OSAC 2023-N-0003 Standard for Diagramming Scenes

Crime Scene Investigation and Reconstruction Subcommittee
Scene Examination Scientific Area Committee
Organization of Scientific Area Committees (OSAC) for Forensic Science

Draft OSAC Proposed Standard

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Prepared by
Crime Scene Investigation and Reconstruction Subcommittee
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Disclaimer:

This OSAC Proposed Standard was written by the Organization of Scientific Area Committees (OSAC) for Forensic Science following a process that includes an open comment period. This Proposed Standard will be submitted to the standards developing organization and is subject to change.

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Foreword

This document delineates standards and recommendations for the diagramming of a scene and physical evidence during scene investigations. The approach outlined is recommended as good professional practice even though the facts and issues of each situation require specific considerations and may involve matters not expressly dealt with herein. Not every portion of this document may apply to every incident or investigation. It is up to the individual capturing the data to apply the appropriate recommended procedures in this guide to a particular incident or investigation. In addition, it is recognized that time, and resource limitations or existing policies may limit the degree to which the recommendations in this document will be applied in a given investigation. The responsibility of the individual preparing the diagram for evidence preservation and the scope of that responsibility varies based on such factors as the jurisdiction, the status of the individual as a public official and private sector investigator, indication of criminal conduct, and applicable laws and regulations. This document should be utilized in conjunction with local regulations and any requirements set forth by entities examining document evidence to inform or augment policies relating to collecting and preserving physical evidence.

This document has been drafted by the Crime Scene Investigation and Reconstruction Subcommittee of the Organization of Scientific Area Committees (OSAC) for Forensic Science through a consensus process.

This standard provides guidance on some safety issues but is not exhaustive. It is the responsibility of the appropriate agency to develop a full health and safety plan.

All hyperlinks and web addresses shown in this document are current as of the publication date of this standard.

Keywords: diagram; sketch; map; measurement; baseline; triangulation

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1. Scope

1.1 The scope of this document includes guidelines for the diagramming of a scene and physical evidence.

1.2 This document covers scene measurement and diagramming methods, as well as the translation of scene work to output.

1.3 If compliance with this standard is claimed, justification for any deviation from this standard must be documented.

2. Normative References

Standard for Scene Documentation Procedures (DRAFT)

3. Terms and Definitions

3.1
Azimuth
a reference direction is measured as a clockwise angle from the north. (Boots, 2010)

3.2
baseline
the method used to measure items of evidence when there are numerous objects in the scene. This is accomplished by laying a tape measure down so that it crosses the entire room or area to be measured. This first tape measure becomes the baseline for all other measurements in the scene. Measurements are then made perpendicular from this tape by laying another tape measure at a 90-degree angle to the first tape and measuring out to the evidence. (NFSTC, 2013)

3.3
polar coordinate
method appropriate for an outdoor scene in which only a single fixed or reference point is present. This method measures the distance and direction (angle) of an object from a known reference point. The angle can be measured with either a large protractor or an optical device such as a transit or a compass. The protractor technique with a 360-degree protractor is useful for underwater scenes. (NFSTC, 2013)

3.4
triangulation
a measurement method that utilizes two fixed permanent objects within the scene. Measurements are taken from each fixed point to each piece of evidence. (NFSTC, 2013)

3.5
photogrammetry
the art, science, and technology of obtaining reliable information about physical objects and the environment through recording, measuring, and interpreting images and patterns of electromagnetic radiant energy and other phenomena. (ASPRS, 2014, 597)

3.6
terrestrial LiDAR scanning
a method for surveying tasks that acquires complex geometric data where each point is determined by the position (X, Y, Z) and the intensity (i) of the returning signal, also known as terrestrial laser scanning (RTI International, 2016). This method differs from a total station in its ability to automatically capture a large number of points in a predefined window. (FTCoE, 2022)

3.7
total station
a surveying instrument that uses a theodolite with an electronic distance meter to read slope distances from the instrument to a particular point. (RTI International, 2016)

Alternate Def: An electronic instrument that combines a theodolite and EDMI to collect angles and distances from the instrument to various points. (Boots, 2010)

3.8
mobile mapping
the collection of highly precise point cloud data provided by laser scanning systems on moving platforms with an integrated navigation solution (Puente et al., 2013)

3.9
global navigation satellite system (GNSS)/global positioning system (GPS)
a general term describing any satellite constellation that provides positioning, navigation, and timing services on a global or regional basis. (GPS.GOV)

4. Significance and Use

4.1 This practice is intended to provide a graphic representation of the scene and evidence at hand and in such a fashion as to allow another individual to interpret the particulars of the incident.

4.2 This practice is suggested for documenting conditions and data of a scene and evidence that may change or be lost with further scene investigation.

4.3 The primary use of this practice is to preserve pertinent information for use by technical experts and other technical personnel who may be called upon to reconstruct the events

surrounding the incident.

5. Quality Assurance

5.1 Verification of Measuring Equipment

5.1.1 Prior to being put into service, new measuring equipment shall be verified against a traceable standard to requirements defined by the agency according to the purpose of the measurement. For example, newly purchased measuring devices can be compared directly (either in their entirety or in representative sections) against a known calibrated measurement standard (e.g., a traceable ruler or tape).

5.2 Calibration of Measurement Tools

5.2.1 Whenever measurements are reported or directly impact reported results, the associated measuring device(s) shall be calibrated. A vendor accredited to ISO/IEC 17025 shall be used when available.

5.2.2 The agency will specify calibration specifications according to the purpose of the measurement. Sources for calibration specifications may come from standards or equipment manufacturer recommendations.

5.3 Q.C. Checks of Measuring Equipment

5.3.1 All equipment that collects measurements should be verified on a defined schedule against a traceable standard and meet acceptability requirements. The agency defines the verification schedule and requirements according to the purpose of the measurement.

5.4 Uncertainty of Measurement

5.4.1 Uncertainty of measurement considerations may vary depending on the agency's needs and should be considered and estimated when appropriate. Methods of estimating uncertainty are outside the scope of this standard.

6. Considerations

6.1 The diagramming and mapping described in this practice may be prepared by any person(s) in a formal capacity. Persons investigating in a formal capacity include but may not be limited to international, federal, state, and local officials, employers, owners, insurance personnel, and other technical experts.

6.2 When multiple methods are available, the method that maximizes the accuracy and reduces error should be chosen. Considerations for method selection should be

documented (i.e., Environmental factors, equipment availability, personnel availability, investigative circumstances).

7. Documentation and Custody

7.1 The minimum requirements for documentation can be found in **Standard for Scene Documentation Procedures**.

7.2 All output/deliverables and supporting data shall be preserved according to agency evidence handling requirements.

8. Measurement Methods

8.1 General Considerations

8.1.1 Agency policy shall define the level to which measurements must be recorded (e.g., to the nearest ¼") to include the process of rounding.

8.1.2 The handling procedures for measuring devices can significantly affect the resulting value (e.g., sag in measuring tape, not perpendicular, etc.). Measurement methods shall specify the manner in which measuring devices are used to ensure measurements meet agency requirements.

8.2 Manual Methods

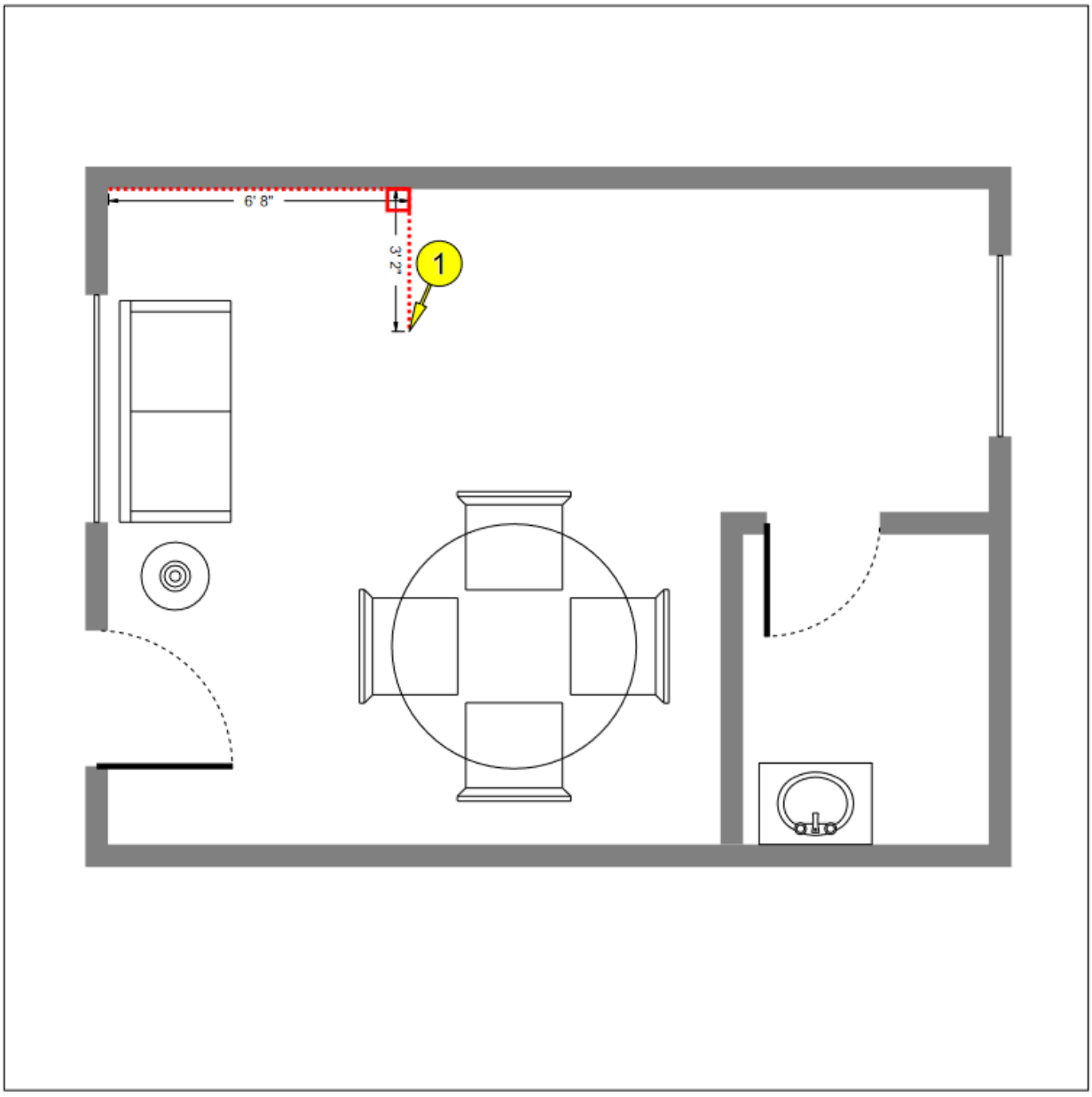
8.2.1 Manual distance measurements are measurements recorded by hand using tape measures, roll-a-wheels, laser handheld distance measuring devices, etc.

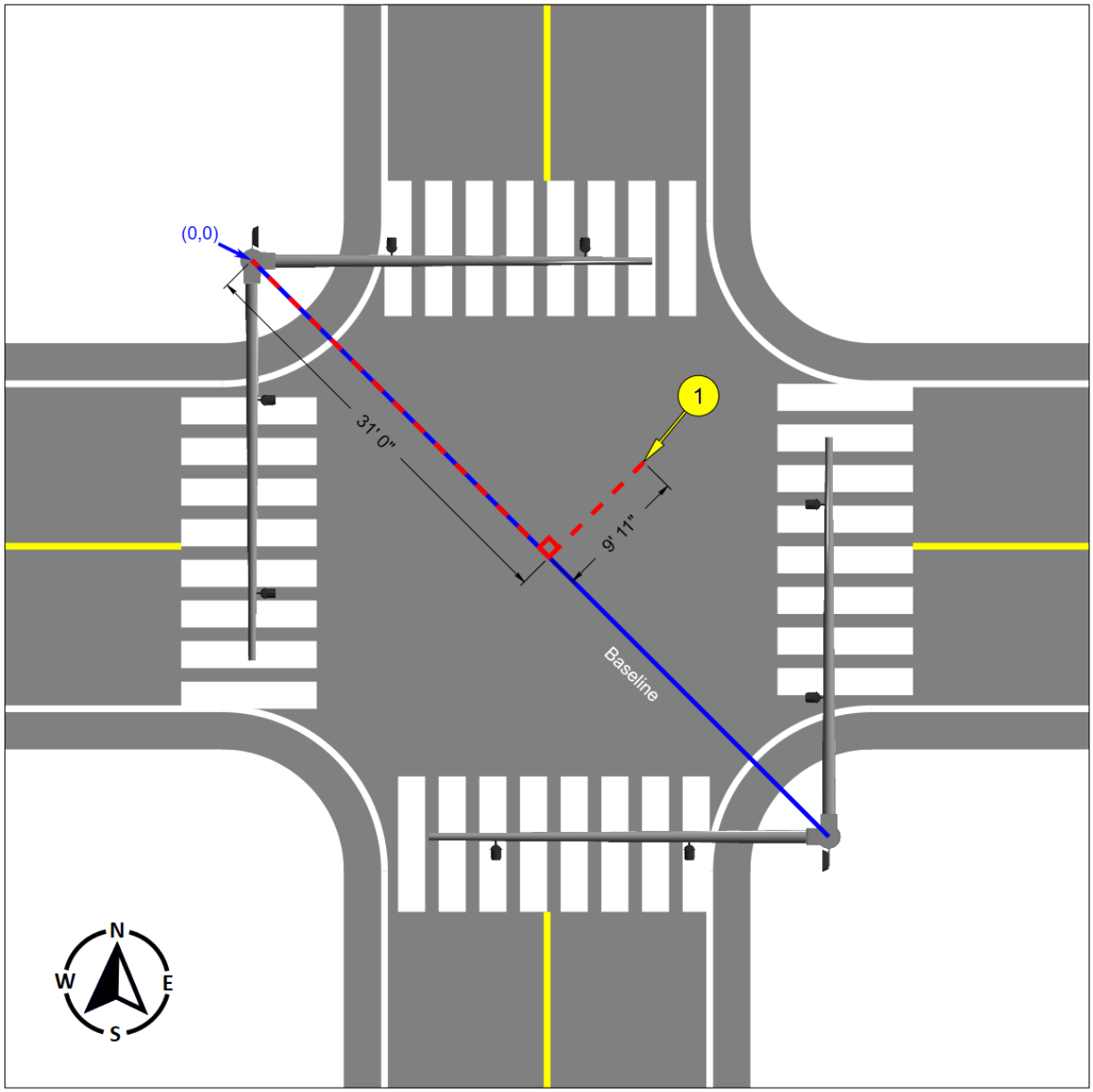
8.2.2 Manual angle measurements indicate the degree of angles and can be recorded using transit, compass, azimuth wheel, clinometer, etc.

8.2.3 Measurement units can consist of metric or imperial units, but only one should be used for any single diagram.

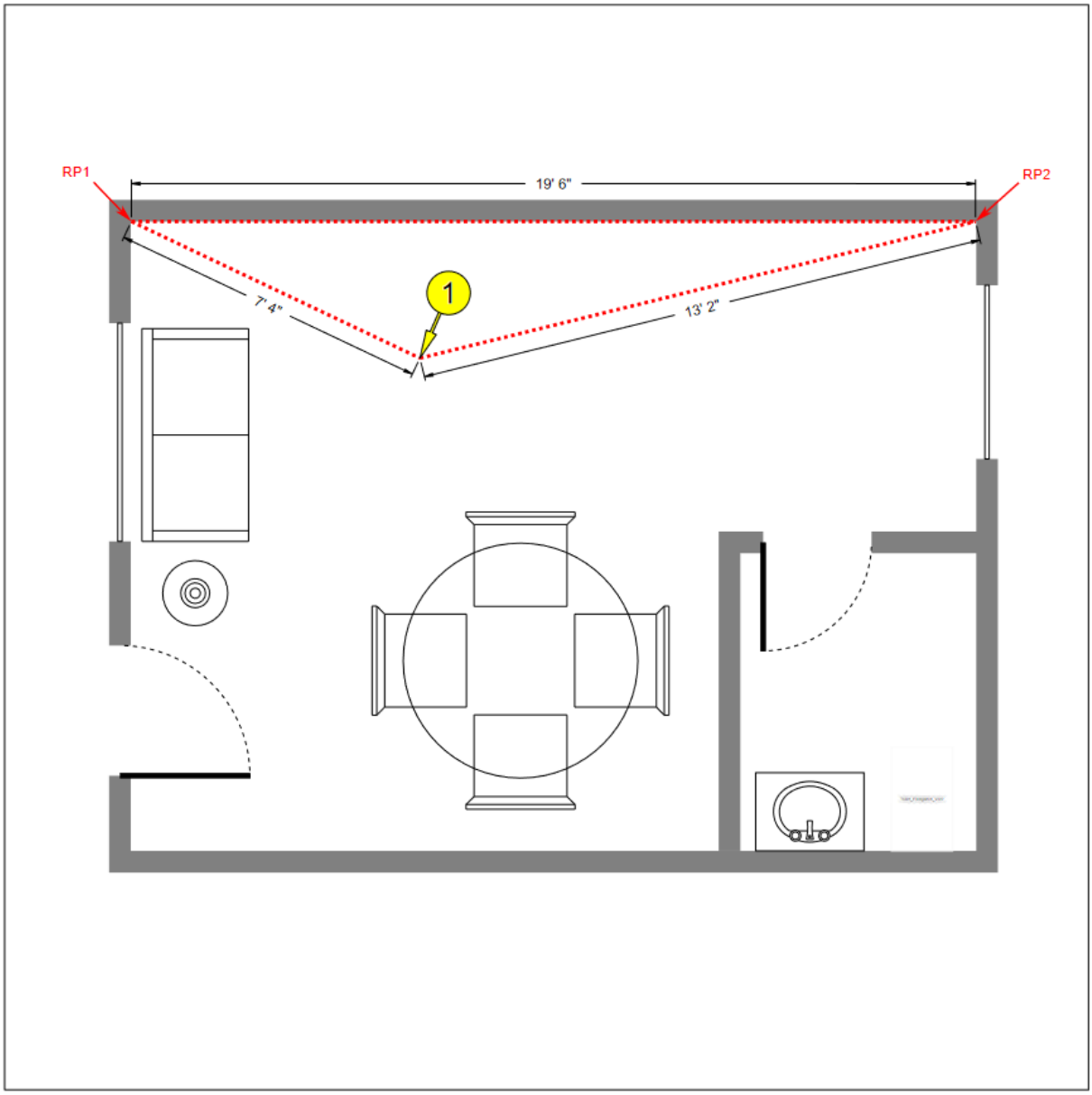
8.2.4 Manual measurements can be recorded using any number of available measurement methods, including, but not limited to:

8.2.4.1 Baseline

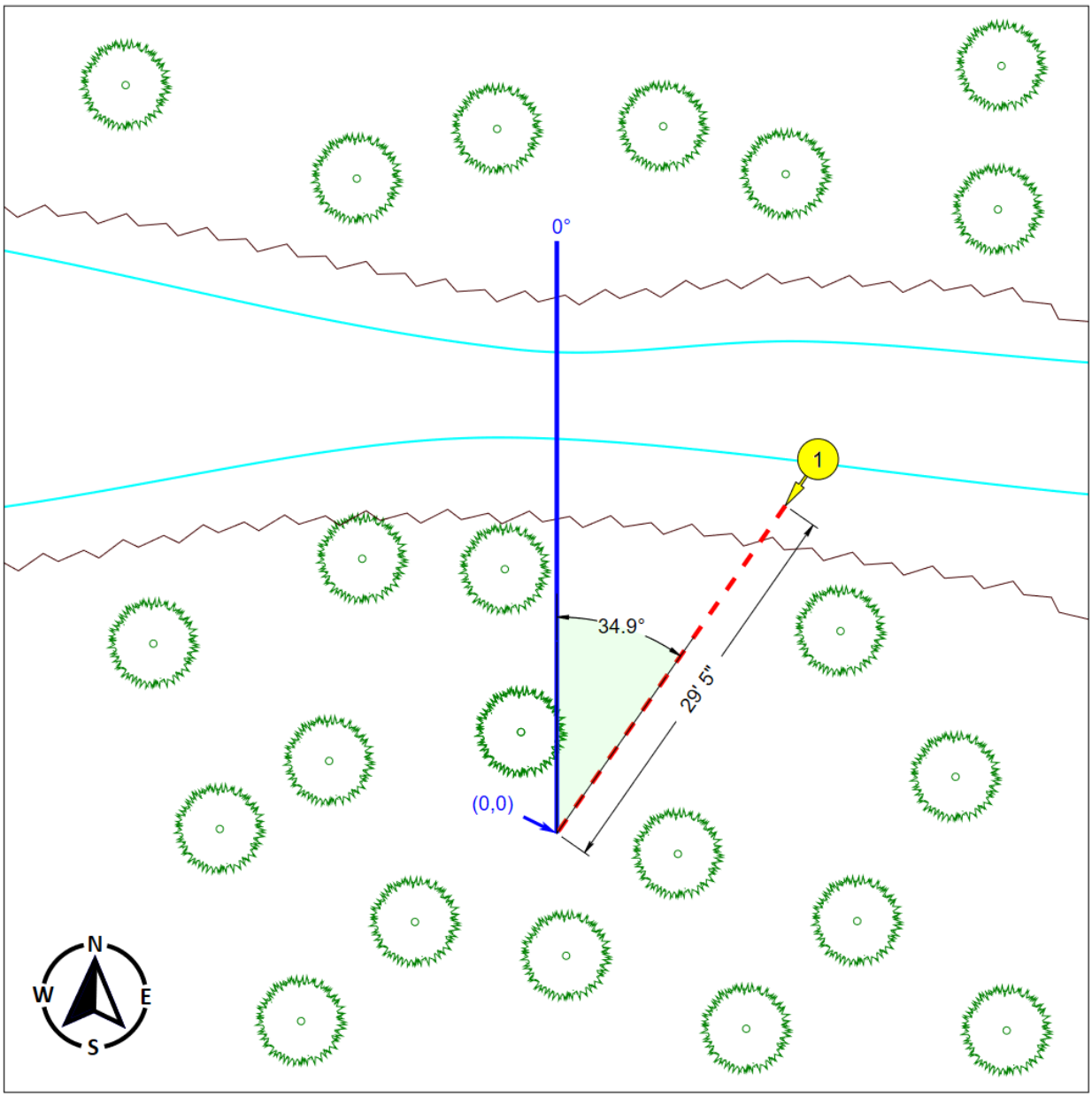



(0,0)
31' 0"
1
9' 11"
Baseline
N
W
E
S

8.2.4.2 Triangulation



8.2.4.3 Polar Coordinate



8.3 Electronic Methods - The following list includes but is not limited to available electronic diagramming methods. Specific information and requirements on the use of these methods are outside the scope of this document.

8.3.1 Terrestrial LiDAR Scanning

8.3.2 Mobile Mapping

8.3.3 Photogrammetry

8.3.3.1 Aerial

8.3.3.2 Terrestrial
8.3.3.3 Close-Range

8.3.4 Global Navigation Satellite System (GNSS)/Global Positioning System (GPS)

8.3.5 Total Station

8.3.6 Blended Methods

9 Output/Deliverables

9.1 Typically any of the above methods can be converted into any of these below types of deliverables. What output is created is likely to be driven by local protocols or policy.

9.2 Data may be processed through intermediate or proprietary software to reach the below output types. All data handling should adhere to local protocols for evidence handling and protection from data loss. The integrity of data procedures should be established.

9.3 For any output, it is the responsibility of the investigator to convey the following, at a minimum:

9.3.1 Measurement type (Metric or standard)
9.3.2 Legend
9.3.3 Key
9.3.4 Orientation of the scene to compass directions (ex. include a direction arrow, compass rose, or written description of direction)

9.4 Diagrams can be presented in various perspective formats based on the investigator's needs. Perspective diagram options include bird eye/floor plan, elevated, exploded, and 3-D.

9.5 Scale 2-D Diagrams
9.5.1 Computer Generated
9.5.2 Hand-Drawn

9.6 Computer-based output
9.6.1 2-D imagery or depictions of scenes
9.6.2 3-D imagery or depictions of scenes
9.6.3 Software-specific renderings of 2-D and 3-D environments

9.7 3-D Printed Materials

9.7.1 Physical printed items from 3-D printers

Annex A (Informative) References

ASTM E1020-13 - Standard Practice for Reporting Incidents that May Involve Criminal or Civil Litigation

Boots, Kent E., and Joel Salinas. *Fundamentals of forensic mapping*. Kinetic Energy Press, 2010.

"Guidelines for use of terrestrial LiDAR scanners in criminal justice applications." *Forensic Technology Center of Excellence (FTCoE)*. Accessed October 4, 2022. https://forensiccoe.org/guidelines_terrestrial_lidar_scanner/

Puente, I., H. González-Jorge, J. Martínez-Sánchez, and P. Arias. "Review of mobile mapping and surveying technologies." *Measurement* 46, 7, 2013, 2127-2145.

National Forensic Science Technology Center (U.S.). "Crime Scene Investigation." *Bureau of Justice Assistance*, U.S. Department of Justice, National Institute of Justice, NIST, NFSTC, 2013.

American Society for Photogrammetry and Remote Sensing. "ASPRS Guidelines for Procurement of Geospatial Mapping Products and Services." *Photogrammetric Engineering & Remote Sensing*, July, 2014, 597.