

# ASSISTING YOUR BARRISTER - ACCIDENT RECONSTRUCTION CASE STUDY

John Boyd, [jboyd@orange.nsw.gov.au](mailto:jboyd@orange.nsw.gov.au)  
Acting Director Technical Service , Orange City Council,  
NSW, Australia

## Abstract

As engineers we are often asked to write reports on incidents or accidents. However, when it comes to assisting our legal representatives in court we tend to be overlooked in favour of administrative or corporate staff. Our technical expertise as part of the team in a major case is essential in presenting the strongest possible defence against a claim. This paper presents a case study where expertise from Council's Engineering staff made a significant contribution in the defence of a civil claim against Council.

**Key Words:** accident crash investigation reconstruction perspective grid photograph expert witness engineer claim court

## Introduction

This case study discusses how a defence was developed against a civil claim by assessing seven year old evidence to reconstruct the circumstances of a motor vehicle accident. Our reconstruction of events differed markedly from the account presented by the investigating police officer and that proposed by the plaintiff.

advised that they were not to be competitive against one another.

During the 1994 event a Mini Cooper S left the road and passed through a drain leading from a culvert. It travelled another 47m and hit a tree some 13m from the shoulder of the road. The driver was killed as a result of the impact. During a 1995 coronial inquest into the event, the coroner identified the death as an accident and apportioned no blame.

In 2002 the family of the deceased took civil action against Council, the event organiser and the police with a claim in the order of \$1.4M.

This case, which was held in the Supreme Court, lasted many weeks. While the initial claims against Council were concerned with administrative matters it was quickly realised through the line of questioning that the condition of the road and surrounds would be a major focus of the plaintiff's case.

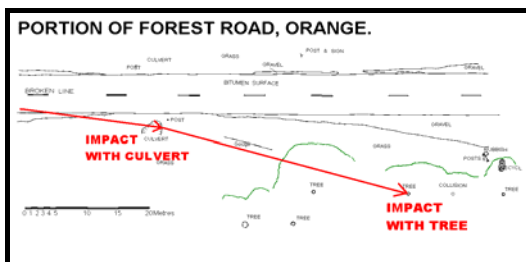


Diagram 1

## History

In October 1994 a motor vehicle event called the Gnoo Blas Classic was held at Orange. This event, which had occurred in previous years, was an opportunity for vintage car enthusiasts to show off their vehicles by driving them around the old Gnoo Blas racing circuit. Drivers were briefed and

## The Plaintiff's Case

**Diagram 1** gives a general overview of the situation as it existed at the time of the accident. This diagram also shows

the approximate path of the vehicle as it left the road and passed through a drain extending from a pipe culvert to the eventual point of impact with the tree. Wet weather conditions prevailed at the time of the accident.



Photo 1

In a very summarised form the scenario that was brought forward from the officer who investigated the case suggested that the driver had control of the vehicle and made a conscious choice to leave the road and drive on the wet grass verge. The estimated speed of the vehicle at the time was approximately 80 kph.

This officer suggested that the car left the road, travelling without yaw, at an angle of  $30^\circ$  and that no guide-post was in place at the culvert to warn the driver of its existence. Once the vehicle impacted with the drain leading from the culvert the driver lost control of the vehicle resulting in a collision with a tree some 47m further on.

## The first signs of inconsistency

**Photo 1** shows the path where the vehicle left the road. On face value this photograph appears to show the vehicle driving straight at an angle of approximately  $30^\circ$ , directly into the culvert drain.

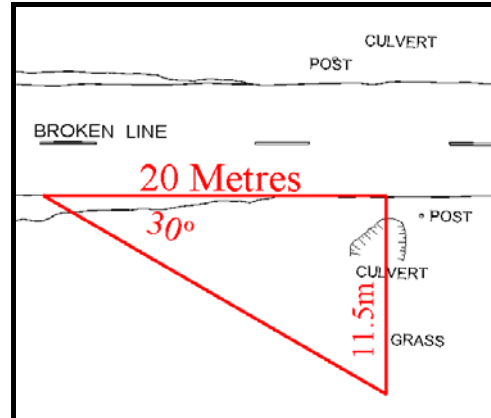


Diagram 2

Aside from the apparent illogical decision to drive on wet grass at high speed, I, as an engineer saw an inconsistency. A quick estimation considering the  $30^\circ$  angle and 20m distance put the car over 11m from the road not the 1.5m to 2m where it struck near the culvert head wall. (**Diagram 2**)

Thus, it appeared to me that the officer was simply using photos to interpret the accident rather than actual measurements or facts. This prompted me to investigate **Photo 1** in much more detail.

Looking further it appeared that in comparison to the officer's height the wheel tracks were relatively narrow (even for a Mini). Given the officer's foot was on one of the wheel tracks I thought it reasonable to be able to estimate dimensions at this distance from the camera. Based on the assumption that the officer was around 1.75m tall (his height was observed in Court) the distance between the tracks scaled at approximately 0.75m (**Diagram 3**). This was significantly

narrower than the 1.2m wheel span of a Mini Cooper S.

The only explanation I could see was the vehicle had left the road with a yaw to the direction of travel. However, to support this theory it was necessary to identify where the other two wheels left the road.

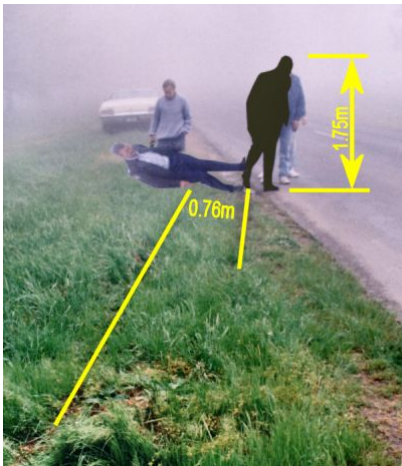


Diagram 3

### More supporting evidence

Looking at other photographs in greater depth revealed four yellow paint marks along the road shoulder **Photo 2**.



Photo 2

It was also apparent from the crossing tyre marks after the culvert that the car had rotated a full 360° in a clockwise direction before hitting the tree **Photo 7**.

Immediately following the accident it was understood that the vehicles constant velocity (CV) joint was found to be damaged. While ultimately the evidence as to when the joint failed was

inconclusive we did manage to find the vehicle (stored under cover and intact after 7 years) and were able to take numerous photos as the CV joint was removed. From these photos further anomalies appeared which later prompted us to engage a mechanical engineer to inspect the vehicle.

Of immediate interest however was the wheel shown in **Photo 3**. This left front wheel clearly shows dirt packed into it, and significant damage to the rim. These facts seem to suggest that the tyre may initially have deflated on the bitumen road surface before the left front wheel impacted with the drain leading from the culvert. The dirt packed in the wheel provided more evidence that the car was not travelling straight at the time of impact.



Photo 3

While this was enough to convince me that the vehicle was out of control before it left the road I needed to convey this in a clear manner to Council's barrister and the other defendants in the case.

I undertook this by developing a small animation, taking a series of photographs of a toy car on a large sheet of paper. These photographs were combined as a "GIF" file, which created a cartoon style stop animation that could be seen on a web browser.

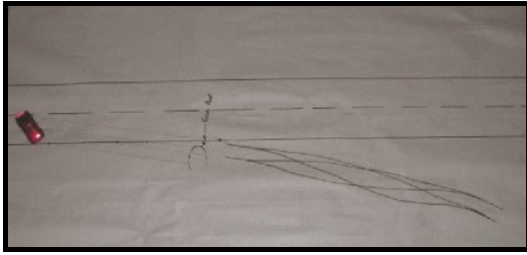


Photo 4

A snapshot of this animation is shown as **Photo 4**. While rather crude, it effectively galvanised all the facts known at that time. As a team we were now all confident of what had happened on the day, however our barrister still had to bring this information out of the plaintiff's witnesses.

To assist our barrister when questioning witnesses this scenario was drawn up by a Council draftsman. At a staff level this was about as far as we could assist in reconstructing the events that had occurred. As we believed that the police had misinterpreted the evidence (I hasten to say innocently) we now needed to engage experts in the field who could give unbiased opinions as Expert Witnesses in court.

### The Expert Witnesses

Four expert witnesses were engaged as part of reconstructing the accident. These included a metallurgist, a mechanical engineer and two accident reconstruction experts.

The metallurgist was very competent in his skills however the treatment of the Mini's CV joint during the plaintiff's earlier investigations led to inconclusive results as to whether the part failed and caused the accident, or whether it was a result of the accident.

Far more helpful was the investigation by the Mechanical Engineer. While looking for modifications or problems that may have caused the Mini to lose control he discovered a vertical crease in the passenger side door. This crease shown in **Photo 5** was accompanied by white paint marks strongly suggesting

the vehicle had hit a standard white wooden guidepost. As these marks were inside folds in the door which had occurred as a result of the impact with the tree it was highly unlikely that this crease had been caused after the accident.

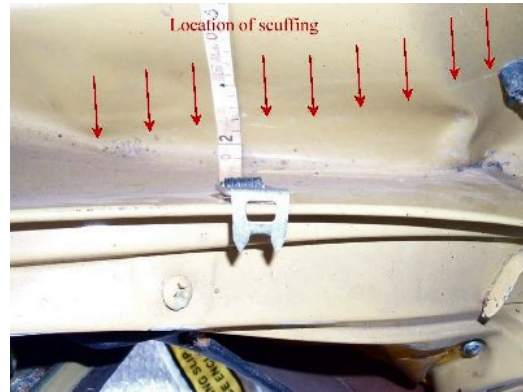


Photo 5

This evidence of the guidepost hitting the door fitted perfectly with our scenario and showed the culvert was delineated, contrary to the police opinion. It also explained why the police didn't notice the guidepost marks as they had assumed the vehicle to be travelling forward without yaw.

### Reconstructing the accident

As the claims concerning the culvert and the road first arose during the trial, significant resources had to be put into quickly reconstructing the accident. Hence two consultants were engaged, one to reconstruct the path of the vehicle and the other to develop a calibrated, computer generated model verifying the scenario we had proposed.

Mr Mark George of M H George & Associates reconstructed the path of the vehicle using two different techniques. These were *perspective grid analysis* and *photographic reconstruction*. Mr George was very professional in his approach to investigating the accident and spent a great deal of time explaining his methodologies. Mr George's advice has subsequently led me to fine tune

my own approach to investigating accidents.

### **Perspective Grid Analysis**

While the plaintiff offered an “expert” to say that measurements could not be taken from a single photograph, Mr George demonstrated this not to be the case by using a photogrammetry technique referred to as *perspective grid analysis*. In simple terms if it is possible to define a rectangle on a plane in a photograph, subdividing or extending this rectangle can allow reasonable measurements to be made. **Photo 6** illustrates how this was achieved knowing; 1) the straight centre line of the road is parallel to the road edge, 2) the distance between centre line markings and 3) the lane width, which was measured at the time of the accident.

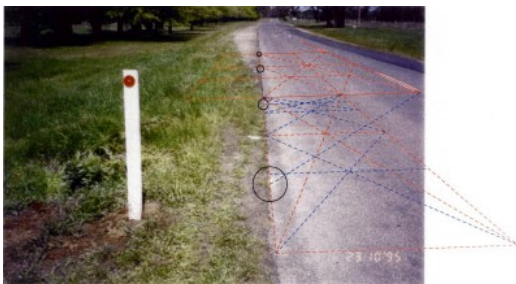


Photo 6

As can be seen in **Diagram 4** each subdivision of the rectangles on the photograph are copied onto the plan view so measurements can easily be scaled.

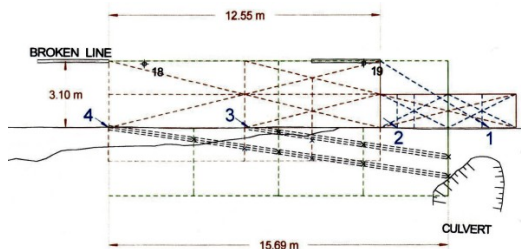


Diagram 4

These measurements were then transferred to **Photo 1** allowing measurements to be taken of the wheel

separation where the vehicle left the road. Mr George’s work verified our earlier assumption that the separation of the wheel track was far narrower than the distance between the Mini’s front wheels.

### **Photographic Reconstruction**

*Photographic reconstruction* is a simple but very effective method of re-establishing tyre marks (as shown in **Photo 7**) by looking through a transparency of a photograph from the point the original photograph was taken.

Traditionally this was done by tracing key elements such as trees and tyre marks onto a transparent sheet. This was then mounted onto a stand and through trial and error positioned at a location where the original was taken. A viewing hole was then adjusted to emulate the focal length of the camera. In Mr George’s reconstruction of the Mini’s tyre marks, photographs were colour photocopied onto overhead transparency sheets.



Photo 7

Once the transparency was correctly positioned as shown in **Photo 8** it was simply a matter of looking through the transparency and placing marks on the ground corresponding to the wheel marks. The results of this approach can be seen in **Photo 9**.

A one man total station theodolite was used to survey this information for later inclusion on plans.



Photo 8



Photo 9

### Modelling the accident

The information derived from the reconstruction of the accident was passed on to Mr Grant Johnston of Grant Johnston Consulting Engineers Pty Ltd who modelled the path of the Mini as it left the road.

This model was more than just a graphic representation of the accident, as it dynamically modelled the impact of the vehicle with the culvert drain and illustrated the subsequent rotation on the grass surface before coming into contact with the tree (**Photo 10**).

The almost identical tyre marks generated demonstrated that the scenario we had developed was accurate and compelling evidence that a court would accept.

### The outcome

I must stress that the scenario proposed here is only our interpretation of events which was obviously different

from that of the Plaintiff and investigating police officer at the time.

Nonetheless, once the accident was reconstructed by Mr George a copy of the document was presented to the plaintiff's legal counsel and within a very short time an offer was made by the plaintiff that was economically acceptable, and the case was settled. It is my view that the quantum of the settlement was largely as a result of the investigation into the accident which clearly demonstrated that the car was out of control before it left the road and not as a result of hitting the outlet of an unmarked culvert.

In some ways I was personally disappointed that, as a result of the settlement, the judge did not get to see the work undertaken by the experts. However in presenting a case strong enough to persuade the other side to settle for a commercially acceptable amount a good outcome was achieved.



Photo 10

### Conclusion

While most engineers are not experts in accident reconstruction, our training and experience allows us to analyse these types of situations in greater depth than other professionals may be able to. It is essential that we play a part in assisting our legal representatives during a court case as our skills can at least identify physical inconsistencies in evidence that can then be pursued by experts in the field.

## **References**

Stannard Baker, J. & Fricke, L.B. (1986) The Traffic-Accident Investigation Manual, 9th ed., Northwestern University Traffic Institute, Evanston Illinois.

## **Acknowledgment**

I wish to acknowledge the assistance of Messrs Mark George and Grant Johnston for advice and allowing the use of diagrams they developed while reconstructing this accident.

## **Author Biography**



**John Boyd** is currently employed as Acting Director, Technical Services with Orange City Council. John holds a degree in Civil Engineering from the University of Technology Sydney, and a Post-graduate Diploma in Local Government Engineering.

John commenced his engineering career in 1982 at Parkes Shire Council where he was employed as a Junior Engineer. In 1990 John took the position of Deputy Engineer at Narromine Shire Council and subsequently commenced work with Orange City Council as Works Manager in 1994.

**Postal Address:** John Boyd Acting Director,  
Technical Services, Orange City Council, PO  
Box 35 Orange 2800

**E-mail:** [jboyd@orange.nsw.gov.au](mailto:jboyd@orange.nsw.gov.au)

**Website:** [www.orange.nsw.gov.au](http://www.orange.nsw.gov.au)