

Evaluation of Loss of Control Tire Marks on a Gravel Shoulder

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At Gorski Consulting we take considerable time for documentation and evaluation of tire marks on gravel shoulders of rural highways. It is known that many of the fatal and serious-injury collisions that occur on rural highways begin when a vehicle, often travelling around a curve in the road, travels onto a gravel shoulder and a loss-of-control occurs. This occurrence is often not identified or mis-interpreted because investigators have a lack of experience in identification and interpreting the evidence that occurs when vehicles enter a gravel shoulder at highway speed.

In a continuation of our discussions on this issue this article presents another example of a set of loss-of-control tire marks on the gravel shoulder of a curve of rural highway. We will provide a number photos of the evidence as well as some interpretations of what the evidence means.

The tire mark evidence we will be discussing was created sometime over the 24 hour period of July 31st and August 1st, 2013 on Clarke Road just north of Fanshawe Park Road on the north-eastern outskirts of London, Ontario. Readers may be aware that this is the site of many previous discussions in articles on our Gorski Consulting website as the unusual S-curve provides many opportunities for drivers to lose control of their vehicles.

Clarke Road is a north-south roadway in the vicinity of a large number of gravel pits on the edge of the built up area of London, Ontario. In vicinity of the S-curve that we are going to examine there are a large number of dump trucks and petroleum tanker trucks that pass through the curve throughout the day. Most of the drivers of these vehicles pass through the curve a number times in a day so they are very familiar with its characteristics and hence can pass through the unusual curve at substantial speed. However, on occasion, a driver passes through who is unfamiliar and the potential for loss of control is increased. Most of those drivers who are not familiar with the curve are generally passenger car and light truck drivers.

The opening photo we show of the site (on Page 2) is a view looking north toward the sharp left curve which is the second of the two portions of the S-curve for northbound drivers. Interestingly, the photo shows a set of long, skid marks, unmistakable from a large truck, in the northbound lane just as the truck was approaching the sharp left curve. Those tire skid marks are not the subject of our discussion but they high-light that even drivers of large trucks may become surprised by the extent of the curvature or perhaps the driver needed to deal with some kind of obstacle that developed. The tire marks we are actually interested in are not visible in Figure 1 but they exist on the east

(right) shoulder in the area of the curve where the road surface is not visible. Those tire marks were caused by a northbound car or light truck where the driver would appear to have badly misjudged the curve and travelled well into the shoulder before taking actions to gain control of the vehicle.



Figure 1: View, looking north, toward the left (north) curve portion of the S-curve on Clarke Road.

Figure 2 brings us further into the left curve and now we can see the surface of the road as well as the east gravel shoulder where the loss-of-control tire marks exist. The loss-of-control tire marks are not particularly visible in Figure 2 and this gives us an opportunity to comment on this fact whenever we take photos or examine photos of such marks.

Most investigators will not be professional photographers and, although they may have some reasonably good quality equipment, they may not have a wealth of knowledge on how to achieve the best results in making tire marks in gravel more visible in their photos. So, in many cases, very obvious tire marks may exist on a gravel shoulder but they may not become all that visible in a photo. Sunny days, such as the one shown in Figures 1 and 2 pose a significant problem to displaying tire marks on any roadway surface as the stark sun tends to white wash much of the contrast that might exist. It is generally preferable, when possible, to take these photos early at sunrise or late near sunset, or on a cloudy day. But obviously, that is not always possible.



Figure 2: View, looking north, along the east shoulder of Clarke Road in the vicinity of the loss-of-control tire marks on the gravel shoulder.

However, as we move slightly further north into the curve, Figure 3 demonstrates that the loss-of-control tire marks on the east shoulder suddenly become much easier to see. We suggest that, as the vehicle begins to change direction, and the tires begin to slip sides more and more, more contrast is developed between the monotone shade of the gravel and the freshly turned up gravel where the tire sideslip occurs and this makes the tire mark more visible.

Unmistakably, and very commonly, the initial portion of the visible tire mark is just a single mark that is difficult to detect in the foreground of Figure 3. But as the vehicle begins to rotate counter-clockwise that single tire mark, which comes from the two right side tires, begins to diverge into two separate tire marks. This characteristic can be appreciated by looking into the background of the shoulder shown in Figure 3.

Now, look in Figure 3 at how far the right side wheels of the vehicle have moved off the road surface and onto the gravel shoulder. This is not just a small amount of mis-judgment . At the apex of this curved tire mark the left side tires would be very close to also coming off the pavement and onto the gravel shoulder.



Figure 3: View, looking north, along the east shoulder where the curved, loss-of-control, tire mark becomes more visible.

In Figures 4 and 5 we are looking north further along the loss-of-control tire marks on the east shoulder. Now the divergence of the right side tires into two tire marks is quite visible. We can see that the driver is obviously steering to the left and attempting to bring the vehicle back onto the pavement as the tire marks curve back toward the pavement.

In Figures 6 and 7 we reverse the direction of view, and we are now looking south along the east shoulder and back in the direction from which the loss-of-control vehicle came. Interestingly we can obtain some indication of the timing of the occurrence by noting that another tire mark, likely from a farm-tractor-type vehicle crosses over and obliterates our tire marks as can be seen in the foreground of Figures 6 and 7. The evaluation of how one set of tire marks crosses over and destroys a previously-made set of marks is one of the tools we use to understand the timing of what occurred at an accident site.

Figure 8 is also a view looking south but the camera's location is further north of Figures 6 and 7 and here we see another set of interesting tire marks on the east shoulder. For comparison, you can look into the background of Figure 8 and find the previously-discussed tire marks. So why does this new set of tire marks exist? Could they be related the tire marks we have already discussed? Well, yes, they are.



Figure 4: View, looking north along the loss-of-control tire marks.



Figure 5: View, looking north, along the loss-of-control tire marks.



Figure 6: View, looking south, showing the loss-of-control tire marks in the east gravel shoulder.



Figure 7: View, looking south, showing the loss-of-control tire marks in the east gravel shoulder.



Figure 8: View, looking south, showing a new set of loss-of-control tire marks in the foreground of the east shoulder.

On the day and night of July 31st and August 1st it had been raining and the road surface was wet. So when our mystery vehicle came back onto the road surface after producing its first set of tire marks in the shoulder the wet road surface prevented the creation of any visible yaw marks on the pavement which would have clarified its motion for us, and this is a common scenario. Upon re-entering the roadway the driver had successfully brought the vehicle out of the counter-clockwise rotation and the driver then counter-steered to the right to prevent the vehicle from crossing the road into the opposite (west) roadside. But we cannot see this action because the wet road has prevented the yaw marks from being seen. So the tire marks in the foreground of Figure 8 are caused by the same vehicle that caused the tire marks in the background of Figure 8. So, in the foreground of Figure 8 our loss-of-control vehicle is now headed toward the camera and back into the east shoulder again.

Interestingly, recall those farm-tractor-type tire marks that we discussed in Figures 6 and 7? Well, those same farm-tractor-type tire marks can be seen again in the foreground of Figure 8 and, once again, they are seen obliterating our loss-of-control tires marks near the asphalt edge. So this is another indication that both sets of loss-of-control tire marks were created at a similar time.

If we turn the camera around to face northward Figures 9 and 10 show the second set of loss-of-control tire marks as our mystery vehicle slides back into the east shoulder.



Figure 9: View, looking north, at the second set of loss-of-control tire marks.



Figure 10: View of second set of loss-of-control tire marks as the vehicle re-enters the east shoulder.

Fortunately, our mystery driver lost a substantial amount of speed during his travel up to the point where the vehicle re-enters the east shoulder and we can see in Figure 10 that once again the tire marks curve back toward the road surface and we will see shortly that the driver then accelerates under control and "scoots off into the sunset", never to be seen again. However it is important to understand the difference between the situation in this second set of tire marks where the driver regains traction and is no longer side-slipping versus the condition in the first set of tire marks where the vehicle was side-slipping. So let us look more closely at some of the characteristics of this second set of tire marks which demonstrate a controlled acceleration at the latter end of the marks.

Let us follow those tire marks as they pass through the shoulder and then exit it. Figure 11 takes us further along the tire marks as the right side tires enter the edge of the grass. The vehicle is still side-slipping at this point and just completing its clockwise rotation as the tires begin to gain hold of the surface.



Figure 11: View, of the second set of tire marks showing side-slipping in the early portion of the tire marks.

In Figure 12 we proceed further north and we can see how the grass is torn up by the sliding tires indicating the existence of the side-slipping action, then Figure 13 shows how the side-slipping begins to dissipate as the vehicle travels toward back toward its lane.



Figure 12: View of tearing of grass indicating the tires are side-slipping as they pass over it.



Figure 13: View showing the tire marks as they progress back toward the northbound lane.

Figure 14 is a close-up view of the tire mark produced by the right side tires of the vehicle and in the foreground you can see the tread pattern in the mark indicating that the tires are no longer side-slipping. Yet, you can also see how the gravel to the left and right of the tire mark is being disbursed as the tires are "plowing" into the gravel as the tire is accelerating and "moving" the gravel.



Figure 14: Close-up view of the right side tire mark.

Figure 15 shows a view of the tire marks looking south from where the vehicle has accelerated back into the northbound lane. And Figure 16 shows a closer view of those marks.



Figure 15: View looking south, toward the second set of tire marks.



Figure 16: View, looking southbound, showing a closer view of second set of tire marks.

Let us take several closer views of the characteristics of these marks. Figure 17 brings us close to the tire mark caused by the right side tires.



Figure 17: Close-up view of the characteristics of the tire mark caused by the right side tires.

Similarly, Figure 18 shows a view of the mark produced by the left side tires, and Figure 19 shows a closer view of the mark.



Figure 18: View, looking south along the tire mark produced by the left side tires.



Figure 19: View, looking north, showing a closer view of the left side tire mark.

Figure 20 shows us the point of transition in the left side tire mark where the tires change from side-slipping rotation to forward acceleration. You should be able to see within the mark how there is a disturbance of the gravel within the mark in the background and then toward the foreground that disturbance changes into a condition where we can see the tread of the tire in the mark, as the side-slipping is ceased and the acceleration commences. You might also be able to detect how, during side-slipping, a majority of the disturbed gravel is thrown to one side of the tire mark whereas in acceleration the gravel and earth are "squashed" to both sides of the mark.



Figure 20: View, looking south, along the left side tire mark showing its transition from side-slipping in the background to acceleration in the foreground.

The side-slipping portion of the tire marks is further evidenced in Figure 21 and in the closer view of the left side tire mark shown in Figure 22.

These photos were taken within 24 hours of their creation. Also the substantial amount of rain during that time made the gravel shoulder softer and easier to carve out by the motion of the tires. So the characteristics of the tire marks are easier to see. In many cases, even when police might arrive within minutes of a collision, dry conditions and the compaction of gravel into a hard surface can make the characteristics of such tire marks difficult to detect. So evaluations of tire marks on a gravel shoulder to reconstruct what happened during collision events is not always easy.



Figure 21: View of side-slipping portion of tire marks.



Figure 22: Closer view of the left side tire mark showing its side-slipping portion.

As with anything one might do, it is important to become a focused student of what you are involved in. With exposure and experience seemingly difficult tasks become easier.

The study is tire marks on gravel shoulders should be viewed as an extremely important part of any investigator's education since so many fatal and serious injury collisions commence with a vehicle travelling onto a gravel shoulder.

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