

Tread Analysis Report

Sheku Bayoh Inquiry

Produced by

Paul ■ Ryder B.Sc.(Hons), C.Chem., MRSC

Reporting Scientist, Cellmark Forensic Services

6th October 2022

On the Instruction of:

■■■■■■■■■■

Assistant Solicitor to the Inquiry

Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 2 of 13

Table of Contents

Qualifications and Experience.....	3
Information	4
Instructions	5
Technical Notes.....	6
Examination and Results.....	8
Examination of the boots of Sheku Bayoh.....	8
Examination of the boots of PC Craig Walker	8
Examination of the police vest of PC Nicole Short.....	9
Conclusions and Interpretation	11
Use of Assistants	12
Statement of Truth and Expert Witness Declaration.....	13

Signature.....

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Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 3 of 13

Qualifications and Experience

I am a Bachelor of Science with a First Class Honours Degree in Chemistry from the University of Manchester. I am a Chartered Chemist and a Member of the Royal Society of Chemistry. I have been employed as a Forensic Scientist for over 33 years, initially by the Forensic Science Service for over nineteen years between July 1989 and August 2008 and latterly by Cellmark Forensic Services since August 2008. As well as still practising as a Forensic Scientist, I hold the role of Forensic Science Manager at the Chorley Laboratory of Cellmark Forensic Services. A key part of this role is the management of the quality of the work undertaken by staff at this laboratory ensuring that work conforms to the appropriate regulations and accreditation. This includes ensuring staff have demonstrated the necessary competence and expertise and that competence is maintained to allow them to fulfil their role.

Whilst previously employed by the Forensic Science Service, I received training in the examination of various marks and in the recovery and identification of trace evidence at a microscopic level and below and in the reporting of findings from such examinations to the Court. I have also presented evidence in relation to my reported findings in many courts. Many of these cases involved investigation of assaults, a significant number of which had resulted in fatalities. I have attended a large number of scenes of such incidents and attended a number of post mortem examinations where I have shared my expertise in relation to marks with the pathologists and investigators to maximise the recovery of evidence that might assist a particular investigation. I have then carried out subsequent comparisons of recorded marks and offered opinions on whether the mark had been made by a particular item, be it the uppers or sole of a particular shoe or whether it had been made by a particular implement or weapon.

I have designed and delivered modules on tool and footwear mark examinations to students from Wolverhampton University as part of a Forensic Marks Comparison Masters Degree. I have also been responsible for defining and maintaining the Laboratory Standard Operating Procedures for Cellmark Forensic Services and overseeing the validation of those methods resulting in their accreditation by UKAS to the standards required by the Forensic Regulator.

In addition to conducting my own examinations and reporting the findings, I undertake the peer review of the work of his colleagues to ensure the quality of the provision of forensic science and have acted as a scientific advisor for a large number of other high profile cases, both current and historic. My combination of skills was recently utilised in the investigation of the Manchester Arena bomb culminating in presenting evidence at both the criminal trial and subsequent inquiry in relation to that matter. As well as undertaking work for law enforcement agencies I have also been instructed as an expert in a number of civil cases and undertaken defence reviews of forensic evidence.

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 4 of 13

Information

1. I have been provided with a letter of instruction dated 27th July 2022 from which I understand that Sheku Bayoh died on 3rd May 2015 after being restrained by police in the street in Kirkcaldy.
2. A mark(s) was present on the vest of police officer, PC Nicole Short. Examinations have previously been undertaken to determine whether this mark(s) had been made as a result of contact with the footwear of Sheku Bayoh as a result of him stamping on the officer in question as she lay on the ground.
3. Further to this a suggestion has been made that a further officer, PC Craig Walker might have stood on PC Nicole Short during the incident in question.
4. I have been provided with the following documents and productions in relation to the above incident:

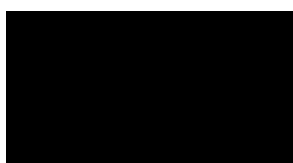
Physical evidence

- I. Sheku Bayoh Urban Logic Size: 10 (UK) Right Boot (PIRC-00977)
- II. Sheku Bayoh Urban Logic Size: 10 (UK) Left Boot (PIRC-00978)
- III. PC Craig Walker (040523) Left Boot (PIRC-00812)
- IV. PC Craig Walker (040523) Right Boot (PIRC-00813)
- V. Nicole Short Police Vest (PIRC-00862)
- VI. Sheku Bayoh Urban Logic Size: 10 (UK) Left Boot Lift (SPA-00025)
- VII. Sheku Bayoh Urban Logic Size: 10 (UK) Right Boot Lift (SPA-00024)

Examination Notes and Report

- VIII. Sheku Bayoh Boots Examination Notes (SPA-00023)
- IX. Nicole Short Vest Examination Notes (SPA-00028)
- X. SPA Forensic Services Report 24/08/2015 (COPFS-00114)
- XI. Photographs (PIRC-01176)
- XII. SPA-00083 RES_0031 Vest Photo copy
- XIII. SPA-00084 RES_0032 Vest Photo copy
- XIV. SPA-00085 RES_0033 Vest Photo copy
- XV. SPA-00086 RES_0034 Vest Photo copy

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 5 of 13

Statements and Transcripts

Laura Macphie

- XVI. Inquiry Statement of Laura MacPhie (SBPI-00111)
- XVII. Joint Statement of Laura MacPhie (SPA-00058)
- XVIII. Inquiry Transcript of Laura MacPhie pages 18-83

Shirley Chin

- XIX. Inquiry Statement of Shirley Chin (SBPI-00122)

Alison Marven

- XX. Inquiry Statement of Alison Marven (SBPI-00123)
- XXI. Inquiry Transcript of Alison Marven pages 83-172

Miscellaneous

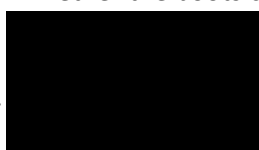
- XXII. Inquiry Transcript Day 17 pages 1 -245

- 5. From laboratory held records I understand that items I to V were hand delivered to Cellmark Forensic Services on 28th July 2022. The remaining documentary items were received via invitation to the secure electronic platform, Objective Connect.

Instructions

- 6. In relation to the boots taken from Sheku Bayoh I have been instructed to undertake the following:
 - I. Examine the vest and offer a view as to the nature of the dark mark in the area of the back, beneath the "POLICE" logo and to the extent, if any, this extends inside the right arm hole.
 - II. Examine and comment on the boots recovered from Sheku Bayoh.
 - III. Consider whether there are any features of the mark on the vest, consistent/inconsistent with it being a footprint?
 - IV. Conduct a forensic comparison of the tread on the boots with the mark on the vest and offer a view as to whether there are:
 - Any areas of consistency as between the tread on the boots and mark on the vest; and
 - Any areas of inconsistency as between the tread on the boots and the mark on the vest.
 - V. Whether any conclusions can be drawn from this comparison and in particular whether, in my opinion, the mark on the vest is consistent with having been made by either of the boots; or whether the boots can, in my opinion, be excluded from having made the mark.

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 6 of 13

7. In relation to the boots of PC Craig Walker I have been instructed to undertake the following:
- I. Examine and comment on the boots recovered from PC Craig Walker.
 - II. Conduct a forensic comparison of the tread on the boots with the mark on the vest and offer a view as to whether there are:
 - Any areas of consistency as between the tread on the boots and mark on the vest; and
 - Any areas of inconsistency as between the tread on the boots and the mark on the vest.
 - III. Whether any conclusions can be drawn from this comparison and in particular whether, in your opinion, the mark on the vest is consistent with having been made by either of the boots; or whether the boots can, in your opinion, be excluded as having made the mark.

Technical Notes

8. When an item of footwear comes into contact with a surface a mark is often left. This may be in the form of material transferred from the under surface of the shoe or as a result of the shoe removing material from that surface. If there is sufficient contrast between the surface and the material deposited or removed, then the mark produced may be readily visible. If there is limited or no contrast, then processes or treatments are required to assist in visualising any marks that might be present. Once the mark has been recovered, or a record made, it can be compared with an item of footwear to determine whether or not that item of footwear could have made the mark(s) in question and assess the likelihood it was that specific shoe as opposed to another of similar manufacture.
9. Any footwear mark examination undertaken initially takes into consideration the shoe tread/under surface pattern. Given the vast number of different footwear manufacturers and the number of different tread patterns that each of these produces, even a correspondence in pattern alone can in some circumstances be of some meaningful significance.
10. The character of the under surface of shoes also normally changes significantly as a shoe becomes more worn. It is therefore possible to further discriminate between shoes of a particular pattern as a consequence of this. If the degree and distribution of wear and the precise configuration of the pattern components is considered in combination, even when there is a delay between the offence and the seizure of the shoes, a considerable degree of discrimination can be achieved between shoes of the tread patterns in question
11. Furthermore, as shoes become more worn the under surfaces normally become damaged. As a result of the random way in which the damage to shoes occurs, the appearance and the position of the damage can be highly characteristic. Depending upon the clarity of the mark, the presence or absence of such character from a mark may further assist in addressing whether a mark has

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 7 of 13

been made by a particular shoe or not and can lead to an unequivocal link between a shoe and a mark or the shoe may be excluded.

12. When it is not possible to exclude an item of footwear from having made a mark and a conclusive link has not been established it is possible to assess the significance of the findings to form an opinion as to how likely it is that the shoe in question has or has not made the mark. In assessing the significance of any correspondences or differences found between a shoe and a mark resulting from a comparison, the likelihood of obtaining the observed correspondences or differences are considered against two alternative propositions:
- (a) The shoe in question has made the mark it has been compared with.
 - (b) The shoe has not made the mark.
13. The strength of the assessment of the footwear mark evidence is normally expressed as a level of support for one or other of the above two propositions. The assessment is based on the observations made during the comparison and the experience of the examiner and any data that may be available to compliment the assessment of the findings.
14. In order to form a view the examiner of the mark(s) must have confidence that the pattern elements that they are considering can be attributed to footwear of the pattern type in question and relies on any correspondences or differences in the spatial arrangement and definition of other parts of the mark surrounding each considered feature. In instances where the considered mark is so poorly defined that it cannot be established that the mark relates to an item of footwear of that pattern type and/or it is not possible to discern whether it has been made by an alternative item the mark(s) are considered to be unsuitable for comparison.

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 8 of 13

Examination and Results

Examination of the boots of Sheku Bayoh

15. The submitted boots GAY016 and GAY017 relating to Sheku Bayoh were the subject of examinations undertaken under the direction of trace evidence expert Dr Lorna Dawson at Cellmark Forensic Services on 11th August 2022 to recover and preserve any potential trace evidence from these boots prior to my examination of these items.
16. I understand that prior to the above examinations that the boots have been subject to examinations by Scottish Police Authority Forensic Services and impressions of the soles of the boots were taken by powdering their soles and lifting off the powder. These previous examinations had no impact on the examination of the boots that I was instructed to undertake.
17. The right boot GAY016 and left boot GAY017 formed an apparent pair of brown ankle boots manufactured under the brand name "Urban Logik". The boots were marked as UK size "10". The uppers were in an apparently well-maintained condition.
18. The under surfaces or soles of the boots bore a complex pattern comprising a central arrangement of pairs of triangles surrounded by chevron shaped blocks. The under surfaces were relatively well worn with some areas of the soles being worn to the extent that the lattice of the mid-sole was visible in the copies of the marks provided to me that had been prepared by Scottish Police Authority Forensic Services.
19. Further test impressions were made with these boots by myself and it was from these impressions that transparent overlays were produced for the purpose of comparison with mark(s) on the submitted police vest as per the instructions received.

Examination of the boots of PC Craig Walker

20. The submitted boots AM001 and AM002 were the subject of examinations undertaken under the direction of trace evidence expert Dr Lorna Dawson at Cellmark Forensic Services on 11th August 2022 to recover and preserve any potential trace evidence from these boots prior to my examination of these items.
21. I am not aware of any examinations of these boots having been undertaken prior to the examination described above.
22. The left boot AM0001 and right boot AM002 formed an apparent pair of black ankle boots manufactured under the brand name "Magnum" which is a registered trademark of Hi-Tec Sports

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 9 of 13

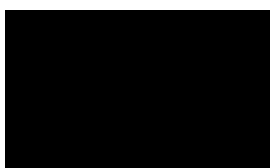
International. The boots were marked as UK size "12". The uppers were in a worn condition with scuffing to the toe area of each boot.

23. The under surfaces of the boots bore a complex pattern comprising a central arrangement of circular and oval shaped studs accompanied by arrangements of four sided geometric shapes. This central arrangement was surrounded by an arrangement of paired geometric shapes. The under surfaces were in a moderately worn condition.
24. Test impressions were made with these boots by myself and transparent overlays were produced for the purpose of comparison with mark(s) on the submitted police vest as per the instructions received.

Examination of the police vest of PC Nicole Short

25. Item JM019 at the time of my examination consisted of a black protective police vest, a torch, a leather strap and a sheet of brown paper that I understand was the sheet of paper that this item had been examined on prior to submission for my consideration. Also present was a yellow high visibility fluorescent police vest packaged in a further polythene bag.
26. No marks that I consider could be footwear marks were noted on the black vest.
27. The fluorescent vest was examined. A number of dark coloured deposits were observed on the fluorescent fabric at the rear right of this vest to at the juncture of the vertical and horizontal reflective strips of the vest. These deposits continued on to the fabric part of the horizontal reflective strip. There was black staining to the plastic-coated aspects of the reflective strips and to the police badge on the rear of the vest. I understand that this staining was a result of treating these parts of the vest with a black powder suspension with a view to developing any fingerprints that might be present. As a consequence of this treatment being applied as a liquid and then having to be removed by a washing process, parts of the yellow fluorescent fabric adjacent to the treated areas have been stained black. This includes the part of the vest on which the dark deposits had been observed.
28. From reference to the production PIRC-01176 provided to me it was observed that this staining from the fingerprint treatment had obscured parts of the dark staining that had originally been present on this vest. It was also evident that the dark deposits that remained at the time of my examination were less evident than those recorded in the photographs in production PIRC-01176 indicating that the deposits had eroded to some extent. This was in my opinion likely to be the unavoidable consequence of the item being repeatedly folded and unfolded whilst unpackaging and repackaging it for, and subsequent to, each previous examination.

Signature.....

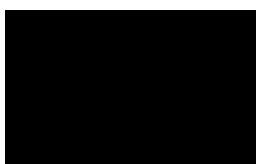


Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 10 of 13

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29. At my request further electronic copies of the images RES_0031.JPG to 34 included in PIRC-01176 have been provided as items XII to XV listed previously. Item SPA-00086 RES_0034 Vest Photo copy has been reproduced at this laboratory to actual size to represent the dark staining at the time prior to the treatments that have unavoidably impacted on the visualisation of these deposits. Records of the deposits at the time of my examination have also been made by photographing them under a range of lighting conditions and using filters to try to enhance the appearance of these deposits. It was my opinion that item SPA-00086 RES_0034 Vest Photo copy was the clearest representation of the deposits under consideration. No detail was observed beyond that recorded in this image that would in my view further assist in addressing the matters subject to my instructions.
30. I have considered the recorded deposits to determine whether there is any pattern to them that I consider could relate to a pattern element from an item of footwear. No features were present that I can be satisfied are geometric shapes that I would expect to see if they were related to an item of footwear being brought down in forceful contact with this vest. I have explored the arrangement of deposits further by positioning actual size transparent representations of the footwear patterns in multiple positions over the mark(s) to determine if there is any spatial correspondence between the features in the mark(s) on the vest and those on the respective pairs of footwear. No such correlation was found that I would consider to be indicative of these deposits having resulted from a contact with the sole of either of these pairs of boots.
31. As part of my examination I have taken into account that the deposits have been left on a textured fabric surface which has the potential to impact on the clarity and detail recorded in any impressions left. I have also been asked to consider whether the marks are the consequence of a forceful dynamic motion which in my experience would have the potential to distort any impressions left. Nonetheless I have seen no detail during my examinations that allow me to form a view that these deposits have been left as a result of a contact with the sole of an item of footwear and in particular either of the considered items of footwear.
32. Given the nature of the marks it is also my view that I am not able to exclude the possibility that either of the submitted pairs of footwear could have contributed to this deposited material in some way, but that contribution is so indistinct that it is not recognisable as having been made by an item of footwear.
33. Overall, it is therefore my opinion there is insufficient definition and detail within the mark(s) on the vest to be able to carry out a meaningful comparison with the submitted footwear and/or to be able to offer an opinion as to the nature of the surface these deposits have been transferred from.

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

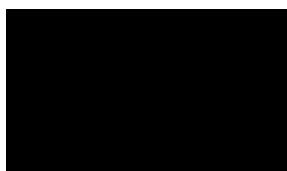
Page 11 of 13

34. Had the mark(s) or part of it been produced by an item of footwear making forceful contact with PC Nicole Short whilst she lay on the ground, there is in my opinion a further expectation of a possible transfer of material to the parts of her vest that were in contact with the ground, particularly if the ground was wet. This would most likely be to the front or left side of the vest if the mark on the right side was a result of someone stamping on her. No significant deposits of dirt were observed during my examination of the vest or from examination of photographs of the vest provided to me. The absence of such deposits could, in my opinion, be considered to support the view that she had not been lying on the ground when the alleged stamp occurred resulting in the staining that has been the subject of my examinations. I have however been made aware that items of police equipment including her radio and utility belt were also being worn with this vest. As such, I am unable to rule out the possibility that this equipment may have prevented a contact occurring between the ground and the vest and therefore precluding the transfer of material to it. This further consideration therefore in my opinion also does not assist in respect of whether the mark was a result of a stamping action.

Conclusions and Interpretation

35. It is my opinion that the mark(s) in the form of deposits on the rear of the fluorescent police vest in the vicinity of the police badge are poorly defined and it is not possible to offer a view from examination of the marks as to what may be the source of this mark(s).
36. I do not recognise any features within this mark that would allow me to offer an opinion that it had been made by the under surface (sole) of an item of footwear.
37. I have found no correspondence with the footwear GAY016/GAY017 of Sheku Bayoh or AM001/AM002 of PC Craig Walker that would allow me to provide an opinion that either of these sets of footwear could have produced this mark(s).
38. As a consequence of the poorly defined nature of the mark(s) I am also unable to exclude the possibility that either or both of these sets of footwear might have contributed in some way to the mark(s) on the considered vest.
39. Overall, it is my opinion, that the mark(s) considered in this instance are unsuitable to undertake any meaningful comparison and hence do not provide any opportunity to offer an expert opinion that would assist in addressing whether or not the mark(s) on the fluorescent police vest might have been made by the footwear provided to me.

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

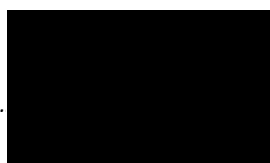
Page 12 of 13

Use of Assistants

In undertaking the work connected with this report, I was assisted by trained members of staff using established procedures within an accredited framework. Their involvement, qualifications and experience is outlined in the table below. A case file, comprising notes made at the time of the examinations, represents a full record of the contributions of assisting members of staff. To undertake the work each member of staff has been assessed and deemed to be suitably qualified, experienced and competent to undertake the assigned tasks according to Cellmark's quality management systems.

Name	Qualification	Started in Forensics	Outline of work undertaken
[REDACTED]	[REDACTED]	[REDACTED]	Photography
[REDACTED]	[REDACTED]	[REDACTED]	Photography
[REDACTED]	[REDACTED]	[REDACTED]	Exhibit Examination
[REDACTED]	[REDACTED]	[REDACTED]	Peer Review

Signature.....



Reporting Scientist Paul [REDACTED] Ryder
Client Reference Sheku Bayoh Inquiry
Lab Reference CFS/958121/22
Date of Report 6th October 2022

Page 13 of 13

Statement of Truth and Expert Witness Declaration

I understand that my overriding duty is to the court and I have and continue to comply with that duty.

I have read Part 35 of the Civil Procedure Rules, the associated Practice Direction and the guidance for Instruction of Experts in Civil Claims 2014 and I have complied with their requirements

I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.

I understand that proceedings for contempt of court may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief in its truth.

I confirm that, to the best of my knowledge and belief, I have acted in accordance with the Code of Conduct published by the Forensic Science Regulator (Issue 7).

Cellmark is a UKAS accredited laboratory - ISO 17025 accreditation [testing laboratory number 2045] and ISO 17020 accreditation [inspection body number 5761].

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