Driving performance on an expressway under fog conditions and its improvement use of a fog warning system

Graham James Brisbane

University of Wollongong

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DRIVING PERFORMANCE ON AN EXPRESSWAY UNDER FOG CONDITIONS AND ITS IMPROVEMENT BY USE OF A FOG WARNING SYSTEM

A Research Thesis Submitted To

The Department Of Civil, Mining And Environmental Engineering Of

The University Of Wollongong

By Graham James Beattie Brisbane

For The Degree Of Doctor Of Philosophy

February 1998
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THESIS ABSTRACT

DRIVING PERFORMANCE ON AN EXPRESSWAY UNDER FOG CONDITIONS AND ITS IMPROVEMENT BY USE OF A FOG WARNING SYSTEM

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Problem

Driving in any situation where the available sight distance is less than that appropriate for the travel speed of the vehicle will naturally present a problem when a hazard occurs. A motorist is often forced to take some emergency action to avoid a potential accident.

In most situations on the road there are many visual cues to give motorists an indication of an appropriate travel speed as well as conferring a perception of the speed actually being travelled. These may take the form of longitudinal lines on the road, warning signs or the general roadside landscaping.

However, in fog these cues cease to be visible and motorists commonly drive at speeds well in excess of the available stopping distance, frequently unaware they are doing so having lost the cues that help create the perception of speed. This problem is obviously
accentuated on higher speed roads such as divided carriageways where the only cues are to tell drivers they are on a high speed road and no apparent threats are available to prompt a lowering of speed.

To address this there have been many attempts to provide Driver Aid Systems to warn motorists of the hazards they face. One such system was provided on the Waterfall-Bulli section of the F6 in 1974. However the continued occurrences of multiple vehicle accidents culminating in a 66 vehicle event in 1986 suggested that the system may no longer be as effective as was originally intended. (No research was ever undertaken to assess whether the system actually met its objectives although this was unlikely, given the nature of the fog in the Bulli Tops area, the way the system operated and the fact a number of features of the original proposal were never actually installed).

**Proposed Solution**

Rather than simply replace a system which was no longer maintainable or visible in bad fog conditions with a similar system, a research project was proposed to examine changes in technology which had become available since the 70s and to determine whether these could be used to develop a workable system.

The new solution proposed a dynamic, site independent system which could monitor both the fog and the motorists and provide real-time advice to the motorist if vehicle speed was inappropriate to the conditions.
Research

Before developing a new system based purely on the theory, a trial site was selected and research undertaken to assess the effectiveness of the arrangement outlined.

Over a three year period studies were undertaken on the characteristics of vehicles when travelling in various fog visibilities ranging from 250 m to under 50 m.

The research was undertaken in three discrete stages:

April - December, 1992, - characteristics of vehicles unaffected by any sign display

January - April, 1993, - evaluation of the 1974 sign system modified to provide some limited dynamic information

May, 1993 - December, 1994, - evaluation of an improved sign arrangement with full dynamic information provided on fog and speed where appropriate.

The results showed that an independent dynamic sign display could be used which would be effective in modifying vehicle speed characteristics, particularly at times when the speeds were highest without the use of such a sign.

Outcome

As a result of the results of this research project, the RTA proceeded with the design and construction of a new Driver Aid System for the F6 Waterfall-Bulli Freeway. The work involved a $3.5m contract with Telstra and was commissioned in 1996.
A number of factors in the design were directly attributable to the findings of the research including:

- the use of dynamic independent sites

- incorporation into each site of fog detection equipment, speed detection and warning signs capable of displaying appropriate warning messages for individual motorists relative to the situation

- location of the appropriate areas for the system to be located

- use of flashing warning lights in association with each sign display

**Papers Published**

The following papers on this research have been published at various major Conferences:


DRIVING PERFORMANCE ON AN EXPRESSWAY
UNDER FOG CONDITIONS AND ITS IMPROVEMENT
BY USE OF A FOG WARNING SYSTEM

A CASE STUDY OF THE F6 SOUTHERN EXPRESSWAY AT BULLI TOPS.

CONTENTS

1 Introduction 1

1.1 Background 1

1.2 Aims 3

1.3 Scope of Study 4

2 Background 7

2.1 Accidents 7

2.1.1 Accidents in Fog 7

2.1.2 F6 Fog Accidents 9

2.2 Fog Formation 15

2.3 Measurement of Visibility 19

2.3.1 General 19

2.3.2 Daytime 23

2.3.3 Night-time 30
2.3.4 Daytime with Lights-on 33

2.4 Visibility in Fog 34

2.5 F6 - Southern Expressway 38

2.6 Driving Performance in Restricted Visibility 43
   2.6.1 Speed 43
   2.6.2 Headway 49

2.7 Visibility Measuring Devices 52
   2.7.1 General Background 52
   2.7.2 Transmissometers 53
   2.7.3 Scatter Devices 54

2.8 Driver Aid Systems 57

3 Analysis Arrangements 62
   3.1 Experimental Proposal 62
      3.1.1 Proposal 62
      3.1.2 Variables 63
         i) Visibility 64
         ii) Speed 67
         iii) Headways 68
         iv) Vehicle Length 71
         v) Travel Lane 71
         vi) Time of Day 72
vii) Day of Week 72

viii) Wet and Dry Conditions 73

3.2 Site Selection 73

3.2.1 Assessment Criteria 73

3.2.2 Site Analysis 78

i) Fog Frequency 78

ii) Level of Service 82

iii) Lane Discipline 82

iv) Accessibility 83

v) Freedom from Outside Influence 83

vi) Future Options 83

vii) Maximised Traffic Volumes 83

3.2.3 Selection 84

3.3 Equipment 85

3.3.1 Visibility Measurement Devices 85

3.3.2 Speed Measurement Devices 89

i) Options 89

ii) Selection 93

3.4 Stage 2 Proposal 96

3.5 Stage 3 Proposal 97

3.5.1 Type of sign 98
5.1.1 Speed Analysis 154
5.1.2 Headways 155

5.2 Speed Analysis 156
5.2.1 Methodology 156
5.2.2 Regression Analysis 156

5.3 Comments on Speed Results 159
5.3.1 Visibilities 250 - 1000 m 159
5.3.2 Visibilities below 250 m 160
   i) All Conditions 160
   ii) Speed Variations 162
   iii) Night Vs Day 164
   iv) Dawn and Dusk Vs Day 165
   v) Day of week 166
   vi) Rain 168
   vii) Heavy Vehicles 170

5.4 Headways 173
5.4.1 Results 174
   i) Daytime 177
   ii) Dusk 179
   iii) Night 180
   iv) Dawn 180
5.5 Conclusions

5.5.1 Mean and 85th Percentiles

5.5.2 Coefficient of Variation

5.5.3 Headways

6 Existing Driver Aid System

6.1 Introduction

6.2 Stage 2 Proposals

6.3 Results

6.3.1 Visibility

6.3.2 Vehicle Data

6.4 Speeds

6.4.1 Results

6.4.2 Analysis

6.5 Headways

6.6 Summary

7 New Sign Characteristics

7.1 Introduction

7.1.1 Sign Construction

7.1.2 Software

7.2 Site Changes

7.3 Sign Effectiveness
7.3.1 Speed Modification Trial 219

7.3.2 Modification Results 220

7.4 Results of Vehicle Speed and Headway Changes in Fog when using New Sign 221

7.4.1 Data Collection 221

7.4.2 Visibility 224

7.4.3 Speed At Central Site 226

7.4.4 Speed Through Test Length 236

7.4.5 Headways 242

7.5 Summary 250

8 Summary and Conclusions 252

8.1 Project Summary 252

8.2 Results Summary 254

8.2.1 Accidents 254

8.2.2 Visibility 255

8.2.3 Trial Details 256

8.2.4 Speed And Headways In Fog Conditions Without Modification 257

8.2.5 Effectiveness of Existing System 261

8.2.6 Speed And Headways Using Dynamic Warning Sign 263

8.3 Main Conclusion 265
8.4 Replacement System 267

8.5 Future Work 271

BIBLIOGRAPHY

Bibliography 273

APPENDICES

Appendix A Usage of F6 Driver Aid System 1985-1990 281

Appendix B Analysis of Accidents In Fog And All Other Conditions 289
In The Vicinity Of Bulli Tops

Appendix C Analysis of Deceleration Sight Distances 297

Appendix D Speed Correlation 302

Appendix E Level of Service 310

Appendix F Statistical Analysis Inputs and Outputs 311

Appendix G Catalogue of Known Driver Aid Systems 318

Appendix H Site Plan 324

Appendix I Data Files 325
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig 2.01</td>
<td>Comparison Of Accidents In Clear &amp; Fog Conditions 1987 - 1990</td>
<td>10</td>
</tr>
<tr>
<td>Fig 2.02</td>
<td>Comparison Of Vehicles In Accidents In Clear &amp; Fog Conditions, 1987 - 1990</td>
<td>11</td>
</tr>
<tr>
<td>Fig 2.03</td>
<td>Percentage Of Vehicles In Accidents By Time Of Day 1987 - 1990</td>
<td>14</td>
</tr>
<tr>
<td>Fig 2.04</td>
<td>Upslope Fog Caused By Escarpment Forcing Up Air Flow</td>
<td>18</td>
</tr>
<tr>
<td>Fig 2.05</td>
<td>Average Annual Hours Of Fog At Site 64N By Time Of Day</td>
<td>19</td>
</tr>
<tr>
<td>Fig 2.06</td>
<td>Comparison Of Vehicle Observation With Distance (after Behrendt, 1978)</td>
<td>21</td>
</tr>
<tr>
<td>Fig 2.07</td>
<td>Comparison Of Approaching Vehicle With Headlights On And Departing Vehicle With No Lights (MOR 130 m)</td>
<td>22</td>
</tr>
<tr>
<td>Fig 2.08</td>
<td>Comparison Of Approaching Truck And Departing Car (MOR 130 m)</td>
<td>23</td>
</tr>
<tr>
<td>Fig 2.09</td>
<td>Veiling Luminance Due To Headlight Backscatter (Allen et al 1977)</td>
<td>26</td>
</tr>
<tr>
<td>Fig 2.10</td>
<td>Scattering Function (Spencer 1960)</td>
<td>26</td>
</tr>
<tr>
<td>Fig 2.11</td>
<td>Extinction Coefficient From Various Atmospheric Conditions (Allen et al, 1977)</td>
<td>30</td>
</tr>
<tr>
<td>Fig 2.12</td>
<td>Variation Of Visual Range With Extinction Coefficient (White &amp; Jeffery, 1980)</td>
<td>31</td>
</tr>
<tr>
<td>Fig 2.13</td>
<td>Relation Between Intensity Of Light Source And Visibility Distance In Various Daylight Fogs (Moore &amp; Cooper, 1972)</td>
<td>32</td>
</tr>
<tr>
<td>Fig 2.14</td>
<td>Control Sites On Existing Driver Aid System</td>
<td>39</td>
</tr>
</tbody>
</table>
Fig 2.15 Advisory Message Sign On F6 (DMR, 1975) 40
Fig 2.16 Mean Speed & Visibility In Fog M4 Winter 75/76 (Sumner et al, 1976) 45
Fig 2.17 Close-up Of Oregon Advisory Sign Installation (George et al, 1979) 58
Fig 2.18 M25 Trial Sign (Traffic Engineering & Control, 1991) 60
Fig 2.19 European Style Fog Warning Sign 61
Fig 3.01 Trial Site 63
Fig 3.02 Visibility - 0800-1900, 26 March 1992 64
Fig 3.03 Visibility - 1230-1330, 13 September 1993 65
Fig 3.04 Traffic Lane Proportions Through Test Site 70
Fig 3.05 Stopping Distances For Different Countries 76
(after Hawkins 1984)
Fig 3.06 Deceleration Sight Distance - Daytime 77
Fig 3.07 Fog Occurrence At Northbound Sites: 1985 - 1990 79
Fig 3.08 Monthly Fog Occurrences (Days) At Site 64N: 1985-1990 80
Fig 3.09 Hours Of Fog Occurrences Per Month At Site 64N 1985 - 1990 80
Fig 3.10 Physical Layout Of FD12 86
Fig 3.11 FD 12 Relative To Roadway 88
Fig 3.12 Detector Siting 89
Fig 3.13 Loop Layout 94
Fig 3.14 Traffic Signal Control Box With Equipment 95
Fig 3.15 Schematic Layout Showing Display Options for Each Panel (Brisbane 1994) 102

Fig 4.01 Speed Vs Visibility For Cars - Visibility 251 - 1000m 126

Fig 4.02 Speed Vs Visibility for Cars During Day In Slow Lane - Vis 251 - 1000m 127

Fig 4.03 Speed Vs Visibility For Cars At Night In Slow Lane Vis 251:1000m 128

Fig 4.04 Speed Vs Visibility For Both Lanes In All Conditions - Vis <250m 129

Fig 4.05 Speed Vs Visibility For All Cars In Fast Lane - Vis <250m 130

Fig 4.06 Speed Vs Visibility For All Cars In Slow Lane - Vis <250m 131

Fig 4.07 Speed Vs Visibility For Cars In Fast Lane During Day Vis <250m 132

Fig 4.08 Speed Vs Visibility For Cars In Slow Lane During Day Vis <250m 133

Fig 4.09 Speed Vs Visibility For Cars In Fast Lane At Night Vis <250m 134

Fig 4.10 Speed Vs Visibility For Cars In Slow Lane At Night Vis <250m 135

Fig 4.11 Speed Vs Visibility For Cars In Fast Lane At Dawn Vis <250m 136

Fig 4.12 Speed Vs Visibility For Cars In Slow Lane At Dawn Vis <250m 137

Fig 4.13 Speed Vs Visibility For Cars In Fast Lane At Dusk Vis < 250m 138

Fig 4.14 Speed Vs Visibility For Cars In Slow Lane At Dusk Vis <250m 139

Fig 4.15 Speed Vs Visibility For Cars In Fast Lane In Dry Vis <250m 140

Fig 4.16 Speed Vs Visibility For Cars In Slow Lane In Dry Vis <250m 141

Fig 4.17 Speed Vs Visibility For Cars In Fast Lane In Rain Vis <250m 142

Fig 4.18 Speed Vs Visibility For Cars In Slow Lane In Rain Vis <250m 143
Fig 4.19  Speed Vs Visibility For Cars In Fast Lane On Weekdays Vis <250m

Fig 4.20  Speed Vs Visibility For Cars In Slow Lane On Weekdays Vis <250m

Fig 4.21  Speed Vs Visibility For Cars In Fast Lane On Saturdays Vis <250m

Fig 4.22  Speed Vs Visibility For Cars In Slow Lane On Saturdays Vis <250m

Fig 4.23  Speed Vs Visibility For Cars In Fast Lane On Sundays Vis <250m

Fig 4.24  Speed Vs Visibility For Cars In Slow Lane On Sundays Vis <250m

Fig 4.25  Speed Vs Visibility For Heavy Vehicles In Fast Lane Vis <250m

Fig 4.26  Speed Vs Visibility For Heavy Vehicles In Slow Lane Vis <250m

Fig 5.01  Speed Vs Visibility For Cars In Slow Lane During Day & Night - Visibility 251 - 1000m

Fig 5.02  Average & 85th Percentile Speeds For All Conditions

Fig 5.03  Coefficient Of Variation For All Conditions

Fig 5.04  Coefficient Of Variation In Slow Lane By Time Of Day

Fig 5.05  Coefficient Of Variation In Fast Lane By Time Of Day

Fig 5.06  Speed Differences By Lane For Night & Day Conditions

Fig 5.07  Speed Differences In Slow Lane For Dawn, Dusk & Day Conditions

Fig 5.08  Speed Differences For Sundays & Weekdays
Fig 5.09  Speed Differences For Saturdays & Weekdays  
Fig 5.10  Coefficient Of Variation During Week & Weekends  
Fig 5.11  Speed Reduction In Dry & Rain Conditions  
Fig 5.12  Coefficient Of Variation In Dry & Wet Conditions  
Fig 5.13  Average & 85th Percentiles For Heavy Vehicles In Slow Lane All Conditions  
Fig 5.14  Coefficient Of Variation For Heavy Vehicles In Slow Lane All Conditions  
Fig 5.15  Headway Distribution By Time Of Day - Vis < 150m  
Fig 5.16  Comparison Of Headway Distributions In slow lane- Day  
Fig 5.17  Comparison Of Headway Distributions In slow lane- Dusk  
Fig 5.18  Comparison Of Headway Distributions In Slow Lane- Night  
Fig 5.19  Comparison Of Headway Distributions In Slow Lane - Dawn  
Fig 5.20  Increasing Coefficient Of Variations  
Fig 5.21  Coefficient Of Variations Without Change  
Fig 6.01  Original Fibre-optic Sign From 130m With MOR 130m  
Fig 6.02  Original Fibre-optic Sign From 70 m With MOR 130m  
Fig 6.03  Speed Vs Visibility During Day VIS <250 m (7577 Cars)  
Fig 6.04  Speed Vs Visibility During Dusk VIS <250 m (448 Cars)  
Fig 6.05  Speed Vs Visibility At Night VIS <250 m (3498 Cars)  
Fig 6.06  Speed Vs Visibility At Dawn VIS <250 m (822 Cars)
Fig 6.07 Coefficient Of Variation When Using Existing Sign (Slow Lane) 196

Fig 6.08 Speed Differences During Day When Using Existing Sign 98

Fig 6.09 Speed Differences At Dusk When Using Existing Sign 199

Fig 6.10 Speed Differences At Night When Using Existing Sign 200

Fig 6.11 Speed Differences At Dawn When Using Existing Sign 200

Fig 6.12 Comparison Of Headway Distributions In Slow Lane- Night 203

Fig 6.13 Comparison Of Headway Distributions In Slow Lane- Dawn 203

Fig 7.01 Demonstration Of Sign At RTA Granville Workshops (From 150 m) 207

Fig 7.02 Example Of Warning Circle In Operation (From 150 m) 208

Fig 7.03 Maximum Differential Velocities 09

Fig 7.04 Relationship Of high & Low Speed Vehicles With Maximum Differential Speeds - Slow Lane In Day 210

Fig 7.05 Display Of ‘YOUR SPEED’ (50 m) 211

Fig 7.06 Display Of ‘SAFER SPEED’ (20 m) 212

Fig 7.07 Flowchart For Selection Of Messages Generated By Site Computer Based On Site Conditions 214

Fig 7.08 Insertion Of New Message Into Sign Queue For Display 215

Fig 7.09 Sign Erection 217

Fig 7.10 Sign Warning Motorists Of Speeding Behaviour (Brisbane, 1994) 219

Fig 7.11 Q. Why Use A Variable Message Sign?
   A. Because It’s there ???? (Brisbane, 1995) 220
Fig 7.12 New Fibre-optic Sign From 130 m With MOR 80m 222

Fig 7.13 New Fibre-optic Sign From 70 m With MOR 80m 222

Fig 7.14 New Fibre-optic Sign From 30 m With MOR 80m 223

Fig 7.15 Speed Vs Visibility During Day With New Sign Vis <250 m 226
(16678 Cars)

Fig 7.16 Speed Vs Visibility During Night With New Sign Vis <250 m 227
(6460 Cars)

Fig 7.17 Coefficient Of Variation With New Sign (Slow Lane) 227

Fig 7.18 Comparison Of Average Speeds With and Without New Sign 228
During Day Vis <250m

Fig 7.19 Average Speeds For Heavy Vehicles With And Without New Sign 229
In Slow Lane Vis <250m

Fig 7.20 Comparison Of Average Speeds With And Without New Sign At 229
Night Vis <250m

Fig 7.21 Coefficient Of Variation Comparison In Day (Slow Lane) 230

Fig 7.21 Coefficient Of Variation Comparison In Day (Slow Lane) 231

Fig 7.23 Distribution Of Time Of Day Samples 232

Fig 7.24 Distribution Of Day Of Week Samples 232

Fig 7.25 Distribution Of Samples By Visibility (Mar 1992 - Dec 1994) 235

Fig 7.26 Speed Changes At Site A - Slow Lane 237

Fig 7.27 Speed Changes At Site A - Fast Lane 238

Fig 7.28 Speed Changes Through Sites During Day 241
Fig 7.29  Speed Changes Through Sites During Night 241
Fig 7.30  Headway With & Without Sign (Site C) 242
Fig 7.31  Headways With & Without Sign At Night (Site C) 244
Fig 7.32  Headways With & Without Sign At Dawn (Site C) 245
Fig 7.33  Headways With & Without Sign At Dusk (Site C) 245
Fig 7.34  Headways With & Without Sign At Night (Site D) 249
Fig 7.35  Headways With & Without Sign At Dusk (Site E) 250
Fig 8.01  New Sign In Operation 268
Fig 8.02  New Sign Providing Advance Warning Of Fog 269
Fig 8.03  Mobile Warning Sign In Operation 271

APPENDICES

Fig A.1  Fog Usage Of F6 Southbound Sites: 1985 - 1990 283
Fig A.2  Fog Usage Of F6 Northbound Sites: 1985 - 1990 284
Fig A.3  Fog Usage Of Other Sites: 1985 1990 285
Fig A.4  Days Usage At Site 64N: 1985 - 1990 286
Fig A.5  Monthly (Hours) Usage At Site 64N: 1985 - 1990 287
Fig A.6  Hourly Usage At Site 64N: 1985 - 1990 288
Fig B.1  Accident Occurrences By Units Numbers Involved Per Accident 294
Fig B.2  Unit Involvement By Units Numbers Involved Per Accident 294
Fig B.3  Percentage Of Vehicle Accidents By Time Of Day 296
Fig B.4 Percentage Of Units In Fog Accidents By Time Of Day 296

Fig D.1 Scatter Plot & Linear Regression Line For Loop 3 - 5th August 1992 303

Fig D.2 Scatter Plot & Linear Regression Line For All Loops - 5th August 1992 303

Fig D.3 Scatter Plot Of Speed Difference Against Loop Speeds 306

Fig D.4 Scatter Plot & Linear Regression Line For All Loops - 27 November 1993 307
LIST OF TABLES

Table 2.01 Accident Severity: 1987 - 1990 12
Table 2.02 Vehicles Involved In Accidents On F6/Bulli Tops By Time Of Day: 1987 - 1990 13
Table 2.03 Relationship Between Standard Visual Ranges & Actual Visibility Distances In Fog (Behrendt, 1978) 20
Table 2.04 Decrease In Lateral Vision With Speed (after Etienne 1991) 37
Table 3.01 Kepner-Tregoe Analysis For Site Selection 84
Table 3.02 Kepner-Tregoe Analysis For Speed Detection Selection 93
Table 3.03 Character Heights For Light Emitting Signs 100
Table 4.01 Sample Output From 260392.FOG File 107
Table 4.02 Sample Output From 050492.CMB File 108
Table 4.03 Sample Output from 010492.CNT File 110
Table 4.04 Selected Days For Normal Behaviour 111
Table 4.05 Average Speeds For Days Of Week & Time Of Day 111
Table 4.06 Statistical Results For Normal Speed Characteristics 112
Table 4.07 Minimum MOR For 16th March - 31st December 1992 113
Table 4.08 Comparison Of Visibility With Precipitation 115
Table 4.09 Typical Sorted Data 116
Table 4.10 Coefficient Of Variation Through Site By Time Of Day 118
Table 4.11  Comparison Of Speeds & 85th Percentiles For Lead Vehicles & All Vehicles During Daylight

Table 4.12  Comparison Of Speeds & 85th Percentiles For Lead Vehicles & all Vehicles During Night

Table 4.13  Summary Of Results

Table 4.14  Speed Vs Visibility For Cars - Vis 251 - 1000m

Table 4.15  Speed Vs Visibility For Cars During Day In Slow Lane - Vis 251:1000m

Table 4.16  Speed Vs Visibility For Cars At Night In Slow Lane Vis 251:1000m

Table 4.17  Speed Vs Visibility For Both Lanes In All Conditions - Vis <250m

Table 4.18  Speed Vs Visibility For Cars In Fast Lane - Vis <250m

Table 4.19  Speed Vs Visibility For Cars In Slow Lane - Vis <250m

Table 4.20  Speed Vs Visibility For Cars In Fast Lane During Day Vis <250m

Table 4.21  Speed Vs Visibility For Cars In Slow Lane During Day Vis <250m

Table 4.22  Speed Vs Visibility For Cars In Fast Lane At Night Vis <250m

Table 4.23  Speed Vs Visibility For Cars In Slow Lane At Night Vis <250m

Table 4.24  Speed Vs Visibility For Cars In Fast Lane At Dawn Vis <250m

Table 4.25  Speed Vs Visibility For Cars In Slow Lane At Dawn Vis <250m

Table 4.26  Speed Vs Visibility For Cars In Fast Lane At Dusk Vis <250m

Table 4.27  Speed Vs Visibility For Cars In Slow Lane At Dusk Vis <250m

Table 4.28  Speed Vs Visibility For Cars In Fast Lane In Dry Vis <250m

Table 4.29  Speed Vs Visibility For Cars In Slow Lane In Dry Vis <250m
Table 4.30 Speed Vs Visibility For Cars In Fast Lane In Rain Vis <250m 142
Table 4.31 Speed Vs Visibility For Cars In Slow Lane In Rain Vis <250m 143
Table 4.32 Speed Vs Visibility For Cars In Fast Lane On Weekdays Vis <250m 144
Table 4.33 Speed Vs Visibility For Cars In Slow Lane On Weekdays Vis <250m 145
Table 4.34 Speed Vs Visibility For Cars In Fast Lane On Saturdays Vis <250m 146
Table 4.35 Speed Vs Visibility For Cars In Slow Lane On Saturdays Vis <250m 147
Table 4.36 Speed Vs Visibility For Cars In Fast Lane On Sundays Vis <250m 148
Table 4.37 Speed Vs Visibility For Cars In Slow Lane On Sundays Vis <250m 149
Table 4.38 Speed Vs Visibility For Heavy Vehicles In Fast Lane Vis <250m 150
Table 4.39 Speed Vs Visibility For Heavy Vehicles In Slow Lane Vis <250m 151
Table 5.01 Average Speed Differentials For Variables (Slow Lane) 157
Table 5.02 Average Speed Differentials For Variables (Fast Lane) 158
Table 5.03 Kolmogorov-Smirnov Test On Cumulative Distributions In Fog By Time Of Day 175
Table 5.04 Kolmogorov-Smirnov Test On Cumulative Distributions With Normal & Fog Conditions 176
Table 5.05 Kolmogorov-Smirnov Test On Cumulative Distributions With Fog Conditions Below 150m During Day 178
Table 6.01 Minimum MOR For 17th January -23rd April 1993 192
Table 6.02 Kolmogorov-Smirnov Test On Cumulative Distributions With No Sign & Existing Sign 202
Table 7.01  Comparison Of Normal Speeds In Clear Conditions 1992/1993  

Table 7.02  Comparison Of Normal Speeds In Clear Conditions 1992/1994  

Table 7.03  Minimum MOR For 21st July 1993 - 31st December 1994  

Table 7.04  Speed Changes At Site C - Slow Lane  

Table 7.05  Speed Changes At Site C - Fast Lane  

Table 7.06  Speed Changes At Site A  

Table 7.07  Speed Changes At Site D  

Table 7.08  Speed Changes At Site E  

Table 7.09  Kolmogorov-Smirnov Test On Cumulative Distributions With No Sign & New Sign At Site C  

Table 7.10  Kolmogorov-Smirnov Test On Cumulative Distributions With No Sign & New Sign At Site D  

Table 7.11  Kolmogorov-Smirnov Test On Cumulative Distributions With No Sign & New Sign At Site E
APPENDICES

Table A.1  Fog Usage Of F6 Southbound Sites: 1985 - 1990  
Table A.2  Fog Usage Of F6 Northbound Sites: 1985 - 1990  
Table A.3  Fog Usage Of Other Sites: 1985 1990  
Table A.4  Days Usage At Site 64N: 1985 - 1990  
Table A.5  Monthly (Hours) Usage At Site 64N: 1985 - 1990  
Table A.6  Hourly Usage At Site 64N: 1985 - 1990  
Table B.1  Accidents In Fog Around Bulli Tops 1987-1990 (From RTA Accident Data Base)  
Table B.2  Accidents By Number Of Units In Accident  
Table B.3  Accident Severity  
Table B.4  Accidents By Time Of Day  
Table C.1  Stopping Distances  
Table C.2  Deceleration Sight Distances  
Table C.3  Maximum Differential Velocities For MOR  
Table D.1  Results Of Speeds By Radar & Loops Taken 5/8/92  
Table D.2  Correlation & Standard Deviations Of Errors - 5/8/92  
Table D.3  Speeds Loops 1 - 5 By Radar & Loops Taken 27/11/93  
Table D.4  Speeds Loops 6 - 10 By Radar & Loops Taken 27/11/93  
Table D.5  Correlation & Standard Deviations Of Errors 27/11/93