Visibility Analysis

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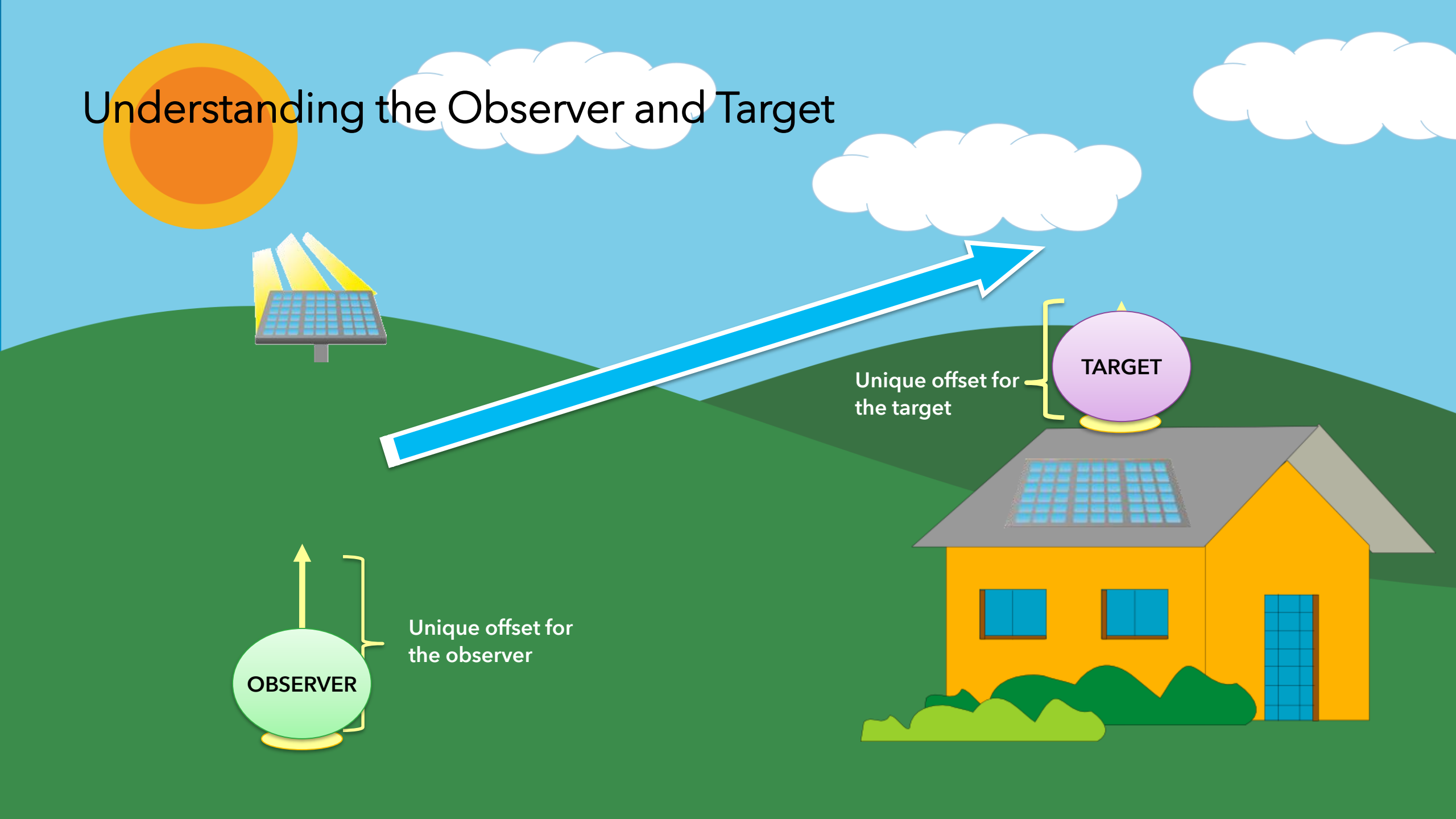
Overview of Visibility Analysis

- Core concepts
  - Analysis capabilities
    - How to access/use the tools
      - Demonstrations
        - Questions & Answers

Visibility Concepts

Understanding terminology

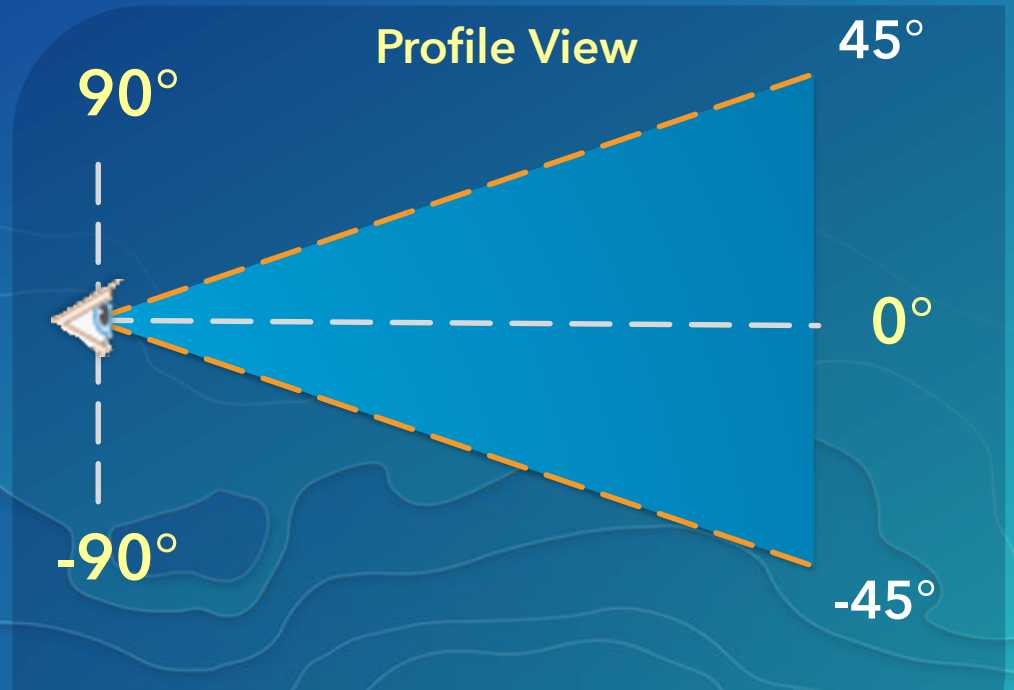
Understanding the Observer and Target

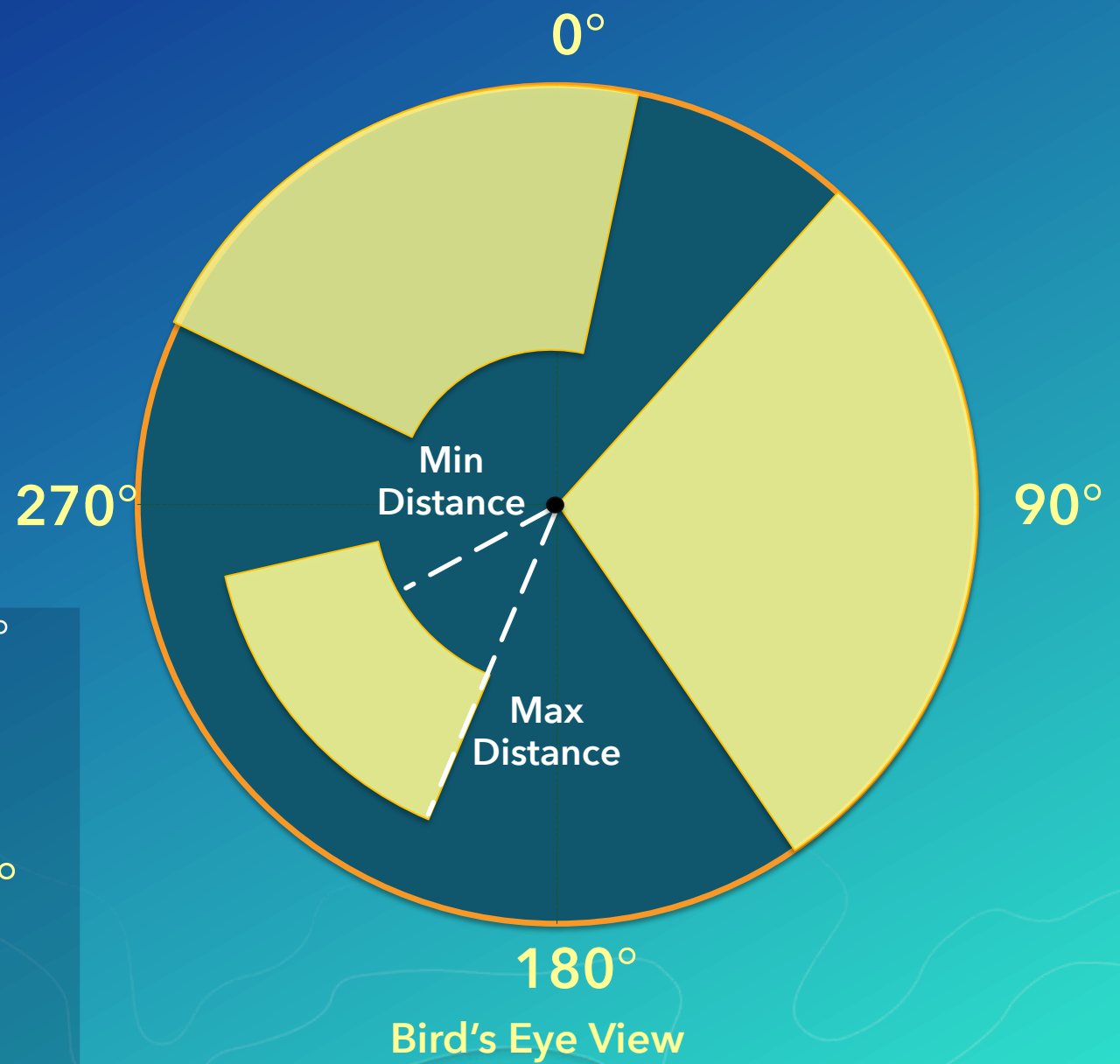


Controlling the Observer

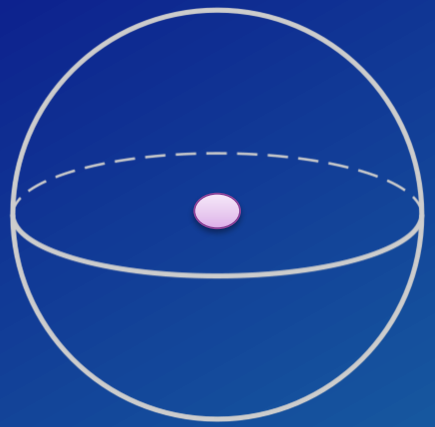
Viewshed frustum defined by:

- Azimuth and vertical angle range
- Visibile distance range
- Observer and target offset





Examples of Observer Profiles



Spherical Observer

Azimuth ::: 0° to 360°
Vertical Angle ::: -90° to 90°
Distance ::: 0 to 100 meters

Offset Frustum

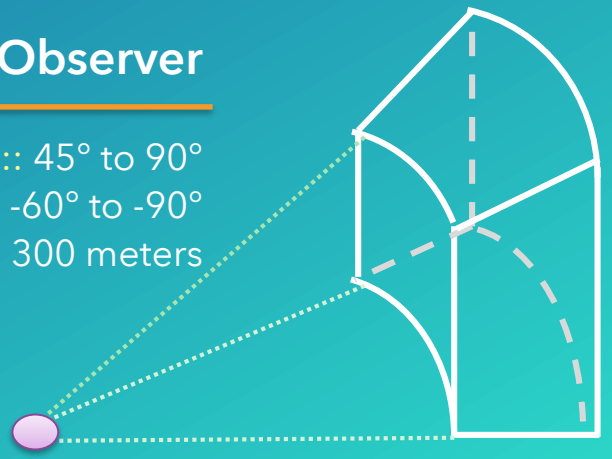
Azimuth ::: 0° to 360°
Vertical Angle ::: -60° to -90°
Distance ::: 0 to 12 meters

Hemispherical Observer

Azimuth ::: 0° to 360°
Vertical Angle ::: -90° to 90°
Distance ::: 45 to 100 meters

Conical Observer

Azimuth ::: 45° to 90°
Vertical Angle ::: -60° to -90°
Distance ::: 250 to 300 meters

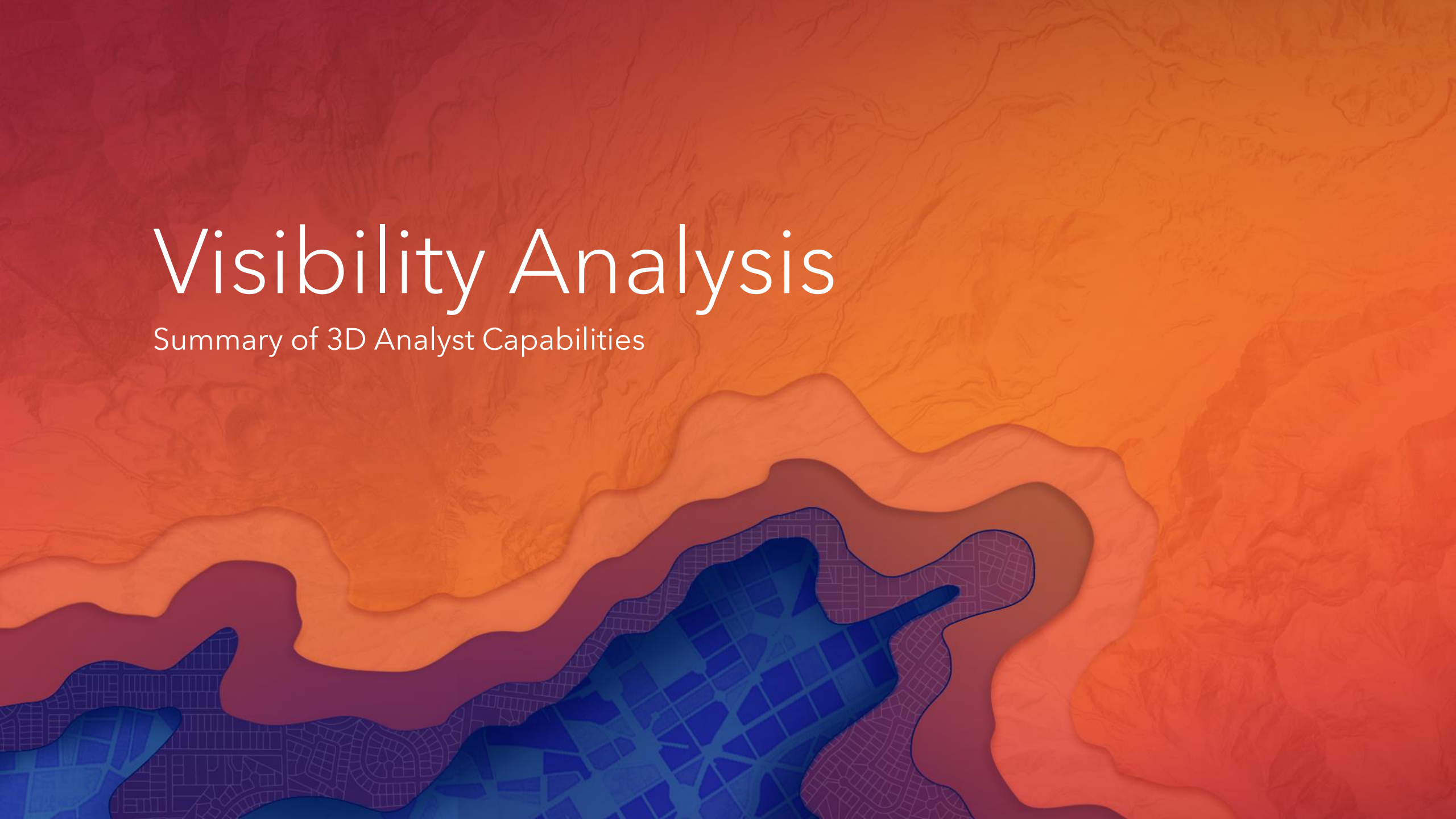


Atmospheric Refraction

- Bending of light passing through the atmosphere
- Influenced by variations in air pressure, density, humidity, temperature & elevation
- Refraction coefficient supported in:
  - Line of sight
  - Skyline
  - Viewshed
  - Solar radiation

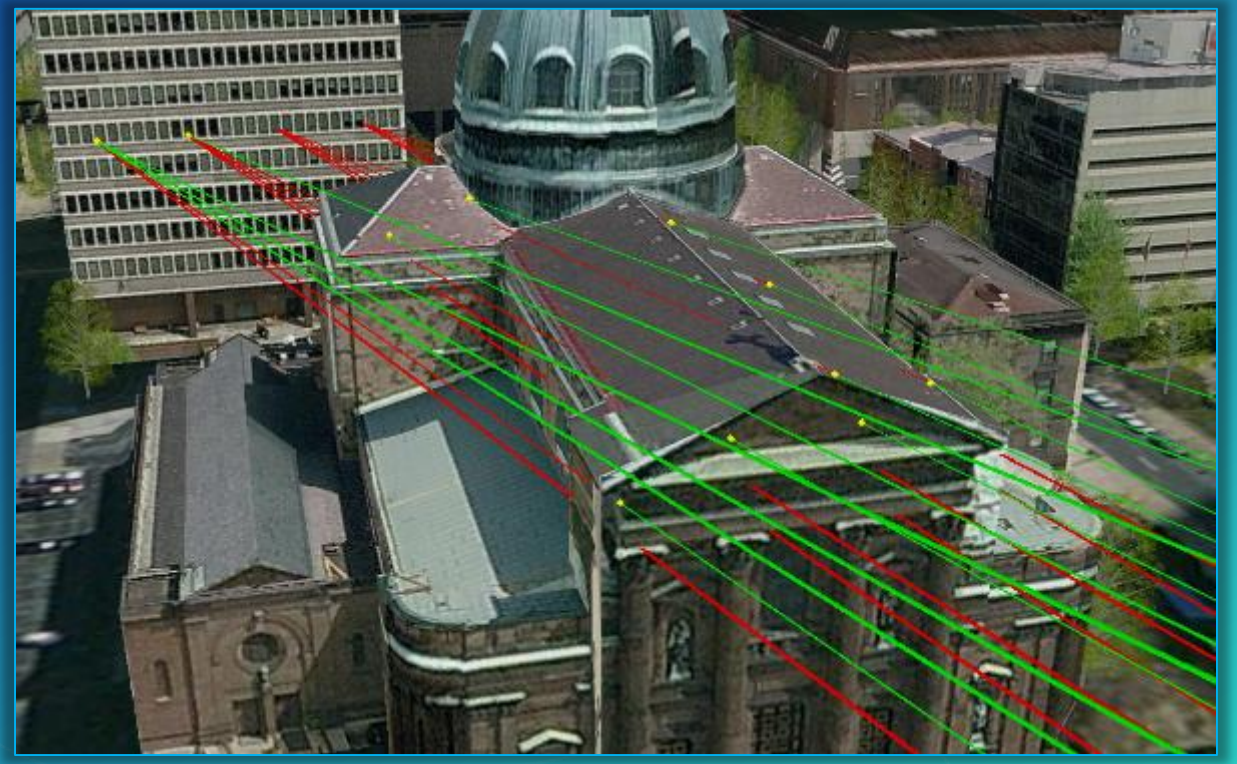
Visibility Analysis

Summary of 3D Analyst Capabilities



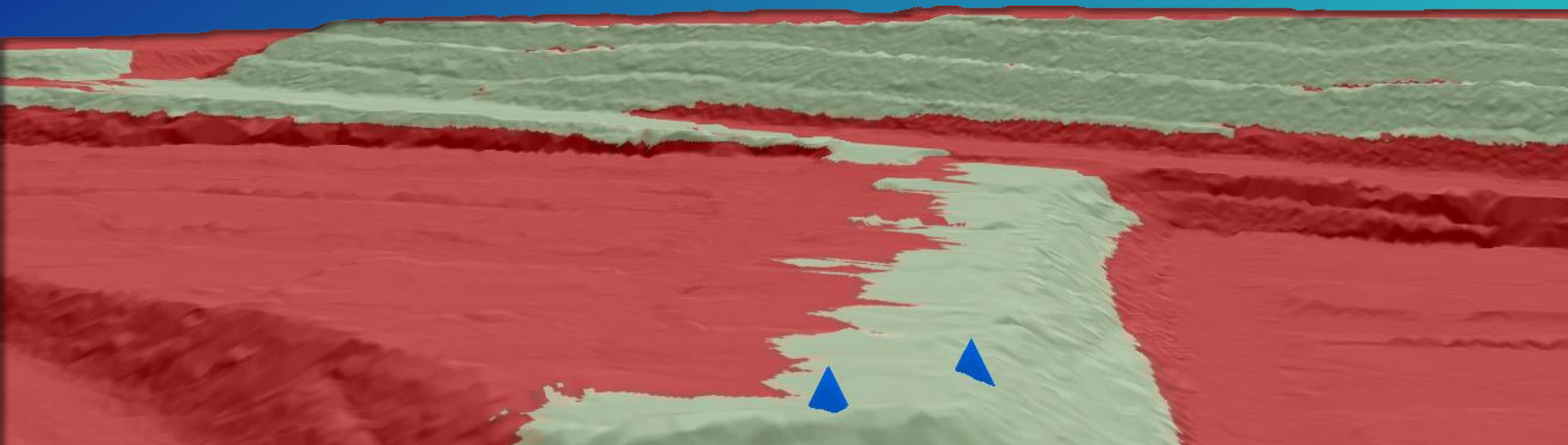
Line of Sight

- Determine visibility along a line in true 3D space
- Identify points of obstructions
- Sight lines can be constructed from observer points and target features of any kind

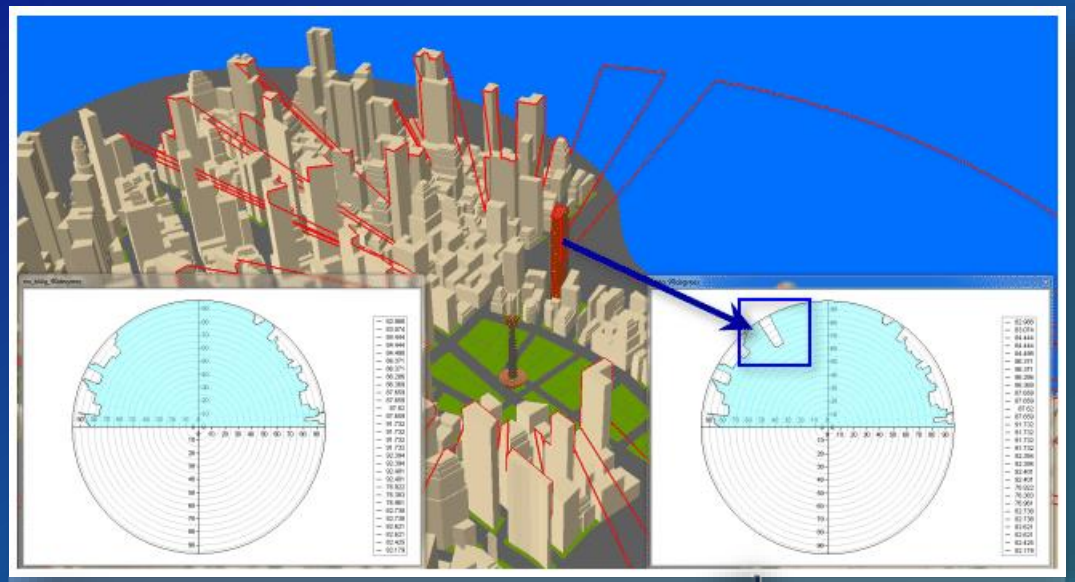


Viewshed

- Determine how many observers can see a given location
- Determine which specific observers see a specific location
- Find the height a non-visible location must be raised to become visible



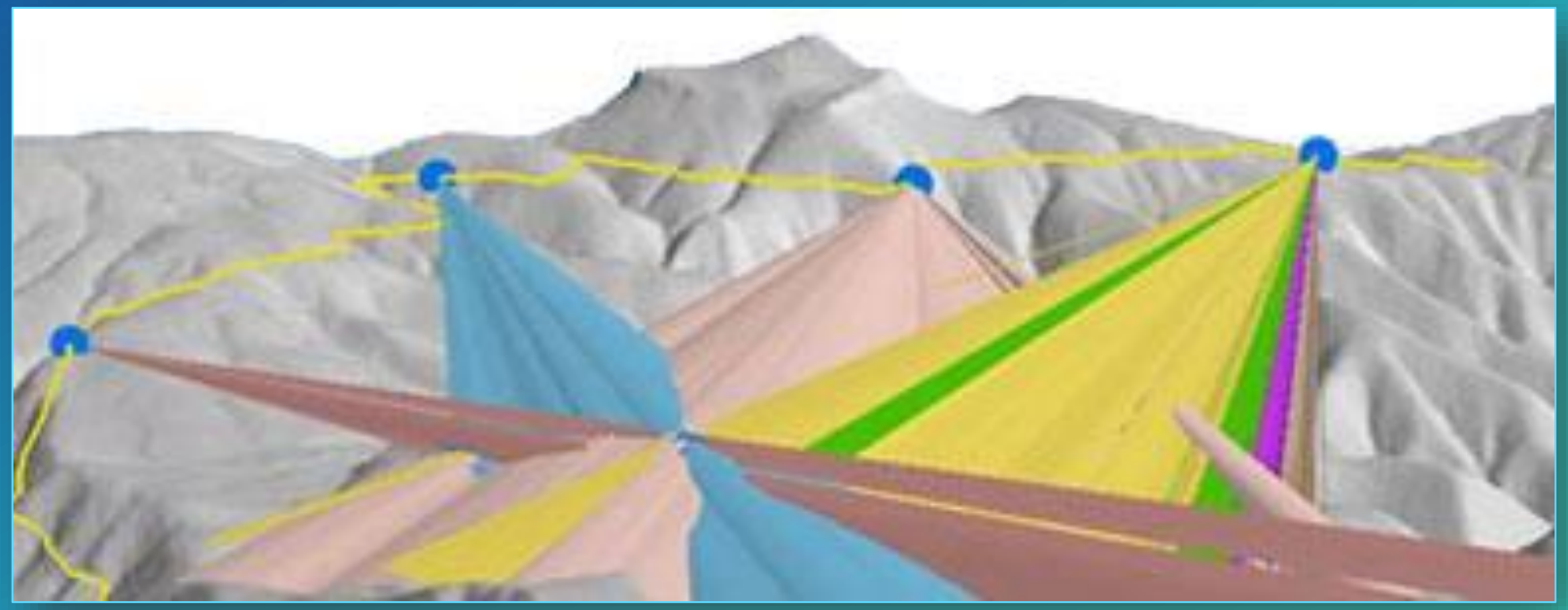
Skyline Analysis



- Delineate the horizon
- Segment the horizon by contributing feature
- Graph the percent of obstructed sky

Skyline Barrier

- Create closed volumes representing an observer's visible frustum
- Perform inside/outside tests using the resulting geometry
- Model shadows cast by localized light sources

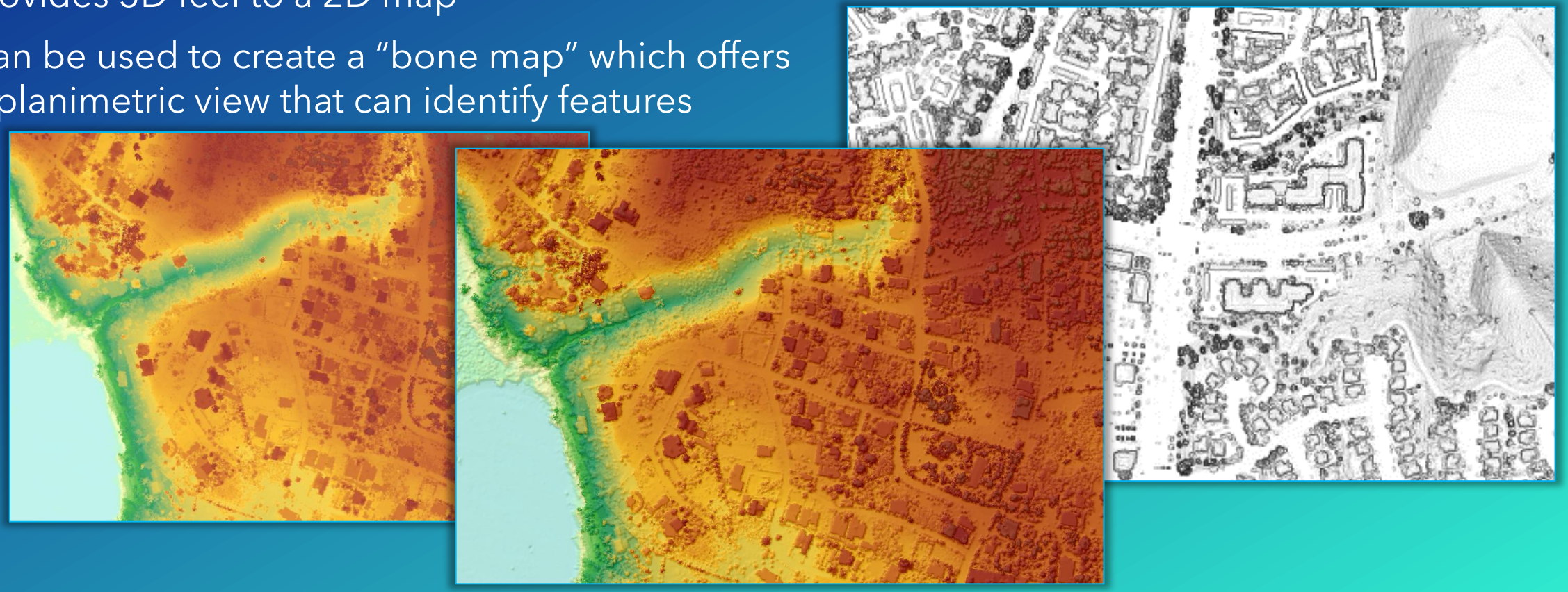


Sun Shadow Volume

- Determines shadows cast by 3D features
- Creates closed volumes that can be used in overlay analysis
  - Find what features intersect or are entirely contained by one or more shadows
  - Right-to-light studies
  - Urban heat island estimation

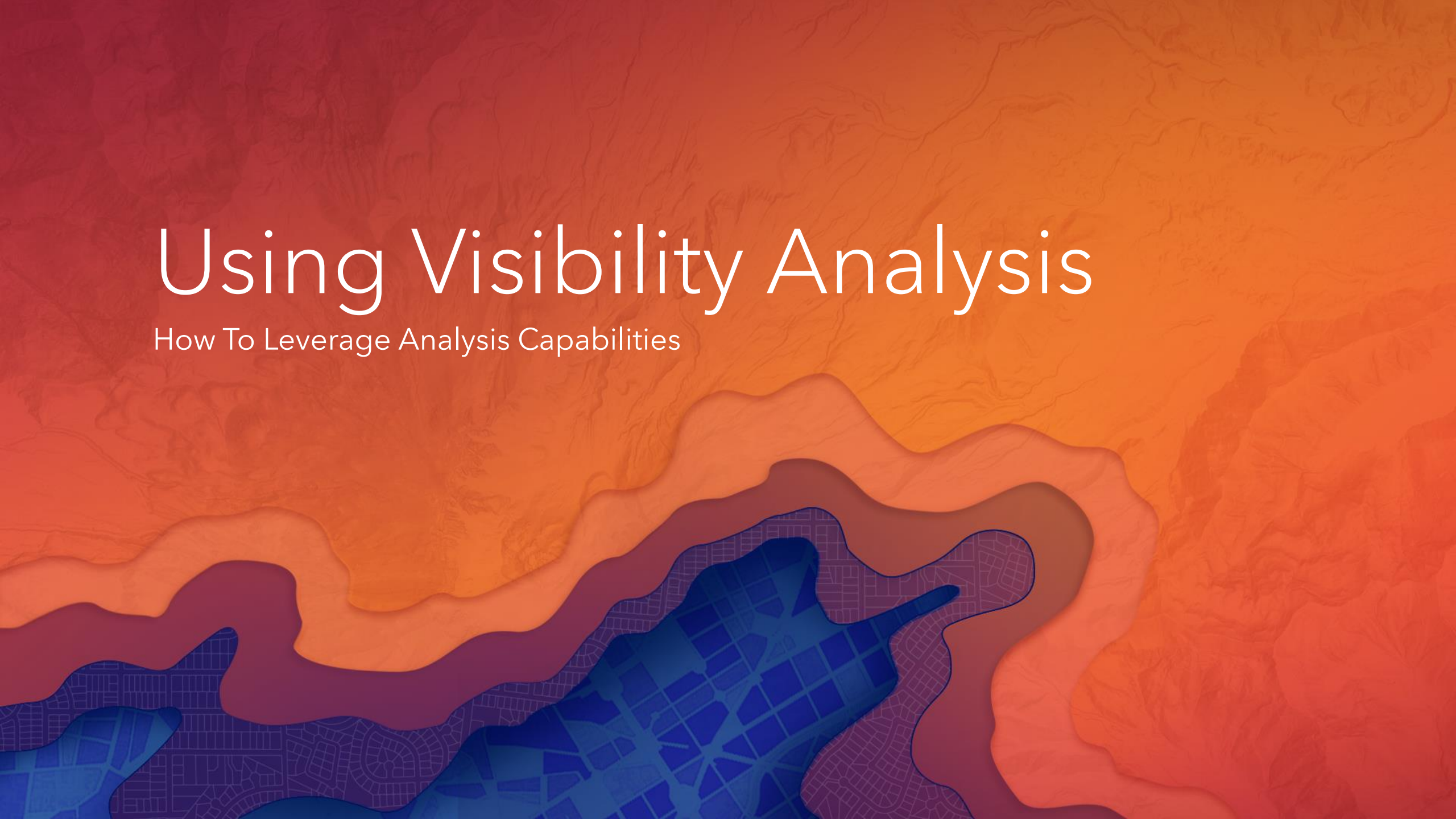
Hillshade

- Localized illumination from a fixed trajectory of light
- Provides 3D feel to a 2D map
- Can be used to create a “bone map” which offers a planimetric view that can identify features



Using Visibility Analysis

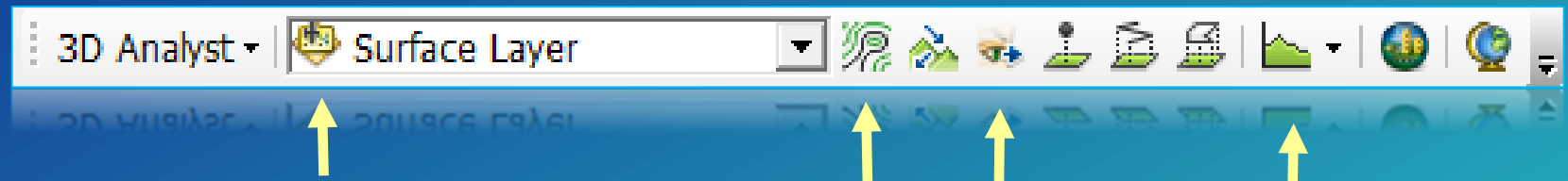
How To Leverage Analysis Capabilities



Exploratory Analysis in ArcMap

Interpolate Geometry: Creates 3D features based on surface Z.

Steepest Path: Determines steepest path from select point.



Target Surface Layer: Surface layer in document that will be processed by interactive tools.

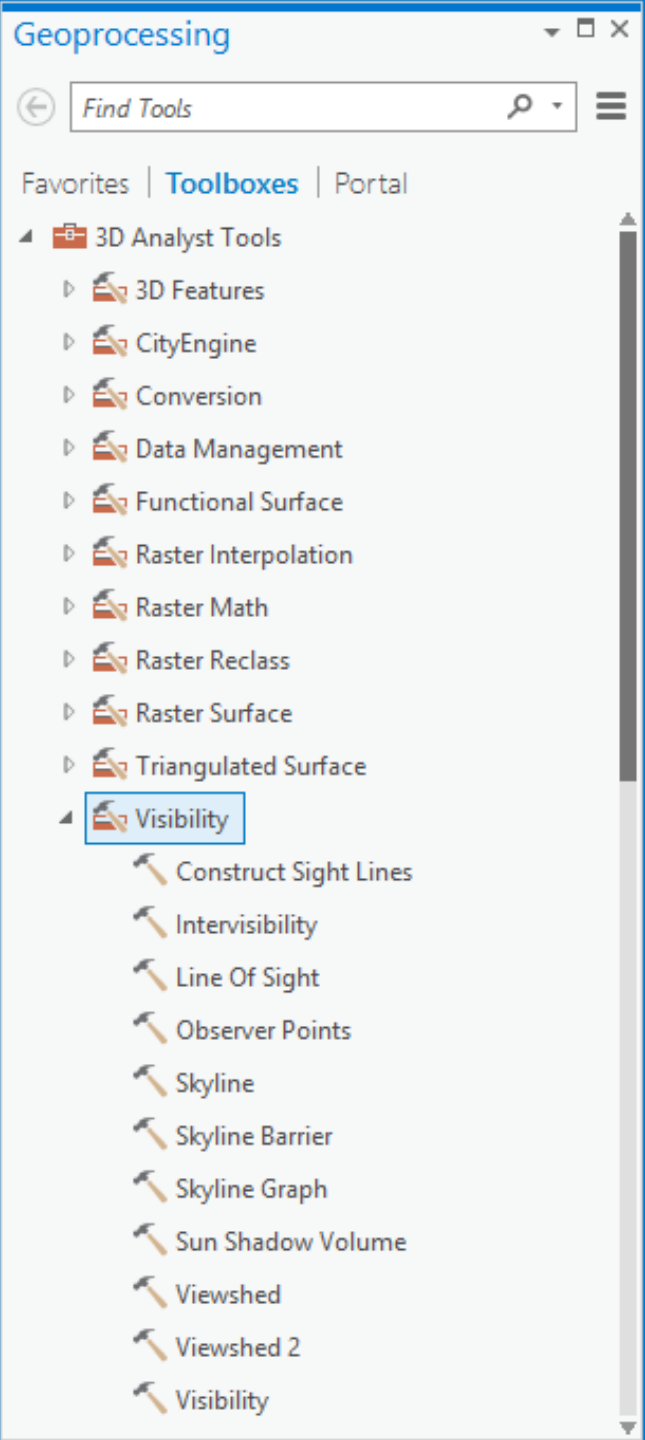
Contour: Creates a single isoline at the selected point.

Profile: Creates profile graph of surface or point cloud.

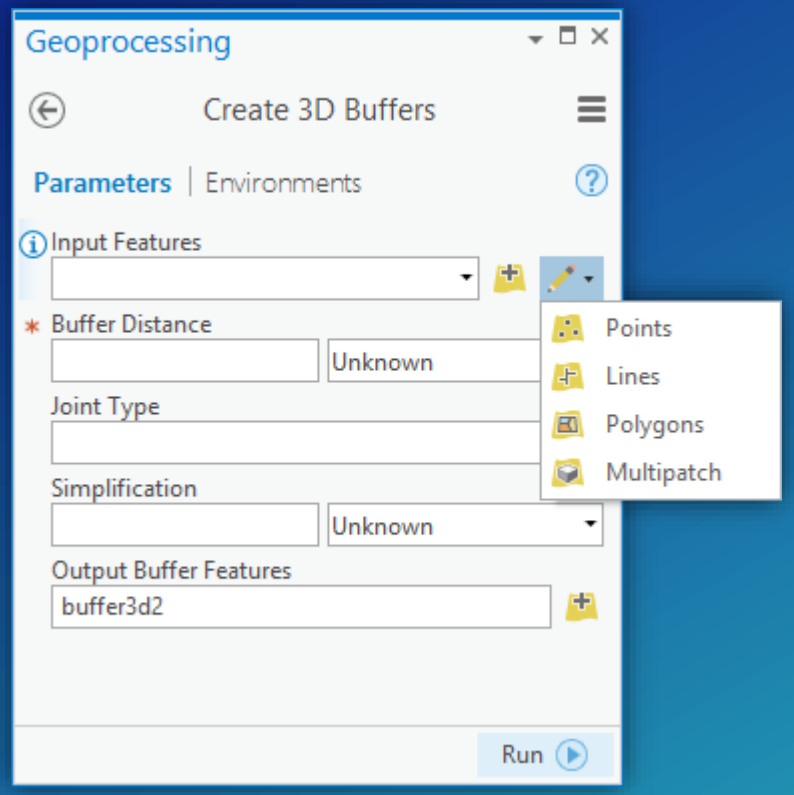
Line of Sight: Determines visibility of sight line & identifies possible obstructing point

Visibility Analysis Geoprocessing Tools

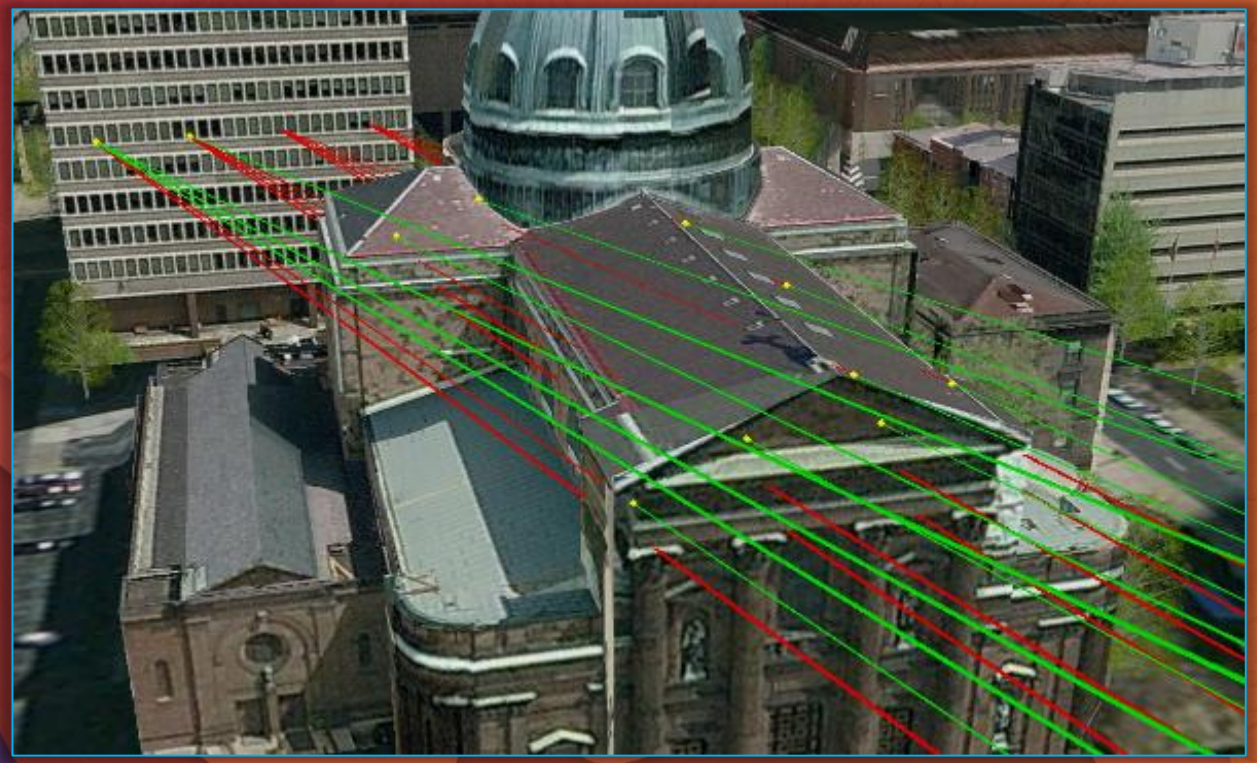
- Tools provide individual analysis operations that can be combined to accomplish complete workflows
- Tools can be chained using:
  - Model Builder
  - Python
  - Task



Interactive Inputs for Geoprocessing



- Point, line and polygon geometry can be interactively defined for tools
- Many geoprocessing tools now also support this capability directly
- Feature set control can be assigned for custom script tools and models



Visibility Analysis

Videos and Demonstrations

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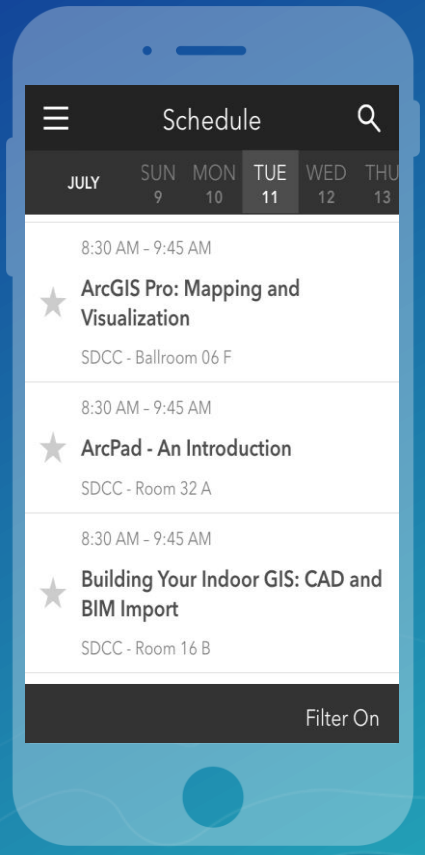
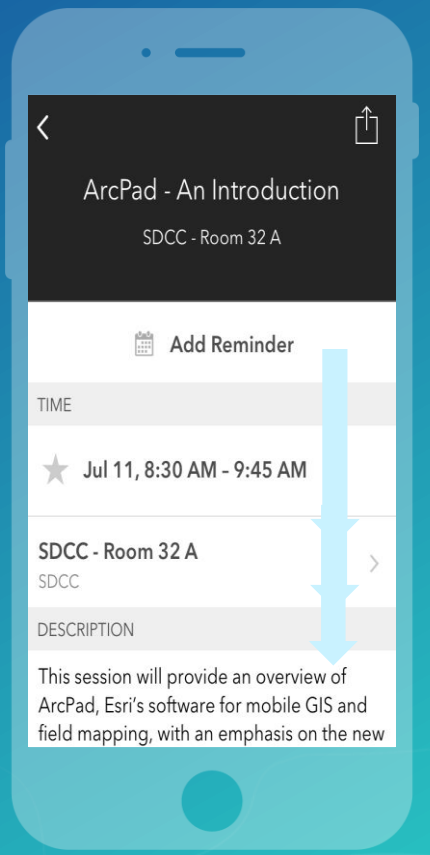
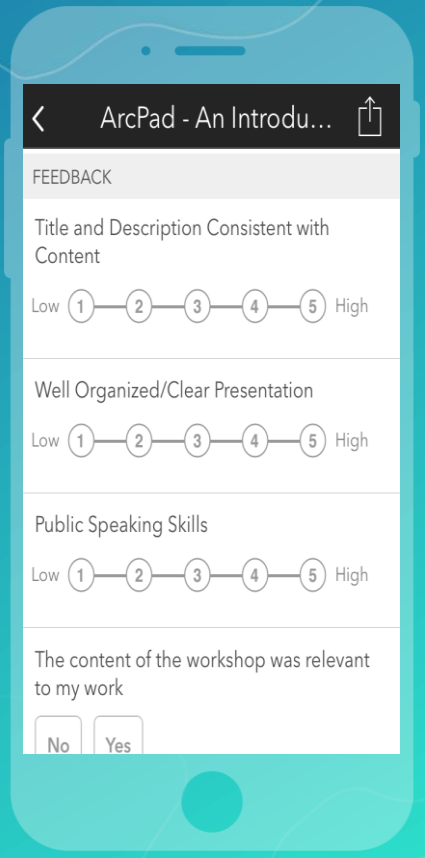


Scroll down to find the survey



Complete Answers and Select "Submit"



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