

Design a 3D local scene

www.learn.arcgis.com

380 New York Street
Redlands, California 92373 – 8100 USA

Copyright © 2018 Esri

All rights reserved.

Printed in the United States of America.

The information contained in this document is the exclusive property of Esri. This work is protected under United States copyright law and other international copyright treaties and conventions. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, except as expressly permitted in writing by Esri. All requests should be sent to Attention: Contracts and Legal Services Manager, Esri, 380 New York Street, Redlands, CA 92373-8100 USA.

The information contained in this document is subject to change without notice.

Time: 30 minutes

Design a 3D local scene

Overview

Maps and scenes can both use illumination to achieve different effects. Maps use illumination mainly to make maps look more three dimensional by applying shaded relief or hillshades. A scene, however, needs a light source to illuminate it, and you can configure this light source to achieve different effects within the scene. Having a good understanding of these settings will allow you to add an extra level of quality to your 3D scenes.

In this lesson, you will learn to do the following:

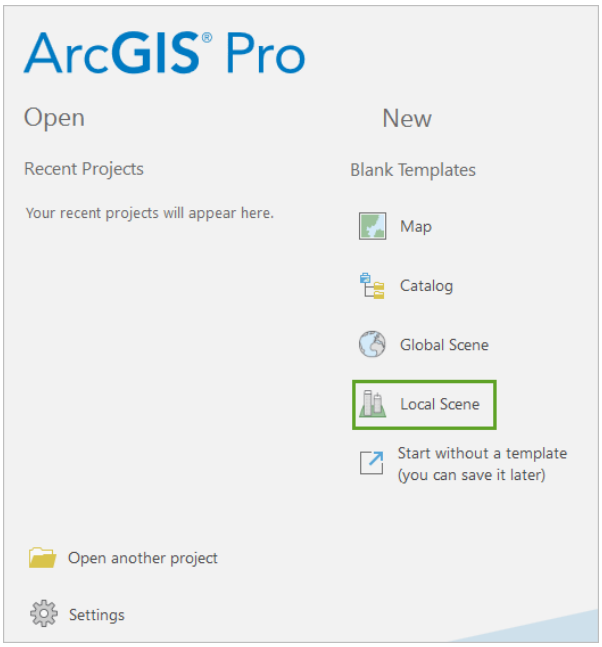
- Use illumination settings, including sun position, shadows, and atmospheric effects
- Enable the north arrow and on-screen Navigator control
- View content in a local scene
- Work with the parallel view mode

Getting started

The content for this lesson is a web scene and a map package.

1. Download the **PortBuilding_WithCage.zip** compressed folder.
2. Locate the downloaded file on your computer and extract it to a location you can easily find, such as your Documents folder.

1. Start ArcGIS Pro and create an ArcGIS project based on the Local Scene project template.



***Hint**: From the main ArcGIS Pro window, in the Create a New Project area, click **Local_Scene** or from within ArcGIS Pro, click the **Project** tab, and then click **Local_Scene** to create a project based on the Local Scene project template.*

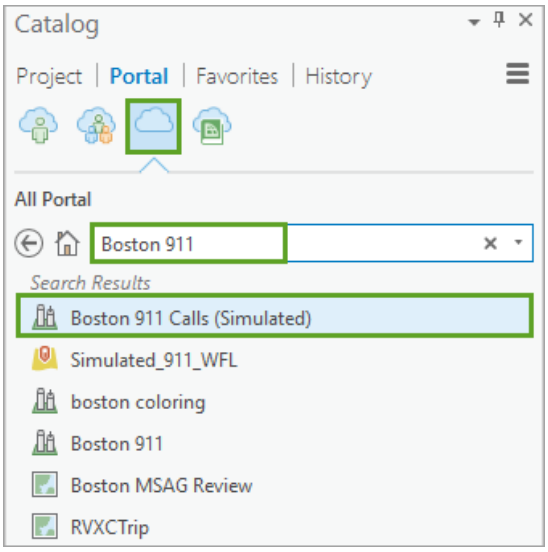
Note: If you don't have ArcGIS Pro or an ArcGIS account, you can sign up for an ArcGIS free trial.

2. Save with the name **Scene-Level-Properties** in your Projects folder.

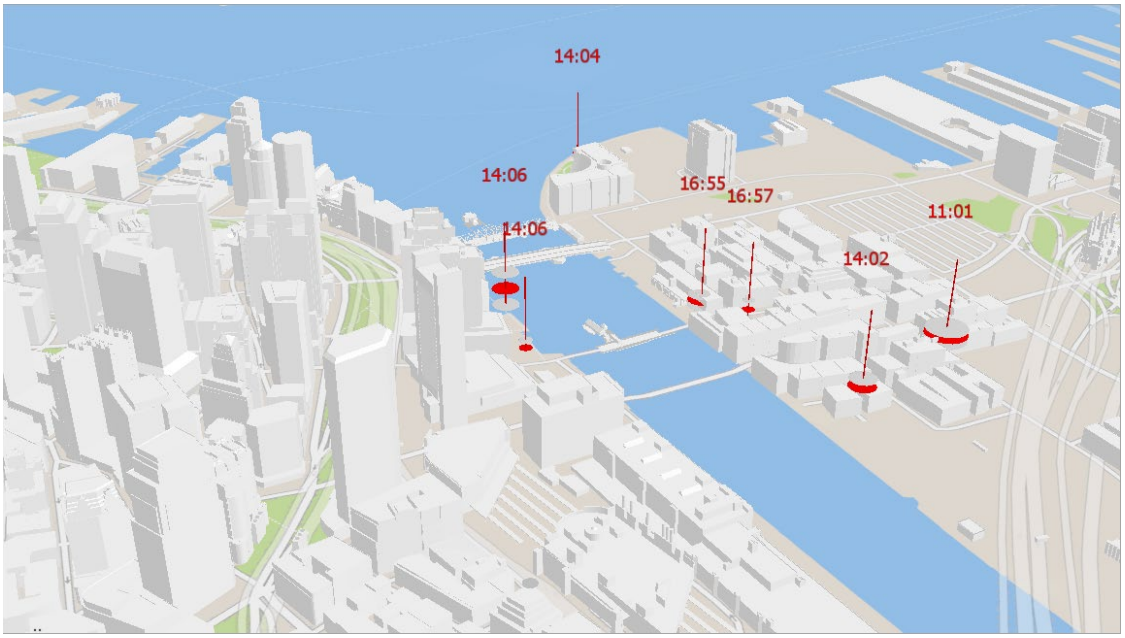
Find and open the web scene

For this first section, we will use content already published to ArcGIS Online.

1. In the **Catalog** pane, click the **Portal** tab, and then click the **All Portal** button.
2. Type “Boston 911” in the search text box and click **Enter**.
3. In **Search Results**, right-click **Boston 911 Calls (Simulated)**, and click **Add and Open**.



The published scene opens and displays 3D layers representing buildings, 911 call locations, and the estimated x,y,z accuracy of the location from where a 911 call was made.



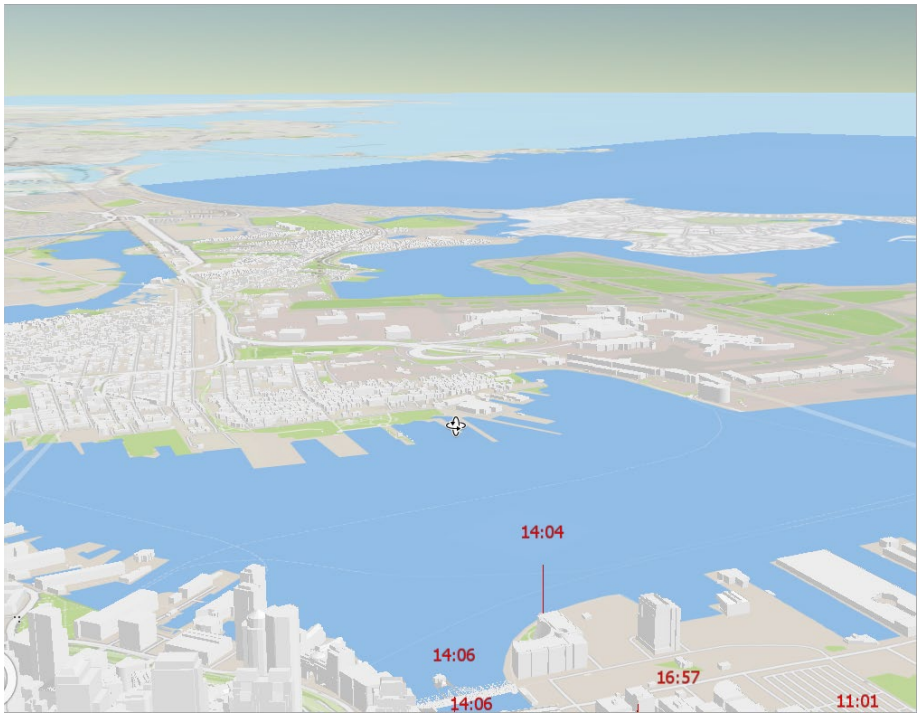
Illumination settings

Nothing has a bigger visual impact on a scene than the illumination settings. It defines the location of the light source for the scene, whether shadows are cast from features, how the sky displays, and if the terrain surface is shaded. These settings can be set to a specific moment to match the purpose of the scene, such as the time of day when a plane is landing, or purely for aesthetic reasons.
We will experiment with a variety of light settings.

1. Spend a few minutes exploring the scene by zooming and panning around.

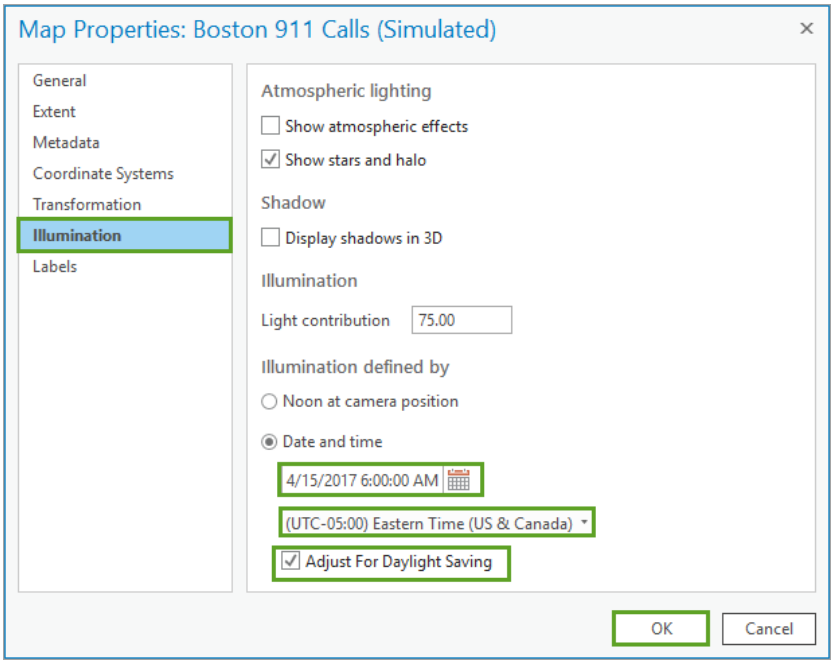
2. Use **Bookmarks** to return to **Area of Interest**.

3. On the keyboard, hold down the **B** key, and left-click-drag to tilt the camera viewpoint to see the horizon.



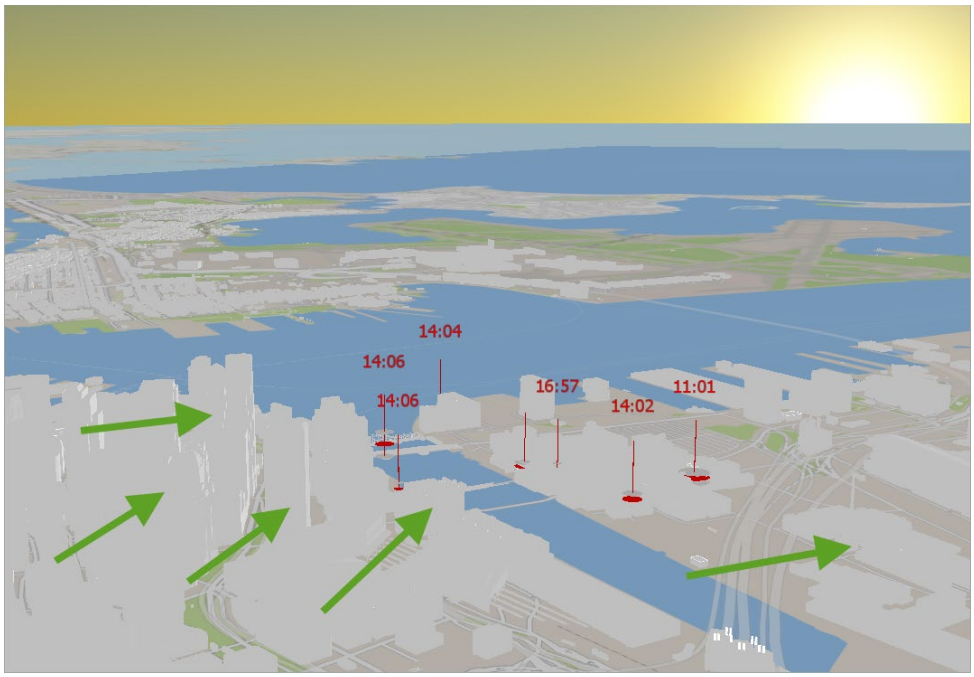
4. In the **Contents** pane, double-click **Boston 911 Calls (Simulated)** to open the **Map Properties** dialog box.

5. On the **Illumination** tab, make the following updates to the **Date and time** properties:
   - For **Date/Time**, choose **4/15/2017 6:00:00 AM**
   - For **Timezone**, choose (**UTC-05:00) Eastern Time (US & Canada)**
   - Check the **Adjust for Daylight Saving** check box



6. Click **OK.**

The scene updates, showing the sun is just coming up over the horizon. While this certainly looks pretty, you may notice the uniformity of the face shading for the building faces pointed away from the sun causes them to blend together in a single blob of color.

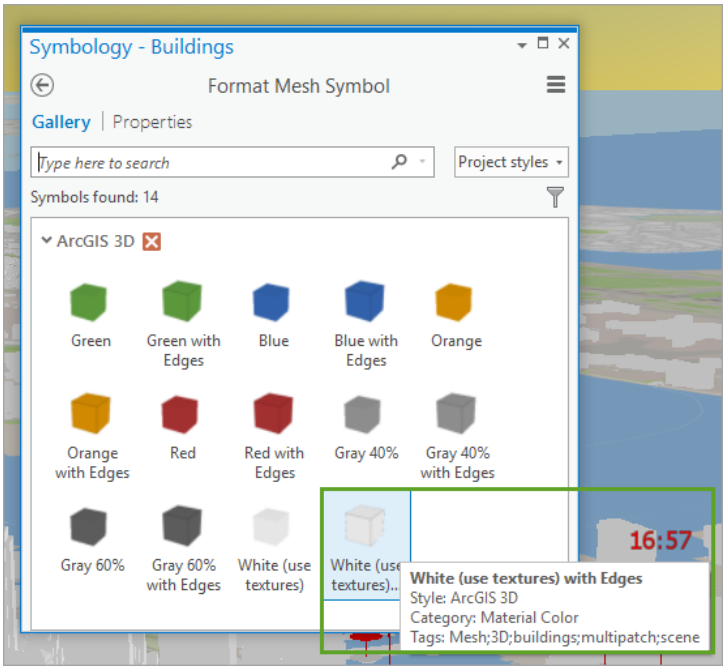


No edge rendering

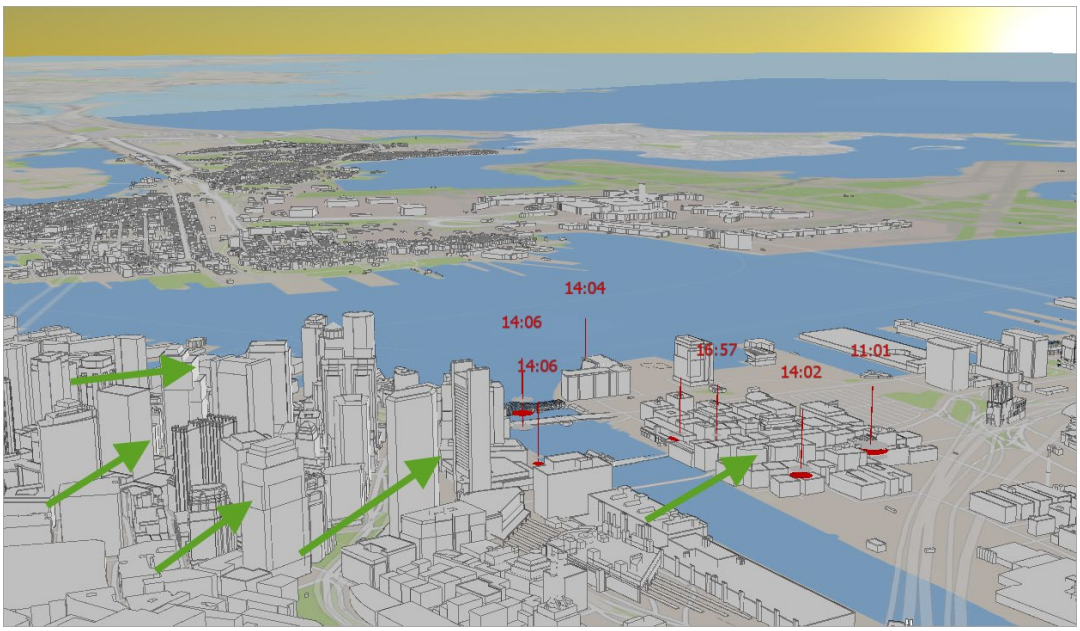
To better differentiate between features and faces, we can add edge rendering to the buildings.

7. In the **Contents** pane, for the **Buildings** layer, expand the legend, then click the symbol.

8. In the **Symbology** pane, in the **Gallery**, click the **White (use textures) With Edges** item



9. By rendering lines on the sharp boundaries of building edges, they can be visually separated.

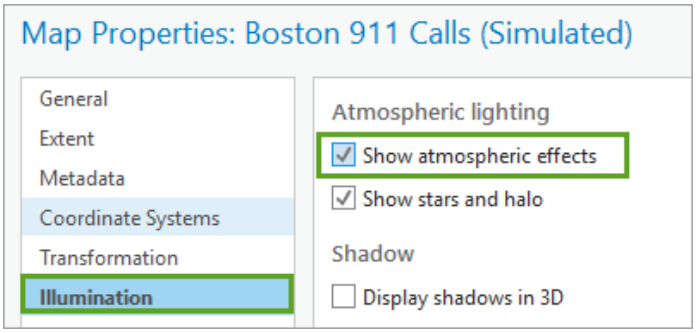


With edge rendering

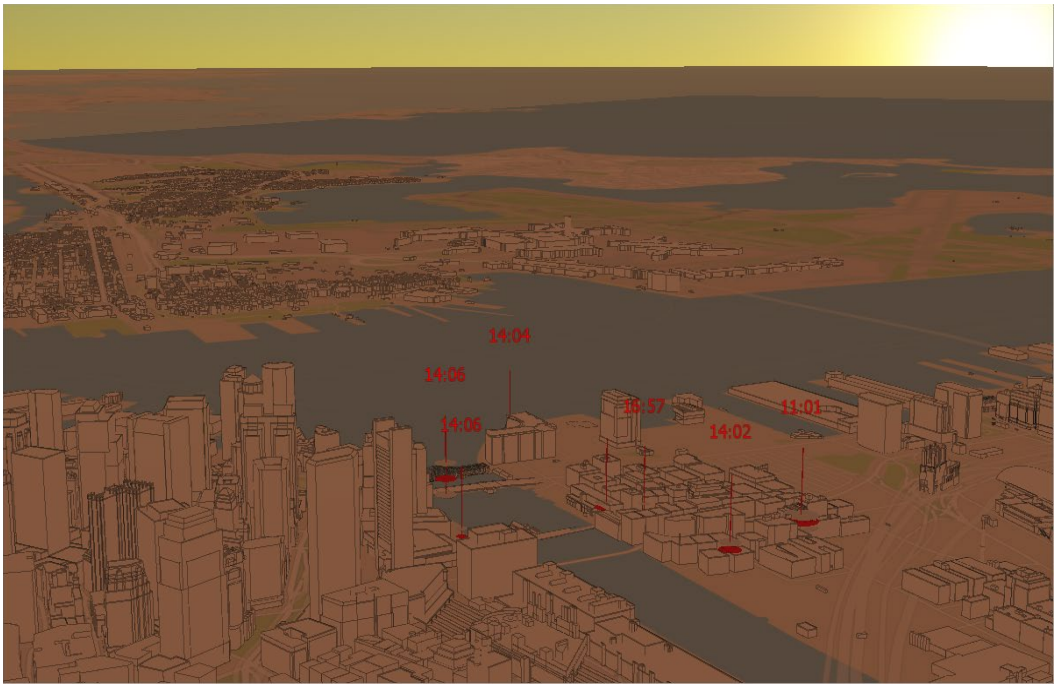
The current display does not allow for the reddish tinge the atmosphere adds when the sun is low in the sky. For a more realistic understanding of the morning light, we can enable this option.

10. In the **Contents** pane, double-click **Boston 911 Calls (Simulated)** to open the **Map Properties** dialog box.

11. On the **Illumination** tab, check the **Show atmospheric effects** check box and click **OK**.

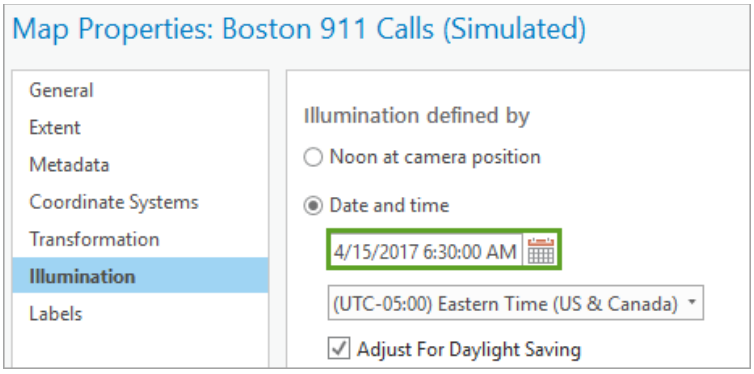


The scene updates and the tinting effect is very pronounced.

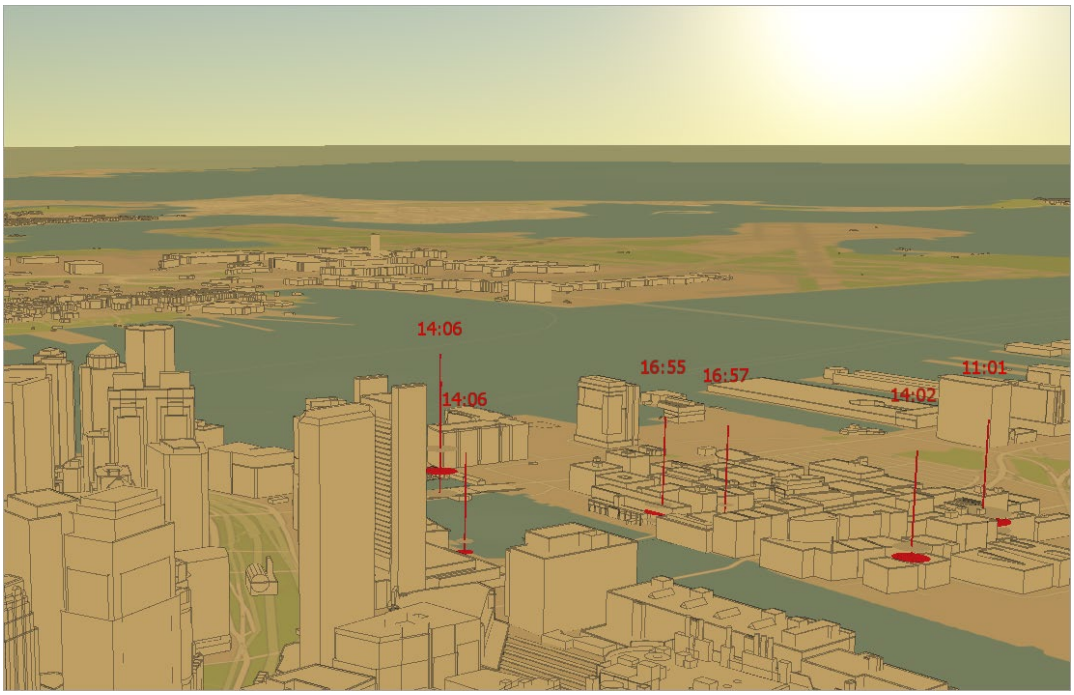


12. In the **Contents** pane, double-click **Boston 911 Calls (Simulated)** to open the **Map Properties** dialog box.

13. On the **Illumination** tab, change **Date and time** by 30 minutes, to **4/15/2017 6:30:00 AM**, and click **OK**.



The scene updates and the tinting effect has softened significantly.



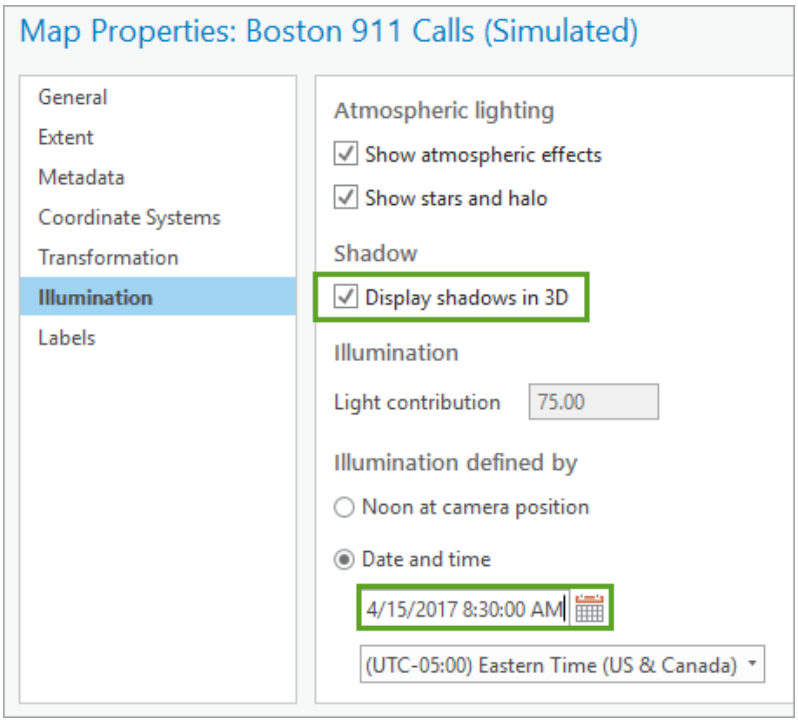
6.30 a.m.

Next, add shadows to the scene to produce a more realistic result.

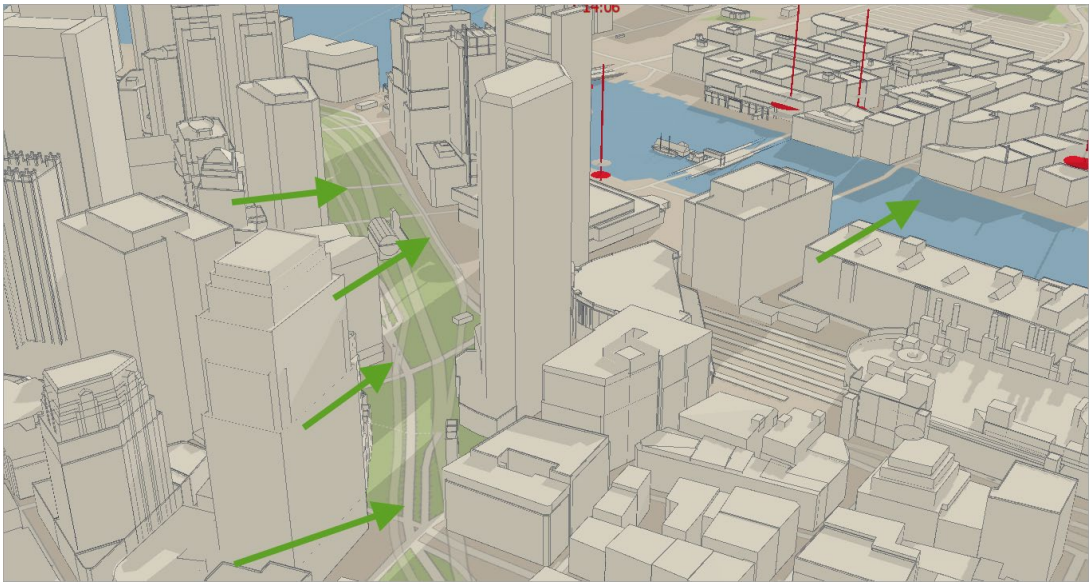
14. In the **Contents** pane, double-click **Boston 911 Calls (Simulated)** to open the **Map Properties** dialog box.

15. On the **Illumination** tab, check the **Display shadows in 3D** check box.

16. On the **Illumination** tab, change **Date and time** by two hours, to **4/15/2017 8:30:00 AM**, and click **OK**.



The scene updates, and we can now observe shadows cast by the vector buildings' features. These are based on the current illumination settings.

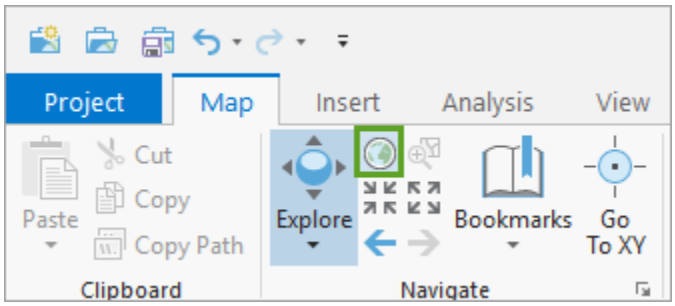


8.30 a.m., with shadows

Note: shadows can reduce display performance, and they are automatically dropped from the display for longer viewing distances.

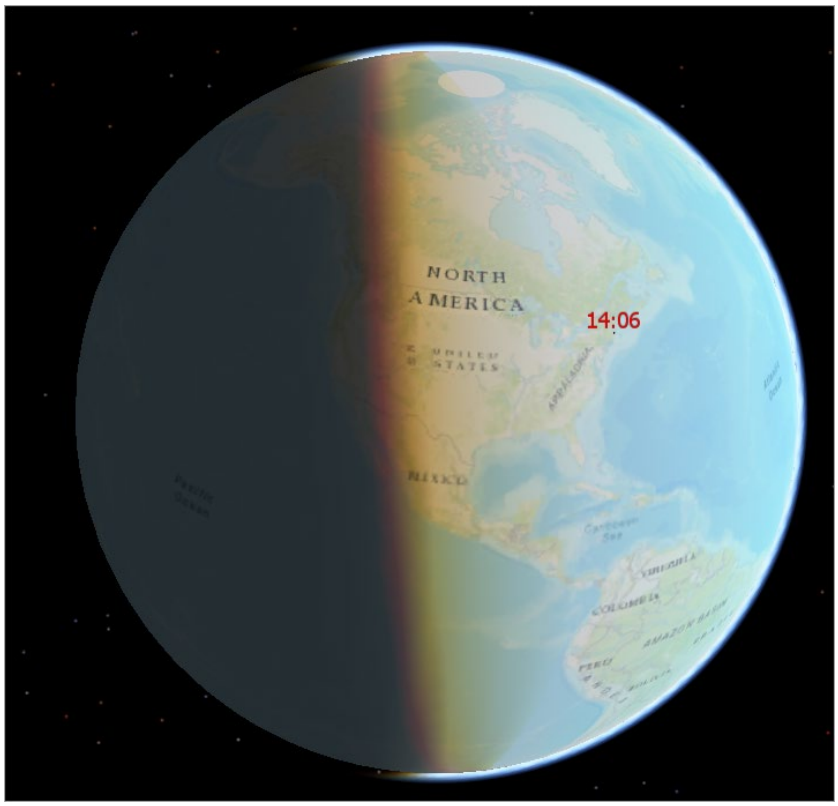
While we've only viewed the atmospheric effect in a small, localized view extent, keep in mind that it is also calculated and applied for the entire planet in a scene.

17. On the **Map** ribbon, in the **Navigate** group, click the **Full Extent** command.



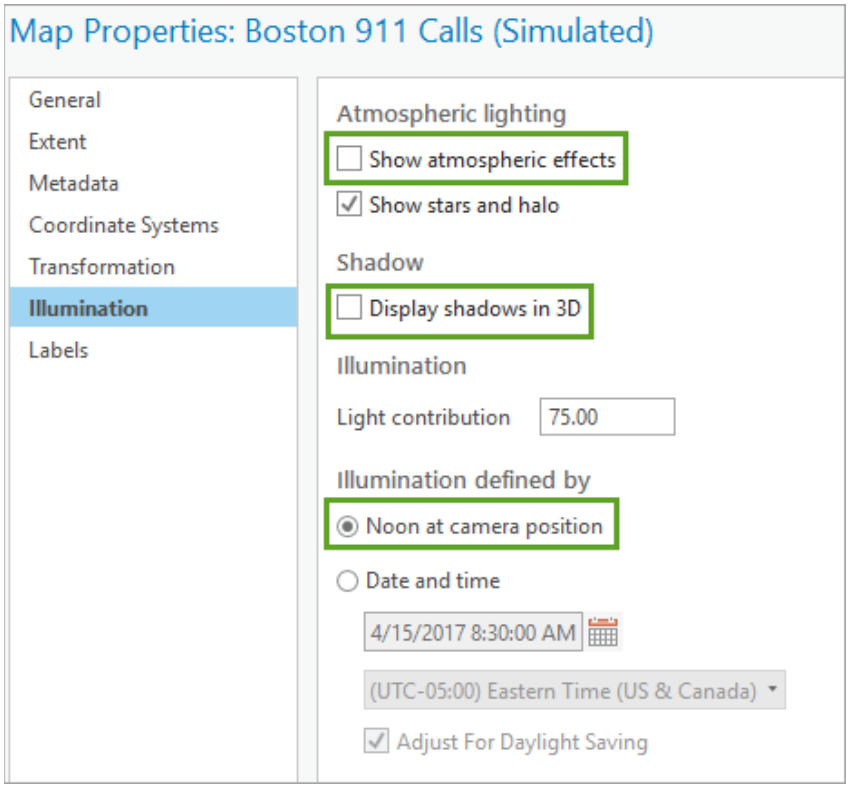
18. Use left-mouse-drag to pan around the planet to see North America.

As expected, Boston has recently emerged into the morning sun. You can also see what other parts of the planet are experiencing at sunrise at the same time. If you continue to pan around the planet, you can see the sun and the moon off in the distance, both modeled correctly for the date and time.



Many scenes do not require these kinds of effects. For simple scenes, you just want to be sure the scene is well illuminated, regardless of where you navigate. In these cases, you can set the illumination for the scene to be based on the current camera location.

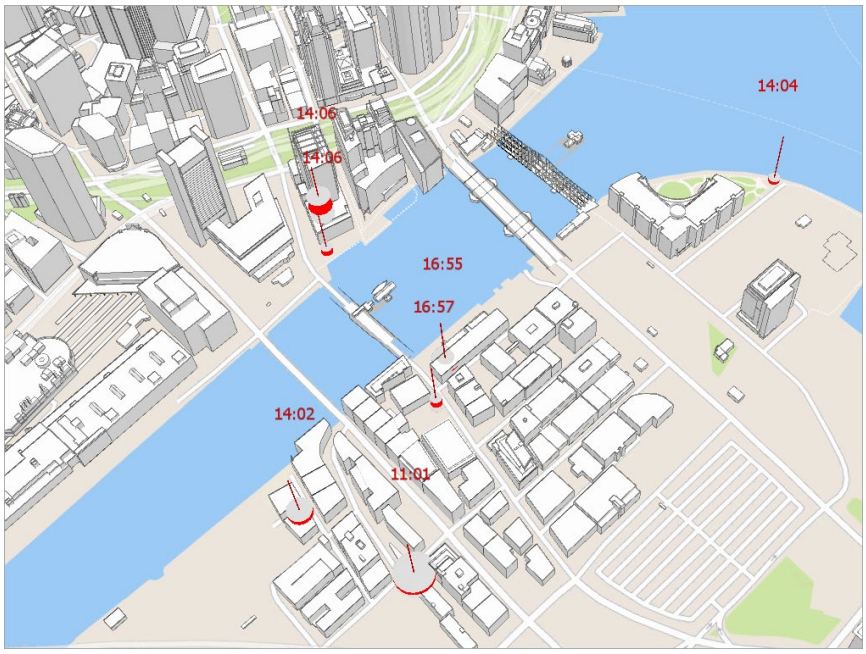
19. In the **Contents** pane, double-click **Boston 911 Calls (Simulated)** to open the **Map Properties** dialog box.
20. On the **Illumination** tab, uncheck the **Show atmospheric effects** check box.
21. On the **Illumination** tab, uncheck the **Display shadows in 3D** check box.
22. On the **Illumination** tab, check the **Noon at camera position** check box.
23. Click **OK**.



Regardless of where you zoom or pan, the lighting will now be consistently shown as “from above”.

24. In the **Contents** pane, right-click **Call Locations**, and click **Zoom to Layer**.

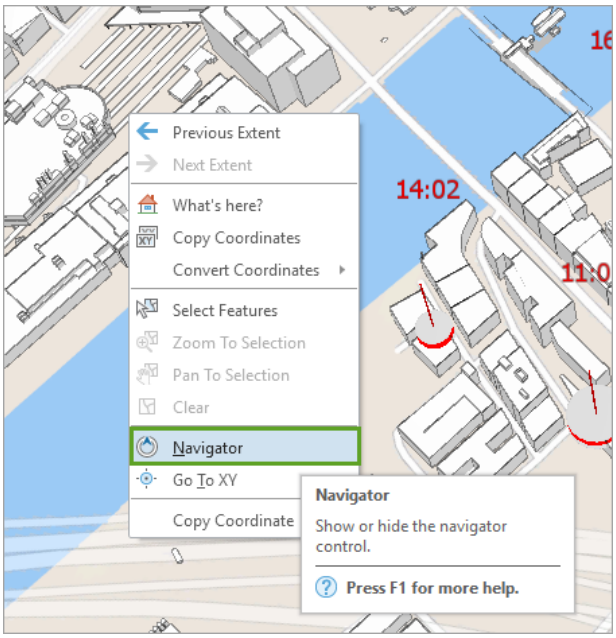
The scene updates to the extent of the features in the call locations layer.



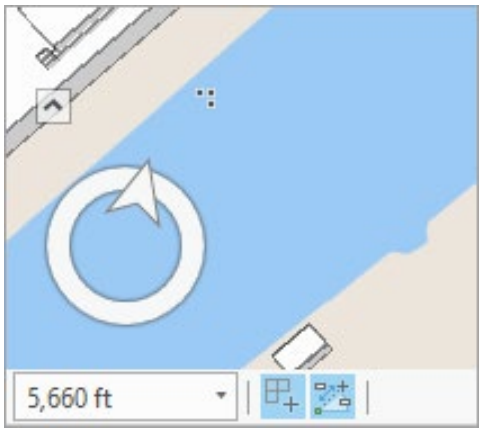
Locating north and using the on-screen Navigator

Navigating in 3D, and knowing which direction is north, can be difficult. You can enable an on-screen control to help with both problems.

1. Right-click anywhere in the scene and click **Navigator** to display the navigator control.



The scene updates to display the 3D **Navigator** in the lower left of the scene.



The **Navigator** control arrow indicates north and can also be used to move the camera position.

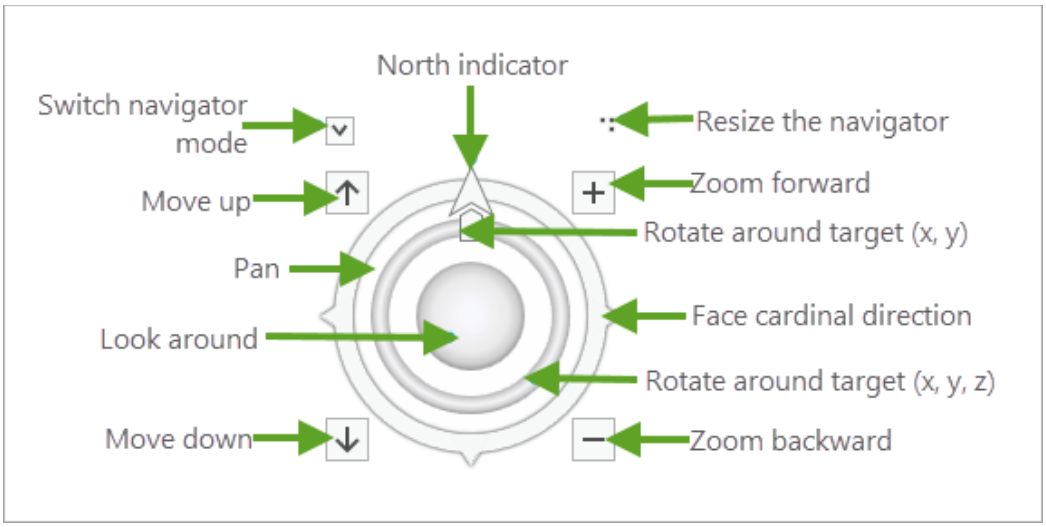
2. On the **Navigator**, click the north arrow indicator to orientate the scene north.



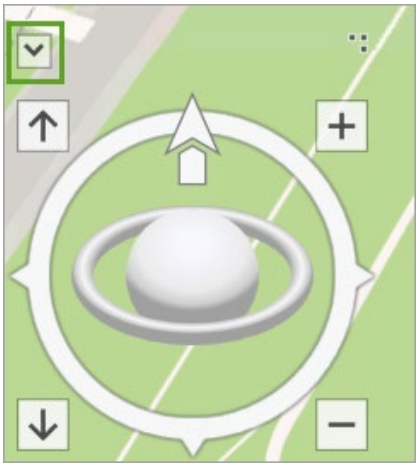
3. On the **Navigator**, click-and-hold the outer ring to pan in the direction of your pointer. The ring will highlight blue as you pan.



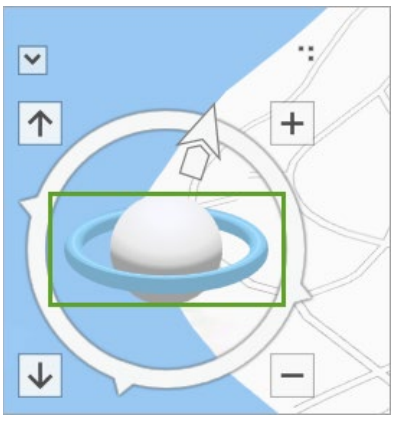
The **Navigator** control can be expanded for more advanced 3D navigation options.



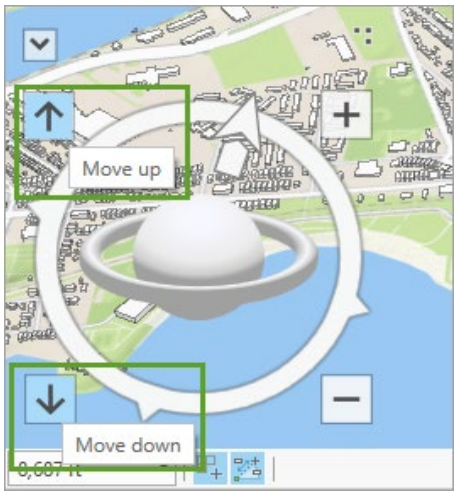
4. On the **Navigator**, click the **Show Full Control** command (the up-arrow button in the top left corner).



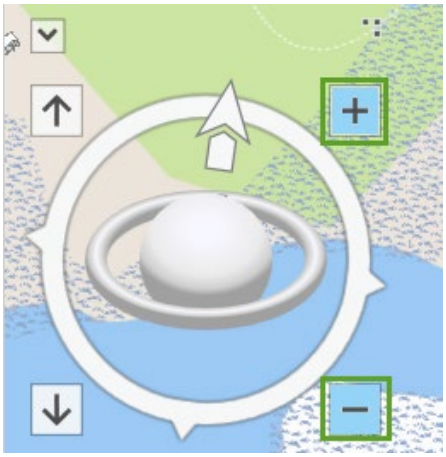
5. Using the inner ring, tilt and rotate the scene.



6. Use the up/down arrows to move the camera vertically up and down.



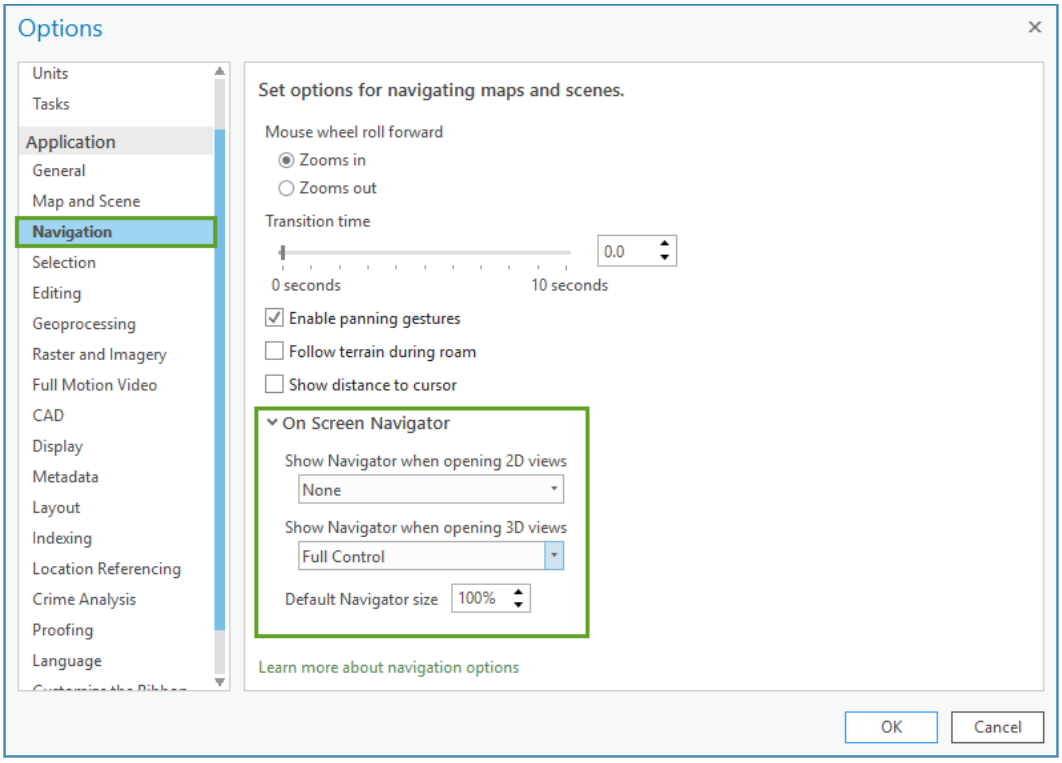
7. Use the **+** and **–** buttons to zoom forward and backward.



8. Use the inner ball to “look around” the scene.



9. Feel free to experiment with the **Navigator** control and remember, you can enable the **Navigator** control by default in 2D or 3D, under **Project > Options > Navigation**.



Local scene settings

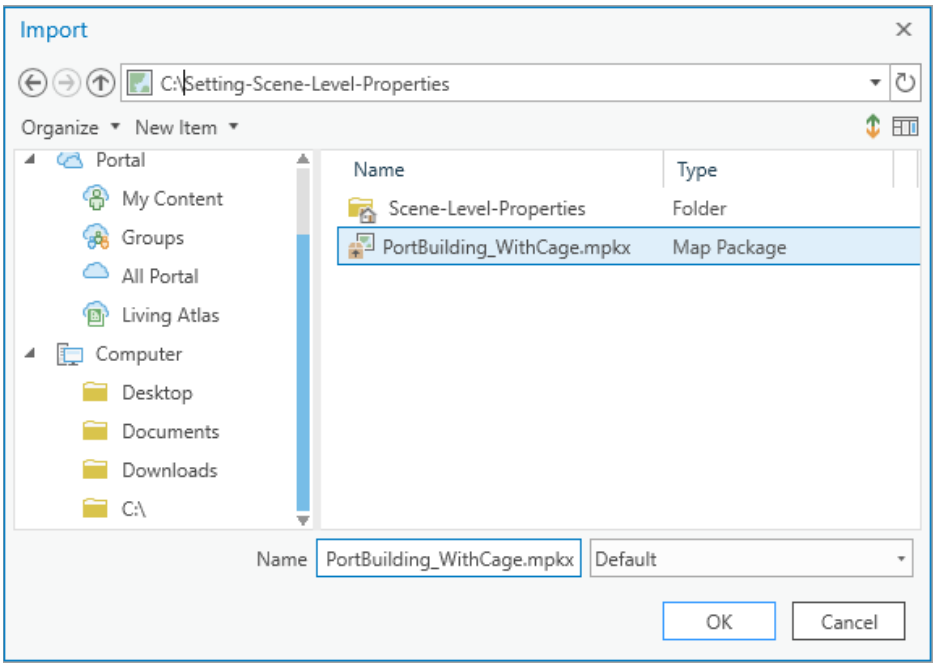
In the previous steps, you worked with the Boston scene, which is a global scene. It rendered its content on a spherical globe, and its lighting model was physically based on an orbit around the sun.

You can also work with your data in a local scene, where the content is rendered in a projected or flat-world space (occasionally referred to as a “fishtank view”).

Local scenes are well suited to content in a small extent, like a campus or a mining site, as well as scientific visualizations. The other huge advantage of a local scene is that it can render in the native coordinate system of your data, making it the recommended view type when editing 3D GIS features.

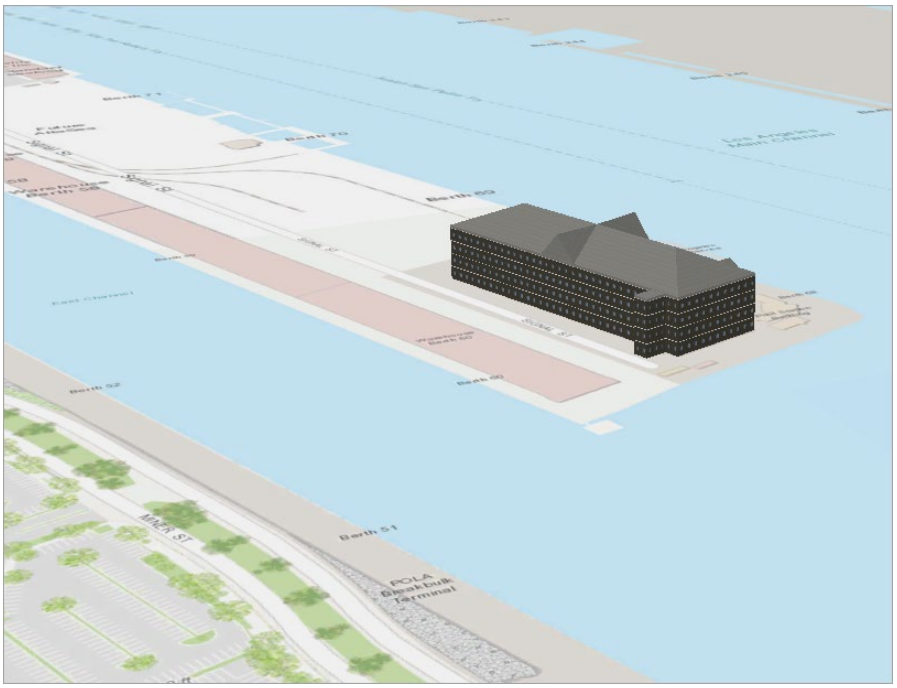
1. On the ribbon, click the **Insert** tab, click the **Project** group, and click **Import Map.**

2. Browse to your home data folder and choose **PortBuilding_WithCage.mpkx**.



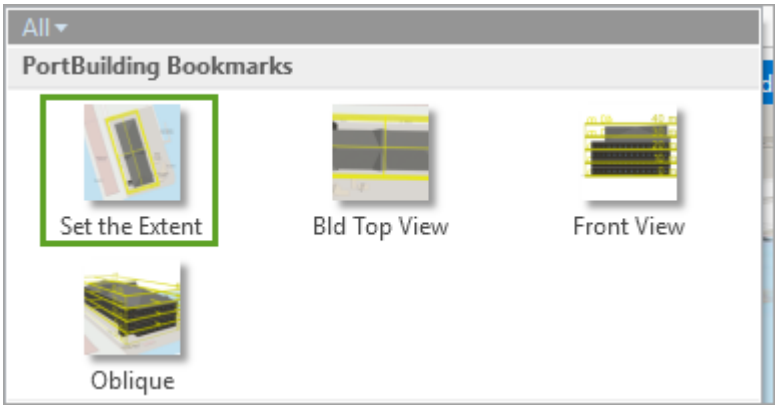
3. Click **OK**.

A new local scene named **PortBuilding** opens and displays a 3D model of a building in the Port of Long Beach, California.

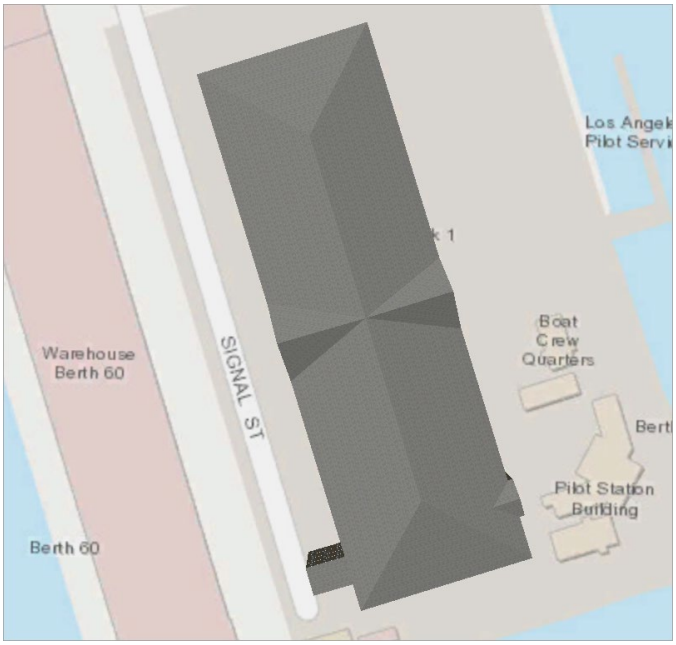


When the scene opens, note that the basemap covers a very large extent that is not needed. We can clip this content down to our area of interest (AOI) by setting an extent for the scene.

4. On the ribbon, click the **Map** tab, click the **Bookmarks** gallery, and click **Set the Extent.**



The clip extent is a rectangle, oriented north, which this bookmark matches. When setting your own custom extent, you can use the **N** (north) and **P** (perpendicular) shortcut keys to correctly preview the clipping view extent.



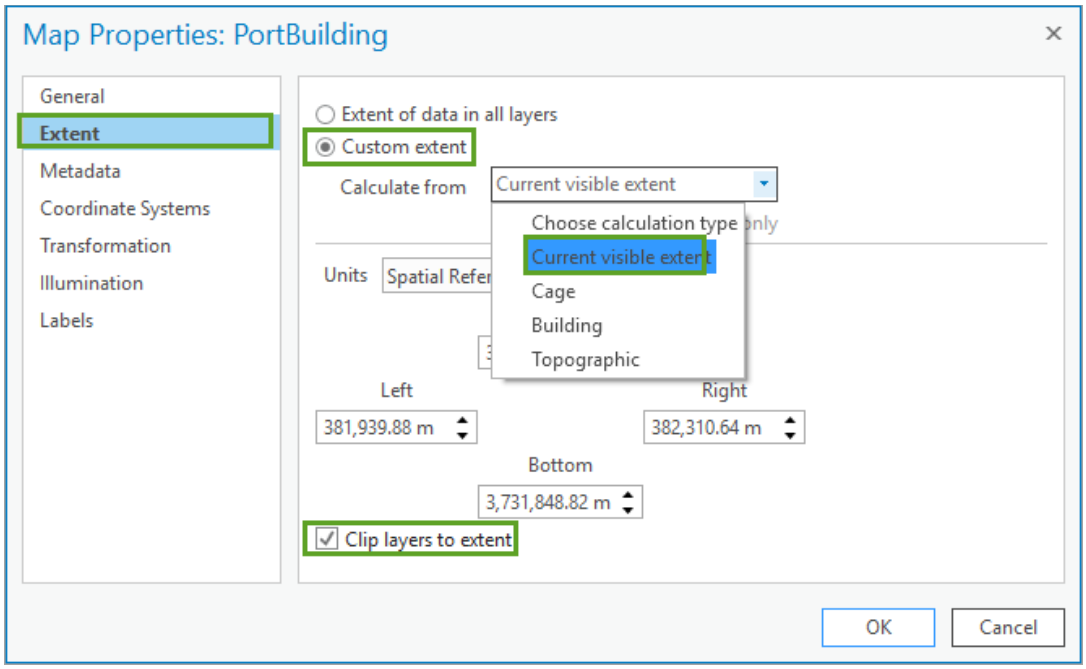
5. In the **Contents** pane, double-click **PortBuilding** to open the **Map Properties** dialog box.

6. On the **Extent** tab, choose the **Custom extent** option.

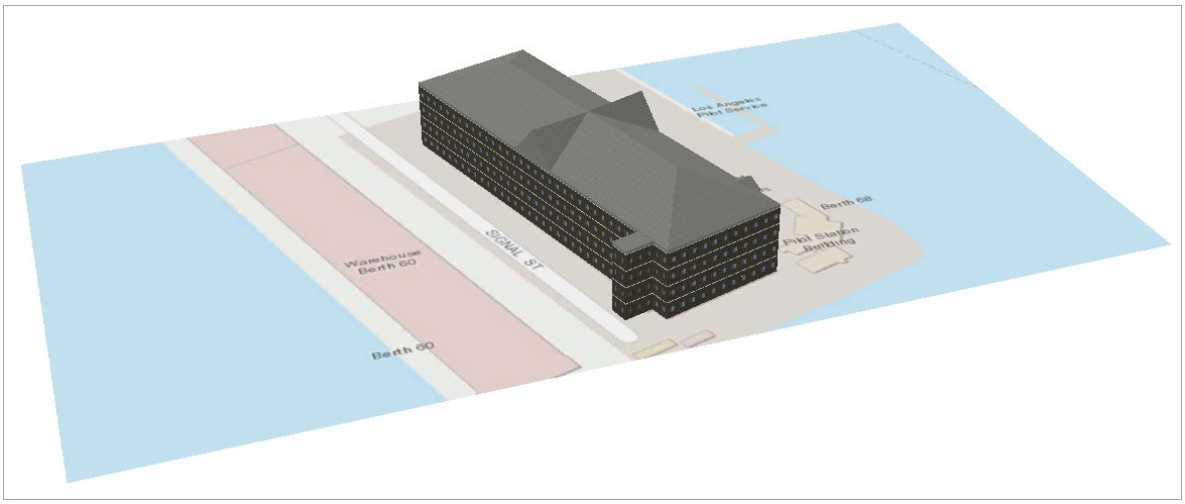
7. On the **Calculate from** drop-down list, choose **Current visible extent.**

8. Check the **Clip layers to extent** check box.

9. Click **OK**.



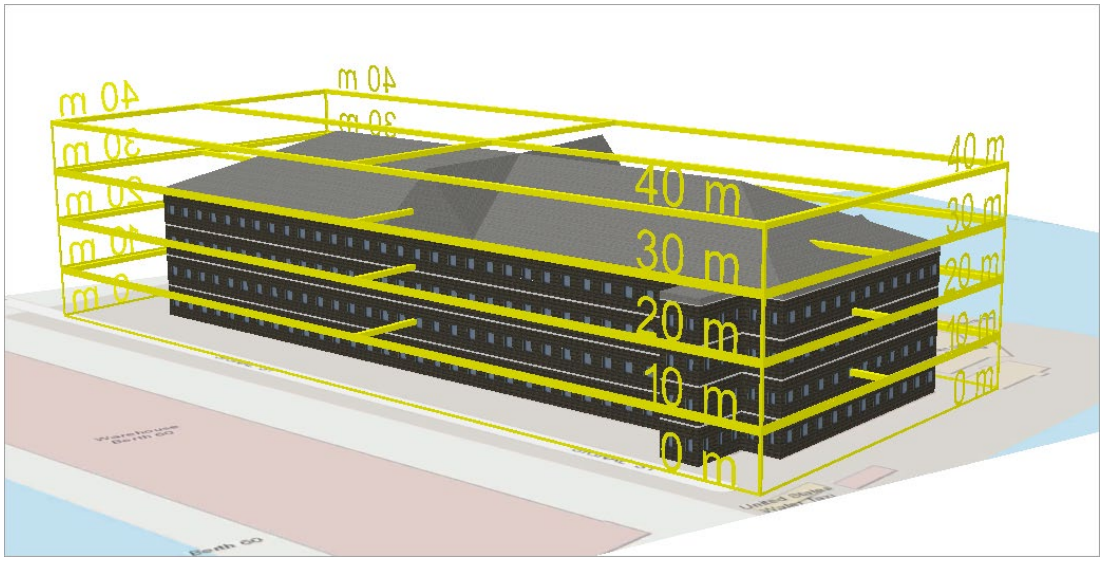
10. Use wheel button-drag to rotate the camera to a different viewpoint.



It is apparent that the local scene is now more visually useful as the extent no longer covers a large area but is clipped to the area around the building which is the focus of this scene.

In some local scenes, it is useful to have a height reference grid around the data. There is a procedural "Cage" symbol that ships with ArcGIS Pro that can help with this requirement. It has two default settings, one for regional extents and one for parcel extents. The symbol has been preconfigured for this scene.

11. In the **Contents** pane, check the **Cage** layer.



The scene updates to display a cage or framework around the building. If you choose, you may click the **Cage** layer symbol in the **Contents** pane and adjust properties in the **Symbology** pane for the feature.

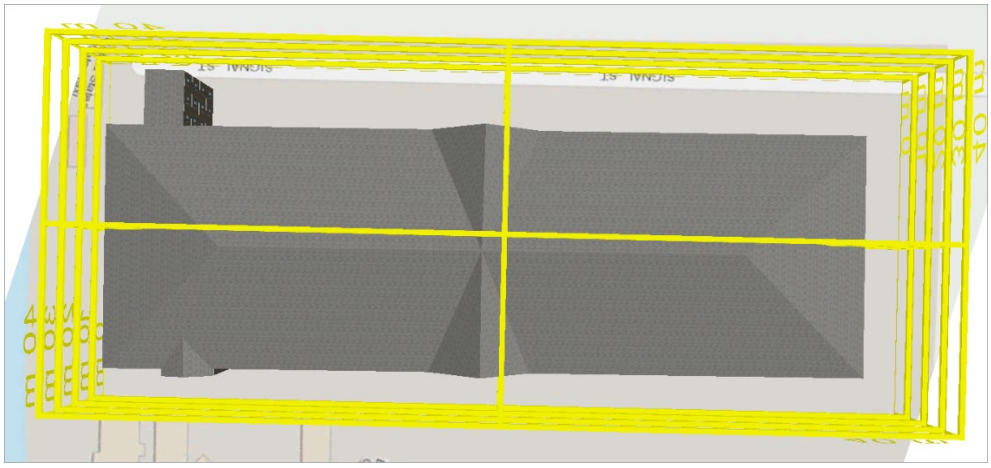
Parallel view mode

A parallel view is a technique often used in architecture and scientific visualizations and is usually presented as a set of static images taken from specific viewpoints (rather than an interactive scene or a video). In this step, you will change from perspective to parallel mode and observe the differences.

In general, we observe the world around us as a perspective view. That is, the light rays disappear to a vanishing point off in the distance, which is why features appear smaller as they move away from us.

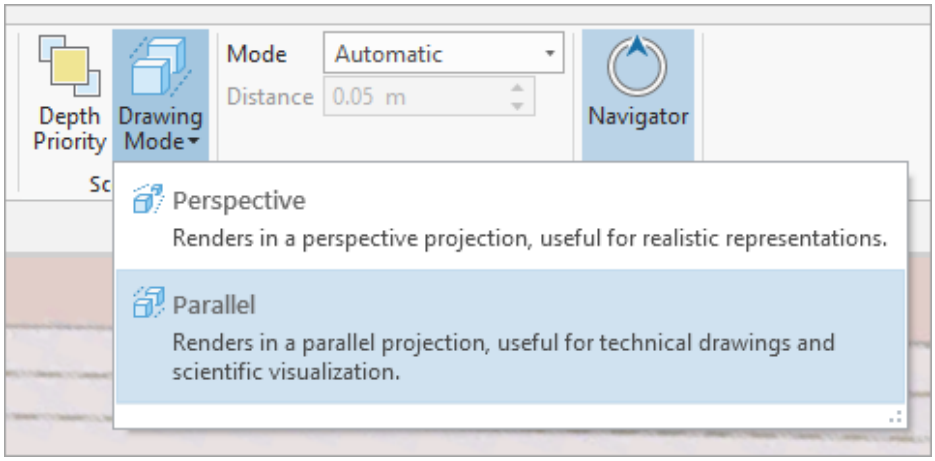
In contrast, parallel view mode forces light rays to be parallel. This means that features appear to have the same visual size regardless of how far away they are from the camera.

1. On the ribbon, click the **Map** tab, click **Bookmarks**, and click **Bld Top View**.

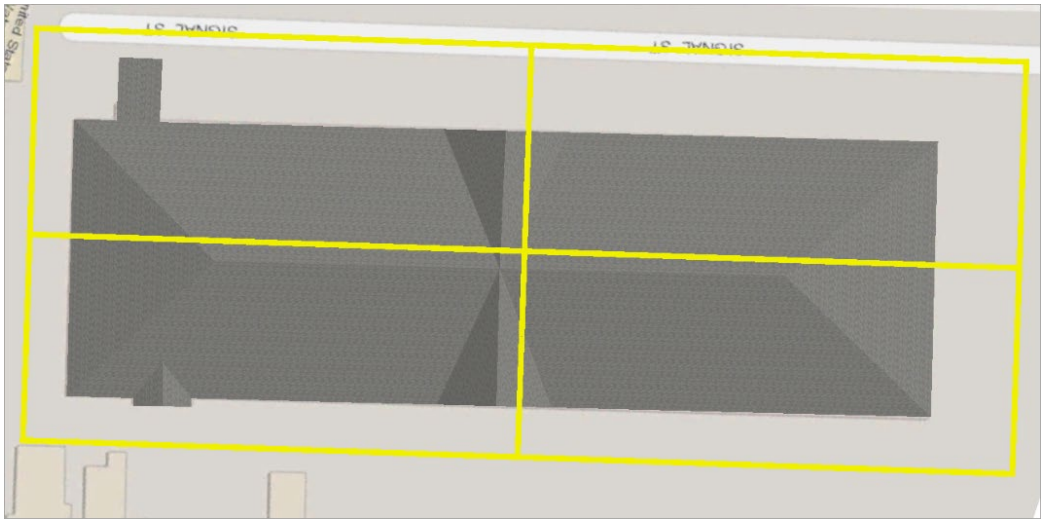


2. On the ribbon, click the **View** tab, click the **Scene** group, and click **Drawing Mode**.

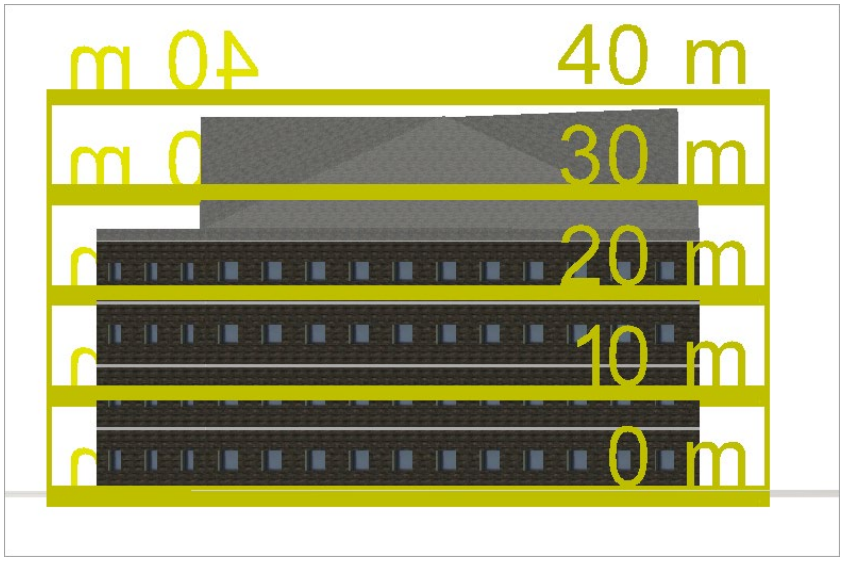
3. In the **Drawing Mode** drop-down menu, choose **Parallel**.



The scene updates to display the building in parallel drawing mode. Note how the stacked cage bars are now visually aligned.

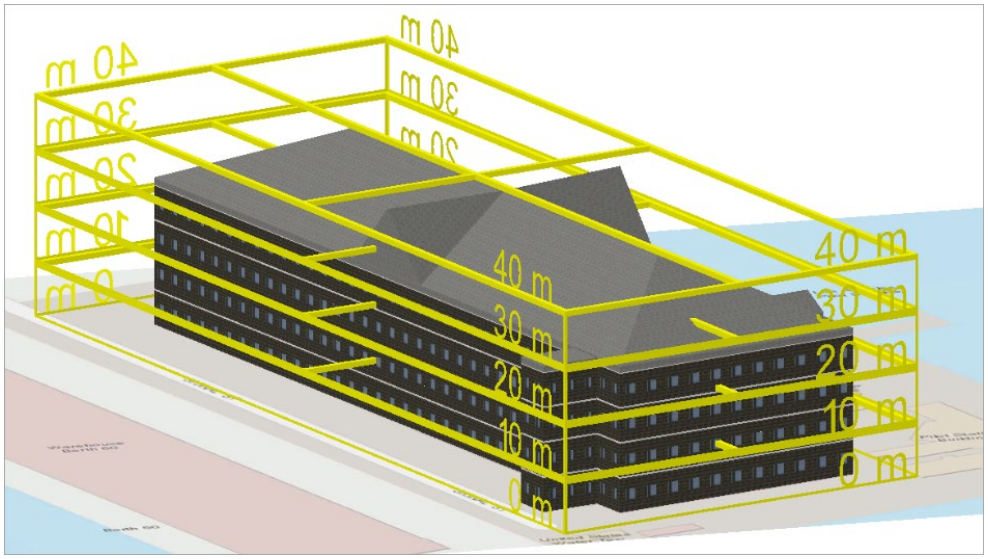


4. On the ribbon, click the **Map** tab, click **Bookmarks**, and click **Front View.**



5. On the ribbon, click the **Map** tab, click **Bookmarks**, and click **Oblique.**

The scene updates to display the building at an oblique angle in parallel mode**.**

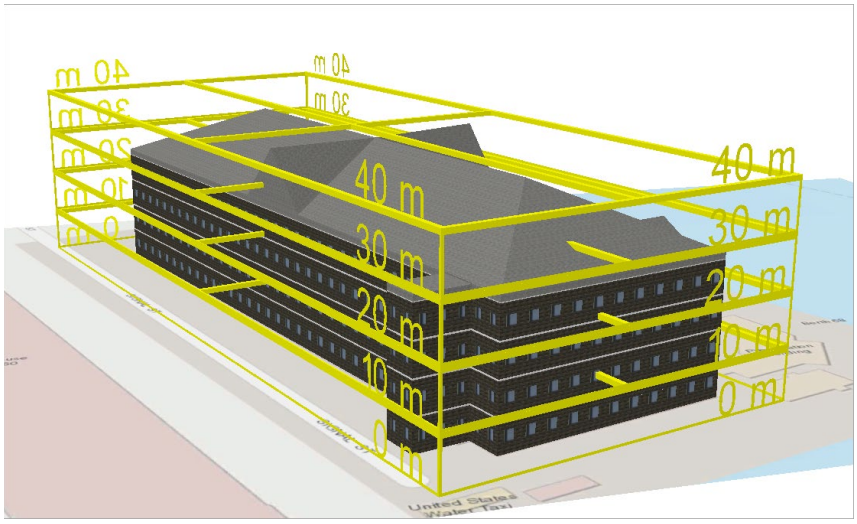


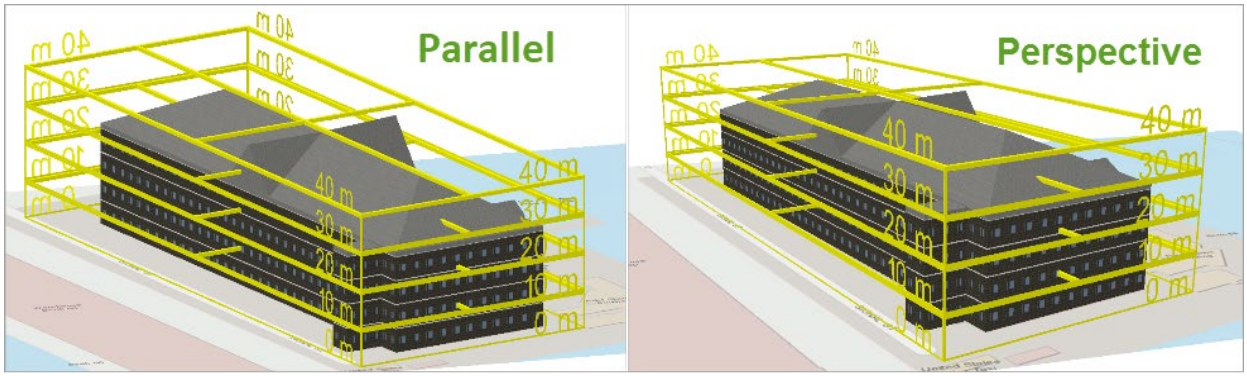
Parallel view mode has a small but crucial role in 3D mapping. It should be used when a visual effect is needed and avoided when it is not. Parallel view mode can appear very unnatural to our eyes as we naturally observe things in perspective, and it can be extremely difficult to do even simple tasks when in parallel view mode, especially editing and navigating.

6. On the ribbon, click the **View** tab, click the **Scene** group, and click **Drawing Mode**.

7. In the drop-down menu, choose **Perspective.**

The scene updates and displays the building at an oblique angle in perspective mode. In this mode, the building appears more squared, whereas in parallel mode, it appears to be higher in the back and lower in front.





Summary

Authoring an effective and attractive 3D view doesn't end with layer properties. You also need to consider scene-level display properties to enhance and improve your scene.

The way a scene is illuminated can add, or distract, from your message. The use of shadows can enhance realism, as well as provide information about the impact of buildings and other features on the world around them. When working with limited-extent data, it can be more effective to clip the display extent to your area of interest and working in your data's native coordinate system is always recommended for GIS work. And, lastly, consider the use of parallel view mode for presenting content without the visual distortion of perspective viewing.