RULE 8 STATEMENT

MARK DEGIOVANNI

ADVANCED LASER IMAGING

1. **Please provide your full name and business address**

   Mark DeGiovanni, Advanced Laser Imaging, Building 3, Chiswick Park 566, Chiswick High Road, London, W4 5YA

Original Material

2. **What original material did ALI rely on in its work?**

   ALI requested and used original material where possible. However the way evidence was submitted to the Inquiry did not come with a continuity chain or date of creation/submission, therefore the Inquiry had 100's of exhibits to work through. ALI spent a lot of time organising and referencing the exhibits to determine which ones were original or copies, but this was very much a 'black box 'exercise, i.e. looking at metadata and formats to make the assessment.

3. **The Snapchat video PIRC-03371 has a different resolution to the other Snapchat files held by the Inquiry. Does this indicate that PIRC-03371 is not the original Snapchat footage? Did the difference in resolution have an impact on your work?**

   ALI cannot confirm the originality of this footage. If a version with greater resolution was available, increased accuracy of the phototgrammetry would be possible, however, it is a case of diminishing returns, and the quality of the footage available was sufficient for a suitable level of accuracy from PIRC-03371.

Ashley Wyse Snapchat footage

4. **Can you confirm if the Snapchat video PIRC-03371 has any ambient sound? If so, why might this not be heard within the Evidence Video Timeline (SBPI-00046)?**

   PIRC-03371 contains some ambient sound. The sound is very low, so requires to be listened to on maximum volume to be picked up. This audio is also in the Evidence Video Timeline. As it is very low level background noise, it may not have been heard on the Inquiry's audio system, which was balanced against the loudest parts of the audio, not the quietest. ALI did not remove sound from the supplied audio/video assets.

5. **Did you consider enhancing the sound within the Snapchat footage to assist with its interpretation?**

   ALI were not commissioned to enhance audio recordings on behalf of the Inquiry. This lies outside of our remit. ALI do not hold expertise in interpreting low level noise

as shouting nor in enhancing the audio in a forensically safe manner to make such an interpretation.

6. **Within ALI's first report (SBPI-00149) it is noted within Figure 5.14 on page 45 that an officer appears to take something from his belt area. Is this reference accurate?**

   In the report, Figure 5.14 contains an error, the officer highlighted in blue does not take something from his belt area.

7. **Did you rely on a report produced by Police Scotland's Cybercrime Unit on the data contained within Ashley Wyse's phone when creating the digital reconstruction?**

   ALI did not refer to this report in the works undertaken. This did not impact on ALI's work. A short report PIRC-04514 contained the information ALI required from Ashley Wyse's phone.

8. **Did you attempt to carry out a reconstruction of the view from Ashley Wyse's window to ascertain what could be seen? Would this have improved the analysis of the Snapchat footage?**

   The Snapchat footage gives a clear indication of this view. ALI is not sure a reconstruction of Ashley's eye position could match high resolution video that pans across the view, however this can be done in the 3D interactive application if it had been required.

Harry Kolberg dashcam footage

9. **How did you align Harry Kolberg's dashcam footage with the rest of the Evidence Video Timeline?**

   To determine the time discrepancy of this footage the 999 calls that are heard within the footage are used. Whilst the start point of one of the references was not available due to the gaps in the dash cam footage, the end point was, so both 999 calls were used to assess the timing of the Dashcam footage and both were consistent in their result.

10. **Would the alignment of the dashcam footage within the Evidence Video Timeline have been more accurate if you had had access to the original dashcam footage?**

    The original footage in this case would not have made a difference as the timecode was clearly displayed, and audio clearly heard.

11. **What impact, if any, did the 10 second gaps contained within the dashcam footage have on the accuracy of the placement of the footage within the Evidence Video Timeline?**

    The 10 second gaps do not impact significantly on accuracy as the timecode is always visible. It may add additional timing error in placement, but this will be by 1 or

2 frames i.e. maximum 0.08 seconds error on top of the of the audio placement error of 1 second.

Robson Kolberg iPhone footage

12. How was the footage from Robson Kolberg's iPhone aligned with the rest of the Evidence Video Timeline?

Robson Kolberg's phone shares many visual common points with the dash cam footage as well audio. For example the braking and turning of vehicles and conversations in the vehicle between Robson and Harry Kolberg. These were used to align Robson's iPhone footage to Harry's Dashcam Footage.

Gallagher's Public House CCTV footage

13. Within ALI's first report at paragraph 3.2.1.2.1 it is noted that the display resolution of the CCTV from Gallagher's Public House is 352 x 290 pixels. Figure 5.23 on page 53 of the report identifies that the resolution is 352 x 288. Please can you confirm which of these references is correct.

There is an error in the report in 3.2.1.2.1, the display resolution of the video is 352x288 not 352x290.

14. Is PIRC-01287 the original footage from the Gallagher's Public House CCTV? If not, did this have any impact on your work?

The origin of PIRC-01287 is not specified, it is as close to an original that we have been given as other version were part of compilations. I believe the Inquiry now have the original seized CCTV, so this can be answered more fully once that is examined. ALI cannot identify the original format from the OSD (on screen display) as this lies outside of our expertise.

Unless the original footage is of significant improvement in resolution / quality, there is no impact of the work produced. However if the original resolution is double or quadruple that of PIRC-01287, significant gains in both measurement and interpretation of events could be possible.

15. Is PIRC-01287 cropped and, if so, did this make any difference to your work?

It is not known if PIRC-01287 is cropped, one cannot assume what processes have occurred to an image from sensor to storage, so it is possible. I do not think if cropping has occurred to PIRC-01287 that it affects the viewing of the events.

16. What is involved in cropping, scaling and stabilization of video footage? Why was cropping and scaling carried out to the Evidence Video Timeline? Was stabilisation of the CCTV from Gallagher's required in producing the Evidence Video Timeline?

Cropping involves the trimming of the frame of a video or image from one or more sides. Scaling is where the pixel density is either increased or decreased to simulate

a larger or smaller image. These processes are used to highlight an area of significance and remove areas of non significance. It can also be used to change the proportions of the frame to maximise its viewing on a screen.

Cropping and scaling has been carried out on the Evidence Video Timeline, this was utilised to maximise the visual space of the screen to include all video assets simultaneously. The base assets were always available as individual video files for the Inquiry to use if it felt that was more appropriate. Stabilisation was not required as the camera was fixed.

17. What tools did ALI use for scaling? What alternative tools could have been used?

ALI have used the inbuilt Lanczos scaling functionality within Adobe Premiere for scaling. There are recognised alternatives that could be employed, these are Nearest Neighbour, Bi-Linear or Bi-Cubic interpolation. ALI does not use nor recommend vectorising/AI/ML interpolation solutions for forensic applications.

18. Was the footage contained within PIRC-01287 created by way of a screengrab?

ALI does not believe that the AVI is a screen grab from the CCTV. Screengrabs will usually be captured at the frame rate of the monitor i.e. 50 or 60 hertz, this isn't apparent in this case. It's more likely that this is an export from the system/viewer or direct conversion of the original.

19. At paragraph 3.2.1.2.3 of ALI's first report, it is noted that the CCTV footage was found to be running 10 minutes and 52 seconds slow by DC Fiona McEwan. Was there any additional information that you would have benefited from having in relation to the timing of the CCTV footage? If so, what impact, if any, did not having this information have on ALI's report?

Regarding DC McEwan's Statement, ALI would have liked the actual timings that were taken by the officer. This would have given us a level of validation of the 10 min 52 difference. Also if multiple timings were made, this would offer verification of the result, however this is not standard practice by police officers collecting footage. Further information of method of extraction would be useful so issues on whether a Digital copy is original or not could be answered. There was little impact on ALI's work, we were able to validate DC McEwan's findings independently.

Footage from van driven by witness Grey

20. How was the footage from the van driven by witness Grey aligned with the rest of the Evidence Video Timeline?

The Van footage was aligned to the timeline using common points with other footage supplied.

Airwave / 999 / 101 calls

21. Were ALI provided with the 999 and 101 calls as MP3 or WAV files?

There is an error in the full report paragraph 3.2.2.1.1. The format of the supplied material was .WAV not .MP3.

22. How did ALI confirm the timing of the Airwave transmission noted as being from PC Alan Paton at 07:21:02 within the Combined Audio and Video Timeline (SBPI-00047)?

ALI have checked the timings of the Airwave audio based on the .WAV files and the start times in the csv files, these are correct in the Evidence Timeline Video. PS13679 has a start time of 07:20:10 and a duration of 45 seconds. PS13680 has a start time of 07:20:56 and a duration of 32 seconds. 'Officer Injured 'occurs 6 seconds into PS13680, making the timing of this event 07:21:02.

23. Will the timings of the Airwave transmissions noted within the Combined Audio and Video Timeline differ in any way from the timings noted within the underlying Airwave data?

The timings recorded within the audio and video timeline relate to the timing of the audio that is heard over the Airwave, this does not necessarily match the timing of the Airwave data itself as this records when the button will be pressed to initiate the transmission. There may be a gap between these two events.

24. The Combined Audio and Video Timeline identifies an Airwave message from PS Stephen Kay at 07:20:56. Which transmission within the underlying Airwave data do ALI believe this message is associated with?

In terms of the transmission by Stephen Kay, the audio commences at 07:20:56 and is recorded as such within the combined audio and video timeline (SBPI-00047). Within the Airwave data transmissions are noted from Stephen Kay at 07:20:48 but also at 07:20:54. It is assumed that the latter transmission relates to the audio heard two seconds later at 07:20:56.

25. The timings of the Airwave, 999 and 101 calls are noted within ALI's first report as being accurate to within one second. In what way should account be taken of this when reviewing the timings?

The one second tolerance in audio would be expected to be taken into consideration if there are critical points where the audio is heard at the same time something is seen on the screen. So where visual and audio events occur close to each other, then caution should be applied to the interpretation as to which one came first.

26. Does the Combined Audio and Video Timeline include timings that are accurate to fractions of a second?

In the spreadsheet, timings are shown in the format hh:mm:ss. There has not been any attempt to determine audio or video timings to a sub second.

ARLS

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27. In what way were the documents listed from PIRC-03527 – COPFS-00170 (inclusive) on page 71 of ALI's first report used in creation of the digital reconstruction?

ALI used PIRC-03527 to PIRC-03543 in reconstructing the ARLS tile in the Evidence Video Timeline. PIRC-03546 & PIRC-03548 were not used as these would be contained in the other files. COPFS-00170 was not used or relied upon in the work conducted.

Subjective and objective evidence

28. ALI has previously explained the distinction between subjective and objective evidence and discussed its approach and methodology to these types of evidence. Do you have any further comments on the level of subjective interpretation that was used in creating the digital reconstruction?

ALI has spent some time on this and looking at where subjectivity would have been incorporated into the works. Below is our findings:

Identifying a contact position between the person and the ground is a subjective task, but not a complex task. Where complexity arose such as multiple people occupying a similar screen space, the analysis was not carried out.

ALI have identified areas where more complex subjective assessment are present in the work. In these cases a foot position is not easily identifiable and locations were determined by what could be seen, or by natural constraints in the scene. This could lead to inaccuracy beyond those assessed, these are at the following times:

Start time	End time	Note	Subjective
07:11:01	07:11:18	Person partially obscured by bushes	Person's movement constricted to path
07:20:51	07:21:01	People partially obscured by tree	People positioned assessed by what could be seen
07:21:20	07:21:24	Person moving away from building, hedge blocking feet	Person's movement constricted to path
07:23:45	07:23:50	Person moving towards building, hedge blocking feet	Person's movement constricted to path
07:31:01	07:31:05	Person moving away from building, hedge blocking feet	Person's movement constricted to path
07:33:19	07:33:21	Person moving towards building, hedge blocking feet	Person's movement constricted to path

07:33:26	07:33:27	Person moving towards building, hedge blocking feet	Person's movement constricted to path

The work, in regards to the positioning of people, was only ever stated as indicative and stands as a tool to assist witnesses and the chair, which is how it was used during the hearing. It is not considered necessary nor practical to update the product at this point.

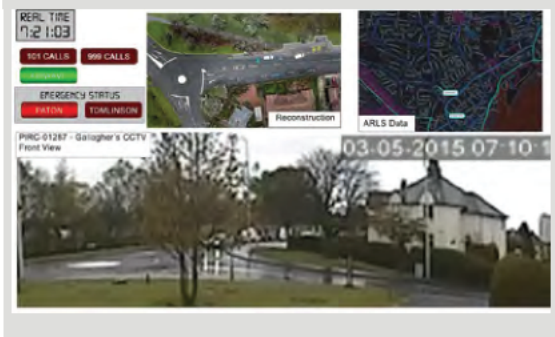
Technical matters

29. What is a re-encoding error? Is there potential that any re-encoding process will introduce errors? What impact, if any, might such errors have on the Evidence Video Timeline and the Chair's reliance on same?

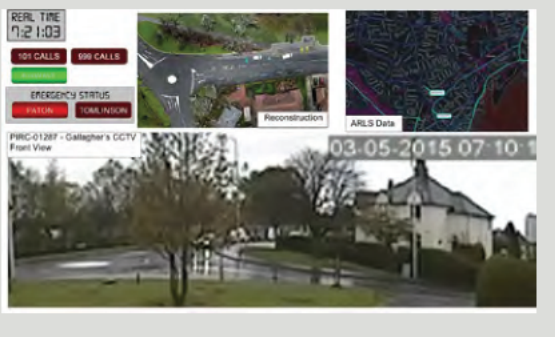
Re-encoding errors occur when a video file is decoded to a series of images, then encoded again to save as a new video file. This results in a second set of compression artefacts being created over the original set. In our case the Evidence Video Timeline is a re-encoding. Compression artefacts are a distortion in the images produced as a result of encoding and compression.

Considering re-encoding errors when creating videos, such as time base, frame rate, or compression errors. In creating the Evidence Video Timeline, time base/frame rate errors were assessed against the OSD (on screen display) timecode where available. Where a timecode was not available, common footage was used to validate as much as possible, however these were generally short videos, so time based errors would be negligible. To reduce compression artefacts, a high bit rate was used in combination with a high resolution when creating the Evidence Video Timeline. Though this does not completely eliminate the effect, it significantly reduces it. Because of the length of footage, using a lossless video format would not be practical.

As way of an example, the frame below was captured from the editing software (a) and from the resultant video (b). Frame exports are both in lossless format so they would not generate any further artefacts in their creation. Using an inverted difference map, one can compare any variation in the images (c). Only by removing 95% of the available colour range can the artefacts start to be visible in the CCTV tile (d). Basically the artefacts are there, but not perceivable under normal viewing.



(a) From video Edit



(b) From Produced Video

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(c) Inverted Difference Map

(d) Inverted difference map excluding 95% of colour range

All original material was still available to be used and reviewed during the hearings, so the Inquiry could refer back to that footage at any point.

As the re-encoding errors are not perceivable under normal viewing and all timings have been checked, ALI does not believe that this impacts on the Evidence Video Timeline. This being said, it would be prudent in making interpretation from a specific CCTV tile in the Evidence Video Timeline that the same interpretation can be made in the original CCTV video.

30. What differences are there between camera lines of sight and human vision?

There are several differences between camera lines of sight and human vision.

(a) In the human eye, the density of cone distribution is much higher towards the centre of the retina and drops off towards the outer vision. In camera vision (virtual or physical) the distribution is homogenous.

(b) Human vision is, in most cases stereoscopic (not regarding loss of vision in one or both eyes from illness / injury). Our central vision is only 13 degrees, after that we rely on peripheral vision all the way up to almost 195 degrees. To view the world around us our eyes are constantly moving both consciously and subconsciously known as exploratory saccades. This means our eyes never stay in the same place for any length of time. The human eye also using a motion called 'smooth pursuit' to track and look at moving objects. Camera vision does not work in the same way, however the camera can be used to simulate 'smooth pursuit'.

(c) If we are referring to dynamic cases the frame rate that the human eye can perceive flicker in monitors between 50-90Hz, that means 50-90 frames per second, however in a separate study (Davis, J., Hsieh, YH. & Lee, HC. Sci Rep 5, 7861 (2015)) Humans perceive flicker artefacts at 500 Hz, in reality this is still an area under study, what is clear is that humans perception of frame rate is not simple. Video Camera's however have fixed frame rates, often defined by standards such as PAL, NTSC.

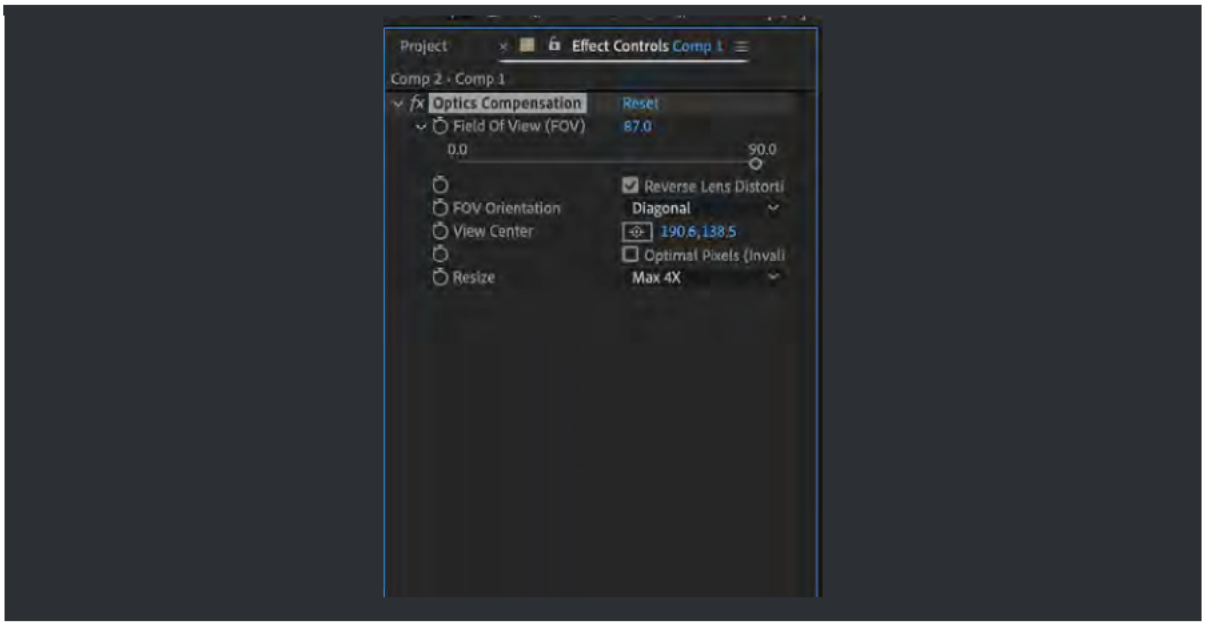
Human Vision and digital vision (virtual or physical) have fundamental differences. Though digital imagery may be useful to understand the obstructions from a view point, it doesn't represent the whole of a person's vision and can't replicate the exploratory saccades or dynamic perception of human eyesight.

Signature of witness…… [redacted] ……..

In the placement of people during the hearing, the views created are to help the chair in his understanding of the events, and those potential lines of sight, but placement of people will be from memory and therefore subject to those limitations.

31. Is Adobe Aftereffects 2022 a recognised forensic video processing software application? What methodology was utilised when using Adobe Aftereffects in creating the digital reconstruction?

ALI are unaware of a UK Government list of recognised forensic video processing softwares or one issued by the Forensics Regulator. Below outlines the methodology used and validation checks conducted. The 'Optics Compensation' Filter was used where the field of view along with the principle point can be defined.



The output is as shown in the Full Report, p. 54, Figure 5.24a. This process was only used for place the blue dots on the 3D Reconstruction Tile in the 3D view.

32. Can ALI provide further details in relation to the steps taken to validate the photogrammetry used in creation of the digital reconstruction tile within the Evidence Video Timeline?

In the case of digital single image oblique photogrammetry the following are considered to have the greatest effect on error.

- Photogrammetric Error Propagation
- Lens Distortion

The process conducted in Section 5.5.3 of the Full Report (SBPI-00149) aimed to reduce Lens distortion errors, leaving Photogrammetric Error Propagation as the main source of error. In simpler terms after this process the error should increase linearly with distance from the camera throughout the frame.

A system of part and whole validation was used throughout the process to assess the success and suitability of the end product.

Part Validation of Lens Distortion Removal

The end result from the lens distortion removal was a series of adjusted images.

To test the success of the operation, a new image from the sequence can be run through the photogrammetric software Photomodeler. In this case the principle point and lens distortions are locked at 0 so the solution has to solve with perspective only, 12 well distributed points were used in the calibration. If the optics compensation filter is successful, then the software should be able to find a 3D solution with a low RMS (Root Mean Squared) error. In this case the average RMS was 2.67 pixels, which means the error from a selected point in the image and the measured point is 2.67 pixels on average. This result is good based on the image quality and resolution of the image.

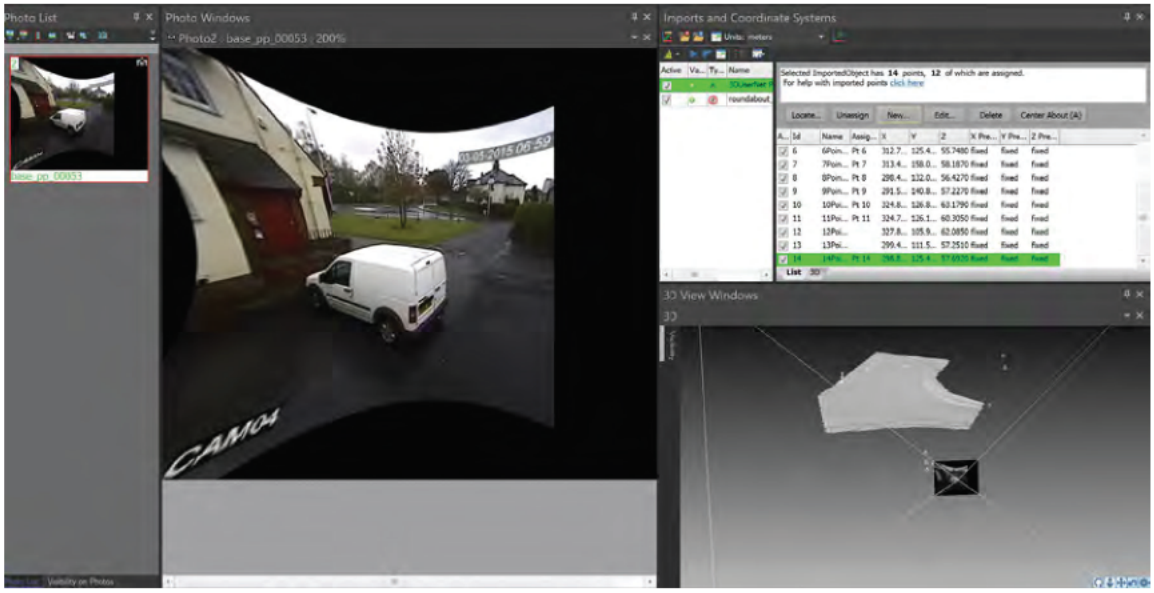


Figure A.1 output from photogrammetry software

Whole Testing of the Calibrated Solution

Once a calibrated field has been produced it can be tested empirically. Objects or lines can be recreated through the same process as placement of people, and then compared back to the source material. This returns an error which can be assessed against distance from the camera.

In this case the centre of the roundabout and one of the white lines along Hendry road was used in the mid field distance from the camera.

Beyond this the quality of the video is such that identification of line markings is too difficult to do accurately, however, rest positions of vehicles calculated from higher resolution video (analysis of the snapchat videos, section 5.5.1.2 from the Full Report, SBPI-00149) can be used.

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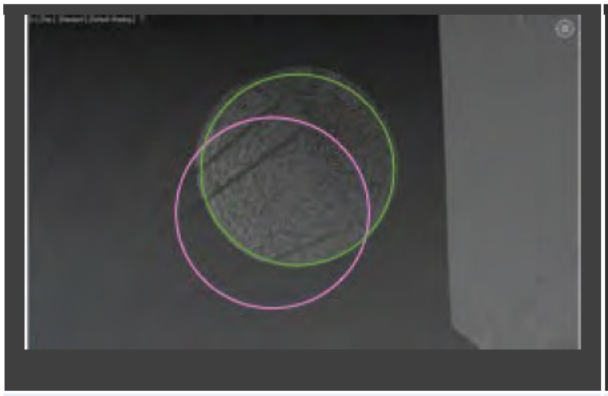
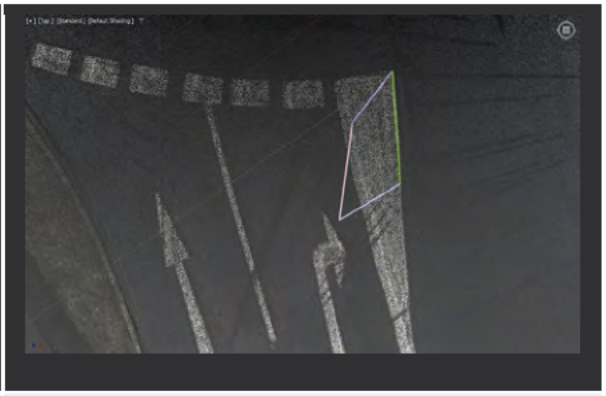
The figure below shows the placement of objects (pink) and the actual (green).

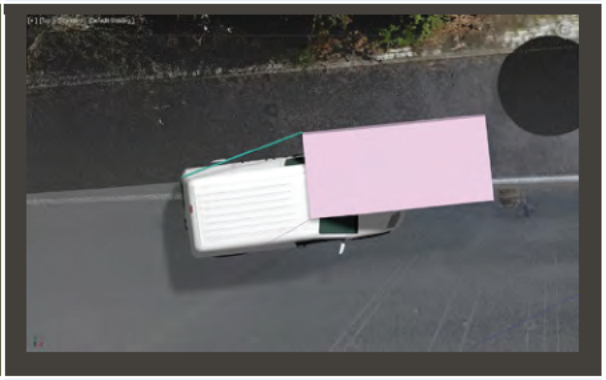


(a)Roundabout circle markings



(b)Line marking

(c) Astra Position



(d) Ford Connect Position

Figure A.2 variation of measurement of objects within the scene

The results are as follows:

Object	Error	Distance from camera	Error/Dist
Roundabout circle	0.95m	39.29m	0.024
White Line	1.41m	36.42m	0.038
Astra	2.23m	62.69m	0.036
Fishvan	2.57m	79.39m	0.032

In the mid-field distances, the errors are between 0.95 and 1.41 metres, this is in the area near the roundabout. Further away from the camera the errors are 2.23 -2.57m this is the range between the Astra and the Ford Connect (Fishvan).

The average for the error/distance is 0.0325, basically meaning that for each metre away from the camera, an error of 0.0325 metres is possible. It indicates that at the

Signature of witness…… [redacted]

furthest point of measurement, approximately 100 metres from the camera, the expected error would be 3.25 metres.

Based on this, it is recommended that the location of people using this process be considered indicative but it is still a useful tool to understand general movement and location of people at specific times.

I believe the facts stated in this witness statement are true. I understand that this statement may form part of the evidence before the Inquiry and be published on the Inquiry's website.

Date November 17, 2022 | 6:18 PM GMT Signature [redacted]

Signature of witness…….....