



Road Safety
Camera
Commissioner

REPORT OF THE ROAD SAFETY CAMERA COMMISSIONER TO THE MINISTER FOR POLICE AND EMERGENCY SERVICES

Investigation into the fixed road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

Release date: 3 April 2014



Office of the Road Safety Camera Commissioner

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AT A GLANCE

Following local media attention in Geelong and forty complaints to my office regarding large numbers of red light infringements, I conducted a technical investigation into the operation of the fixed road safety camera at the intersection of The Boulevard and Princes Highway in Norlane.

I analysed data recorded by the road safety camera over a 24-month period and the images of infringement notices referred to me by the public and did not find any technical or systemic issues relating to the fixed road safety camera or the traffic lights.

I concluded that driver impatience caused the high number of infringements being issued as the vast majority of vehicles were photographed entering the intersection against a red arrow when they were the last vehicles in the queue.

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

PURPOSE

- 1 The purpose of this report is to document the Road Safety Camera Commissioner's findings following an investigation into the operation, accuracy and reliability of the road safety camera installed at the intersection of The Boulevard and Princes Highway, Norlane.

BACKGROUND

- 2 The fixed road safety camera at the intersection of The Boulevard and Princes Highway in Norlane has been in operation since November 2005. The camera is located on the east bound approach to the intersection, monitoring the speed limit of 60km/h and detecting any red light incidents for vehicles travelling east or turning on to Princes Highway. The west bound approach to the intersection is North Shore Road, where the Ford Australia engine plant, stamping plant and Research and Development Centre is located.
- 3 Originally, the traffic lights operated on what VicRoads terms "partially controlled" right hand turns, where there are no red arrows for right hand turns. **Figure One** shows the original lane and traffic light configuration. In this configuration, the yellow right turn arrow had a duration of three seconds and the yellow light for straight through traffic, was four seconds in duration.
- 4 This type of traffic light sequence allows vehicles to wait within the intersection to effect a right hand turn when there is no oncoming traffic from the opposite direction and where a single red light is used to prevent vehicles from proceeding through the intersection.

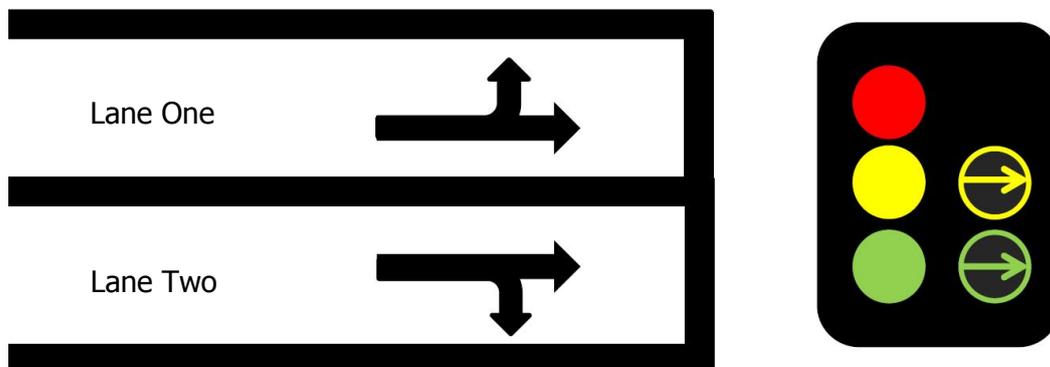


Figure One – The configuration of the lanes and traffic lights at the intersection of The Boulevard and Princes Highway until June 2012. **Note** - The traffic lights include partially controlled left turn arrows, however these are not included.

- 5 In June 2012, VicRoads made changes to the traffic light sequence and lane layout at the western approach of the intersection. **Figure Two** shows the lane and traffic light configuration. The changes were:
 - a. The right hand lane, Lane Two, was altered to be a right turn only lane, and
 - b. The right hand turn phase of the traffic light sequence changed to a "fully controlled" movement with the addition of a red right turn arrow.
- 6 The changes resulted in:

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

- a. The right hand turn arrows for east bound and west bound traffic operate to allow vehicles effecting a right hand turn to complete the manoeuvre safely, then
- b. The straight through movement for both east bound and west bound traffic operate to complete the cycle for traffic travelling along The Boulevard and North Shore Road.

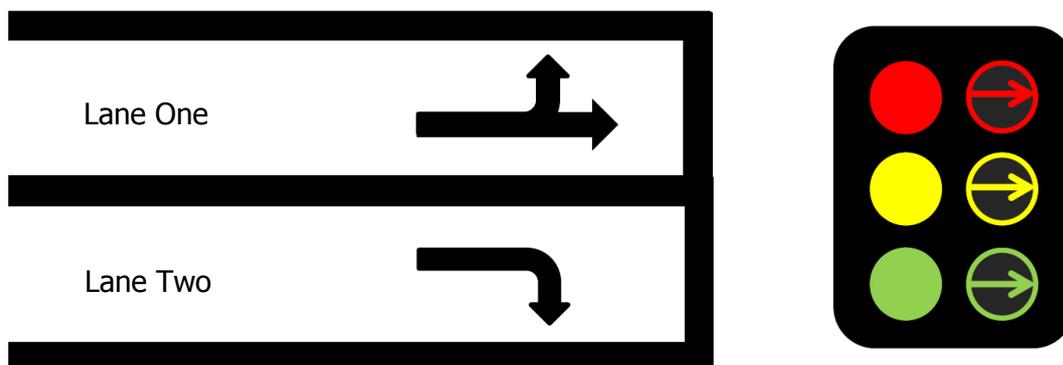


Figure Two – The configuration of the lanes and traffic lights at the intersection of The Boulevard and Princes Highway from June 2012 until February 2014. **Note:** the traffic lights include partially controlled left turn arrows, however these are not included.

- 7 These changes were made in anticipation of the opening of a new Bunnings Warehouse. The Bunnings Warehouse has a car park exit on to The Boulevard, which has brought higher traffic volume to the east bound approach of the intersection. Following the changes made by VicRoads, the *Geelong Advertiser* ran an article about the increased number of infringements detected by the road safety camera at this location, increasing from approximately 200 per quarter prior to June 2012, to over 1,000 per quarter after June 2012.
- 8 Motorists also complained to the *Geelong Advertiser* and the *Geelong Independent* regarding traffic infringements they had received, detected by the road safety camera at this location. Since motorists began writing to the *Geelong Advertiser* and *Geelong Independent*, I have received 40 individual complaints from motorists regarding this intersection and the infringement notices they have received.
- 9 Due to the number of complaints I have received concerning the camera, I undertook a technical investigation into the operation, accuracy and reliability of the road safety camera installed at the intersection of The Boulevard and Princes Highway, Norlane, pursuant to my powers under section 10(e) of the *Road Safety Camera Commissioner Act 2011*.

THE ROAD SAFETY CAMERA SYSTEM

- 10 The road safety camera installed at the intersection of The Boulevard and Princes Highway, Norlane is the Robot Traffipax Traffistar SR520, which is prescribed for use in Victoria by the *Road Safety (General) Regulations 2009*. This type of road safety camera uses a set of two inductive loop sensors installed a short distance apart in each lane to detect vehicle presence and speed. Inductive loop sensors measure a change in magnetism corresponding to the metallic content of vehicles when they travel over the loops.
- 11 Road safety cameras in Victoria must be tested, sealed and used in accordance with the *Road Safety (General) Regulations 2009*. As a part of this process, the primary speed calculation unit of a fixed road safety camera is calibrated and certified by an independent

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

Testing Officer to ensure that it accurately measures the speed of vehicles and tested to ensure it accurately records each change of traffic light phase made by the VicRoads traffic controller.

- 12 In addition to annual certification and recalibration, the camera at the intersection of The Boulevard and Princes Highway in Norlane is subject to a rigorous program of monthly maintenance and quarterly testing by an independent contractor, to ensure that the camera is performing within the specifications of the manufacturer and the requirements of the Department of Justice.
- 13 When the road safety camera detects that the red light phase has activated, it will wait for a Victoria Police mandated 0.5 second grace period where it will not record any images of vehicles it detects entering the intersection against a red light. Once the 0.5 second grace period has passed, it will then begin recording images of vehicles it detects entering the intersection.

NATURE OF COMPLAINTS

- 14 At the date of this report, I have received 40 complaints from motorists who have received at least one infringement notice detected at the intersection of The Boulevard and Princes Highway in Norlane. Each complaint related to an infringement notice the motorist had received when effecting a right hand turn from Lane Two of The Boulevard into Princes Highway. The complaints all focused on one or more of the following issues:
 - a. The duration of the green arrow phase was not long enough,
 - b. The duration of the yellow arrow phase was not long enough,
 - c. There was no yellow arrow phase at all,
 - d. The motorist was stuck within and "could not clear" the intersection, as the traffic light sequence was too short, and
 - e. The lane direction markings were not sufficiently clear when VicRoads implemented its changes.
- 15 I have not received any complaints relating to motorists who have received red light infringements for travelling straight through the intersection against a red light. There has also been no complaint from motorists concerning infringements for exceeding the speed limit at the intersection.

SCOPE OF INVESTIGATION

- 16 The investigation focused on the main issues that motorists have written to me about. From the complaints I received, I concentrated on understanding the following issues at Lane Two of The Boulevard:
 - a. The general operation of the road safety camera before and after the change made by VicRoads,

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

- b. The testing, maintenance and certification activities of the road safety camera after the changes made by VicRoads,
 - c. The changes to the design and operation of the intersection and traffic light sequence made by VicRoads,
 - d. Differences in the traffic volume and behaviour at the intersection of The Boulevard and Princes Highway before and after the alteration made by VicRoads, and
 - e. Any other external influences that may have had an impact on the number of complaints from motorists regarding their traffic light infringements.
- 17** This investigation did not include enquiries into the manual processing of images and data recorded by the road safety camera system, as those procedures and policies do not have any impact on the operation of the road safety camera system or the way the intersection traffic lights function.
- 18** In this report, the phrases "vehicle detected speeding" and "red light incident" refer to the camera detecting a vehicle exceeding the speed limit and/or entering the intersection against a red light or red arrow. This is a direct measurement of the road safety camera's effectiveness, reliability and accuracy and does not refer to the final number of infringements issued by Victoria Police to motorists.
- 19** Data recorded by the road safety camera at the intersection of The Boulevard and Princes Highway in Norlane, was analysed for the periods:
 - a. 1 January 2012 to 31 May 2012, and
 - b. 1 July 2012 to 31 December 2013.
- 20** The two distinct periods of data used in the investigation were selected in order to understand the differences in traffic behaviour before the alterations made to the intersection, and after the alterations were put in place. The analysis of the recorded camera data concentrated on the behaviour of the camera during red light sequences, including the duration of the yellow time afforded to motorists for each red light incident detected. During these periods, over one million vehicle movements were recorded by the fixed road safety camera.
- 21** I also viewed all of the images relating to the individual complaints referred to me by members of the public to determine if there was a common cause for the complaints and to verify whether the camera system was functioning correctly. For each red light infringement issued, two images are recorded by the road safety camera to ensure that the vehicle in question has proceeded through the intersection against a red light. The images should show:
 - a. The vehicle's rear-most axle crossing the road safety camera's sensor area against a red light or red arrow in the first image,
 - b. The vehicle within the intersection against a red light or red arrow in the second image, therefore

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

- c. Showing the vehicle proceeded through the intersection against a red light or red arrow with continuity shown between the two images.

22 I also visited the intersection of The Boulevard and Princes Highway in Norlane with a member of my technical staff and an independent traffic engineer to determine whether there were any external factors that may have played a part in the high number of red light infringements detected by the camera.

RESULTS OF THE INVESTIGATION

OPERATION OF THE ROAD SAFETY CAMERA

23 I am satisfied that the fixed road safety camera at the intersection of The Boulevard and Princes Highway in Norlane was functioning correctly, accurately, reliably and effectively between June 2012 and February 2014. Through examination of the test and maintenance reports, it is clear that the road safety camera was tested, sealed and used in accordance with the legislative and regulatory requirements of the *Road Safety (General) Regulations 2009*. In addition to these requirements, the camera was also routinely maintained and tested to the specifications of the manufacturer and the Department of Justice.

24 There is some public confusion regarding red light infringements as many people believe that infringement notices are issued for "being in the intersection" or "not completing the turn" when the traffic lights or arrows turn red. This is incorrect. The road rules define the offence as entering an intersection **after** the traffic lights or arrows have become red. For more information on what constitutes an intersection in the *Road Safety Road Rules 2009*, please consult **Appendix A**. For more information regarding the road rules relevant to the issuing of red light infringements, please consult **Appendix B**.

25 In examining the images of each infringement referred to me by members of the public, each set of two images showed the vehicle entering into the intersection against a red arrow and then proceeding through it, as per the description in **paragraph 21**. I am satisfied that the infringement notices received by members of the public were issued correctly.

26 In addition, the data recorded by the road safety camera also showed that the 0.5 second grace period was correctly applied to every red light incident. There were no red light incidents detected with a time into red of less than 0.5 seconds.

OPERATION OF THE TRAFFIC SIGNALS

27 I have also examined data recorded by the road safety camera system in relation to the duration of the yellow light phase for each incident detected in Lane Two by the road safety camera from 1 July 2012 to 31 December 2013. Every incident detected by the road safety camera in that lane had a yellow light duration of three seconds or more. Since the standard for yellow light phases at turning lanes is three seconds, as set out in the VicRoads *Traffic Engineering Manual*, I am satisfied that the duration of the yellow arrow phase in Lane Two complies with the guidelines.

28 Therefore, I am satisfied that the changes made by VicRoads were within the guidelines for traffic light sequences and that the traffic lights were operating correctly at the time and after the alterations were implemented.

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

- 29** In relation to the complaints made by motorists that the duration of the green arrow phase was not long enough, that is a matter for VicRoads as it designs, operates and maintains the traffic lights in Victoria.

CHANGES MADE TO LANE MARKINGS

- 30** Some motorists complained to me that the painted directional arrow showing a **right turn only** in Lane Two was not sufficiently clear and that the original **straight through** arrow was still present and visible.
- 31** I made some enquiries of VicRoads regarding these complaints from the public. It advised that the original **straight through** arrow was first covered over with black paint and then subsequently ground away in August 2012, when the black paint began to wear off. VicRoads provided images of the arrows in Lane Two before and after the grinding procedure and I am satisfied that there should not have been any confusion relating to this aspect of the intersection.
- 32** In examining images of infringements referred to me, they show that every motorist was entering the intersection against the red light to complete a right hand turn. Therefore, I am satisfied that no infringements were affected by the lane markings, since no infringements were issued for vehicles travelling straight through the intersection from Lane Two.

ANALYSIS OF DATA RECORDED BY ROAD SAFETY CAMERA

- 33** In examining the incident data recorded by the road safety camera, comparisons were made between the two sets of data recorded before and after the changes made by VicRoads. Prior to the changes made by VicRoads, the road safety camera detected 338 incidents, between 1 January 2012 and 31 May 2012, approximately 2.2 incidents per day. Red light incidents were the majority of detections, at approximately seventy per cent of the total.
- 34** After the changes to Lane Two were implemented, the road safety camera detected a total of 10,330 incidents between 1 July 2012 and 31 December 2013, approximately 18.8 per day. In this case, the number of vehicles detected speeding dropped slightly, from 0.65 detections per day to 0.45 per day. This reduction is possibly due to restricting traffic to one lane when travelling straight through. Red light incidents became the overwhelming majority of detections, increasing from approximately seventy per cent of the total to over 97 per cent of the total.
- 35** **Figure C1**, contained in **Appendix C** shows the average number of incidents detected by the road safety camera per hour for each lane before and after the change made by VicRoads. The results have been normalised over the two periods during which they were recorded. As shown in **Figure C1**, the number of incidents detected remains at a low level for Lane One. However, the number of incidents detected in Lane Two has dramatically increased as a result of the changes implemented by VicRoads.
- 36** To understand the reasons behind this increase in the number of detected incidents, the change in traffic volume was also examined. **Figure C2**, contained in **Appendix C**, shows the change in average traffic volume per hour before and after the changes implemented by VicRoads.

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

- 37** The data shows that the average daily traffic volume has increased by approximately sixty per cent since the implementation of changes to the intersection. However, the number of incidents detected by the camera has increased approximately nine-fold, with Lane Two accounting solely for the increase. The increase in detected incidents cannot be explained by the increase in traffic volume alone.
- 38** In my search for a cause of the increased number of infringements and incidents detected by the road safety camera in Lane Two, I examined images of infringements referred to me in more detail. They showed that the vast majority of motorists entering the intersection against a red arrow, were the last or second last in the queue of vehicles in the lane. The images show that the primary cause of the increased number of red light incidents detected and, ultimately, infringements issued from Lane Two by Victoria Police, was driver impatience.
- 39** I am concerned that some motorists are exhibiting this level of impatience and choosing to treat the yellow light as an extension of the green light, rather than a warning to stop before entering the intersection, if it is safe to do so, as required by rule 57 of the *Road Safety Road Rules 2009*.

FURTHER CHANGES MADE BY VICROADS

- 40** During the investigation, I was advised by representatives of VicRoads that further changes to the intersection and the operation of the traffic lights were to be made, which it believed would improve traffic flow and safety, as well as lower the number of complaints it has received in relation to the intersection. **Figure Three** shows the changes, which were implemented on 12 February 2014.

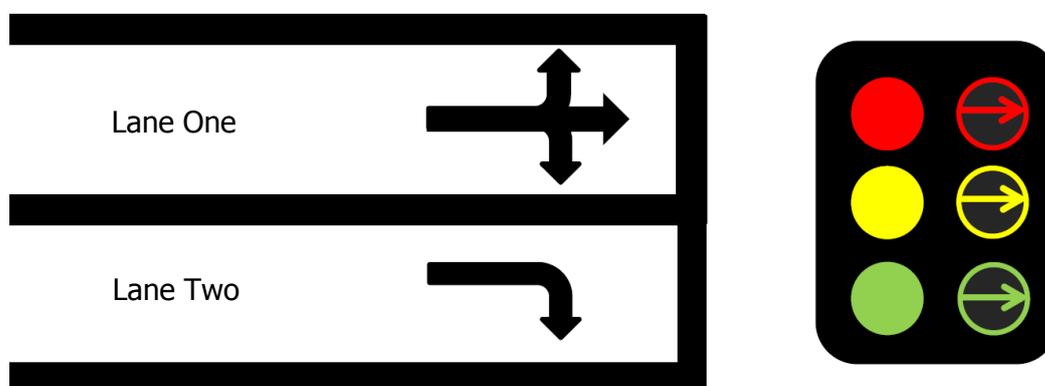


Figure Three – The configuration of the lanes and traffic lights at the intersection of The Boulevard and Princes Highway from 12 February 2014. **Note:** the traffic lights include partially controlled left turn arrows, however these are not included.

- 41** The changes consisted of an alteration to Lane One, enabling motorists to effect a right hand turn from both Lane One and Lane Two. To ensure this new lane configuration is safe, the traffic light cycle has been altered by:
- Allowing vehicles from The Boulevard to travel through the intersection in isolation, then
 - Allowing vehicles from North Shore Road to travel through the intersection in isolation.

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

- 42 This change ensures the green and yellow lights and arrows are the same duration for both The Boulevard and North Shore Road. In effect, this allows more time for motorists to complete a right hand turn.
- 43 The change in lane markings is promulgated on approach to the intersection with a new sign, which is shown in **Figure Four**.



Figure Four – The new sign installed by VicRoads promulgating changes in lane markings on approach to the intersection. (Image credit: VicRoads)

- 44 Analysis of data recorded by the road safety camera since this most recent change shows that the number of vehicles entering the intersection against the red arrow, has decreased dramatically. Data recorded by the fixed road safety camera during the period 13 February 2014 and 13 March 2014 shows that the highest number of incidents detected on one day was five. **Figure C3** contained in **Appendix C** compares the daily number of incidents detected by the road safety camera for both lanes during the periods 13 February to 13 March 2013 and 13 February to 13 March 2014.
- 45 I am confident that the effect of this latest change to the traffic light sequence and operation of the intersection will be a continued reduction in the number of incidents detected made by the road safety camera.

CONCLUSIONS

- 46 After examining the testing, maintenance and certification reports provided by the Department of Justice, I am satisfied that the road safety camera installed at the intersection of The Boulevard and Princes Highway in Norlane, was operating accurately and reliably, both before and after alterations were made by VicRoads to the east bound approach to the intersection.
- 47 After analysing data recorded by the road safety camera and information provided by VicRoads, I am satisfied that the traffic light system installed and maintained by VicRoads was operating correctly. I am satisfied that the durations of the yellow light and yellow arrow for the east bound approach to the intersection, met the guidelines as set out in the VicRoads *Traffic Engineering Manual*.
- 48 From my analysis of the infringements referred to me by motorists, I am satisfied that the lane markings were sufficiently clear, as none of these motorists were issued a red light infringement for travelling straight through the intersection from Lane Two.

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

- 49** From viewing and analysing the images of each infringement notice referred to me by motorists, I am satisfied that each and every vehicle entered and proceeded through the intersection against a red arrow, which contravenes road rule 60 in the *Road Safety Road Rules 2009*. I am satisfied that each infringement notice has been issued correctly based on the images recorded by the road safety camera system.
- 50** I am satisfied that the primary reason for the increased number of infringements issued by Victoria Police originating from this road safety camera, is driver impatience upon seeing the yellow arrow. Instead of stopping, some motorists chose to treat the yellow arrow as an extension of the green arrow, and have ultimately been detected proceeding through the intersection against the red arrow.
- 51** VicRoads are to be commended on acknowledging the concerns of local residents in regards to the operation of the intersection and implementing a solution that I am confident will allay those concerns.

RECOMMENDATIONS

- 52** I recommend that the adequacy of the signage recently erected by VicRoads as shown in **Figure Four** near the intersection of The Boulevard and Princes Highway in Norlane be monitored, particularly in respect of the apparent awareness of motorists of the availability of the left lane to effect a right hand turn.

CONSULTATION

- 53** This report was prepared in consultation with the Department of Justice and VicRoads.

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

APPENDIX A

DEFINITION OF AN INTERSECTION

An intersection is defined in the *Road Safety Road Rules 2009*.

Means the area where two or more roads (except any road related area) meet, and includes-

- a) any area of the roads where vehicles travelling on different roads may collide, and*
- b) the place where any slip lane between the roads meets the road into which traffic on the slip lane may turn-*

But does not include any road related area.

Note: A road related area, as defined in the *Road Safety Road Rules 2009* includes, but is not limited to, areas such as footpaths, driveways and median strips.

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

APPENDIX B

ROAD RULES 59 AND 60

There are two sections of the *Road Safety Road Rules 2009* relating to travelling through an intersection against a red light or red arrow.

Section 59 relates to proceeding through an intersection against a red light:

- 1) *If traffic lights at an intersection or marked foot crossing are showing a red traffic light, a driver must not enter the intersection or marked foot crossing.*
- 2) *However, if the traffic lights are at an intersection with a left turn on red after stopping sign and the driver is turning left at the intersection, the driver may turn left after stopping.*
- 3) *Also, subrule (1) does not apply to a driver if rule 58(1) or (2) applies to the driver.*

Section 60 relates to proceeding through an intersection against a red turn arrow:

If traffic arrows at an intersection are showing a red traffic arrow, and a driver is turning in the direction indicated by the arrow, the driver must not enter the intersection or marked foot crossing.

Note: Section 58 of the *Road Safety Road Rules 2009* refers to cases where motorists are able to complete a turn at traffic lights that are showing red, but with a green arrow in the direction they are turning. It also refers to a special case where there is no stop line or *stop here on red signal* sign present at or near the traffic lights.

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

APPENDIX C

The intersection of The Boulevard and Princes Highway, Norlane Average number of incidents detected by hour of day

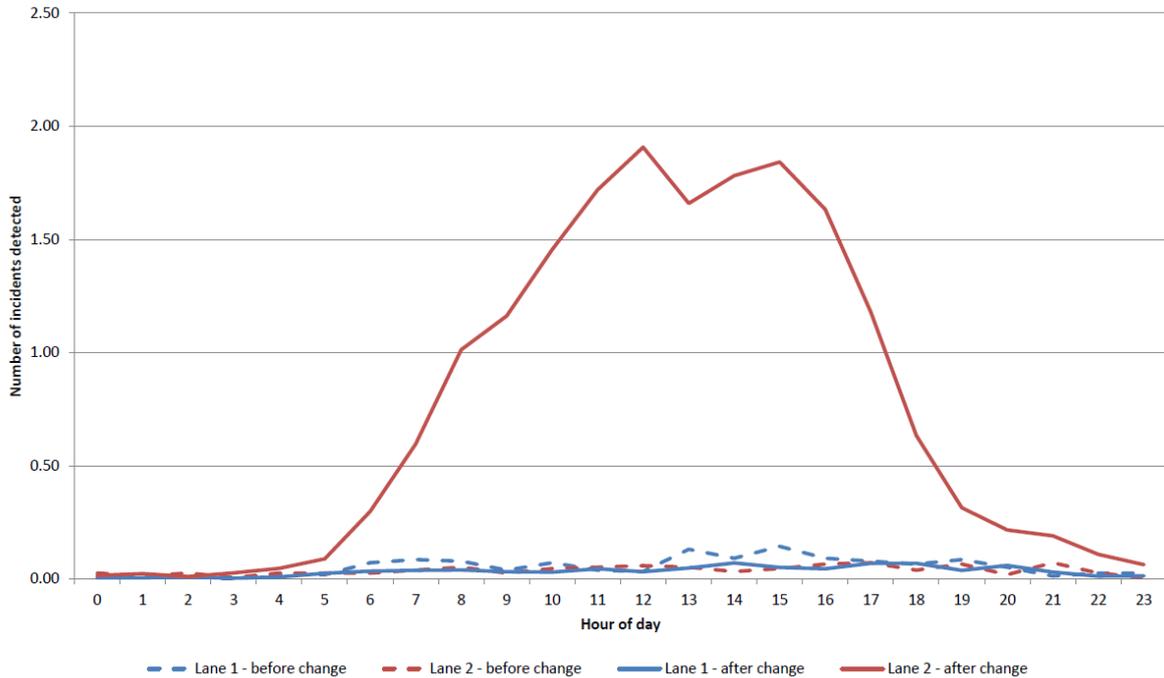


Figure C1 – average number of incidents per hour for each lane before and after the initial change in the traffic light sequence implemented by VicRoads

The intersection of The Boulevard and Princes Highway, Norlane Average traffic volume by hour of day

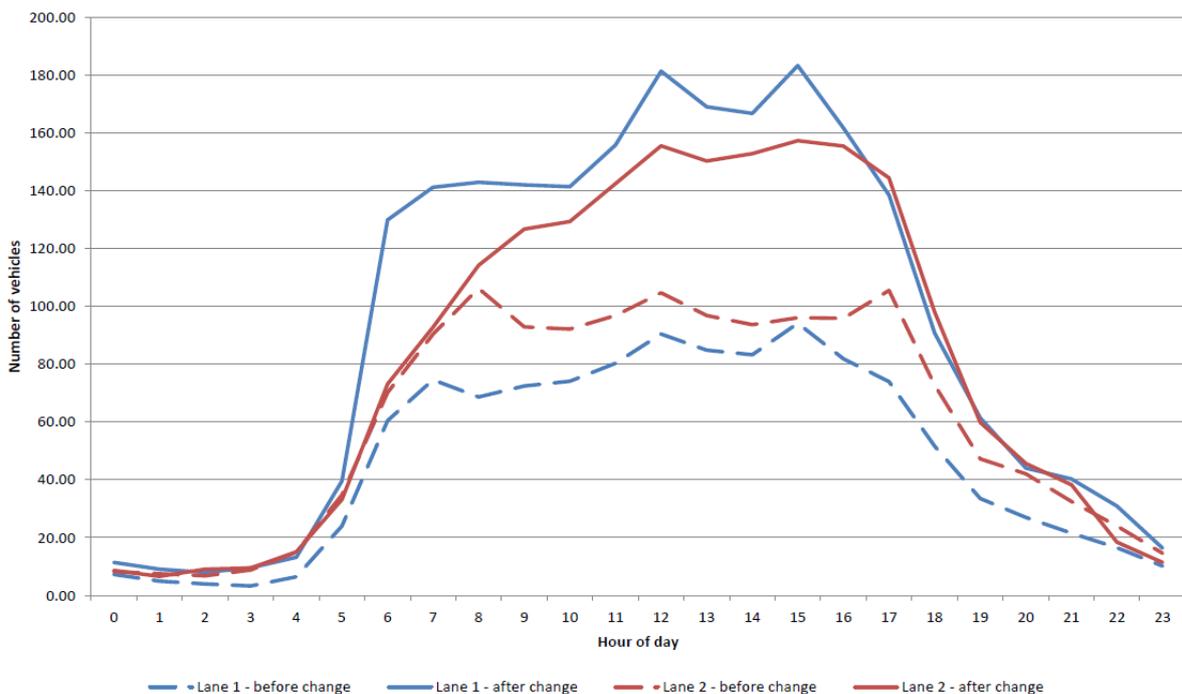


Figure C2 – average traffic volume per hour for each lane before and after the initial change in the traffic light sequence implemented by VicRoads

Office of the Road Safety Camera Commissioner

Investigation into the road safety camera at the intersection of The Boulevard and Princes Highway, Norlane

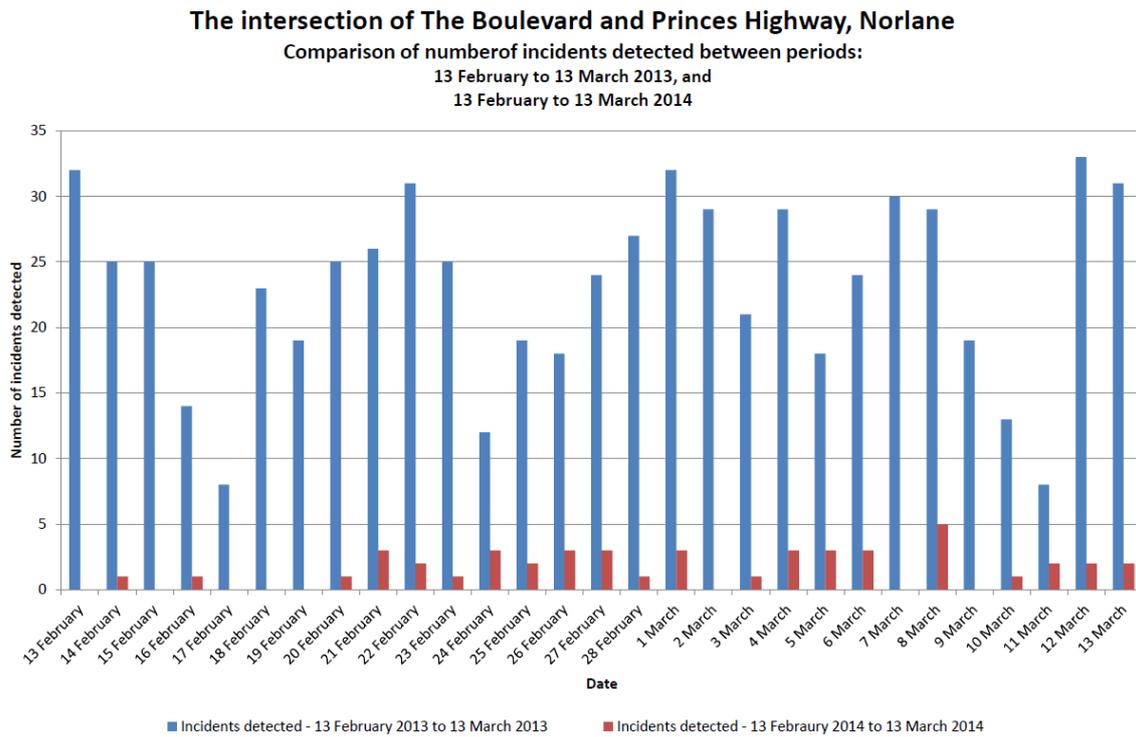


Figure C3 – comparison of number of incidents detected by the road safety camera before and after the most recent traffic light sequence implemented by VicRoads