Lab01 Introduction to ArcGIS Pro Exercise 1 – Explore the ArcGIS Pro interface and structure

At about 4:30 a.m. on January 17, 1994, a magnitude 6.7 earthquake took place in Southern California. The intense shaking lasted between 10 and 20 seconds. Initially, seismologists thought that the earthquake epicenter was in Northridge, and the earthquake is still known as the Northridge earthquake. However, the actual epicenter was in the neighboring city of Reseda, about 20 miles northwest of downtown Los Angeles. Ground shaking was detected as far away as Las Vegas, Nevada, more than 200 miles from the epicenter.

In this exercise, you will explore the ArcGIS Pro interface and the structure of a project. You will create an ArcGIS Pro project that will help you visualize the Northridge earthquake and the damage that it caused. You will work with this project throughout this course as you familiarize yourself with the capabilities of ArcGIS Pro.

To complete exercises, you need the following:

- ArcGIS Pro 3.3.1 (Basic, Standard, or Advanced)

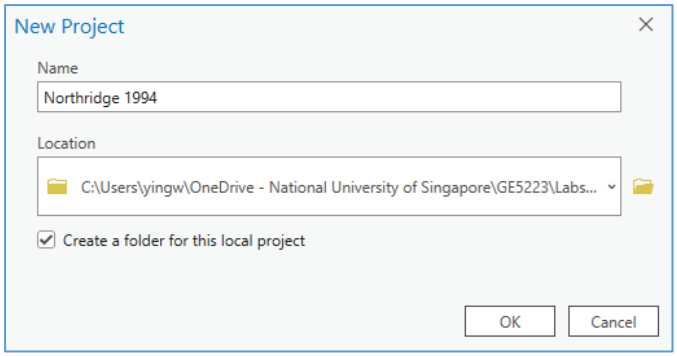
The data needed for this exercise are under the folder Lab 01 (download and unzip it to your own folder)

Exercise 1 Demo Video:
https://mediaweb.ap.panopto.com/Panopto/Pages/Viewer.aspx?id=31bd5b3f-d503-4c4c-86b4-ae7100473144

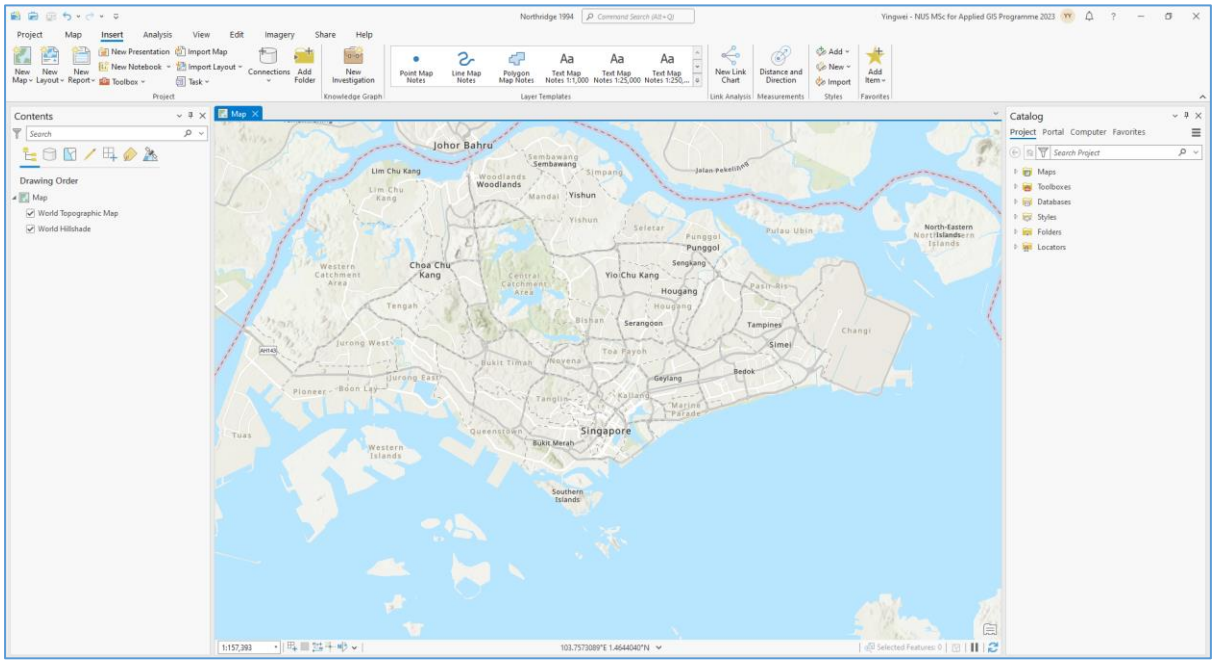
Create a new ArcGIS project

1. Start ArcGIS Pro and sign in if necessary.
2. On the start page, under **Blank Templates**, click **Map**. The Map template creates a new project containing a 2D map.

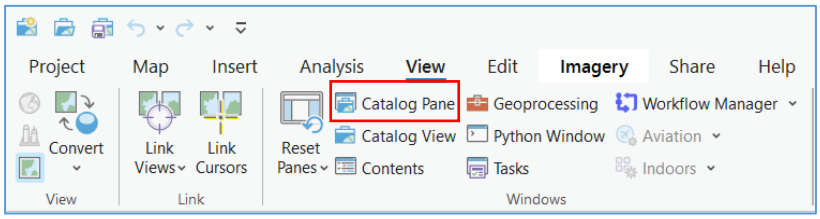
3. On the **New Project** dialog box, in the **Name** box, replace the default project name with Northridge 1994. By default, projects are created in your <User Documents>\ArcGIS\Projects folder. To save a project to a different location, click the **Browse** button and browse to the folder you want.



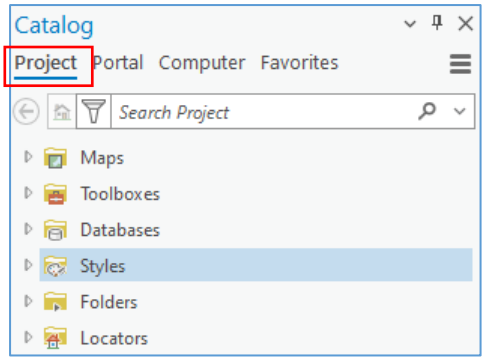
4. Click **OK**. The new project opens with a map view showing a topographic basemap centered on Singapore.



5. Now you will find the **Catalog** pane on the right. The **Contents** pane is on the left. If the **Catalog** pane is not visible, on the **View** tab on the top, click **Catalog Pane** which is in the **Windows** group. In the event your **Contents** pane is missing, select **Reset Panes** then select **Reset Panes for Mapping (Default)**.



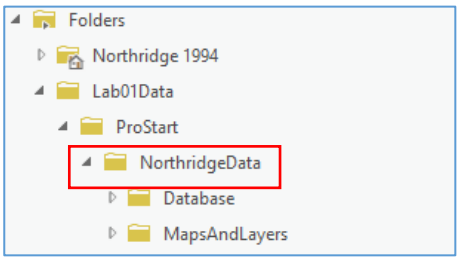
6. In the **Catalog** pane on the right, investigate the contents of the **Project** tab.



Create a folder connection

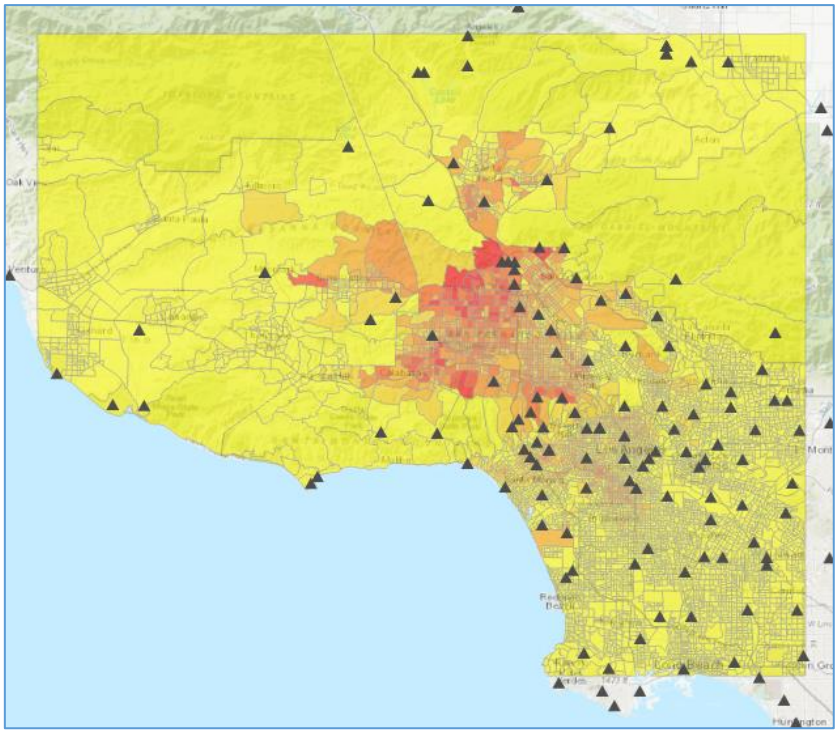
In this project, we will use data that are not contained in the ArcGIS Pro project structure. We will create a connection to the location of the data so that we can work more efficiently.

7. In the Catalog pane, right-click **Folders** and choose **Add Folder Connection**. Create a folder connection to **…\Lab01Data** (the folder that contains the data for this lab). Expand folders and you will see the folder of *NorthridgeData*.



Explore tabs and import a map

8. Click the other tabs on the ribbon to see the available tools
9. On the ribbon, click the **Insert** tab. In the **Project** group, click **Import Map**.
10. In the **Import** dialog box, browse to your working folder **..\ProStart\NorthridgeData\MapsAndLayers**. Click Northridge 1994.mxd.
11. Click **OK**. And you will see the Northridge map is imported into the project. Note that Northridge 1994.mxd is a map document file that has already been created using ArcMap, which is another product of ESRI ArcGIS.

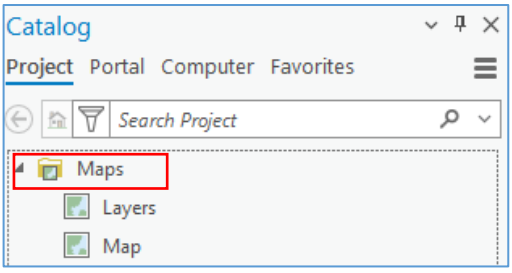


The Northridge map contains the following layers:

- Points representing the locations of seismograph stations in the area
- Points representing the epicenters for the main quake and its aftershocks
- Lines representing the major roads in the area
- Lines representing the known fault lines in the area
- Polygons representing the block groups in the San Fernando Valley, symbolized by the severity of the damage in each block group
- The basemap.
- A DEM map illustrating the Elevation of Northridge

These layers can be turned on or off by clicking the box ☑ next to the layer's name.

In the **Catalog** pane, expand the **Maps** folder, and you will see two maps. "Layers" is the newly imported map, and "Map" is the map we created at the beginning. A more meaningful name for the map "Layers" can be given by right-clicking it, and then rename. Change its name to **Northridge2D**. You may rename the layer by right-clicking the layer and selecting *Rename* to enter the new name of the layer.

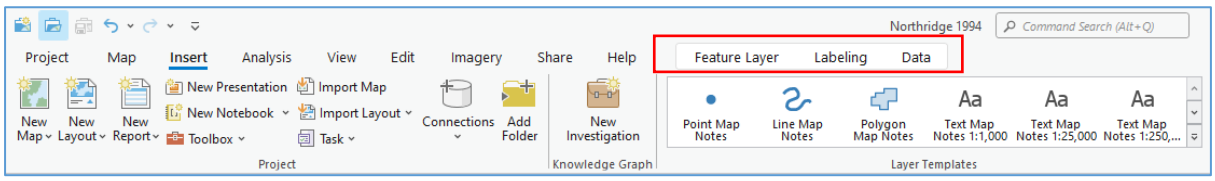


12. Save your project by clicking **Project → Save Project**.

Change the layer symbology

In this step, we will change the symbology of the **BuildingDamage** layer

13. In the **Contents** pane on the left, click the **BuildingDamage** layer. In the ribbon, you will find three new tabs appearing for the feature layer: Feature Layer, Labeling, and Data.

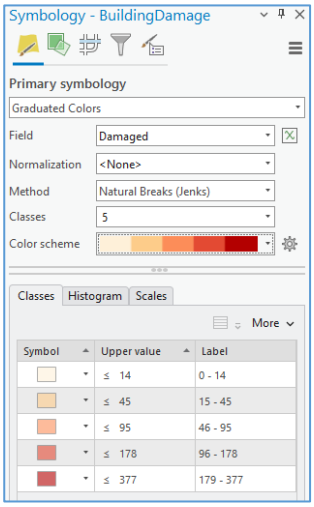


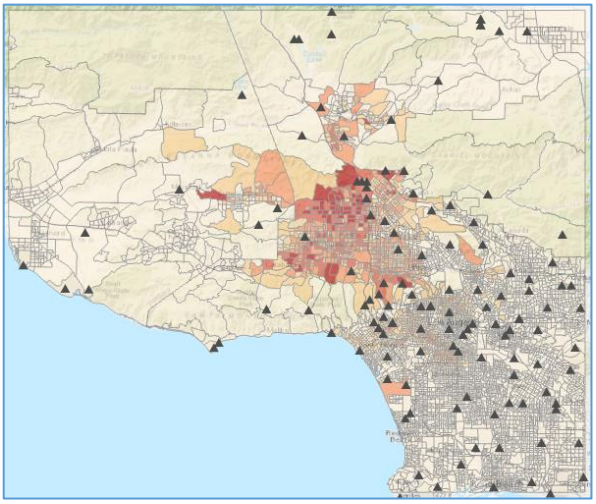
14. Click the **Feature Layer** tab. Using the **Feature Layer** tab, you can set the scale dependencies, transparency, and symbology.

15. Under the **Feature Layer** tab, in the **Drawing** group, click **Symbology** (do not click the down arrow). The **Symbology** pane appears on the right.

16. In this step, we will change the **number** of layers. From the **Classes** drop-down list, choose **5**.

17. In this step, we will change the **color** scheme. From the **Color scheme** drop-down list, check the **Show Names** box. Change the color scheme to **Orange-Red (5 Classes)**. And you will see the map below.





18. The symbology on the map updates automatically. However, the gray outlines of the polygons make some of the smaller block groups difficult to recognize on a small scale. In the next step, we will remove the outlines.

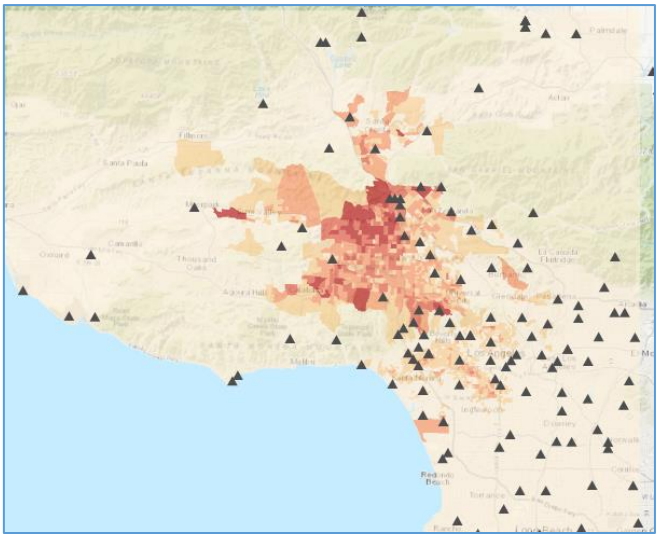
Q-1 What is the area of the most damaged region (polygon)? (2 marks)

Q-2 What is the mean area of polygons in the BuildingDamage layer? (2 marks)

19. In the lower half of the **symbology** pane, click **More → Format All Symbols**. The symbology gallery opens.

20. At the top of the **Symbology** pane, click the **Properties** tab.

21. Change the **Outline Color** to **No Color**. Click **Apply**. And the new map is shown as below.

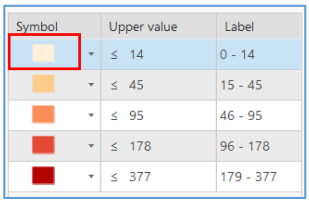


Change the symbology of a single class

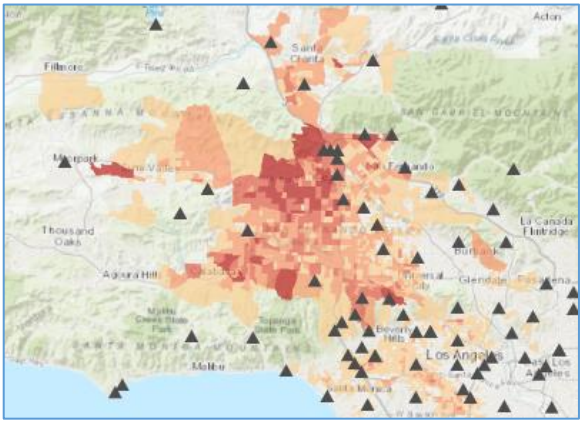
To focus on the areas that were damaged the most, we will make the areas with comparatively less damage transparent.

22. In the **Symbology** pane, click the back arrow .

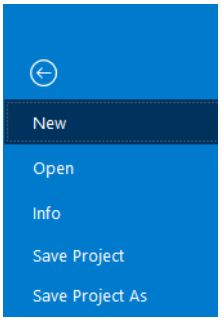
23. In the lower half of the **Symbology** pane, in the **Symbol** column, click the symbol of the class with ≤ 14 label. The symbology gallery opens.



24. Click **Property** tab, and change the **Color** to **No Color**. Click **Apply**. The map is shown as below.



25. On the ribbon, click the **Project** tab, save your project as **Northridge 1994_Exercise 1.aprx,** and then exit ArcGIS Pro. This project will be further used in Exercise 2.



In this exercise, you have learned how to create an ArcGIS Pro project, import a map document, change the symbology of layers and a single class, and use the ribbons, panes, and tabs in ArcGIS Pro.

Lab01 Introduction to ArcGIS Pro Exercise 2 – Work with map views

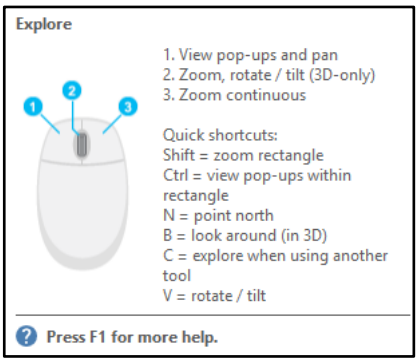
> With ArcGIS Pro, a single project can include multiple maps. In the last project, there are two maps, one is Map and the other is Northridge2D, remember? A single map can contain multiple views. Aside from 2D views, ArcGIS Pro also enables you to visualize data in 3D.
>
> In this exercise, you will visualize data from the 1994 Northridge earthquake. You will learn how to use multiple map views and navigation methods to explore the earthquake's geometry.
>
> The data needed for this exercise are under the folder Lab 01
>
> Exercise 2 Demonstration Video: https://mediaweb.ap.panopto.com/Panopto/Pages/Viewer.aspx?id=b5b70dd9-99c4-4378-9fbf-ae7c0039458c

Open an existing project package

1. Start ArcGIS Pro and sign in if necessary.
2. If the project you want to open is in the list of **Recent Projects**, just click on it, else click **Open another project**, and browse to the folder where you save your projects. Open **Northridge 1994_Exercise 1** and then save the project as **Northridge 1994_Exercise 2**. Do not work on **Northridge 1994_Exercise 1** directly which should be saved as a backup**.**

   You are now ready to start the exercise.

Navigate the map

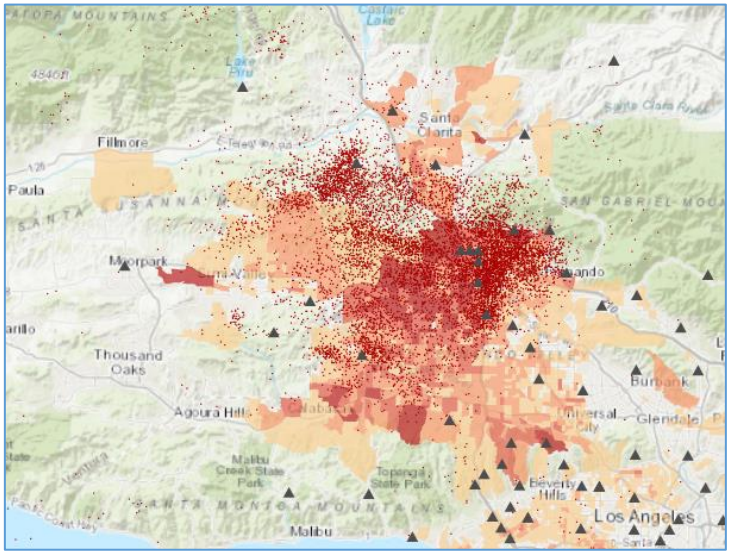


In ArcGIS Pro, there are several ways to navigate a map. In this step, we will explore several of them.

3. On the ribbon, click the **Map** tab. Put your mouse on the **Explore** button, and you will see the figure on the right, which shows a brief list of mouse buttons and keyboard shortcuts for navigating a project.
4. Make sure that the **Explore** tool is activated.
5. Drag the map. Click a location on the map, and then drag the map.
6. Previous Extent. Click the **Previous Extent** button, and you can return to the previous extent if it exists.
7. Next Extent. Click the **Next Extent** button, and you move the view forward to the next extent if it exists.
8. Full Extent. Click the **Full Extent** button, the view zooms to the full extent of the data in the map.
9. On the map view, roll your mouse forward, and the map zooms in. Roll your mouse backward, and the map zooms out.

10. In the **Contents** pane, right-click the **Station** layer and select **Zoom to Layer**, which is quite self-explanatory.

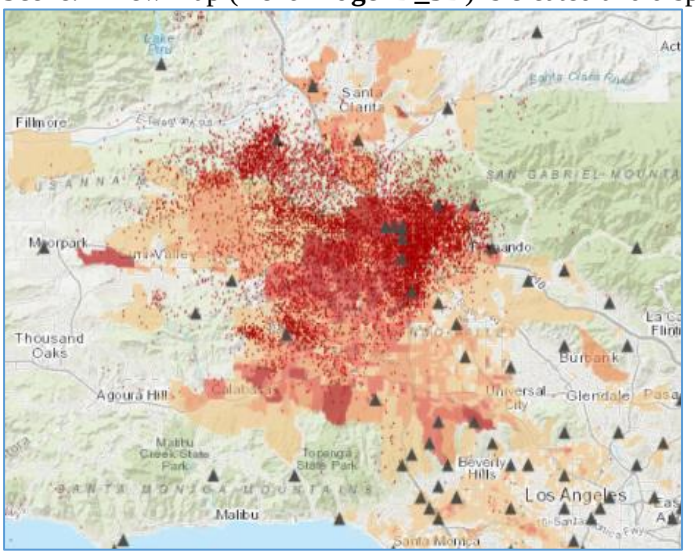
11. Turn on the **Earthquakes** layer by clicking/checking the box ☐ next to it. The screenshot below shows the map.



Create a 3D view of the data

All the aftershocks are displayed on the surface of the earth in a 2D map. However, the large number and concentration of aftershocks on the map make it difficult to interpret. To make the map easier to read, we will create a 3D view of the data.

12. On the ribbon, click the **View** tab, click the **Convert** button, and then click **To Global** Scene. A new map (**Northridge2D_3D**) is created and displayed.

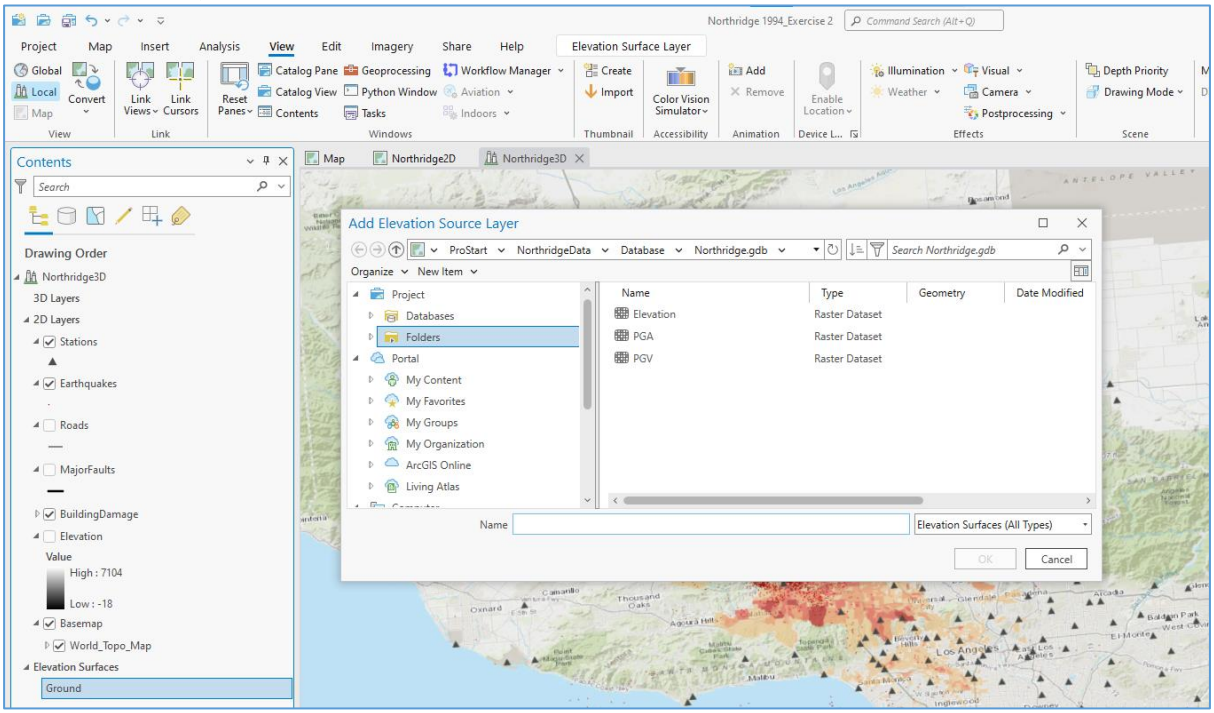


13. Rename the name of the new map from Northridge2D_3D to **Northridge3D** (refer to the method learned in Exercise 01).
14. Under the **View** tab, click Local in the **View** Group. **Global** view is often used for large extent while **Local** view is used for smaller extent. In this exercise, we only want to view San Fernando Valley in California, therefore we choose Local viewing mode.

Set the elevation surface for the 3D view

In the previous step, despite being displayed in 3D, the map still appears flat. In this part, we will change how the elevation of the scene is displayed.
In the **Contents** pane, there is a current elevation source – WorldElevation3D/Terrain3D. However, its resolution is low. So the first thing we are going to do is to replace it with a high-resolution elevation source.

15. In the **Contents** pane, right-click WorldElevation3D/Terrain3D and choose remove.
16. Right-click **Ground**, and then choose **Add Elevation Source**.
17. In your working folder, Browse to ..\ProStart\NorthridgeData\Database\Northridge.gdb. Click **Open**.
18. Select **Elevation**, and click **OK**.



The elevation of the scene has now been set to a source with a higher resolution. Because we want to locate the earthquake and aftershocks under the surface of the scene, we must enable the scene for subsurface display.

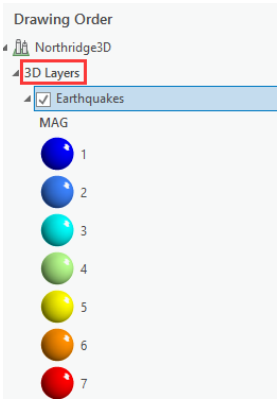
19. In the **Contents** pane, click **Ground**. On the ribbon, the **Elevation Surface Layer** tab appears.
20. Click the **Elevation Surface Layer** tab, in the **Surface** group, check the **Navigate Underground** box.
21. Save the project.

Q-3 What is the cell size of the elevation layer? (2 marks)

Q-4 Given a DEM layer covering an area of 80,000 × 80,000 m^2 with a spatial resolution of 10 m. Each pixel has a cell depth of 16 bits. What is the least data volume (in bytes) required (in bytes) for storing this DEM layer? (3 marks)

Add a 3D layer to the scene

The Earthquakes layer has a field of DEPTH, so the data can be displayed in 3D under the surface of the earth. However, the symbolization process might take too much time, so we will add a 3D layer file that has already been set up correctly.



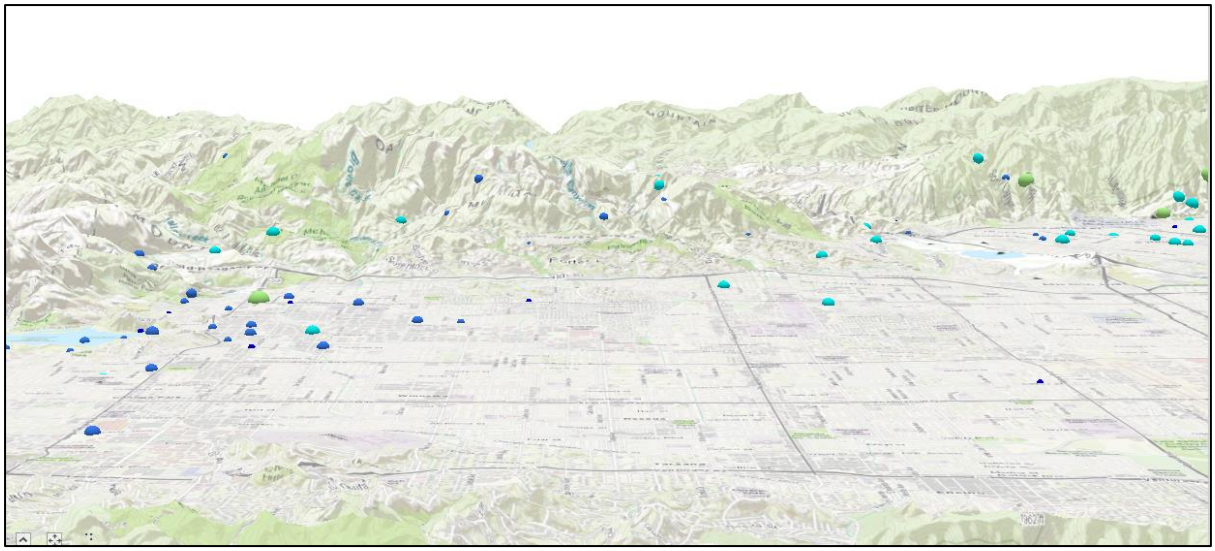
22. In the **Catalog** pane, under **Folders**, expand **NorthridgeData → MapsAndLayers**. You will find two files under **MapsAndLayers,** and they are **Earthquakes.lyrx** and **Northridge1994.mxd**.
23. Drag the **Earthquakes.lyrx** file into the map. The new layer **Earthquakes** is automatically added to the **Contents** pane under **3D Layers**. The layers **Earthquakes** under **3D Layers** and **2D Layers** point to the same data actually where the different colors represent the varying magnitudes. Thus, we can just remove the **Earthquakes** layer under **2D Layers**.
24. In the Contents pane, under **2D Layers**, right-click **Earthquakes**, and choose **Remove**.
25. Save your project.

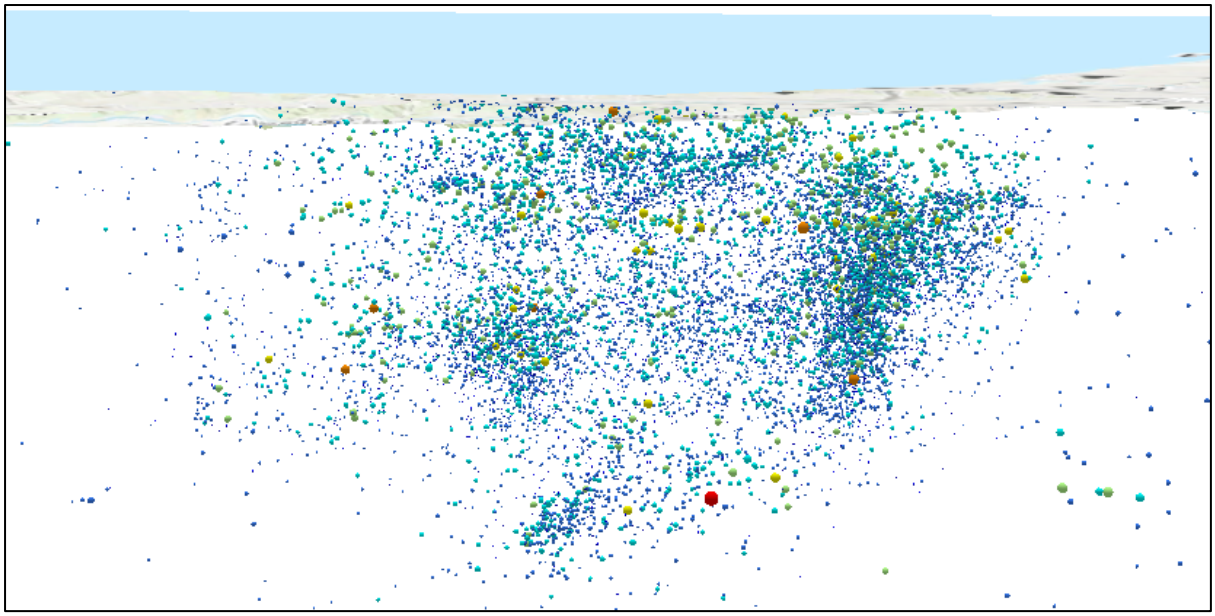
Q-5 What is ".lyrx" file? (2 marks)

Navigate the 3D scene

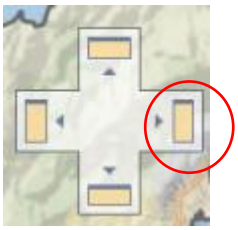
Navigating the 3D scene is slightly different from that in the 2D maps.

26. On the **Map** tab, make sure that the **Explore** tool is activated.
27. Click and drag the scene in any direction. Left-clicking will pan the scene, much like in a 2D map.
28. Previous Extent. Click the **Previous Extent** button , and you can return to the previous extent if it exists.
29. Next Extent. Click the **Next Extent** button , and you move the view forward to the next extent if it exists.
30. Full Extent. Click the **Full Extent** button , the view zooms to the full extent of the data in the map.
31. On the map view, roll your mouse forward, and the map zooms in. Roll your mouse backward, and the map zooms out.
32. Press the center mouse wheel, and move the mouse forward and backward. It will rotate the scene up and down.
33. Press the center mouse wheel, and move the mouse left and right. Moving the mouse left will rotate the scene around the point clicked clockwise, while moving the mouse right will rotate the scene counter-clockwise.
34. Take a few minutes to investigate the data by browsing around the area, particularly around the earthquake symbols under the surface the scene.



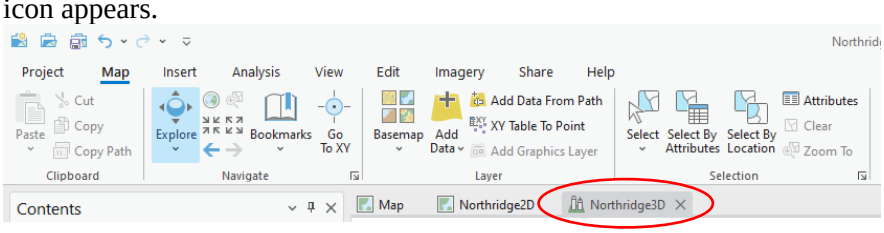


Link 2D and 3D views

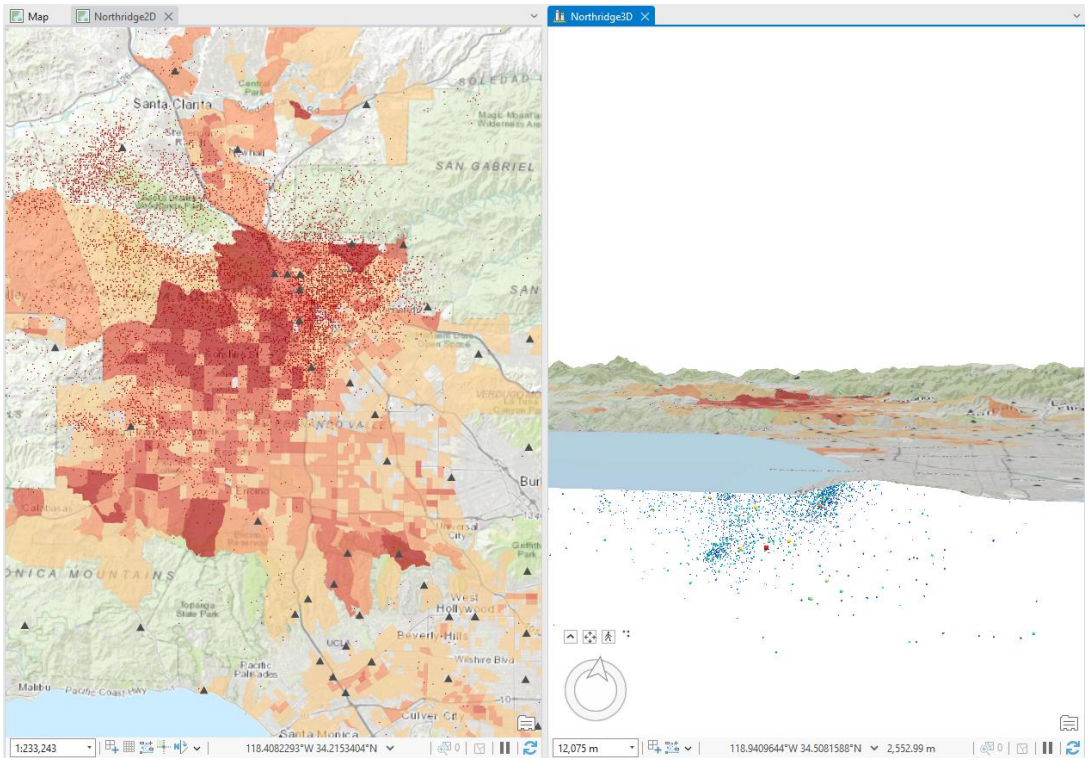


Now you will explore the 2D map and the 3D scene at the same time by linking the 2D and 3D views.

35. Click the Northridge3D tab and drag it to the center of the scene. A docking icon appears.



36. Let the cursor fall on the right side of the docking icon, and release the mouse. Now the windows are aligned side by side.



37. On the **View** tab, in the **Link** group, Click the **Link Views** button and choose **Center And Scale**.
38. Pan around either the map or the scene, and you will find the other view will automatically update to match it.
39. Save your project.

In this exercise, we have learnt how to navigate 2D and 3D views and link them.