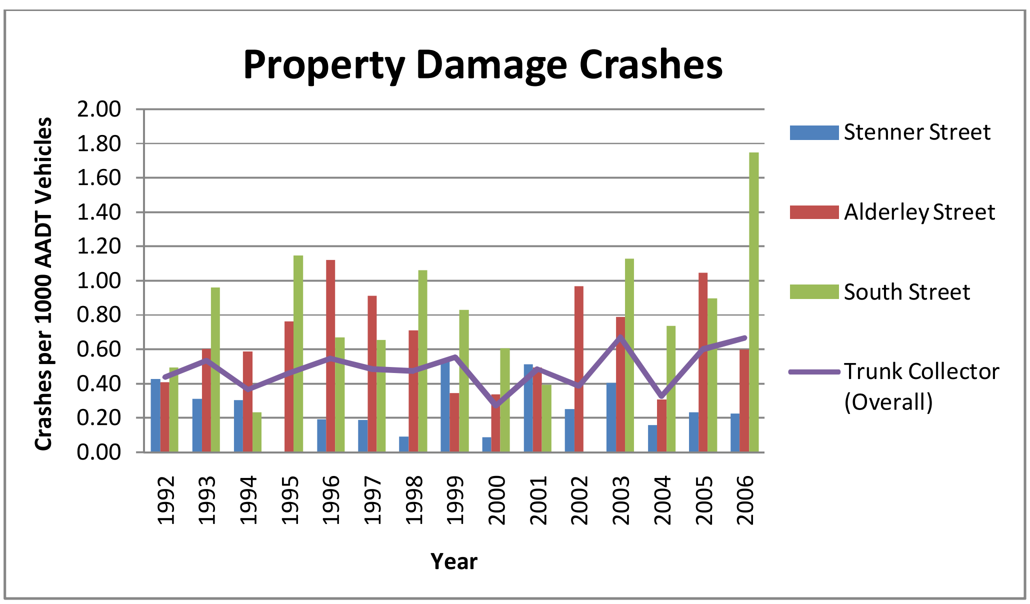


Figure 6.5 Property damage crashes on trunk collector streets

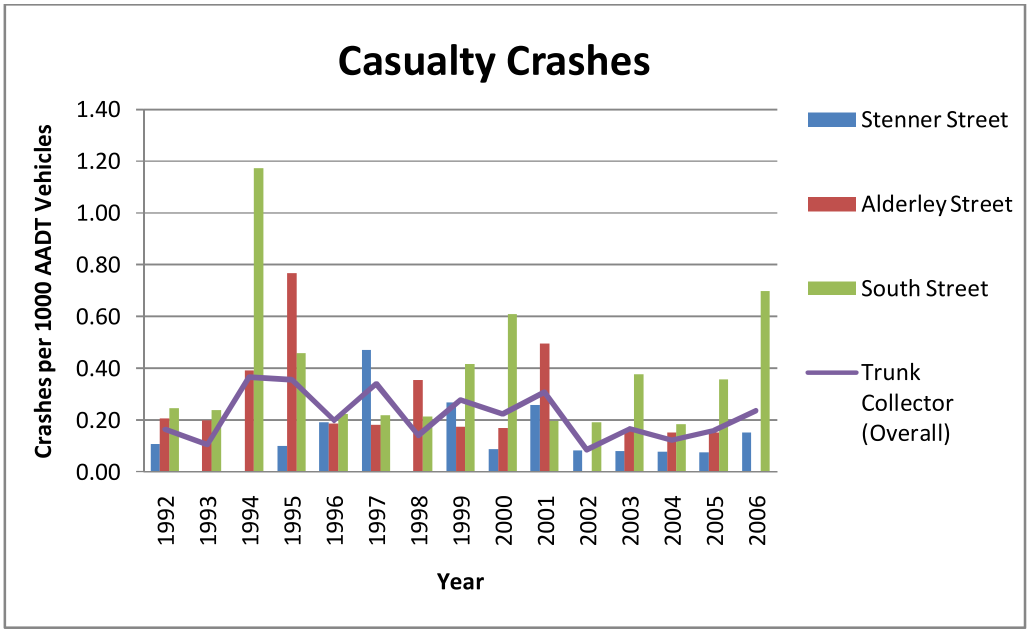


Figure 6.6 Casualty crashes on trunk collector streets

As with sub-arterial roads, there is not enough crash data relating to fatal accidents to make any meaningful observations, with only a single fatal crash occurring along the selected roads within the 15 year timeframe, that being a single fatality on Stenner Street in 1998.

6.2.3 Declared Roads

Analysis of the declared roads within Toowoomba involved a less complicated process than was required for each of the TCC controlled as it was easier to extract the relevant data from the database. The declared roads were divided into the level of authority, either "State" controlled or "Federal" controlled.

The AADT figures were also easier to create and are likely to be of higher accuracy as the Department of Main Roads was able to supply traffic count data already in AADT form from multiple locations along all highways back to 1992. For the purposes of this investigation these figures were simply averaged out.

As there are only two datasets for this section there are no graphs or comparisons made, such as those presented for each of the trunk collector and sub-arterial sections. Instead, the state and federal controlled roads will be directly compared against the truck collector and sub-arterial streets in the next section.

6.3 State and Federal vs. TCC

In this section the roads under the control of the Department of Main Toads will be compared against the higher order roads under the authority of the Toowoomba City Council.

In terms of the total crash rate, Figure 6.7 shows that the state and federal rates are quite comparable, though both are generally three to four times greater than the rate observed on sub-arterial roads, and up to eight times greater than that observed on trunk collector streets. It should be noted that the difference in rate would be higher between the State and Federal roads would be even greater if the West Street data was excluded from the analysis.

The same cyclic trend through the years that was observed in the sub-arterial crashes is present in the State data but is less evident in the Federal data.

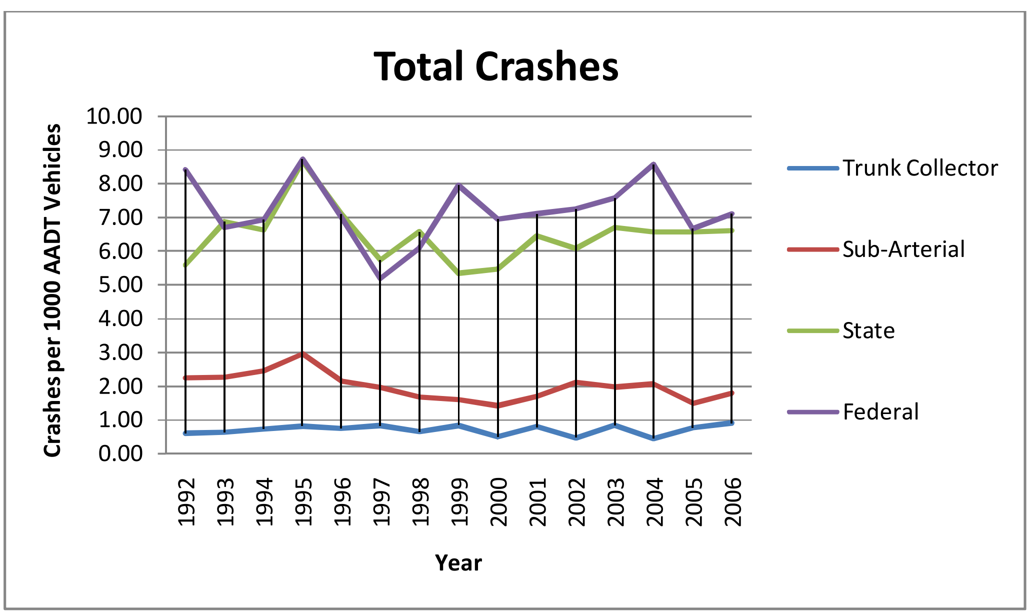


Figure 6.7 Total crashes across road types

In terms of property damage only crashes, Figure 6.8 shows similar results to total crashes with the rates of State and Federal roads between two and four times greater than arterial roads and six to eight times greater than trunk collector roads.

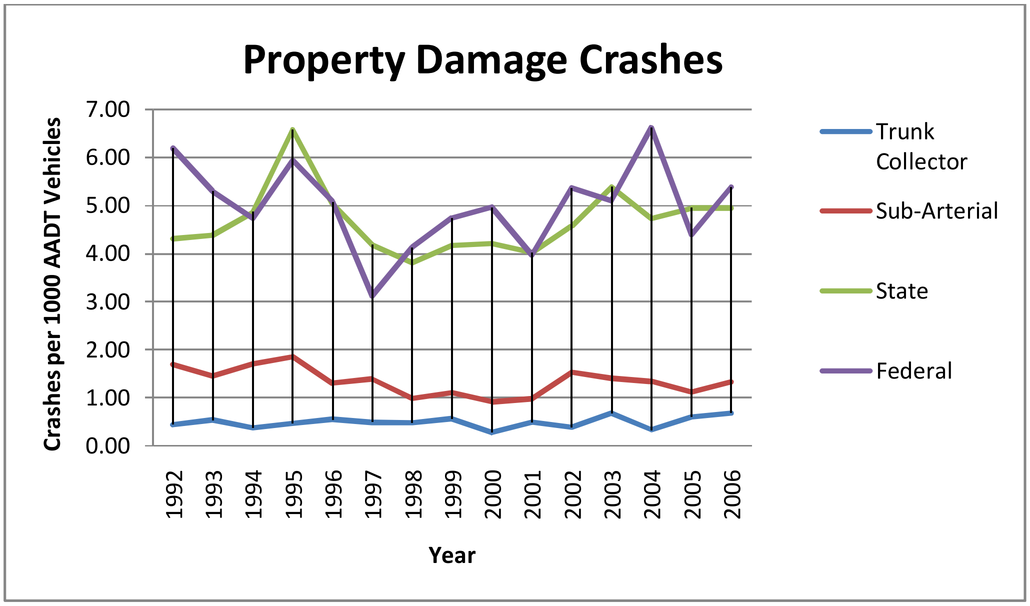


Figure 6.8 Property damage crashes across road types

Figure 6.9 shows that while the rate of crashes causing injury is still greater on State and Federal roads, the difference between them and the sub-arterial and trunk collector streets is less pronounced than the previous crash categories. The graph also demonstrates that rate of casualty crashes on the State and Federal roads are more variable than that observed on the sub-arterial and trunk collector roads, though both State and Federal roads still exhibit a slight downward trend over the time period, similar to the sub-arterial and truck collector roads.

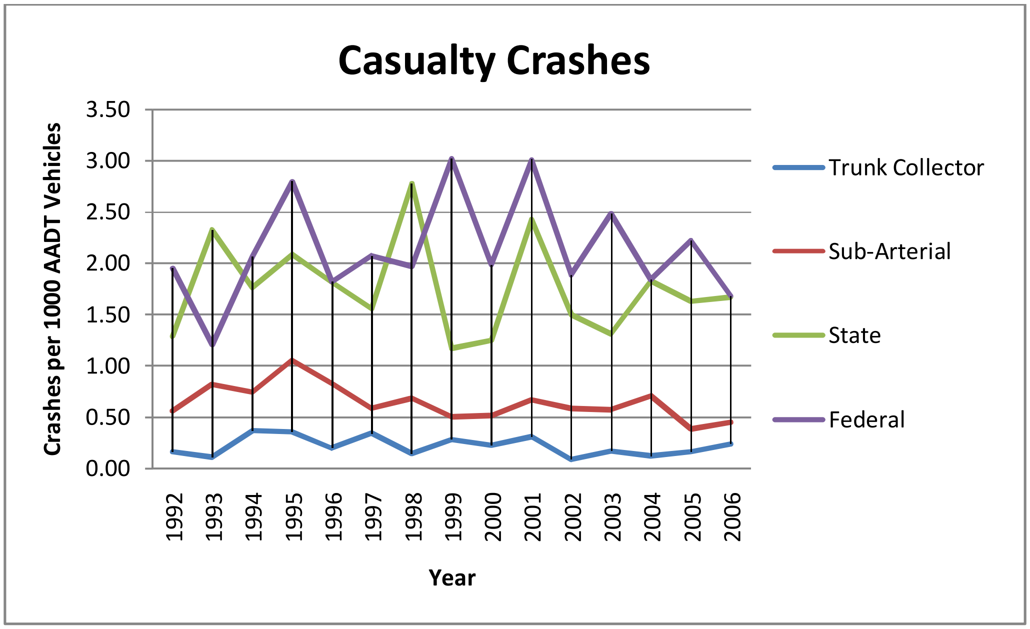


Figure 6.9 Casualty crashes across road types

Figure 6.10 it can be observed that across the various road types that the overall distribution of crashes tends to follow that of the weekly traffic distribution observed earlier, with a flat working week building to a peak on Friday and a noticeable decline on the weekend. It should be noted that the trunk collector data was plot to a different scale to that of the other road types to allow for a reasonable comparison.

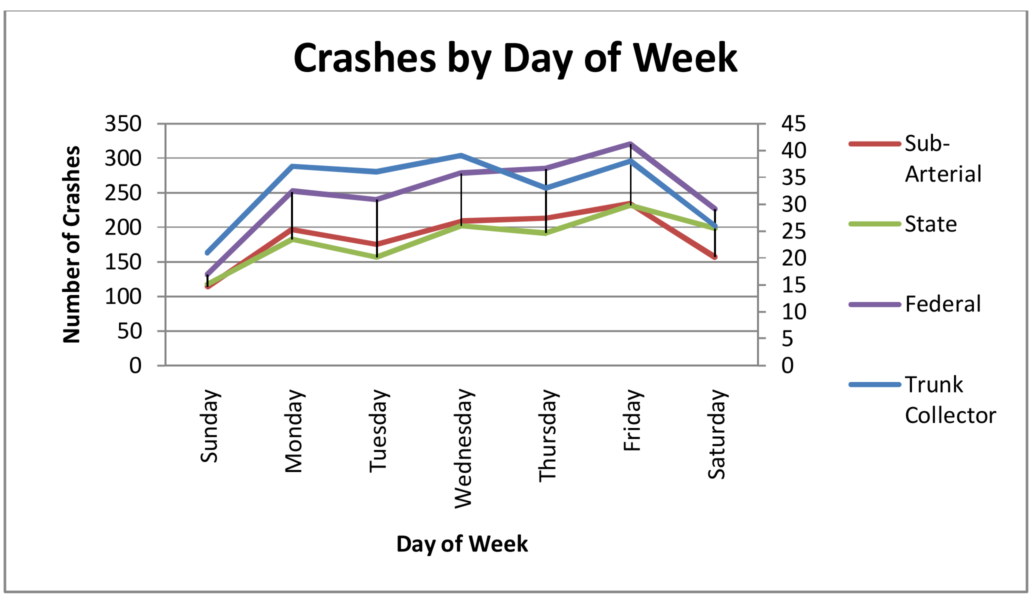


Figure 6.10 Day of week crashes across road types

As can be seen in Figure 6.11, the State, Federal and sub-arterial roads show that the timeframe where most crashes occur is coincidental to the peak traffic flows observed throughout Toowoomba City, with crash occurrences very flat through the early morning before peaking during the morning commute, spread from 8:00a.m. to 12:00p.m., and remaining constant through the day before again peaking during the afternoon commute and dropping as the evening progresses.

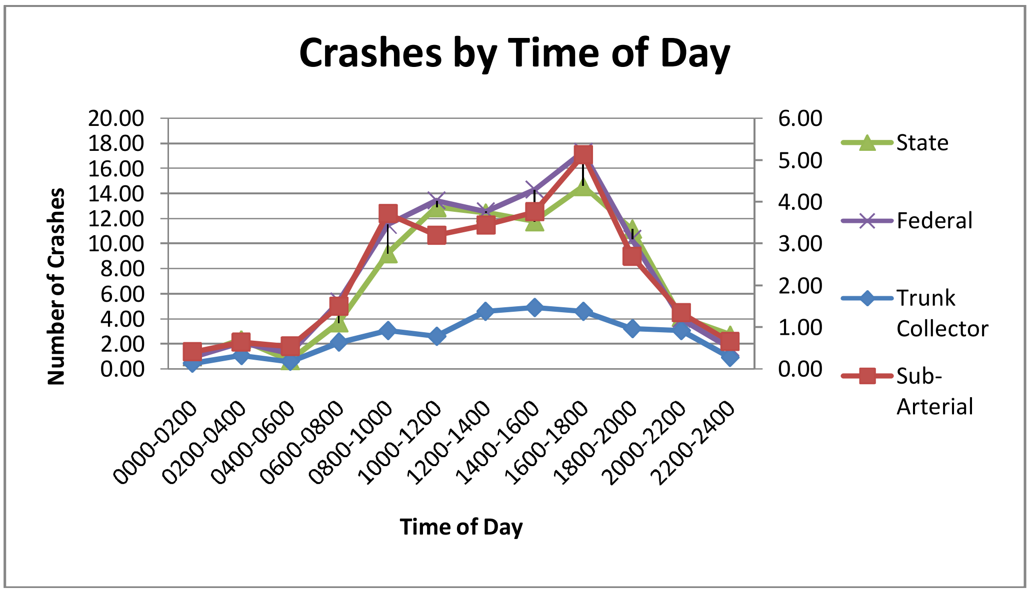


Figure 6.11 Crashes by Time of day across road types

The trunk collector road type again had to be plotted on a separate scale to enable comparison and shows that while there is not the pronounced peak of crashes associated with the morning commute, unlike the other road classes the crashes through the middle of the day occur and greater numbers and there is an complete absence of an spike in crash occurrences representing the evening commute from work.

6.4 Summary

This chapter has looked at the level of severity of crashes occurring on the State and Federal controlled highways and selected roads of the two highest class of road under the authority of the Toowoomba City Council. The comparison was based on the average AADT volumes recorded along the selected roads. A comparison was also made between the selected roads of the hierarchies to determine if there are any differences between roads within the same hierarchy class.

7 Discussion of Results

7.1 Introduction

This chapter builds on the discussions and the results obtained from the previous two chapters. The validity of the data used will also be discussed as well as other problems that arose during the analysis.

7.2 R.U.M. Codes

In the Toowoomba area it was established that intersection crashes make up a majority of crash records, and this is reflected throughout the crash types with RUM codes containing vehicle movements that cross traffic streams have a higher percentage of crashes compared to those that did not.

It was noted that consistently there would be a decrease in the occurrence of crashes through the middle five years of the investigation timeframe compared to the first five years, but would nearly always increase again for the last five years. Pedestrian crashes do not follow this trend, as there has been significant reduction in the total number of crashes in the 2002-2006 timeframe, though casualty and fatal crashes still remain higher than the average over all crash types. It should be noted that within the 2002-2006 timeframe, the 50km/h speed limit was introduced along residential streets (February 2003) and that the 40km/h speed limit was also introduced

Most of the crash types were observed to have followed the trend of the AADT distribution, giving a fairly good indication that more traffic on the road will result in a higher occurrence of crash events. Contrary to this trend were crashes involving vehicles leaving the carriageway, either on a straight alignment or curved alignment (RUM 70-79 and RUM 80-89). Both of these demonstrate that environmental factors such as road lighting or other factors such as fatigue, speed or alcohol may have more of an influence on these crash types than traffic flows and numbers.

Unfortunately, the data collected by the Toowoomba City Council crash data does not contain the necessary information to make that analysis.

7.3 Road Hierarchies

In terms of crashes per 1000 AADT vehicles, both State and Federal controlled roads have noticeably higher rate of casualty, fatal and total crashes than either of the other classes of roads. Overall there were clear distinctions between the rates of the different severity types occurring on the different road hierarchies. The reasons this are not clear are outside the scope of this project, but influencing factors may include concentration of heavy vehicles, congestion, concentration of intersections along the highways as well as direct property access interrupting traffic flows or a poor road environment.

However, the rates of crashes along West Street were approaching those of the Arterial highways, and given that the road hierarchies on the Toowoomba City Council roads was determined over four years ago there may be a need to re-evaluate some of the existing classification of which West Street would be one.

7.4 Data Limitations

As with all datasets, it is to be expected that there will be some errors or omissions due to human error in the Toowoomba City Council road crash database. These errors include:

- Multiple crash records with an identical Incident number but different crash factors;
- Duplicate crash entries;
- A high proportion of records without a unique Incident number.

When compared with the data sourced from the Department of Main Roads there were some obvious differences in the amount and detail of the data recorded. An important difference is the record of the severity level of each crash. Toowoomba City Council crash data only having a “KILLED” or “INJURY” record from which property damage crashed can be derived. The Department of Main Roads data contains the property damage and fatality severity levels as well as Hospitalised, Medical Treatment and Minor injury severity levels, giving a much greater relevance when assessing potential hazardous crash locations. The Toowoomba City Council data was also lacking details relating to environmental conditions such as wet roads and fog, as well as causal factors such as speed, drugs, alcohol and fatigue, and the class of vehicles involved in the crash.

In this author’s opinion, it is recommended that Toowoomba City Council complement their existing road crash databases with road crash data sourced from Queensland Transport and also adopt the DCA codes to ensure that both levels of Government are dealing with the same data and analysis techniques.

8 Conclusion and Further Work

8.1 Conclusion

Due to limitation of data and time, the original objective of directly comparing the Department of Main Roads controlled roads and Toowoomba City Council controlled roads was found to be unachievable. The decision was subsequently made to compare the highways with selected roads from each of the road hierarchies set out by the Toowoomba Planning Scheme. Due to time constraints this was further narrowed to comparing the State and Federal highways to the two highest order hierarchies under the authority of the Toowoomba City Council, the sub-arterial and trunk collector street. From this analysis it appears that compared to the higher order Toowoomba roads that the State and Federal roads may be over-represented in local crash statistics, but a comparative study of other large towns with highways going through residential areas.

The analysis of the crash types was completed, though there was no base of comparison used to analyse any relative increase or decrease of crash rates.

8.2 Further Work

There are several areas of future work that have been identified as the result of this study, dependent upon whether there is sufficiently detailed information available to suit the requirements of the proposed investigation topic.

The first proposed area of study would to determine which other Queensland or Australian cities of a similar size have State and Federal highways running though residential areas and compare crash statistics.

Another area may be to determine the effect of the 50km/h speed limit on residential streets and the 40km/h speed limit in school zones has had on not only the number of pedestrian type crashes but also the effects on the severity levels as a result of these speed reductions. To do this data containing more detailed information relating to the level of injury sustained and the age of the people involved in the crash than what is available through the Toowoomba City Council data.

Another area of study could be a complete analysis of the different hierarchies within the Toowoomba area as time constraints limited the analysis to a select few roads within each hierarchal level. This would enable a more valid comparison to be made within each of the road classes as well as perhaps being able to recommend which roads should be classed differently to reflect the true functioning class under the Toowoomba Planning Scheme 2003.

9 References

Andreassen, D 1994, *Model Guidelines for Road Accident Data and Accident Types,* Version 2.1 (ATM29), Australian Road Research Board, Melbourne.

Austroads 2004, Guide to Traffic Engineering Practice Series Part 4, *Treatment of Crash Locations*, Austroads Sydney.

Austroads 1998, Guide to Traffic Engineering Practice Series Part 9*, Arterial Road Traffic Management,* Austroads Sydney.

Austroads 1997, *A Minimum Common Dataset for the Reporting of Crash on Australian Roads,* Austroads Sydney.

Bureau of Transport and Regional Economics 2000, *Road crash costs in Australia*, Bureau of Transport and Regional Economics, Canberra, ACT.

Knowles, D & Tay, R 2002, *Driver Inattention: More Risky than the Fatal Four?*, Driving Institute of Australia.

Maunsell Pty Ltd 1997, *Toowoomba Region Transport Network Study*, Final Environmental Impact Assessment Report, Queensland Transport – Southern District.

National Drug Law Enforcement Research Fund 2007, *The impact of drugs on road crashes, assaults and other trauma – a prospective trauma toxicology study,* National Drug Law Enforcement Research Fund, Adelaide

OECD Scientific Expert Group 1994, *Targeted Road Safety Programmes,* OECD, Paris.

Eppell, V.A.T. (Tony) and McClurg, Brett A and Bunker, Jonathan M (2001) A four level road hierarchy for network planning and management. In Jaeger, Vicki, Eds. *Proceedings 20th ARRB Conference,* Melbourne.

QT 2005, *Road Traffic Crashes in Queensland 2003*, Queensland Transport, Brisbane.

"**Toowoomba**." Encyclopædia Britannica. 2007. Encyclopædia Britannica Online. 21 May 2007 <http://www.search.eb.com/eb/article-9072901>.

Toowoomba Now, *Facts & Figures*, viewed 19 May 2007, <http://www.toowoombanow.com.au/content/view/10/18/>, May 2007.

Toowoomba Suburbs and Surrounding Shires, Toowoomba City Council, viewed 9 May 2007, <http://www.toowoomba.qld.gov.au/index.php?option=com_docman&task=cat_view&gid=231&Itemid=107>.

Violanti J (1998). Cellular Phones and Fatal Traffic Collisions. *Accident Analysis and Prevention*, 30(4): p519-524.

Appendix

Appendix A – Original Project Specification

UNIVERSITY OF SOUTHERN QUEENSLAND
FACULTY OF ENGINEERING AND SURVEYING

ENG4111/4112 RESEARCH PROJECT

PROJECT SPECIFICATION

Student: David Dugdell

Project Topic: Toowoomba Road Crash Review

Project Supervisors: Associate Professor Ron Ayers, USQ
Rod Betts, Toowoomba City Council

Aim
To determine the whether the rate of crashes on Council controlled roads is increasing proportionally with traffic growth and whether crashes on Federal and State controlled roads is increasing proportionally to traffic growth.

Background
Toowoomba City Council's road infrastructure services are overall well planned, integrated, maintained, co-coordinated and delivered to support existing and future development and desired community outcomes.

Program

1. Review existing literature from Australia overseas with regard to:
   - Causes and types of urban crashes
   - Methods of Crash Data Analysis.
   - Effects of the presence of State and Federal Highways in urban areas on area crash statistics

2. Determine whether rates of certain types of crashes on the Council and State/Federal controlled roads are increasing or decreasing with traffic growth

3. From Toowoomba City Council crash data, examine and report on any discrepancies between crash rates on Council Controlled roads and State/Federal Controlled roads, especially after remedial works.

4. If time permits, examine the procedure by which the monetary worth of a crash for cost benefit analysis is calculated, and if applicable, develop a more accurate and up-to-date method.

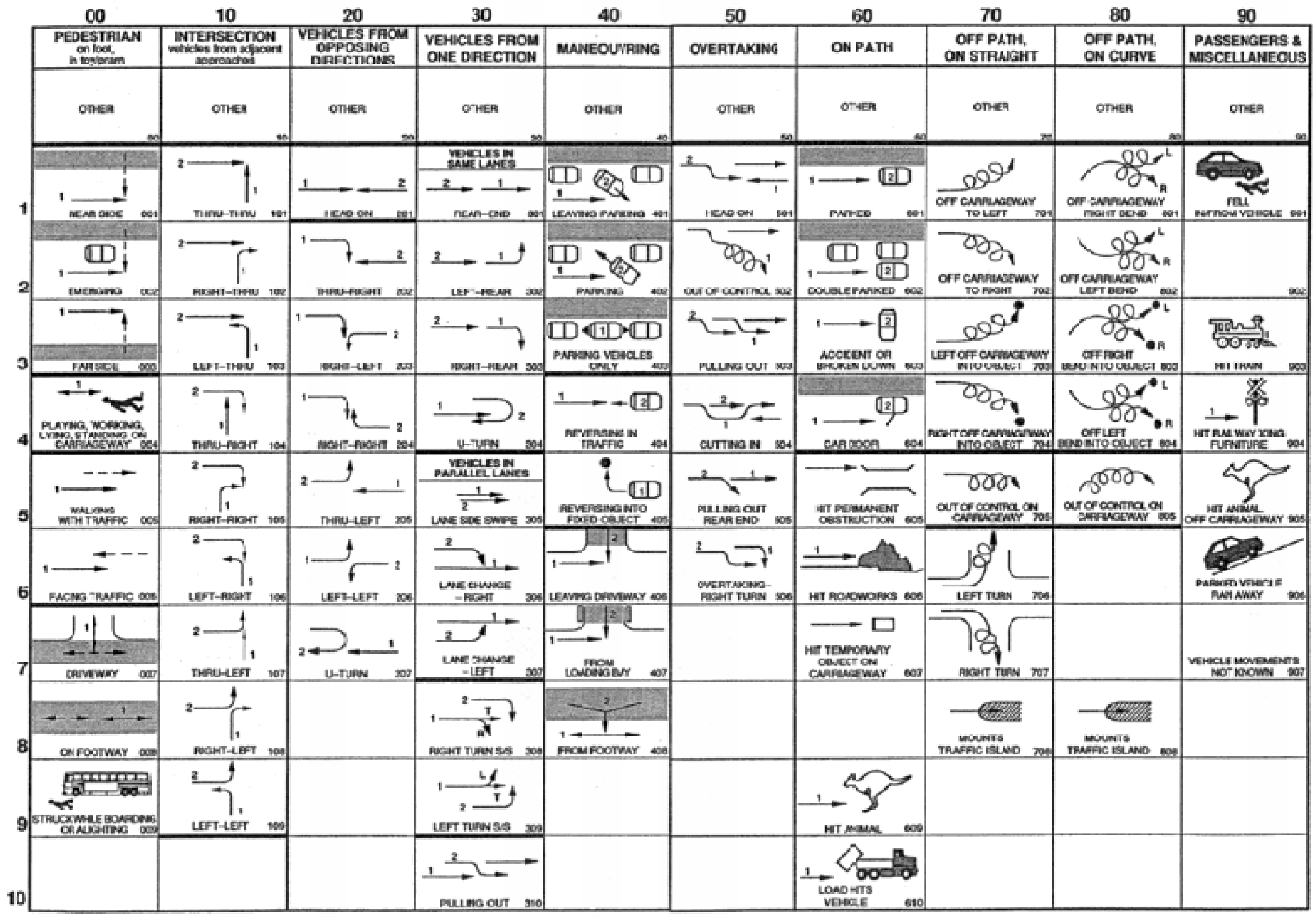
5. Report findings through oral presentation at the Project Conference, and in the required written format.

R. Ayers .... Dugdell ....

Ron Ayers
Date:

David Dugdell
Date:

Appendix B – Definition of Coding of Accidents Table


00 PEDESTRIAN on foot, in toy/pram
10 INTERSECTION vehicles from adjacent approaches
20 VEHICLES FROM OPPOSING DIRECTIONS
30 VEHICLES FROM ONE DIRECTION
40 MANOEUVRING
50 OVERTAKING
60 ON PATH
70 OFF PATH, ON STRAIGHT
80 OFF PATH, ON CURVE
90 PASSENGERS & MISCELLANEOUS
OTHER
NEAR SIDE 001
EMERGING 002
FAR SIDE 003
PLAYING, WORKING, LYING, STANDING ON CARRIAGEWAY 004
WALKING WITH TRAFFIC 005
FACING TRAFFIC 006
DRIVEWAY 007
ON FOOTWAY 008
STRUCK WHILE BOARDING OR ALIGHTING 009
THRU–THRU 101
RIGHT–THRU 102
LEFT–THRU 103
THRU–RIGHT 104
RIGHT–RIGHT 105
LEFT–RIGHT 106
THRU–LEFT 107
RIGHT–LEFT 108
LEFT–LEFT 109
HEAD ON 201
THRU–RIGHT 202
RIGHT–LEFT 203
RIGHT–RIGHT 204
THRU–LEFT 205
LEFT–LEFT 206
U–TURN 207
VEHICLES IN SAME LANES
REAR–END 301
LEFT–REAR 302
RIGHT–REAR 303
U–TURN 304
VEHICLES IN PARALLEL LANES
LANE SIDE SWIPE 305
LANE CHANGE – RIGHT 306
LANE CHANGE – LEFT 307
RIGHT TURN S/S 308
LEFT TURN S/S 309
PULLING OUT 310
LEAVING PARKING 401
PARKING 402
PARKING VEHICLES ONLY 403
REVERSING IN TRAFFIC 404
REVERSING INTO FIXED OBJECT 405
LEAVING DRIVEWAY 406
FROM LOADING BAY 407
FROM FOOTWAY 408
HEAD ON 501
OUT OF CONTROL 502
PULLING OUT 503
CUTTING IN 504
PULLING OUT REAR END 505
OVERTAKING – RIGHT TURN 506
PARKED 601
DOUBLE PARKED 602
ACCIDENT OR BROKEN DOWN 603
CAR DOOR 604
HIT PERMANENT OBSTRUCTION 605
HIT ROADWORKS 606
HIT TEMPORARY OBJECT ON CARRIAGEWAY 607
HIT ANIMAL 609
LOAD HITS VEHICLE 610
OFF CARRIAGEWAY TO LEFT 701
OFF CARRIAGEWAY TO RIGHT 702
LEFT OFF CARRIAGEWAY INTO OBJECT 703
RIGHT OFF CARRIAGEWAY INTO OBJECT 704
OUT OF CONTROL ON CARRIAGEWAY 705
LEFT TURN 706
RIGHT TURN 707
MOUNTS TRAFFIC ISLAND 708
OFF CARRIAGEWAY RIGHT BEND 801
OFF CARRIAGEWAY LEFT BEND 802
OFF RIGHT BEND INTO OBJECT 803
OFF LEFT BEND INTO OBJECT 804
OUT OF CONTROL ON CARRIAGEWAY 805
MOUNTS TRAFFIC ISLAND 808
FELL IN/FROM VEHICLE 901
HIT TRAIN 903
HIT RAILWAY X'ING FURNITURE 904
HIT ANIMAL OFF CARRIAGEWAY 905
PARKED VEHICLE RAN AWAY 906
VEHICLE MOVEMENTS NOT KNOWN 907

Appendix C

Toowoomba City Council Data Received – Sample Only

Traffic Count.xls

ASSET ID	DATE	STREET	FROM	TO	5_7 COUNT	C 1
001013O	Dec-02	Alderley Street	Mackenzie Street	High Street	25171	24074
					33466	32224
001039C	Oct-06	Anzac Avenue	Hill Street	West Street	28461	25719
					35336	32258
001040A	Feb-07	Arabian Street	Brangus Street	Stenner Street	8367	8005
					10609	10173
001040B	Feb-07	Arabian Street	Merino Street	Brangus Street	8317	7951
					10548	10102
001060A	Aug-04	Avondale Street	Holberton Street	Gordon Avenue	1527	1494
					2055	2110
002009A	Feb-07	Ballin Drive	Stenner Street	Lorraine Crescent North	11657	11260
					15214	14714
002093B	Mar-04	Boshammer Street	Blackburn Street	Box Street	1891	1814
					2568	2476
002098B	Apr-02	Boundary St	Darling Street	Private Road 1020M	1679	1454
					2219	195
002099D	Apr-03	Boundary St	Hursley Road	Taylor Street	25645	22115
					31327	27383
002099E	Apr-05	Boundary St	Taylor Street	Carroll Street	31183	26045
					36363	30643
002104C	Mar-04	Box Street	Ironbark Street	McClymont Drive	1043	993
					1490	1431
002111A	May-07	Bracker Street	Neil Street	Hume Street	394	372
					450	427
002115D	Aug-04	Bridge Street	Mort Street	West Street	57985	55077
					75303	71750
002115J	Jun-02	Bridge Street	Mackenzie Street	Wirra Wirra Street	13772	13235
					17294	16671
002115K	Jun-02	Bridge Street	Wirra Wirra Street	Dudley Street	9583	9233

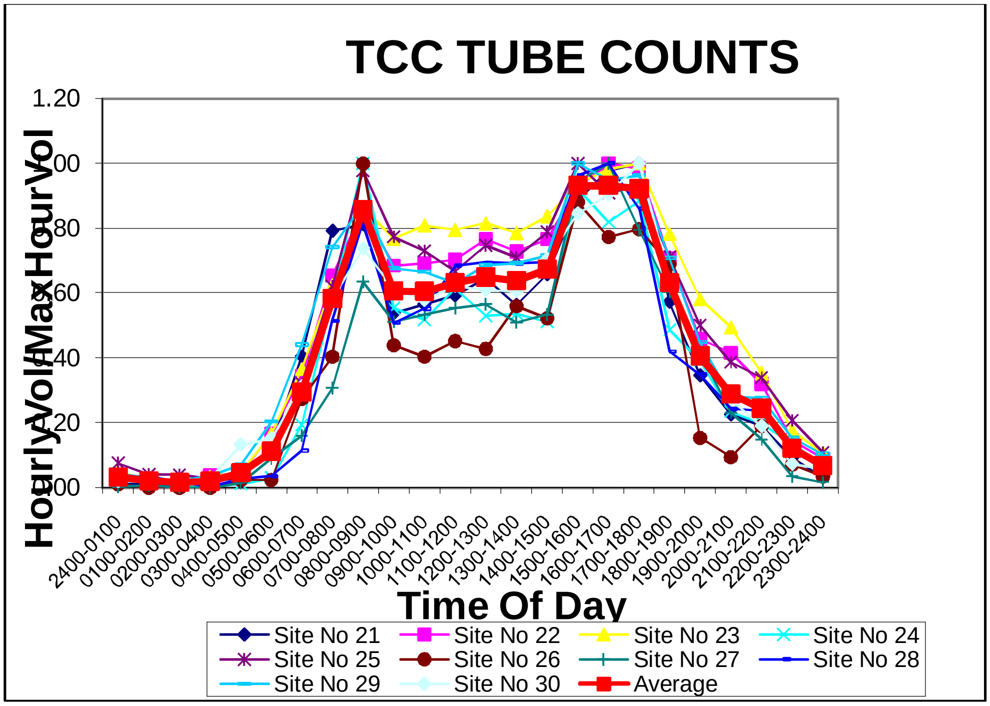
Accident.mdb

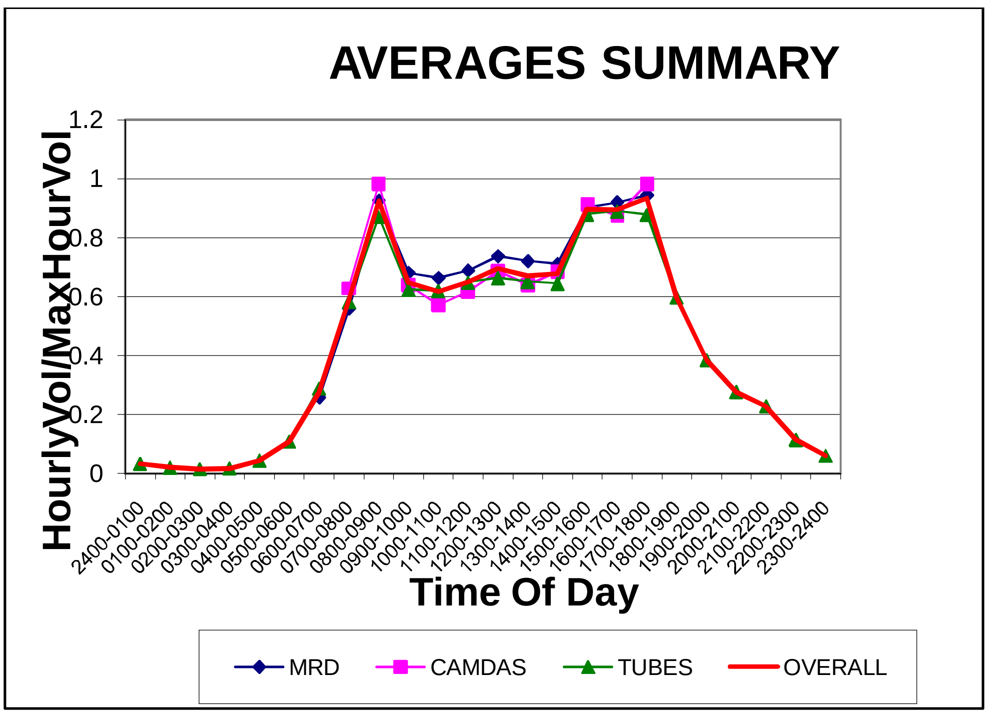
ACCDATE	WEEKDAY	KILLED	INJURY	INCID_NO	RUMDIR	TYPE	STR
05-Jul-06	4	0	0	QP06700027532	60W	MID	HERRIES STREETHERRIES 1
30-Aug-06	4	0	0	QP0656971	21S	3	WEST STREET DRAYTON R
06-Nov-06	2	0	0	QP060094712	47N	MID	HERRIES STREETHERRIES S
29-Oct-06	1	0	0	QP0600126237	32N	MID	RUTHVEN STREETRUTHVE
15-Dec-06	6	0	2	QP0600117774	32E	4	SUFFOLK STREET JAMES S
15-Dec-06	6	0	0	QP0600117771	31N	4	RUTHVEN STREET HERRIES
15-Dec-06	6	0	0	QP0600117668	13W	3	RUTHVEN STREET HURSTV
14-Dec-06	5	0	0	QP0600117075	10S	4	RUTHVEN STREET LONG S
13-Dec-06	4	0	0	QP0600116394	30N	MID	RUTHVEN STREETHERRIES
10-Dec-06	1	0	1	QP0600114792	09N	3	RUTHVEN STREET JOSEPH
11-Dec-06	2	0	0	QP0600114690	30N	4	CLIFFORD STREET HILL STR
09-Dec-06	7	0	0	QP0600113918	10W	4	HUME STREET JAMES STRE
07-Dec-06	5	0	1	QP0600112421	21S	4	RUTHVEN STREET ALDERLI
04-Dec-06	2	0	1	QP0600110366	11W	MID	TOR STREETTOR ST STH H
04-Dec-06	2	0	1	QP0600110325	21E	3	JAMES STREET WATER STR

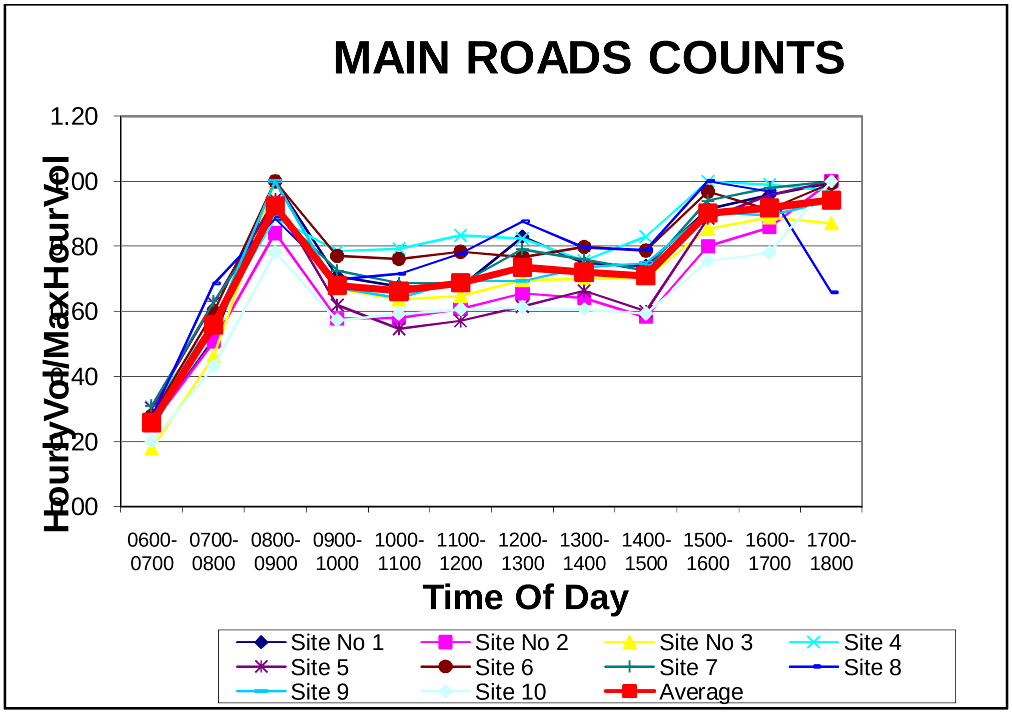
X	Y	STREET1	STREET2	STREET3	STREET_IDS
395615.1	6950745.15	HERRIES STREET	HELEN STREET	WEST STREET	
395450.9	6949508.75	WEST STREET	DRAYTON ROAD		717; 718; 1127;
396218.5	6950659.27	HERRIES STREET	PRESCOTT STREET	DENT STREET	
396454.7	6949472.63	RUTHVEN STREET	IDA STREET	LONG STREET	
398132.2	6949909.25	SUFFOLK STREET	JAMES STREET		2011; 2012; 3837; 3838;
396612.5	6950561.74	RUTHVEN STREET	HERRIES STREET		1737; 1738; 4675; 4676;
0	0	RUTHVEN STREET	HURSTWAY COURT		4759; 4760;
396456.4	6949483.75	RUTHVEN STREET	LONG STREET		4418; 4419; 4742; 4743;
396779.9	6951768.57	RUTHVEN STREET	EVELYN STREET	ARCHIBALD STREET	
396583	6950348.75	RUTHVEN STREET	JOSEPH STREET		2114; 4677; 4678;
396064.7	6950883.24	CLIFFORD STREET	HILL STREET		849; 850; 1772; 1773;
396980	6950073.25	HUME STREET	JAMES STREET		1925; 1926; 2019; 2020;
396290.1	6948350.26	RUTHVEN STREET	ALDERLEY STREET		4182; 4183; 4752; 4753;
394155.2	6950933.4	TOR STREET	HURSLEY ROAD	LENDRUM STREET	
396204.7	6950182.25	JAMES STREET	WATER STREET		5047; 2025; 4843;

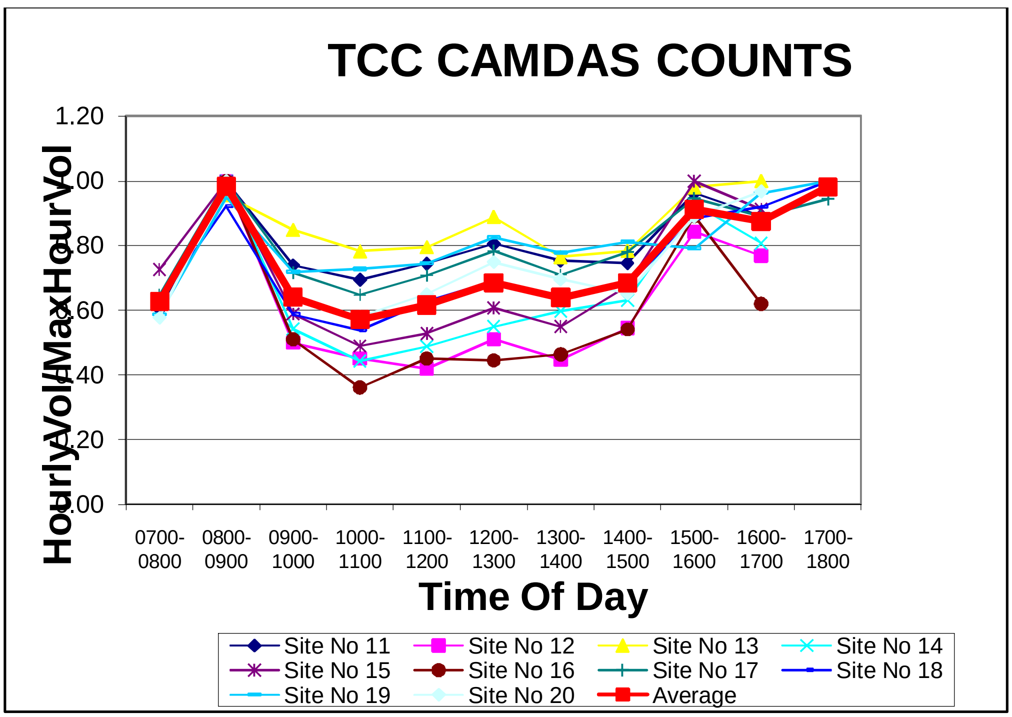
S3SPEED	S4SPEED	S5SPEED	S1AUTH	S2AUTH	S3AUTH	S4AUTH	S5AUTH	ACC_LOC	TCC_4_LA
								21751	TCC
60KM			TCC	TCC	TCC			821	TCC - 4 LA - TCC ONL
								21746	TCC 4 LAN TCC ONLY
								24743	STATE
50KM	50KM	50KM	FEDERAL	FEDERAL	TCC	TCC		1576	FEDERAL
40KM	50KM SIGNED	50KM SIGNED	TCC	TCC	TCC	TCC		1208	TCC - 4 LA - TCC ONL
50KM			STATE	STATE	TCC			3298	STATE
60KM	60KM	60KM	TCC	TCC	STATE	STATE		1747	STATE
								24662	STATE
50KM SIGNED			TCC	TCC	TCC			1628	TCC - 4 LA - TCC ONL
50KM	50KM	50KM	TCC	TCC	TCC	TCC		630	TCC - 4 LA - TCC ONL
60KM	60KM	60KM	STATE	TCC	FEDERAL	FEDERAL		1374	FEDERAL
60KM	60KM	60KM	TCC	TCC	STATE	STATE		75	STATE
								23989	FEDERAL
50KM			FEDERAL	FEDERAL	TCC			1580	FEDERAL

NOT_SQUARE	DCA_CODE	TIME	KSI	4_LANE	RUM
	601	0:58:00	0	NO	60
yes	202	19:50:00	0	YES	21
	406	16:00:00	0	YES	47
	303	12:45:00	0	YES	32
	303	19:48:00	1	YES	32
	302	16:20:00	0	YES	31
	104	11:42:00	0	YES	13
	101	21:15:00	0	YES	10
	301	17:10:00	0	YES	30
	0	16:30:00	1	YES	9
	301	11:45:00	0	YES	30
	101	16:50:00	0	YES	10
	202	10:26:00	1	YES	21
	102	13:00:00	1	YES	11
yes	202	11:45:00	1	YES	21


TCC TUBE COUNTS
HourlyVol/MaxHourVol
Time Of Day
Site No 21
Site No 22
Site No 23
Site No 24
Site No 25
Site No 26
Site No 27
Site No 28
Site No 29
Site No 30
Average


AVERAGES SUMMARY
HourlyVol/MaxHourVol
Time Of Day
MRD
CAMDAS
TUBES
OVERALL


MAIN ROADS COUNTS
HourlyVol/MaxHourVol
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0600-0700
0700-0800
0800-0900
0900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-1600
1600-1700
1700-1800
Time Of Day
Site No 1
Site No 2
Site No 3
Site 4
Site 5
Site 6
Site 7
Site 8
Site 9
Site 10
Average


TCC CAMDAS COUNTS
HourlyVol/MaxHourVol
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0700-0800
0800-0900
0900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-1600
1600-1700
1700-1800
Time Of Day
Site No 11
Site No 12
Site No 13
Site No 14
Site No 15
Site No 16
Site No 17
Site No 18
Site No 19
Site No 20
Average

Appendix D – Department of Main Roads Received Data – Sample Only

Road Crash Data.xls

ACC_NO	SEVERITY	STREET1
959024	Medical attn	Bowden Ct
970014	Property damage	Brisbane Valley Hwy
979006	Property damage	Atkinson Dam Rd
980011	Property damage	Warrego Hwy
990021	Property damage	Warrego Hwy
990034	Medical attn	Oakey - Cooyar Rd
2001048	Medical attn	Warrego Hwy
2002013	Medical attn	Ingoldsby Rd
2003005	Medical attn	Mount Glorious Rd
2003028	Hospitalised	Gatton - Helidon Rd
2004006	Property damage	Warrego Hwy
2004015	Medical attn	Brisbane Valley Hwy
2004016	Property damage	Brisbane Valley Hwy
2004051	Property damage	D'Aguilar Hwy
2005016	Minor injury	Bunya Hwy
2005052	Property damage	Warrego Hwy
2005058	Property damage	Gore Hwy (Prev Tmba-M'Merran-G'Windi Rd)
2005059	Medical attn	Ramsay St
9490015	Property damage	Forest Hill - Fernvale Rd
920000045	Medical attn	Warrego Hwy
920000067	Property damage	Bridge St
920000261	Fatal	Quarry Rd
920000276	Property damage	Gore Hwy (Prev Tmba-M'Merran-G'Windi Rd)

26/03/1995	SUN	17	11	704	6
5/06/1997	THU	7	11	608	1
15/03/1997	SAT	18	99	704	6
27/07/1998	MON	11	99	704	6
18/06/1999	FRI	13	99	800	6
10/09/1999	FRI	15	99	609	11
10/11/2001	SAT	21	20	607	6
14/04/2002	SUN	14	99	805	9
19/01/2003	SUN	9	99	805	9
11/07/2003	FRI	19	20	607	6
5/03/2004	FRI	19	99	607	6
25/04/2004	SUN	19	99	607	6
25/04/2004	SUN	19	99	201	6
29/09/2004	WED	19	99	804	6
11/05/2005	WED	8	99	301	3
29/10/2005	SAT	15	99	301	3
11/12/2005	SUN	21	99	608	1
16/12/2005	FRI	7	99	0	10
8/07/1994	FRI	15	99	301	3
1/01/1992	WED	4	99	703	6
1/01/1992	WED	20	10	202	2
4/01/1992	SAT	11	99	804	6
3/01/1992	FRI	15	11	102	2
6/01/1992	MON	23	99	805	9

DISTANCE	DIST_UNIT	DIRECTION	LANDMARK
0	M		
0	M		
7	KM	E	GATTON-ESK ROAD
200	M	W	ALLAN ST OVERPASS
200	M	E	TABLETOP RD
4	KM	N	HADEN - MACLAGAN RD
3	KM	W	STATION STREET
400	M	N	UPPER TENT HILL SCHOOL ROAD
10	KM	E	WIVENHOE-SOMERSET ROAD
0	M	E	LOCKYER CREEK BRIDGE
200	M	E	CEMETERY ROAD
100	M	N	TOOGOOLAWAH DUMP ENTRANCE
100	M	N	TOOLOOLAWAH DUMP ENTRANCE
300	M	W	WALLABY CREEK
20	M	N	EAST WOOROOLIN ROAD
2	KM	E	OAKEY BYPASS
27	KM	S	CAMPBELL ST MILLMERRAN
40	M	S	SOUTH ST
10	KM	N	WARREGO HWY
60	M	N	TELEPHONE BOOTH, T'MBA RANGE
0	M		
5	KM	N	BUNYA HWY
0	M		
300	M	N	KRENSKE ROAD

NUMBER_OF_	NO_FATALS	NO_HOSP	NO_MEDICAL	NO_MINOR	"UNIT1_DIRECTION"	"FATIGU

1	0	0	1	0	S
6	0	0	0	0	N
1	0	0	0	0	W
1	0	0	0	0	E
1	0	0	0	0	W
2	0	0	1	0	S
2	0	0	1	0	W
2	0	0	1	1	N
1	0	0	1	0	E
1	0	1	1	0	W
1	0	0	0	0	E
1	0	0	1	0	N
2	0	0	0	0	S
1	0	0	0	0	W
2	0	0	0	1	N
2	0	0	0	0	E
2	0	0	0	0	E
2	0	0	1	0	N
2	0	0	0	0	S
1	0	0	1	0	E
2	0	0	0	0	E
1	1	0	0	0	N
2	0	0	0	0	S
1	0	1	0	0	N

RIGID_TRUCK ART_TRUCK BUS MOTORCYCLE TRACTOR TOWED PEDESTR

						"BICYCLE"
0	0	0	1	0	0	0
1	0	0	1	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	1	0	0	0	0	0
0	0	0	1	0	0	0
0	0	0	0	0	0	0
0	0	0	2	0	0	0
0	0	0	1	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
1	0	0	0	0	0	0
1	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
1	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0

SELECTED	Year	Month	RSECT_ID	INTER	TDIST
0	1995	Mar		0	0
0	1997	Jun	42A	1026	7.96
0	1997	Mar		0	0
0	1998	Jul	18A	0	59.644
0	1999	Jun	18A	0	88.02
0	1999	Sep	417	0	38.708
0	2001	Nov	18B	0	47.126
0	2002	Apr		0	0
0	2003	Jan	4023	0	17.1
0	2003	Jul	314	0	9.57
0	2004	Mar	18A	0	45.09
0	2004	Apr	42A	0	66.44
0	2004	Apr	42A	0	66.44
0	2004	Sep	40B	0	31.09
0	2005	May	45B	0	15.84
0	2005	Oct	18B	0	25.26
0	2005	Dec	28B	0	26.9
0	2005	Dec		0	0
0	1994	Jul	412	0	14.38
0	1992	Jan	18A	0	89.47
0	1992	Jan		0	0
0	1992	Jan		0	0
0	1992	Jan	28A	0	31.875
0	1992	Jan		0	0

AADT's 88 to 2006

Road	Site	Start	End	AADT	AADT Adj	AADT Book	Metrocount
18A	30061	28.9	44.26	16065			
18A	30061	28.9	44.26	16065			
18A	30061	28.9	44.26	16065			
18A	30061	28.9	44.26	16065			
18A	30061	28.9	44.26	16065			
18A	30061	28.9	44.26	16065			
18A	30061	28.9	44.26	16065	12696		
18A	30061	28.9	44.26	16065	*12696*	12696	
18A	30061	28.9	44.26	16065	*12696*	12696	
18A	30061	28.9	44.26	16065	*12696*	12696	
18A	30061	28.9	44.26	16065	*12696*	12696	
18A	30061	28.9	44.26	16065	*13550*	13550	
18A	30061	28.9	44.26	14509	14509	14509	13598
18A	30061	28.9	44.26	14934	14934	14925	14377
18A	30061	28.9	44.26	15797	15797	15793	15596
18A	30061	28.9	44.26	17519	17519	16822	16230
18A	30061	28.9	44.26	18810	18810	18810	17930
18A	30061	28.9	44.26	18061	18061	18061	18243
18A	30061	28.9	44.26	18470	18470	18470	18518

18A	30066	44.26	47.86	11294	
18A	30066	44.26	47.86	11294	
18A	30066	44.26	47.86	11294	
18A	30066	44.26	47.86	11294	
18A	30066	44.26	47.86	11294	
18A	30066	44.26	47.86	11294	
18A	30066	44.26	47.86	11294	11294