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THE APPROVAL OF THE COMMITTEE ON OPINIONS

SUPERIOR COURT OF NEW JERSEY
MERCER COUNTY
LAW DIVISION, CRIMINAL PART
INDICTMENT NO. 21-07-0507

STATE OF NEW JERSEY,

Plaintiff,

v.

RAVEL STOKES,

Defendant.

APPROVED FOR PUBLICATION

May 7, 2024

COMMITTEE ON OPINIONS

Decided: March 27, 2023

James Scott, Assistant Prosecutor, for plaintiff (Angelo J. Onofri, Mercer County Prosecutor, attorney).

John S. Furlong, for defendant (Furlong & Krasny, attorney).

LYTLE, J.S.C.

I.

Yuell Moore was shot and killed in broad daylight on Hudson Street in the City of Trenton on March 25, 2020. The Defendant, Ravel Stokes, was arrested in connection with the murder on February 5, 2021. On July 20, 2021, the Mercer County Grand Jury returned Indictment 21-07-0507, charging the Defendant with First Degree Murder (Count I), Second Degree Possession of a

Weapon for an Unlawful Purpose (Count II), and Second Degree Unlawful Possession of a Firearm (Count III). He subsequently entered a not guilty plea to the charges.

The State filed the instant Motion to Admit Expert Testimony Pursuant to N.J.R.E. 702 on January 5, 2022, at which time this case was being overseen by another judge. By way of the motion, the State seeks to introduce at trial the testimony and opinions of its proposed expert, Detective Brandon Epstein. If allowed, the detective will opine that an individual captured in a surveillance video taken from a camera located at 60 Hudson Steet seconds before the homicide is of a similar height as the Defendant. The motion raises an issue of first impression because the detective's opinion is based on a technique known as reverse projection photogrammetry, which has never been admitted before in this State.

On December 7, 2022, the court conducted a N.J.R.E. 104 hearing where the State elicited testimony from its proposed expert. The defense did not call any witnesses at the hearing. On December 8, 2022, the court entered an Order inviting the parties to submit additional briefs, which the State provided on January 9, 2023.

On February 17, 2023, the New Jersey Supreme Court issued its decision in State v. Olenowski, 253 N.J. 133 (2023). The Court in Olenowski abandoned

the Frye "general acceptance" test for use in criminal cases to evaluate the admissibility of expert evidence under N.J.R.E. 702 and replaced it with principles similar to the standard outlined by the United States Supreme Court in Daubert. Id. at 138-39; See also In re Accutane Litig., 234 N.J. 340 (2018). Compare Frye v. United States, 293 F. 1013 (D.C. Cir. 1923) with Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579 (1993). Stated otherwise, Olenowski represents a shift in this State's criminal jurisprudence from the exclusive reliance on Frye's "general acceptance" standard to determine the reliability of expert testimony to a methodology-based approach that is guided by a non-exhaustive list of factors set forth in Daubert. Olenowski, 253 N.J. at 151-52.

The Court emailed the parties immediately following the release of the decision in Olenowski to determine if they wished to submit additional briefing and both declined. This decision, granting the State's motion, follows.

II.

Detective Brandon Epstein was the only witness to testify at the N.J.R.E. 104 hearing. The motion papers included a copy of his curriculum vitae and expert report, the latter of which was admitted into evidence for purposes of the hearing. The State proffered Detective Epstein as an expert in digital forensics.

During the detective's testimony, he did not contradict himself, he listened carefully to all questions, and his responses appeared to the court to be

thoughtful and candid. He readily acknowledged weaknesses in his analysis and opinions. Throughout his testimony on both direct and cross-examination, he demonstrated a demeanor of measured, careful confidence and displayed a good recollection of his participation in the case. He also possessed the ability to process his recollection into responsive answers to questions at the hearing. As such, the court finds that Detective Epstein was a credible witness.

Detective Epstein began his law enforcement career with the City of New Brunswick Police Department ("NBPD"). He was employed by that agency between April 2007 and January 2019, beginning as a patrolman until he was transferred to the Street Crimes Unit and later to the Major Crimes Unit within the department. Detective Epstein's interest in the field of digital forensics began in 2014 while he was assigned to the Major Crimes Unit. According to his testimony, law enforcement at that time was seeing a major influx of video evidence but lacked sufficient resources to handle the data. As a result, early in 2014, Detective Epstein petitioned his administration for training and equipment to improve the manner in which digital evidence was processed. He thereafter helped develop the Digital and Multimedia Evidence Laboratory within the NBPD – acting as its Laboratory Director from January 2017 to January 2019 - which was responsible for performing the video forensics work for all the law

enforcement agencies within Middlesex County. Since that time, Detective Epstein has spent the vast majority of his career performing digital forensics.

Detective Epstein left the NBPD for the Middlesex County Prosecutor's Office ("MCPO") in 2019. Throughout the detective's career with the MCPO, he has been assigned to that agency's Digital Forensics Laboratory ("DFL") within the Technical Operations Unit. According to Detective Epstein, the DFL is responsible for the extraction and analysis of digital evidence from electronic devices (e.g., cell phones, computers, video recording devices) for use in criminal investigations and prosecutions. He testified that his current specialty is in forensic video analysis, which he defined as the scientific examination, evaluation, and/or comparison of video in legal matters. While at the MCPO, Detective Epstein estimated that he spends fifty percent of his time on digital video forensics and the other fifty percent on other forms of digital forensics.

Detective Epstein received a Bachelor of Science Degree in Criminal Justice from American Intercontinental University in 2017. He thereafter received a Master of Science Degree in Recording Arts, with an emphasis in Media Forensics, from the National Center of Media Forensics at the University of Colorado at Denver in December of 2020.[1] He described the Master's

[1] Detective Epstein testified that the National Center of Media Forensics was created from a grant awarded by the Defense Advanced Research Projects

Program as a hybrid that involved both online and in-person coursework. It began with foundational instruction on the fundamentals of digital forensics and research, which was subsequently built upon with semesters of instruction in specific disciplines, including image, audio, video, and cell phone forensics. The program concluded with what he described as a capstone semester of report writing and testimony involving various case scenarios. During that same semester, the detective was required to complete and defend a Master's thesis which focused on video authentication and source identification of video files transmitted to Apple iPhone devices.

In addition to his formal education, Detective Epstein has received training in digital video analysis, primarily from an organization known as the Law Enforcement Emergency Services Video Association ("LEVA"). He described LEVA as a non-profit industry organization comprised of federal, state, and local law enforcement participants, as well as private examiners, members of the judiciary, and academics.

According to Detective Epstein, his LEVA training consisted of four week-long training courses in forensic video analysis. The first week of training covered the fundamentals of acquiring, extracting, and copying video from

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Agency, which is part of the United States Department of Defense, to address in part the need for forensic analysts.

digital video recorders. The second week focused on processing the video to allow for playback. The next week of training centered on image analysis and comparison of objects in recorded imagery and comparing them to known objects in the real world. The final week concentrated on advanced video forensics though case scenarios that required him to produce a report and present it in a moot court setting. Detective Epstein explained further that throughout the four weeks of training, there were various other assignments that he had to complete and examinations that he had to pass in order to receive credit. In addition to this four-week course, Detective Epstein also attended the annual digital forensics conference held by LEVA in October of 2022 and a conference held by the American Academy of Forensic Sciences in February of 2022.[2]

As a result of his education, training, and experience, Detective Epstein has become a Certified Video Forensics Analyst through LEVA and a Certified Forensics Video Examiner through the International Association for Identification ("IAI"). To maintain these certifications, he has been required to take approximately forty (40) hours of additional continuing education. Notably, given the subject of Detective Epstein's proposed testimony, he also

[2] Detective Epstein's curriculum vitae sets forth numerous other trainings and conferences that he attended from 2014 through 2020 on advanced forensic video analysis.

holds a forensic video and crime scene photogrammetry certification from Cognitech Incorporated.[3]

The detective is also an adjunct instructor at the New Jersey Institute of Technology. There, he teaches 400-level courses in mobile device forensics and video forensics. He has also developed various other courses on the same subject matter.[4]

Detective Epstein currently sits on the Digital Evidence Subcommittee for the National Institute of Standards and Technology ("NIST"), as well as the Computer Crimes and Digital Evidence Committee for the International Association of Chiefs of Police. He is also a member of the Forensic Video

[3] According to the company's website, "Cognitech, Inc. is a foremost developer of real-time image and video processing and analysis software tools, 3D video photogrammetry software, lossless video acquisition cards, and integrated workstation systems for professional use by thousands of professional users in forensics, law enforcement, bio-identification, vehicle identification, intelligent CCTV systems, Department of Defense, Department of Homeland Security, geo-intelligence (GEOINTEL) and in surveillance fields." Cognitech highlights on its website the development of a "software suite [that] also contains unique proprietary video photogrammetry tools to measure the true size of people and objects in videos and still images and to perform various bio-metric identification tasks." COGNITECH: THE BEST BEFORE & AFTER, www.cognitech.com/ contact-us/company (last visited Mar. 24, 2023).

[4] The detective's curriculum vitae also indicates that he holds numerous other certifications, including as a video evidence recovery analyst, a forensic video examiner, a forensic video analyst, and a forensic video technician.

Certification Board of the International Association for Identification and has authored the following two peer-reviewed scientific publications:

(1) Brandon Epstein & Bryce Garreth Westlake, Determination of Vehicle Speed from Recorded Video Using Reverse Projection Photogrammetry and File Metadata, 64 J. FORENSIC SCIS. 1523 (2019).

(2) Brandon Evans Epstein, Source and Generational Analysis of Transmitted Video Files to an Apple iPhone (2020) (Master's dissertation, University of Colorado at Denver) (ProQuest).[5]

Detective Epstein has been qualified as an expert fifteen times. On fourteen of those occasions, he was qualified as an expert in forensic video analysis and mobile device forensics in the Superior Court of New Jersey. He was also qualified as an expert in forensic video analysis in the District Court for the County of Jefferson, Colorado, where the trial judge ruled following a Daubert hearing that his opinion applying reverse projection photogrammetry was admissible.

Detective Epstein defined photogrammetry as the analysis of a two-dimensional image which applies mathematics to extrapolate three-dimensional measurements of an object depicted within the image. Stated otherwise, photogrammetry involves the measurement of three-dimensional objects from

[5] Detective Epstein has authored other non-peer reviewed papers for industry publications and has made presentations at conference proceedings on the topic of digital forensics.

two-dimensional images. This Court has found similar definitions of photogrammetry in case law, Hutchinson v. Hamlet, 243 Fed. Appx. 238, 239 (9th Cir. 2007) (Photogrammetry is "'the art, science and technology of obtaining reliable information about objects and their environment from a process of recording, measuring and interpreting photographic images.'"), scientific literature, B.B. TALLEY, ENGINEERING APPLICATIONS OF AERIAL AND TERRESTRIAL PHOTOGRAMMETRY 1 (Pitman and Co. Ltd., 1938) (defining photogrammetry as "the science of measurement from photographs"), and dictionaries, Photogrammetry, MERRIAM-WEBSTER, https://www.merriam-webster.com/dictionary/photogrammetry (defining photogrammetry as "the science of making reliable measurements by the use of photographs and especially aerial photographs (as in surveying)").

Detective Epstein employed two types of photogrammetry during his analysis, namely, reverse projection photogrammetry and single view metrology. He explained that reverse projection photogrammetry involves overlaying an image containing a known measuring object atop an original recorded image at the exact same distance and plane from the camera as the object in the original image that is to be measured in order to determine its size. Single view metrology computes real-world measurements using two-dimensional imagery based upon the fact that parallel lines join toward a

singular point in the image due to the camera's perspective. As an example, the detective used a set of parallel railroad tracks that seem to converge the further away they appear within the imagery. That, coupled with a known measurement from the real world within the imagery, could allow for the calculation of measurements such as width, height, or distance.

According to the detective, although photogrammetry dates back to the time of Leonardo da Vinci,[6] the advent of photography and other forms of imaging over the last 150 years has generated substantially more uses for photogrammetry. In that regard, the detective testified that photogrammetry, including reverse projection photogrammetry, has been accepted by the scientific community as reliable for use in a variety of different fields, including but not limited to medical imaging, astronomy, geology, weather prediction, mapping, surveying, and forensic science. Specific to this case, Detective Epstein testified that photogrammetry has been used for decades in forensic science to determine the height of individuals seen in photographs and videos, typically in connection with bank robberies.

According to Detective Epstein, the Scientific Working Group on Digital Evidence ("SWDGE") has established standards for the use of photogrammetry

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[6] Heinz Gruner, Photogrammetry: 1776-1976, 43 PHOTOGRAMMETRIC ENG'G AND REMOTE SENSING 569, 569 (1977).

in the forensic setting. SWDGE has set standards for the use of photogrammetry through two publications, namely: (1) SWDGE Best Practices for the Forensic Use of Photogrammetry and (2) SWDGE Best Practices for the Forensic Use of Reverse Projection Photogrammetry. See SCIENTIFIC WORKING GROUP ON DIGITAL EVIDENCE (SWGDE), www.swgde.org/documents/published-complete-listing (last visited Mar. 24, 2023). He described SWDGE as a collaborative group of organizations with expertise in digital evidence made up of representatives from private industries; academia; the judiciary; and federal, state, and local law enforcement. These representatives meet three times each year to develop best practices and standards on various topics in digital forensics. See Scientific Working Group on Digital Evidence (SWGDE), www.swgde.org/who-we-are/member-organizations (last visited Mar. 24, 2023).

Detective Epstein provided a detailed explanation of the methodology he employed in connection with the photogrammetric analysis he performed in this case at the request of the Mercer County Prosecutor's Office. Specifically, he was tasked with examining and analyzing, if possible, a video file from a home security camera that captured the homicide to determine the height of the perpetrator while he was walking in front of the recording device. During the detective's testimony, he described each step in the process he followed to reach

his opinion that the height of the questioned person seen walking in the video is between 5 feet, 3.75 inches and 5 feet, 5.75 inches from the ground to the top of the hood of the jacket the individual was wearing.

The first step in the process involved an analysis of the recorded image provided to the detective to determine whether it was suitable for a photogrammetric examination. Detective Epstein explained that his evaluation took into account: (1) the resolution of the imagery, including whether there were enough pixels to accurately determine the desired measurement, which in this case was height; (2) whether the other conditions associated with the video (e.g., compression, lighting, distance from the camera, and angle of the camera) were of sufficient quality to discern where the top and bottom of the questioned individual were situated so that the person could be measured; and (3) whether there were physical items within the image that could be used for comparison.

Upon review of the video provided, as well as his inspection of the area in which it was taken, Detective Epstein determined that it was suitable for analysis because the recording consisted of a high-resolution image (2592 x 1944 pixels) with high-efficiency video-encoding compression that was akin to a 4k television image. In other words, there were ample pixels to allow him to identify specific points on the image. In addition, Detective Epstein found that the overall resolution of the imagery was satisfactory insofar as it consisted of

well-lit daytime footage and the subject to be measured was in relatively close proximity to the camera so as to assist the detective in determining the top of the person's image and bottom of his/her footwear within the frame. Finally, he was able to identify from the video file five intra-frames (i.e., frames where the entire image was refreshed without any artifacts from temporal compression between the frames of the video) for use in the examination, which he numbered as Frame 302, Frame 314, Frame 326, Frame 338, and Frame 350.[7]

Taking all of the foregoing factors into account, Detective Epstein concluded that the video was suitable for photogrammetric examination and analysis. That said, he candidly acknowledged during his testimony that there were some limitations regarding the video file, including that: (1) due to compression, only the intra-frames could be used for analysis, as opposed to every frame in the video; (2) the person in the video was wearing shoes and a hooded jacket, thereby adding uncertainty in identifying the location of the top of the suspect's head and the bottom of his/her feet for purposes of measuring height; and (3) the person in the video was walking, thereby creating a natural rise and fall in gait which results in different measurements depending on where the suspect is in his/her stride.

[7] Detective Epstein assigned a number to each frame of the video file that was given to him beginning at 0. The five intra-frames were numbered accordingly.

The second step in Detective Epstein's analysis involved the application of reverse projection photogrammetry. As described in his report:

> Reverse projection photogrammetry projects images from a camera on new images from the same camera or at least on images from a camera with similar internal (i.e., focal length and distortion) and external (*i.e.*, position and orientation) parameters. In this examination, the same camera located in the same position was utilized. It should be noted that the display aspect ratio of the provided file is 4:3, which may distort an object's appearance. The aspect ratio of the imagery was not corrected in the original image nor in the reverse projection imagery to allow for consistent location of objects in the imagery and accurate measurements.

In order to properly conduct the photogrammetric examination, Detective Epstein was required to go to the same location where the original video file was captured, namely 60 Hudson Street. Once there, he located the digital video recording (DVR) surveillance system that captured the original video. He then took the output from the system that displayed to the monitor inside the house and connected it to a utility that allowed him to link it to his computer, which was equipped with Amped Forensic Image and Video Enhancement ("FIVE") software. He explained that the software allows the user to take a signal into a computer and overlay it on a previously recorded video. As a result, Detective Epstein was able to display the five intra-frames that he deemed suitable for

examination on his computer screen and overlay them with the live feed from the camera located at 60 Hudson Street.

Next, Detective Epstein determined that the camera was in the same location as when it captured the video of the suspect seconds before the homicide. To do so, the detective took the overlayed images and compared them to static objects captured therein – in this case cracks in the sidewalk and where certain fence posts met the ground – and made sure that they all lined up, thereby demonstrating that the camera had not moved from the date of the original recording.

Once that was accomplished, Detective Epstein directed an assistant to place a height determination board onto the live scene in the exact location as the questioned person in each of the five selected intra-frames.[8] To further ensure that the height board was situated at the proper height, rulers were used to measure four (4) feet from the ground to the bottom of the board, which was then leveled at all five (5) positions.

By overlaying the live feed on the five intra-frames, Detective Epstein was able to determine the height of the suspect in each frame from the ground to the top of that individual's hood as noted in the chart below:

[8] The height board sits on a tripod and displays 1.5-inch increments on either side beginning at four (4) feet.

Frame 302	5’ 11’’
Frame 314	5’ 5”
Frame 326	5’ 9.5”
Frame 338	5’ 4.5”
Frame 350	5’ 3”

After determining the heights in each of the five intra-frames, Detective Epstein performed measurement uncertainty calculations using formulas recognized in the field. He explained that the measurement uncertainty calculations take into account resolution accuracy in the plane of the questioned person (subject in inches ÷ subject in pixels = inches/pixel) and the positional accuracy of the height determination board (height of camera – height of subject ÷ distance from camera to subject x 3 = inches/inch). Those values were added together to increase the uncertainty and were used to calculate the following height ranges:

Frame 302	5’ 9.625” to 6’ 0.375”
Frame 314	5’ 3.375” to 5’ 6.375”
Frame 326	5’ 8.25” to 5’ 10.75”
Frame 338	5’ 3.375” to 5’ 5.625”
Frame 350	5’ 2” to 5’ 4”

The third step in Detective Epstein's analysis involved the application of single view metrology. The detective explained that he used this second type of photogrammetry to independently verify the results he obtained using reverse projection photogrammetry. The detective began this additional process by identifying certain lines in each of the five intra-frames that were known to be parallel to each other in the real world but appeared to be converging within the imagery. He chose two lines from the sidewalk in the horizontal plane and two fence posts in the vertical plane. The detective explained that by using this information, coupled with a known measurement from the real world (i.e., another fence post that he measured at the scene to establish its known height of 50.125"), he could derive the height measurements of objects that appeared within the two-dimensional image. The images were then loaded into a software program back at the detective's lab which corrected for lens distortion[9] and

[9] Detective Epstein explained that no correction was made for lens distortion in reverse projection photogrammetry because the same lens was used to overlay one image atop another image. In other words, because the same lens distortion appears in both images, they negate each other insofar as if both or neither are corrected, the same result will be reached. On the other hand, because single view metrology does not involve an overlay of images, the distortion caused by lens curvature on the outer edges of the single image must be corrected in order to create a flat image, which ensures accuracy. The distortion is corrected by the software used by the detective.

experimental uncertainty.[10] This allowed the detective to arrive at a single view metrology known height (i.e., from the bottom of the suspect's shoe to the top of the hood that he was wearing) for each intra-frame with an uncertainty range reflected in the chart below:

	SVM Height	Height Range
Frame 302	5' 5.125"	5' 4.875" to 5' 0.5"
Frame 314	5' 6"	5' 5.625" to 5' 6.5"
Frame 326	5' 6.875"	5' 6.5" to 5' 7.375"
Frame 338	5' 5.25"	5' 4.25" to 5' 6.375"
Frame 350	5' 4.625"	5' 3.5" to 5' 5.625"

The next step in Detective Epstein's methodology involved a comparison of the height measurements from each of the five intra-frames that were obtained by using reverse projection photogrammetry and single view metrology. According to the detective, the data demonstrated that the measurements obtained using single view metrology were more evenly distributed than the measurements obtained using reverse projection photogrammetry. Detective

[10] Experimental uncertainty was calculated by taking the height of the fencepost that the detective had measured himself (i.e., 50.125") to compare to the measurement of the same fencepost by the Amped Five Measure 3D tool he used for this part of his analysis (i.e., 50.239"), resulting in a difference of 0.114" (50.239 - 50.125 = 0.144).

Epstein explained that the results from single view metrology and reverse projection photogrammetry from Frames 302 and 326 did not overlap, while the results for Frames 314, 338, and 350 did overlap. Since the detective could not verify the results from Frames 302 and 326 using both techniques, they were discarded and not used further in his analysis and ultimate opinion. Detective Epstein explained his reasoning in his report as follows:

> Based upon an analysis of the reverse projection and single view metrology measurements, the height ranges for frames 302 and 326 did not overlap with each other when comparing the techniques; as such I could not verify the height measurements for either frame. In an additional review of those frames, a visual inspection of the reverse projection overlay indicates the possibility that the height board is not the same distance to the camera as the subject, resulting in an inaccurate measurement. Since the single view metrology measurements for frames 302 and 326 had the small experimental uncertainty of an eighth of an inch when calculated against a known value, I am confident in their accuracy. Even though I am confident in the single view metrology measurements for frames 302 and 326, since they could not be verified compared with the reverse projection, neither the single view metrology nor the reverse projection measurements for those frames will be used to determine the height of the subject.

Consequently, his opinions were based solely on the results from Frame 314, Frame 338, and Frame 350.

In the final step of his analysis, Detective Epstein calculated the average of the measurements obtained for Frames 314, 338, and 350 using both reverse

projection photogrammetry and single view metrology. According to Detective Epstein, by taking the averages, he was able to reduce uncertainty in the measurements and minimize the effects of the suspect's varying height while walking. In addition to the average values for the minimum and maximum height, population standard deviation and confidence intervals were calculated for the average measured values. He found the resultant standard deviation to be 0.716" within a 95 percent confidence interval that the mean is between 63.9" and 65.6" as shown in the tables below:

	Minimum	Measured	Maximum
Frame 314	64.65"	65.533"	66.416"
Frame 338	63.816"	64.896"	65.975"
Frame 350	62.762"	63.8"	64.837"

	Minimum	Measured	Maximum
Questioned Subject Height	63.743"	64.743"	65.765"

Based upon all of the foregoing, Detective Epstein opined "that the height of the questioned person from the ground to the top of the suspect's hood is between approximately 5' 3.75" (63.743") and 5' 5.75" (65.975") as seen walking in the questioned video.

The methodology employed by Detective Epstein was subject to challenge on cross-examination. As addressed in more detail later in this decision, the

court finds that the issues raised by the defense go to the weight of the detective's opinion. They do not undermine either the methodology that Detective Epstein employed or his resulting opinion to the point of rendering either of them unreliable.

The defense primarily questioned Detective Epstein as to the basis for his decision to exclude the results for Frames 302 and 326 and whether that was simply based on a subjective judgement. The detective explained that his decision was based on the concept of verification. He deemed the measurements for Frames 302 and 326 to be unreliable because they were not verified by both reverse projection photogrammetry and single view metrology. The detective went on to candidly explain that the results obtained through the application of reverse projection photogrammetry were far different from those obtained through single view metrology, likely because he failed to place the height determination board in the exact same spot where the suspect was captured in Frames 302 and 326.[11]

III.

[11] Detective Epstein explained that, because the exercise was performed during the height of the COVID-19 pandemic, he was concerned about spending too much time inside 60 Hudson Street. As a result, he may have not taken enough time to ensure that the height board was placed precisely in the right locations. While this is certain to be a subject of cross-examination at trial, it is not sufficient to undermine the reliability of the detective's methodology, especially since the results were discarded.

"New Jersey Rules of Evidence 702 and 703 control the admission of expert testimony." In re Accutane Litig., 234 N.J. at 348. The party offering the expert testimony has the burden of proving its admissibility by a preponderance of the evidence. State v. Rosales, 202 N.J. 549, 562 (2010). That task is normally performed pretrial at a N.J.R.E. 104 hearing. In re Accutane Litig., 234 N.J. at 350, 371-72. There, the trial court is charged with fulfilling its duty as a gatekeeper by deciding whether expert testimony is reliable enough to be admitted or whether it should be excluded as unreliable. Id. at 388. In that regard, the trial court's "critical determination is whether comparable experts accept the soundness of the methodology, including the reasonableness of relying on [the] type of underlying data and information." Id. at 390 (citing Rubanick v. Witco Chem. Corp., 125 N.J. 421, 451 (1991)).

N.J.R.E. 702 states that "[i]f scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise." To satisfy the Rule the proponent of the evidence must satisfy the following three foundational requirements for the admission of expert testimony:

> (1) the intended testimony must concern a subject matter that is beyond the ken of the average juror; (2) the field testified to must be at a state of the art such that an expert's testimony could be sufficiently reliable;

> and (3) the witness must have sufficient expertise to offer the intended testimony.
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> [In re Accutane Litig., 234 N.J. at 349 (citing State v. Kelly, 97 N.J. 178, 223 (1984)).]

As commentators have observed, our Supreme Court "has stated clearly that the three foundational requirements for expert testimony should be 'construed liberally in light of Rule 702's tilt in favor of the admissibility of expert testimony.'" Biunno, Weissbard & Zegas, Current N.J. Rules of Evidence, cmt. 1 on N.J.R.E. 702 (2022) (quoting State v. Jenewicz, 193 N.J. 440, 454 (2008)). This liberal approach favoring admissibility derives from a recognition that a jury generally should be trusted to weigh any alleged deficiencies in an expert's qualifications and opinions. Rubanick, 242 N.J. Super. 36, 48-49 (App. Div. 1990) (noting that it is ultimately within the province of the jury "to determine the credibility, weight and probative value" of expert testimony), modified on other grounds, 125 N.J. 421 (1991). That said, it should never be lost on judges considering the admissibility of expert testimony in criminal cases that the freedom, or even the life, of an individual is at stake. State v. Cary, 99 N.J. Super. 323, 333 (Law Div. 1968), aff'd after remand, 56 N.J. 16 (1970).[12] With that in mind, the new standard in criminal

[12] "[A]nalysts of the more than 200 DNA exonerations to date claim that in more than 50% of the cases, invalid, or improperly conducted, or misleadingly

cases recently adopted in Olenowski provides that general acceptance still remains a consideration in determining the reliability of an expert's methodology, thereby reinforcing that "a technique that has garnered only minimal support within the scientific community 'may properly be viewed with skepticism.'" In re Accutane Litig., 234 N.J. at 384 (quoting Daubert, 509 U.S. at 594).

N.J.R.E. 703 addresses the factual foundation for expert testimony. Expert opinions must "be grounded in 'facts or data derived from (1) the expert's personal observations, or (2) evidence admitted at the trial, or (3) data relied upon by the expert which is not necessarily admissible in evidence, but which is the type of data normally relied upon by experts.'" Townsend v. Pierre, 221 N.J. 36, 53 (2015) (quoting Polzo v. Cty. of Essex, 196 N.J. 569, 583 (2008)). "The net opinion rule is a 'corollary of [N.J.R.E. 703] . . . which forbids the admission into evidence of an expert's conclusions that are not supported by factual evidence or other data.'" Id. at 53-54 (quoting Polzo, 196 N.J. at 583). Accordingly, an expert is required to "'give the why and wherefore' that

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interpreted forensic science contributed to the wrongful convictions." Margaret A. Berger, The Admissibility of Expert Testimony 27, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE (The National Academies Press, 3d ed. 2011) (citing The Innocence Project, available at www.innocenceproject.org).

supports the opinion, 'rather than a mere conclusion.'" Crispino v. Twp. of Sparta, 243 N.J. 234, 257 (2020) (quoting Townsend v. Pierre, 221 N.J. at 54).

With those guiding principles in mind, this opinion turns to an examination of the testimony and related opinions the State seeks to offer at trial through Detective Epstein.

With respect to the first element of admissibility - whether the proffered testimony concerns a subject matter beyond the ken of an average juror – expert testimony will be admissible if it "will assist the trier of fact to understand the evidence or determine a fact in issue." N.J.R.E. 702. Consequently, the threshold question that the court must address is whether the intended testimony is relevant. By definition, if the intended expert testimony is irrelevant, it will not be helpful to the trier of fact.

The test for relevance is broad and favors admissibility. State v. Deatore, 70 N.J. 100, 116 (1976). N.J.R.E. 401 defines relevant evidence as evidence having a tendency in reason to prove or disprove any fact of consequence to the determination of the action. The fact of consequence determination focuses on the relation between the proposition for which the evidence is offered and the issues in the case. State v. Hutchins, 241 N.J. Super. 353, 359 (App. Div. 1990). To be relevant, the evidence must also have probative value inasmuch as it has a tendency in reason to prove or disprove a fact of consequence. State v. Burr,

195 N.J. 119, 127 (2008). That inquiry focuses on "the logical connection between the proffered evidence and a fact in issue," in other words, whether the evidence offered renders the desired inference more probable than it would be without the evidence. Id. at 358.

In this case, the State seeks to offer the testimony of Detective Epstein as an expert in the field of digital forensics, which includes photogrammetry. The detective has opined, based upon his review and analysis of the video footage at issue in this case, that the height of the questioned person from the ground to the top of the suspect's hood is between 5 feet, 3.75 inches and 5 feet, 5.75 inches. The court finds that the proposed testimony is relevant since it concerns a fact of consequence, namely, the identity of the perpetrator. It is also probative of identity because there is a logical connection between the detective's opinion concerning the estimated height of the suspect in the video and whether that is consistent with the defendant's actual height. Finally, the court also finds that the proffered testimony would render the inference that the suspect depicted in the video is the Defendant more probable than it would be without the testimony of Detective Epstein.

In addition to demonstrating relevance, in order to satisfy the "beyond the ken of an average juror" element of N.J.R.E. 702, the proposed testimony must be helpful to the trier of fact. The justification for permitting expert testimony

at all is the helplessness of the average juror in dealing with a subject that is relevant to the case which is not a matter of common knowledge. State v. Fortin, 189 N.J. 579, 596 (2007). As a result, expert testimony should only be permitted where it concerns a subject matter that is "so distinctively related to some science, profession, business or occupation as to be beyond the ken of the average layman." Boland v. Dolan, 140 N.J. 174, 188 (1995) (citing Nesmith v. Walsh Trucking Co., 247 N.J. Super. 360, 369 (App. Div. 1989), rev'd on other grounds, 123 N.J. 547 (1991)).

Here, the court finds that determining the height of an individual depicted in a video is beyond the ken of an average juror. Accurately estimating the height of someone in person is difficult enough. See State v. Gerena, 465 N.J. Super. 548, 569 (App. Div. 2021) (noting that courts are "cognizant that lay witnesses may err in quantifying the heights of other persons" in proposing factors to consider when deciding whether such testimony should be admissible). As demonstrated by Detective Epstein's testimony at the N.J.R.E. 104 hearing, the application of photogrammetry to estimate the height of an individual depicted in a video requires a level of knowledge concerning the analysis of digital media, as well as the use of scientific and arithmetic means and methods, that are well beyond the ability of an average juror.

For these reasons, the court finds that the first element of N.J.R.E. 702 has been satisfied.

With respect to the second element, as previously noted, the New Jersey Supreme Court's decision in Olenowski constitutes a demarcation in our criminal jurisprudence, scrapping the exclusive reliance on the "general acceptance" standard to determine the reliability of expert testimony in favor of an "approach that focuses directly on reliability by evaluating the methodology and reasoning underlying [the] proposed expert testimony." Olenowski, 253 N.J. at 138. As a result, "'[T]he key to admission' in [criminal] cases now 'is the validity of the expert's reasoning and methodology.'" Ibid. (quoting Landrigan v. Celotex Corp., 127 N.J. 404, 414 (1992)).

Post-Olenowski, expert testimony and opinion may be found sufficiently reliable for admission in criminal cases only "'if it is based on a sound, adequately-founded scientific methodology involving data and information of the type reasonably relied on by experts in the scientific field.'" Olenowski, 253 N.J. at 146 (quoting Rubanick, 125 N.J. at 449). "'In determining if the scientific methodology is sound and well-founded, courts should consider whether others in the field use similar methodologies.'" Ibid. Thus, the focus of the inquiry is on the scientific community's acceptance of the proposed expert's methodology and underlying reasoning. In re Accutane Litig., 234 N.J.

at 396-97. The analysis also requires that there be a "proper fit" insofar as the expert testimony must be sufficiently tied to the facts of the case in order to aid the jury in resolving the matters at issue.[13] Id. at 397-98 (citing Rubanick, 125 N.J. at 449 ("The expert must possess a demonstrated professional capability to assess the scientific significance of the underlying data and information, to apply the scientific methodology, and to explain the bases for the opinion reached.") (emphasis in original)).

To assist in the application of this new methodology-based standard in criminal cases, trial courts are instructed to apply the following non-exhaustive list of Daubert factors:

> (1) whether the scientific theory or technique can be, or at any time has been, tested; (2) whether the scientific theory has been subjected to peer review and publication, noting that publication is one form of peer review but is not a sine qua non; (3) whether there is any known or potential rate of error and whether there exist any standards for maintaining or controlling the technique's operation; and (4) whether there does exist a general acceptance in the scientific community about the scientific theory.
>
> [Id. at 398; Olenowski, 253 N.J. at 147.]

With respect to general acceptance in the scientific community, that factor:

> [c]ontinues to have a bearing because, minimally, it permits the identification of a relevant scientific community and facilitates an express determination of

[13] The "proper fit" element has already been addressed supra.

> a particular degree of acceptance within that community, or contrarily permits a technique with minimal support to be viewed with skepticism.
>
> In re Accutane Litig., 234 N.J. at 398.

However, no single Daubert factor is dispositive in the analysis and a trial court may apply some, all, or none of them depending on the particular expert testimony involved. Kumho Tire Co. v. Carmichael, 526 U.S. 137, 141-42, 151-52 (1999).

The Court in Olenowski emphasized that the list of Daubert factors and resulting case law from other jurisdictions, while helpful, are not a definitive guide that trial courts in New Jersey must follow. Olenowski, 253 N.J. at 149. Rather, the inquiry is a "flexible one" focusing on principles and methodology, not on the outcomes that they generate. Id. at 147. In the end, our Supreme Court has summarized the trial court's gatekeeping role as follows:

> Our view of proper gatekeeping in a methodology-based approach to reliability for expert scientific testimony requires the proponent to demonstrate that the expert applies his or her scientifically recognized methodology in the way that others in the field practice the methodology. When a proponent does not demonstrate the soundness of a methodology, both in terms of its approach to reasoning and to its use of data, from the perspective of others within the relevant scientific community, the gatekeeper should exclude the proposed expert testimony on the basis that it is unreliable.
>
> [In re Accutane Litig., 234 N.J. at 399-400.]

This court is satisfied that, in reaching his opinion, Detective Epstein employed a sound scientific methodology accepted by others in the field of digital forensics and that the data he relies upon is similarly well-accepted. Olenowski, 253 N.J. at 146. The court's conclusion is demonstrated by an application of the principles set forth in Olenowski and its predecessors, including the Daubert factors themselves.

First, the reverse projection photogrammetry technique or "methodology" employed by Detective Epstein can be and has been tested. In re Accutane Litig., 234 N.J. at 397-98 (Daubert factor one). The detective tested, or in his words "verified", the results he obtained through the application of reverse projection photogrammetry by conducting a second analysis using the single view metrology technique. By doing so, the witness was able to verify the accuracy of his measurements for Frames 314, 338, and 350 because the results from both techniques overlapped and exclude Frames 302 and 326 from his ultimate opinion because their results did not overlap. Aside from Detective Epstein's testing, other forensic experts in the field who have used the reverse projection photogrammetry have tested their results simply by superimposing themselves in the questioned image and comparing the results to their known heights. See State v. Matthews, 277 A.3d 991, 1000 (2022) (affirming the trial court's admission of expert testimony following a Daubert hearing from an FBI

scientist who conducted reverse projection photogrammetry analysis to estimate the height of an individual depicted in video footage carrying a shotgun shortly before a murder); Gecker as Trustee for Collins v. Menard, Inc., No. 16 CV 50153, 2019 WL 3778071, at *6-7 (N.D. Ill. Aug. 12, 2019) (noting that other forms of photogrammetry, specifically close-range photogrammetry, can be tested). As a result, the first Daubert factor has been satisfied.

Second, Detective Epstein testified that the reverse projection photogrammetry technique has been subject to peer review. In re Accutane Litig., 234 N.J. at 398 (Daubert factor two). Indeed, the detective has published a peer-reviewed article addressing his use of the technique to determine the speed of a vehicle from a recorded video image. See Gecker, 2019 WL 3778071, at *6-7 (observing that other forms of photogrammetry, specifically close-range photogrammetry, have been subject to peer review). While the court suspects that photogrammetry in general has been the subject of significantly more peer review, given the fact that it is used in various fields including medicine and surveying, it merits repeating that peer review is not an essential condition of admissibility. In re Accutane Litig., 234 N.J. at 398; See also United States v. Williams, 235 F. App'x 925, 928-29 (3d Cir. 2007) (affirming the trial court's admission of expert testimony concerning the estimated height of an alleged bank robber notwithstanding defendant's argument that, among other flaws, the

government failed to proffer evidence that reverse projection photogrammetry has been subject to peer review). For these reasons, the court also finds sufficient evidence in the record to satisfy the second Daubert factor.

Third, although Detective Epstein was not specifically asked on either direct or cross-examination if there is a known error rate for reverse projection photogrammetry, the detective explained that he used certain formulas to calculate rates of uncertainty which were included in his analysis and ultimate opinion. In re Accutane Litig., 234 N.J. at 398 (Daubert factor three). Since the detective testified that the uncertainty formulas are "recognized in the field", they constitute "standards for maintaining or controlling the technique's operation" consistent with the third Daubert factor. Ibid. Even if that was not the case, multiple courts applying Daubert have concluded that the government's failure to proffer evidence regarding the error rate for reverse projection photogrammetry in calculating the height of a suspect from a video did not render the expert's testimony unreliable. See Matthews, 277 A.3d at 1011-18; Williams, 235 F. App'x at 928-29. Instead, the issue of error rate is "well-suited for 'vigorous cross-examination' and 'presentation of contrary evidence.'" Aviva Sports, Inc. v. Fingerhut Direct Mktg., 829 F. Supp. 2d 802, 830 (D. Minn. 2011) (quoting Daubert, 509 U.S. at 596); See also Hisenaj v. Kuehner, 194 N.J. 6, 21-24 (2008) (holding that the expert's failure to account for a

multitude of factors that would contribute to determining whether a low-speed impact could result in a chronic injury properly go to the weight of the expert's testimony as opposed to its admissibility).

Finally, in connection with the fourth Daubert factor, the proponent of scientific evidence can demonstrate that it has been generally accepted "by judicial opinions that indicate the expert premises have gained general acceptance." Kelly, 97 N.J. at 210 (1984). For decades, courts have permitted expert testimony regarding the use of photogrammetry for the specific purpose of calculating the height range of criminal suspects seen in photographic and video images. See United States v. Everett, 825 F.2d 658, 662 (2d Cir. 1987); Williams, 235 F. App'x 925, 926-28 (3d Cir. 2007); United States v. Bobbitt, Nos. 98-4489, 98-4490, 2000 WL 102925, at *2 (4th Cir. 2000); United States v. Rhodes, 569 F.2d 384, 387 (5th Cir. 1978); United States v. Johnson, 114 F.3d 808, 811, 813 (8th Cir. 1997); United States v. Quinn, 18 F.3d 1461, 1464-65 (9th Cir. 1994); United States v. Watson, No. 94-10354, 1995 U.S. App. LEXIS 26101, at *6 (9th Cir. 1995); United States v. Kyler, 429 F. App'x 828, 829-30 (11th Cir. 2011); Chappel v. Garcia, No. CIV S-03-0132 FCD DAD P., 2006 WL 1748424, at *4, *36, *38-*39 (E.D. Cal. June 26, 2006); Apodaca v. Horel, No. 1:08-CV-00414 JMD HC, 2009 WL 1357444, at *2 (E.D. Cal. May 13, 2009); Matthews, 277 A.3d at 1000. Courts have also admitted expert

testimony regarding the use of photogrammetry in a variety of other contexts. See, e.g., U.S. v. Sutton, 642 F. Supp. 3d 57, 81-82 (D.D.C. 2022); Raimey v. City of Niles, 676 F. Supp. 3d 547, 561 (N.D. Ohio 2022), aff'd sub nom., Raimey v. City of Niles, Ohio, 77 F.4th 441 (6th Cir. 2023); Jackson v. E-Z-GO Div. of Textron, Inc., 326 F. Supp. 3d 375, 435-36 (W.D. Ky. 2018) (all admitting expert testimony from accident reconstructionists who applied photogrammetry as a basis for opinions regarding vehicle speed, skid mark length, and severity of impact, among other subjects); Heatherly v. Alexander, 421 F.3d 638, 645 (8th Cir. 2005) (holding that expert testimony of photogrammetrist concerning analysis of aerial photographs was valid evidence of causation); Gecker, 2019 WL 3778071, at *4 (observing that photogrammetry "has a long, recognized history of reliability in the scientific and judicial community" and citing additional cases for that proposition). Further demonstrating the general acceptance of photogrammetry is the fact that it is cited on pages 956 through 958 of the Reference Manual on Scientific Evidence – a publication produced through collaboration with the Federal Judicial Center and the National Research Council of the National Academies – as a method of establishing the accuracy of animations that are often used by engineering and other experts to illustrate their testimony at trial. Based on the foregoing, the court also finds that the fourth Daubert factor has been met.

To summarize, during the N.J.R.E. 104 hearing Detective Epstein: (1) explained the general technique of photogrammetry, as well as the specific techniques of reverse projection photogrammetry and single view metrology; (2) identified the standards and controls that are used in a photogrammetric examination and analysis; (3) described in detail the manner in which he conducted his own examination and analysis, which employed the same methodology used by other experts in the field; (4) described how he used single view metrology to test and verify the results that were generated by using reverse projection photogrammetry, as well as his application of formulas recognized in the field to calculate for uncertainty; and (5) explained that the reverse projection photogrammetry technique is generally accepted for use in measuring the height of individuals by others in the field of forensic science. Given the record evidence, which also supplies the necessary why's and wherefore's required by N.J.R.E. 703, the court concludes that Detective Epstein's testimony and opinions are reliable because they are "based on a sound, adequately-founded scientific methodology involving data and information of the type reasonably relied on by experts in the scientific field." Olenowski, 253 N.J. at 146 (citing Rubanick, 125 N.J. at 449)..

Finally, concerning the third element of the N.J.R.E. 702 analysis, our courts "take a liberal approach when assessing a person's qualifications" to

testify as an expert. Jenewicz, 193 N.J. at 454. N.J.R.E. 702 permits a witness to testify as an expert on a subject if he or she is "qualified . . . by knowledge, skill, experience, training, or education . . ." The Rule, therefore, allows an expert to be qualified by education or by occupational experience. Rosenberg v. Tavorath, 352 N.J. Super. 385, 400 (App Div. 2002). That is, an expert can be qualified by "study without practice or practice without study." State v. Smith, 21 N.J. 326, 334 (1956). The court finds that Detective Epstein is qualified by both. To the extent that there are any weaknesses in his qualifications, our courts allow such vulnerabilities to be explored on cross-examination to affect the weight that the jury will give his opinions and generally discourage the use of such weaknesses to exclude the State's choice of expert. Jenewicz, 193 N.J. at 455.

The court has had the opportunity to review Detective Epstein's curriculum vitae, which is incorporated into this opinion by reference, as well as the testimony that he has provided regarding his education, knowledge, training, and experience. The court has also considered as part of its evaluation the fact that the detective is certified in crime scene photogrammetry; has authored a peer-reviewed article applying reverse projection photogrammetry; and has been qualified as an expert in forensic video analysis in Colorado, where the court accepted his opinions applying reverse projection photogrammetry

following a Daubert hearing. Based upon that information, the court finds that Detective Epstein is duly qualified as an expert in the field of digital forensics and photogrammetry, the latter of which includes reverse projection photogrammetry and single view metrology. In sum, Detective Epstein has "sufficient expertise to offer the intended testimony." Kemp v. State, 174 N.J. 412, 424 (2002) (citing Landrigan v. Celotex Corp., 127 N.J. at 413).

IV.

Having carefully considered the written submissions of the parties, along with the evidence adduced at the N.J.R.E. 104 hearing, the court concludes that the testimony and opinions of Detective Epstein are admissible at trial. As a result, the court will enter an Order granting the State's Motion to Admit Expert Testimony Pursuant to N.J.R.E. 702.