

GEOPAK V8i Edition

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SECTION 4: Geopak – GIS

4.1 - Set a Geographic Coordinate System in a Microstation DGN

Sharing a common coordinate allows DGN files to correctly reference each other. In order to have interoperability with other files, such as aerial photos, GIS files and other geo-referenced files, **there must be a geographically defined coordinate system**. Having known coordinate systems allows translation between source (i.e. aerial photo) and destination files (i.e. DGN horizontal alignment). Using MicroStation tools, DGN files can be assigned a known or custom *Geographic Coordinate System (GeoCS or GCS)*. There are many coordinate systems available to choose from. The **Survey and Mapping office has intimate knowledge of coordinate systems and should be consulted** before using GeoCS tools. They can assist in identifying the proper GeoCS.

Select a Geographic Coordinate System

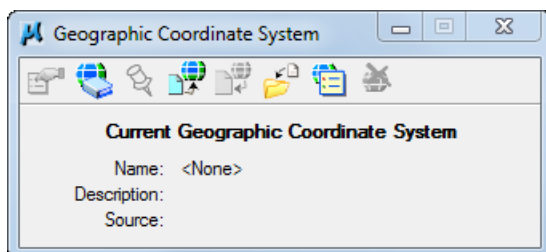
With MicroStation open, go to **File > Geographic > Open as ToolBox**. The **Geographic** menu appears.

Select the globe icon to Select Geographic Coordinate System.



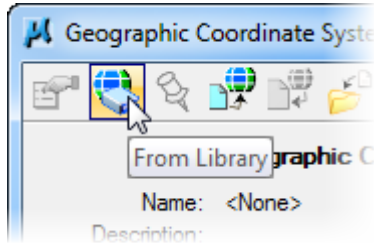
The **Geographic Coordinate System** menu appears. Note the dialog below shows that a GeoCS has not been assigned. There are several methods to select a GeoCS. The following three are described below:

- [From Library](#)
- [From Reference](#)
- [From File](#)

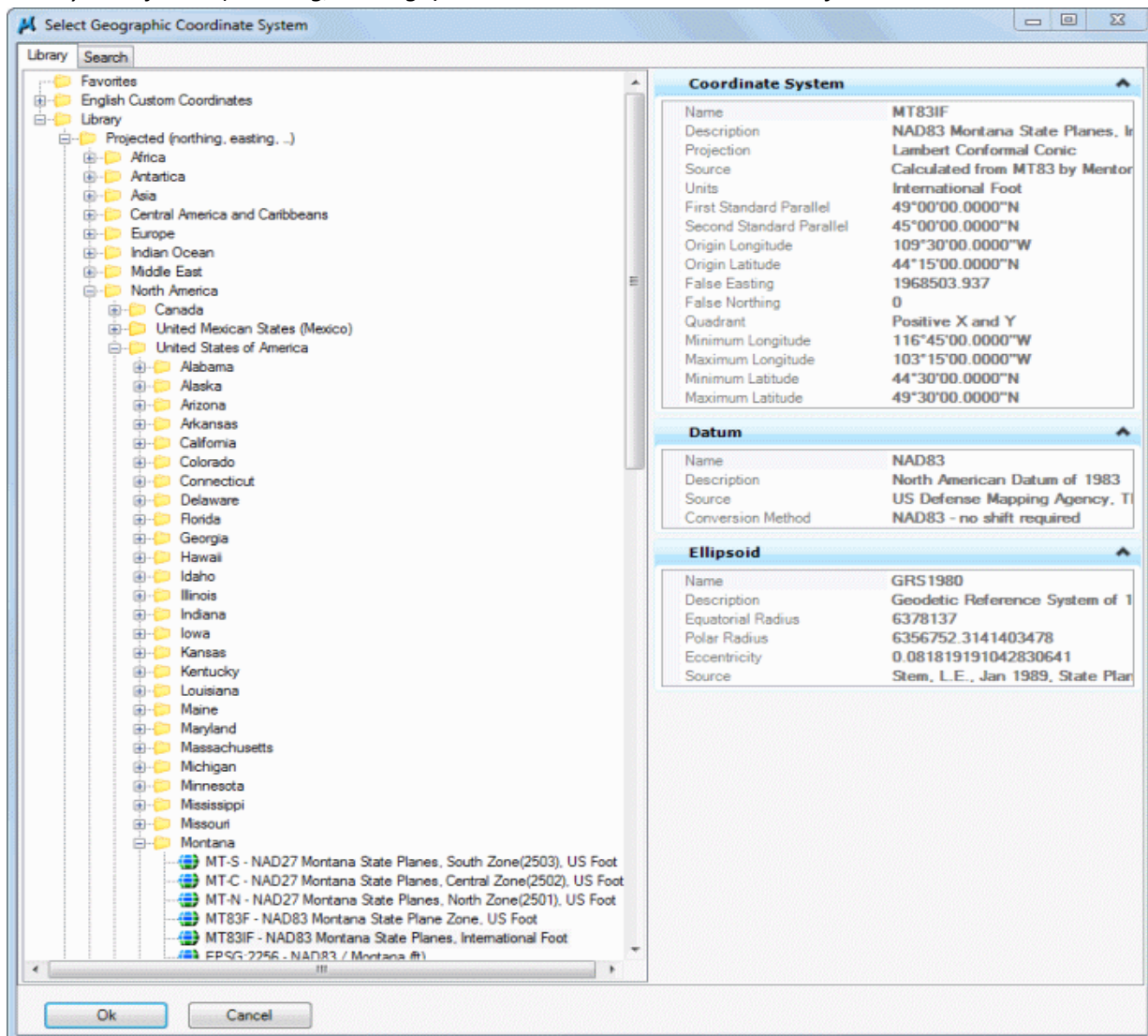


From Library

The **From Library** method involves choosing a GeoCS from a large library. **Consult the Survey and Mapping office to identify the proper GeoCS.**

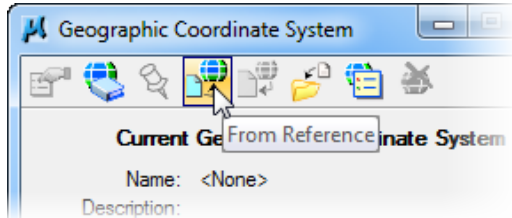


Below is an example of GeoCS list for the state of Montana. Generally, systems used will be from the *Library > Projected (northing, easting -) > North America > United States of America > State*.

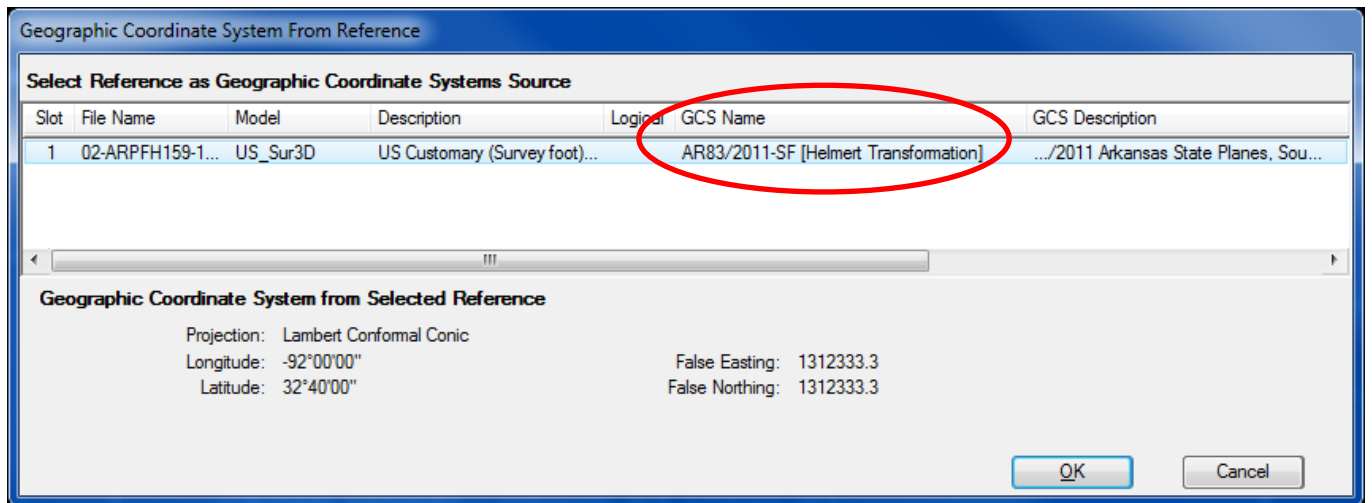


From Reference

The **From Reference** method is the **easiest and the preferred method**. This method allows the inheritance of a GeoCS from an attached reference file that has a GeoCS defined. The preferred source file is the PLM file produced by the Survey and Mapping Department. Inquire with Survey and Mapping to assess if a GeoCS has been assigned.

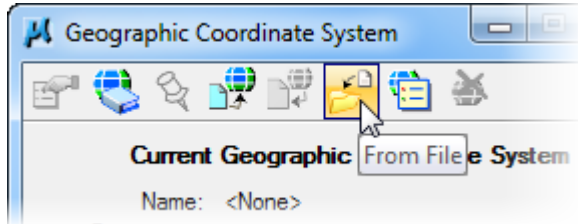


Next **select the reference file to inherit the GeoCS from**. Then select OK. Note the GeoCS has been assigned to the project PLM file.

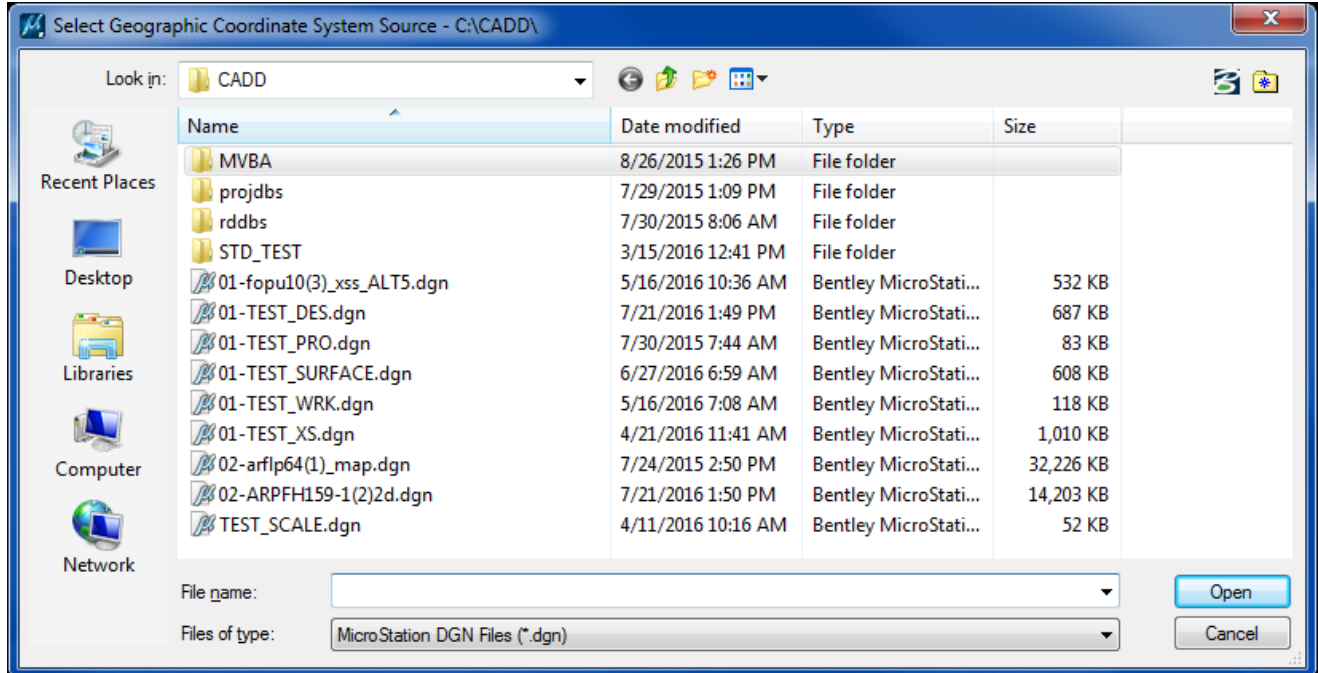


From File

The **From File** method functions much like the *From Reference* method. Using this method requires selecting a file using a standard select file menu. As a best practice **use the project PLM file**.

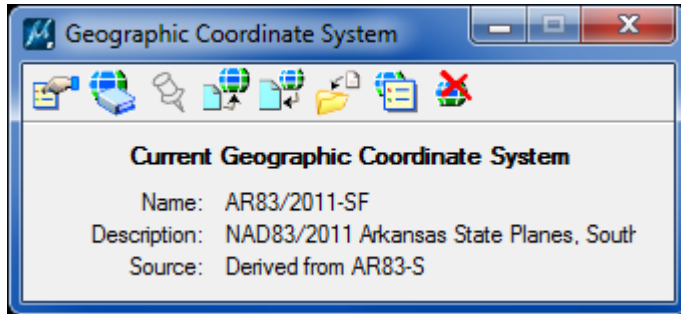


Select the appropriate file. Then Select Open. Inquire with Survey and Mapping to assess if a GeoCS has been assigned.

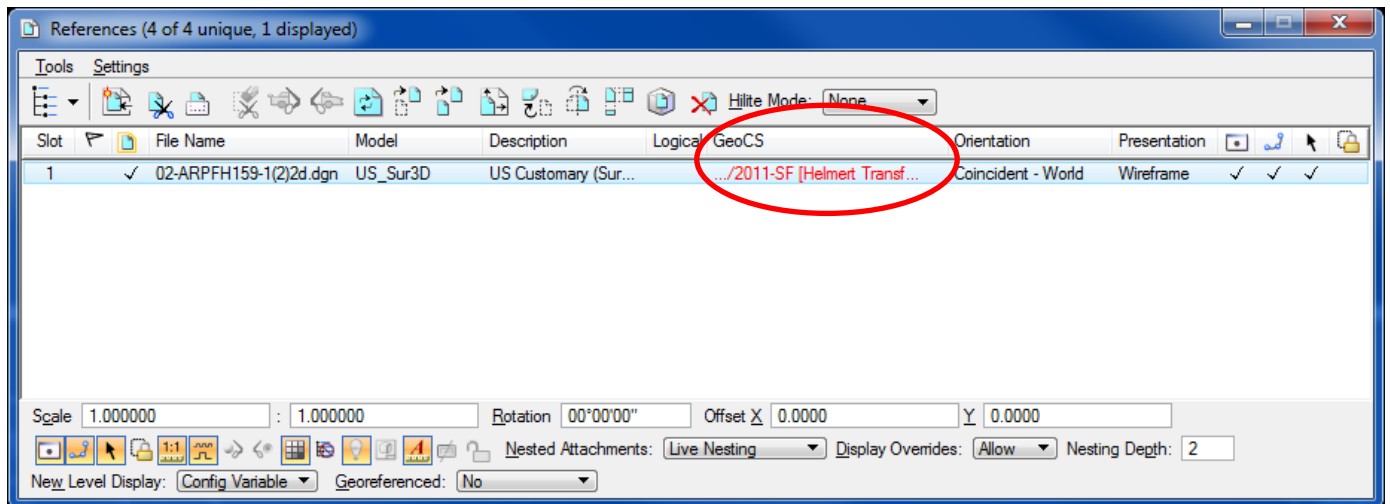


Verification

Once a GeoCS has been selected the Geographic Coordinate System menu should be populated and appear similar to the dialog below.



The Reference menu will show the GeoCS name if assigned. Note; if the GeoCS column is not listed, Right-click on a column heading and add it.



Google Earth Verification

Many users have Google Earth Pro installed. The Geographic Menu has Google Earth tools that can synchronize drawing locations in Google Earth and conversely, synchronize Google images in drawings.

Once the GeoCS has been assigned, **zoom into an area** that would be recognizable in an aerial view. Separately **open Google Earth Pro**. Then in MicroStation **select the Synchronize Google Earth View**. The Google Earth view should be updated to show the corresponding area in the drawing.



Now within your project parameters, **zoom to an area of interest in Google Earth Pro**. Use the **Follow Google Earth icon** to update your drawing view to correspond with the Google Earth view.



4.2 - Georeference Google Earth image into Microstation

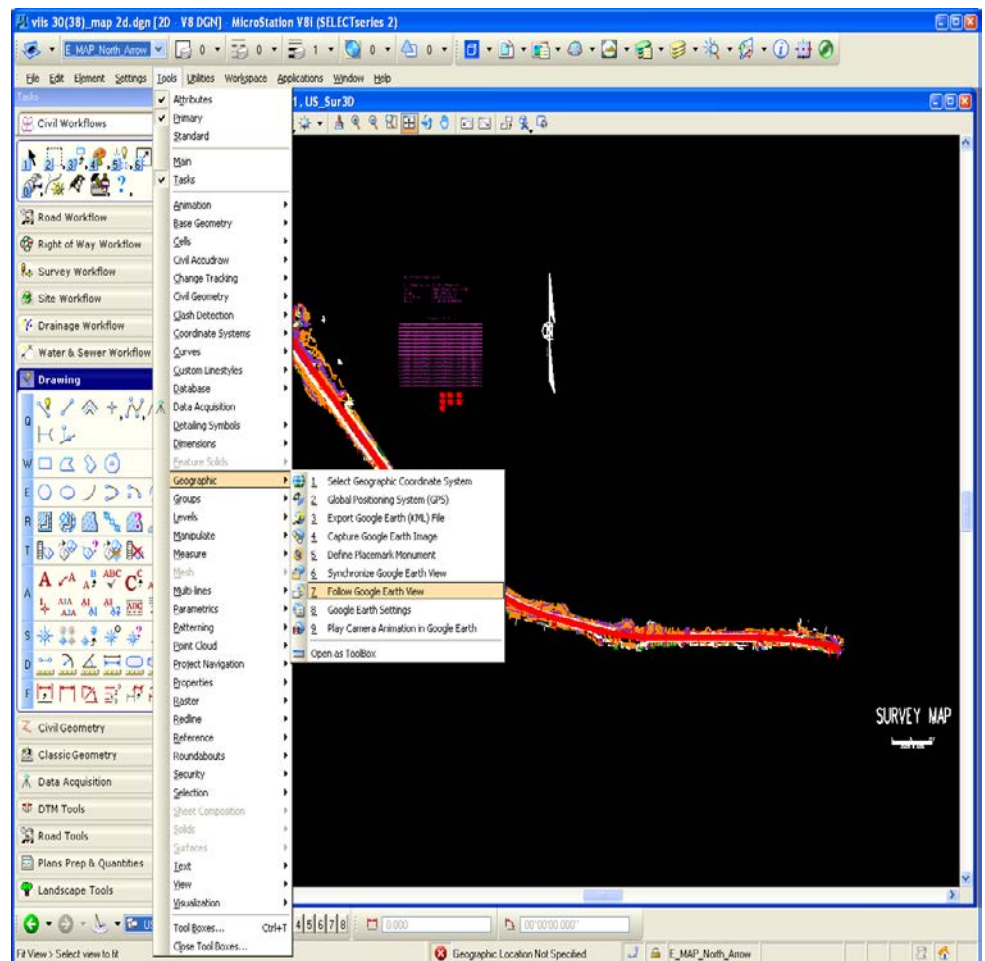
Georeferencing from Google was previously available only in Microstation GeoGraphics and Bentley Map.

Microstation V8i (SELECTseries 3) provides support for geographic coordinate system setup and on-the-fly reprojection of references in different coordinate systems. This geographic coordinate system support allows for easier integration with ArcView Shapefiles, Google Earth, and GPS devices.

Open the dgn file or model you want to reference the Google image into.

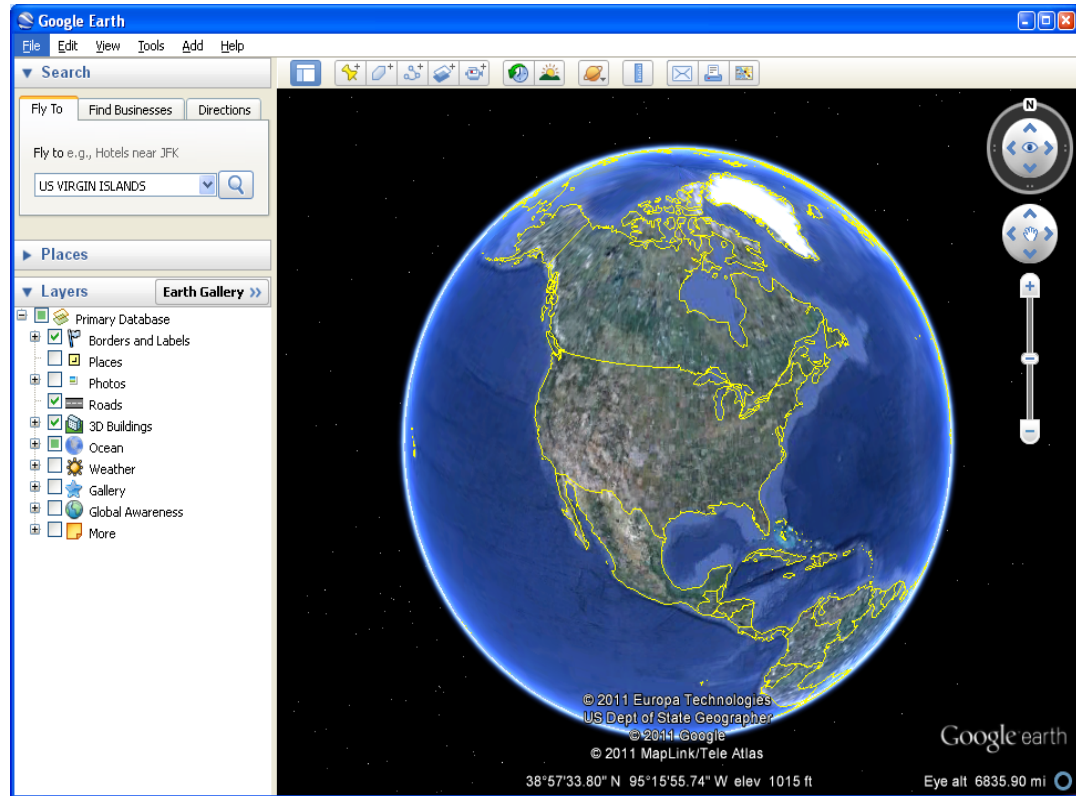
The dgn/model MUST be 3-D.

Start Google Earth by double-clicking the desktop shortcut (if you have one) or start it in the cadd file by navigating to **Tools > Geographic > Follow Google Earth View**.

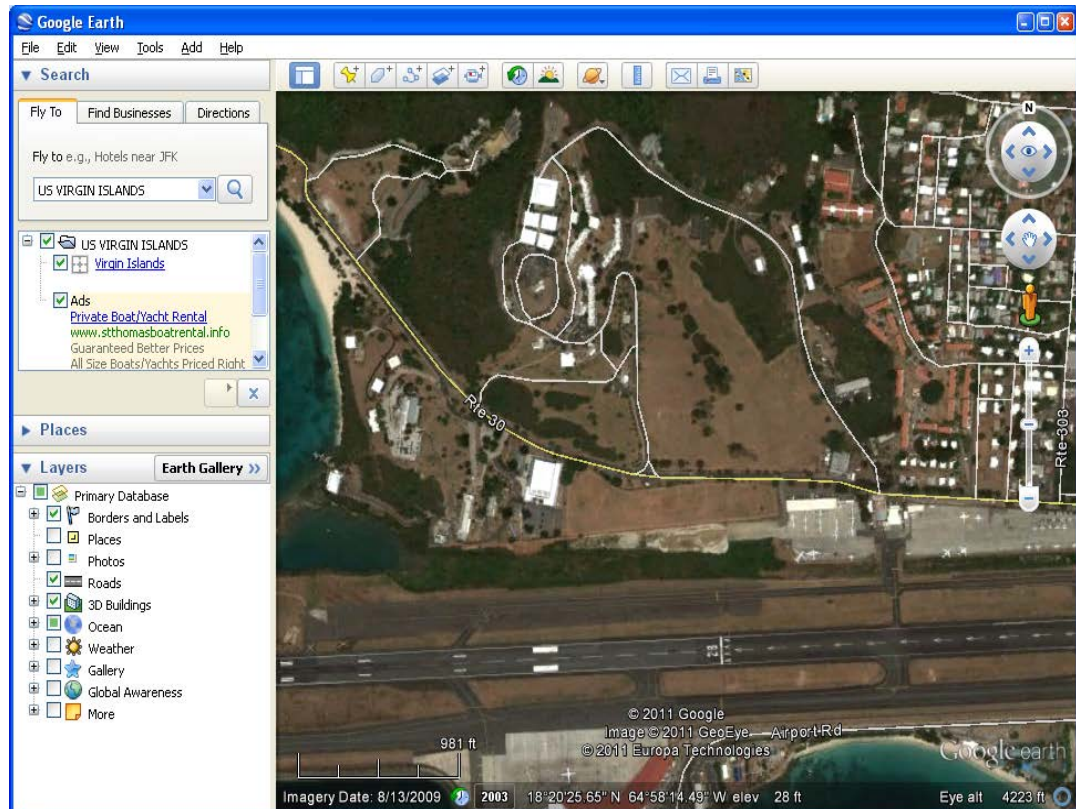


In Google Earth, “fly to” the general area of the image you want to capture.

Toggle on or off, the layers you want displayed in the image; Roads, Parks, Water Boundaries, Labels, etc.

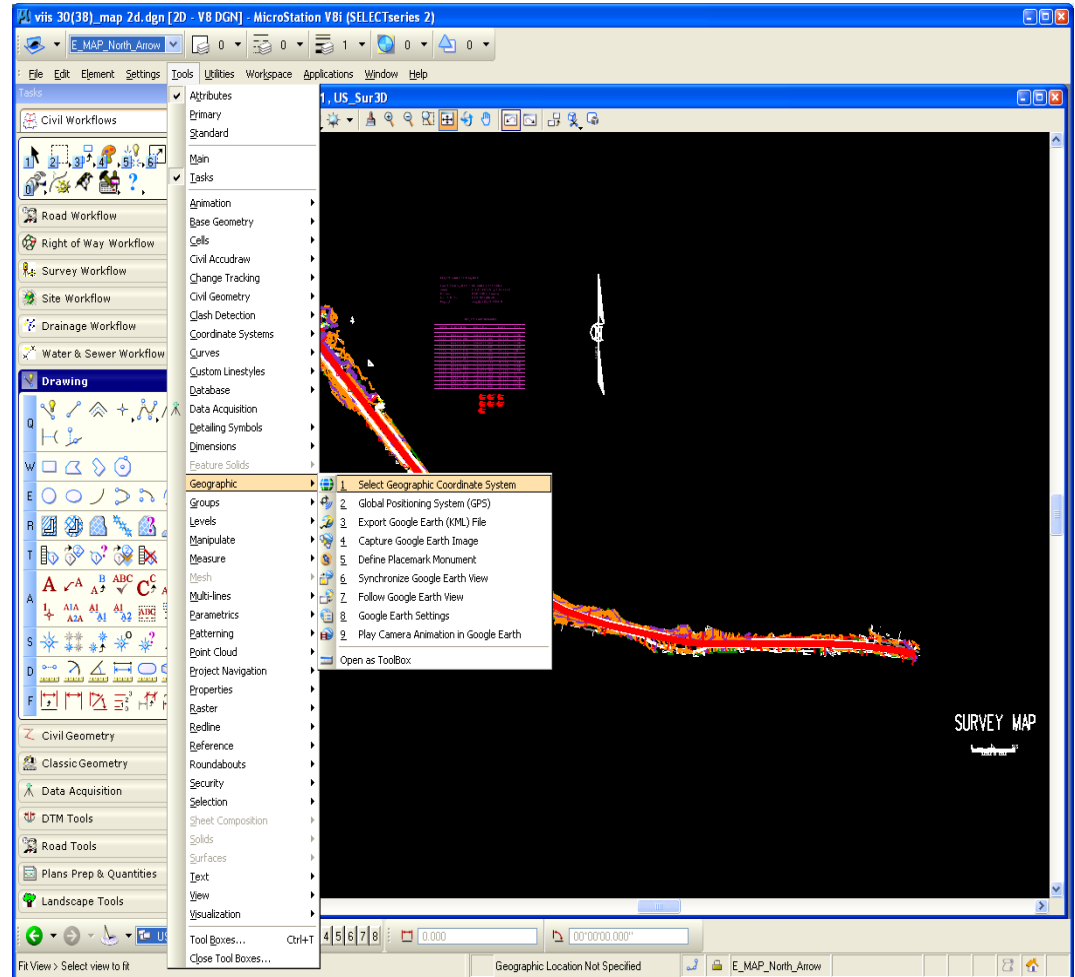


Zoom in or out as needed To fit the desired view area.



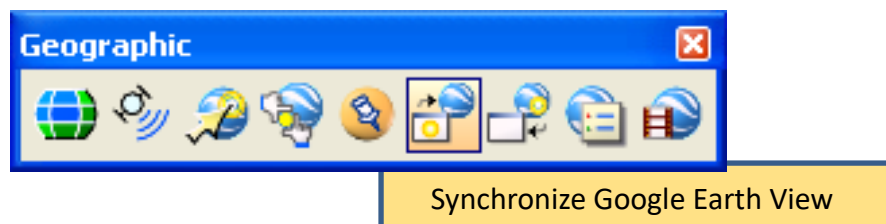
Back in Microstation, you will need to set the proper Geographic Coordinate System.

Go to **Tools > Geographic > Select Geographic Coordinate System**



Follow the steps above in Section 4.1 for selecting the Geographic Coordinate System.

To quickly check if you have selected the correct coordinate system, use the “**Synchronize Google Earth View**” tool;

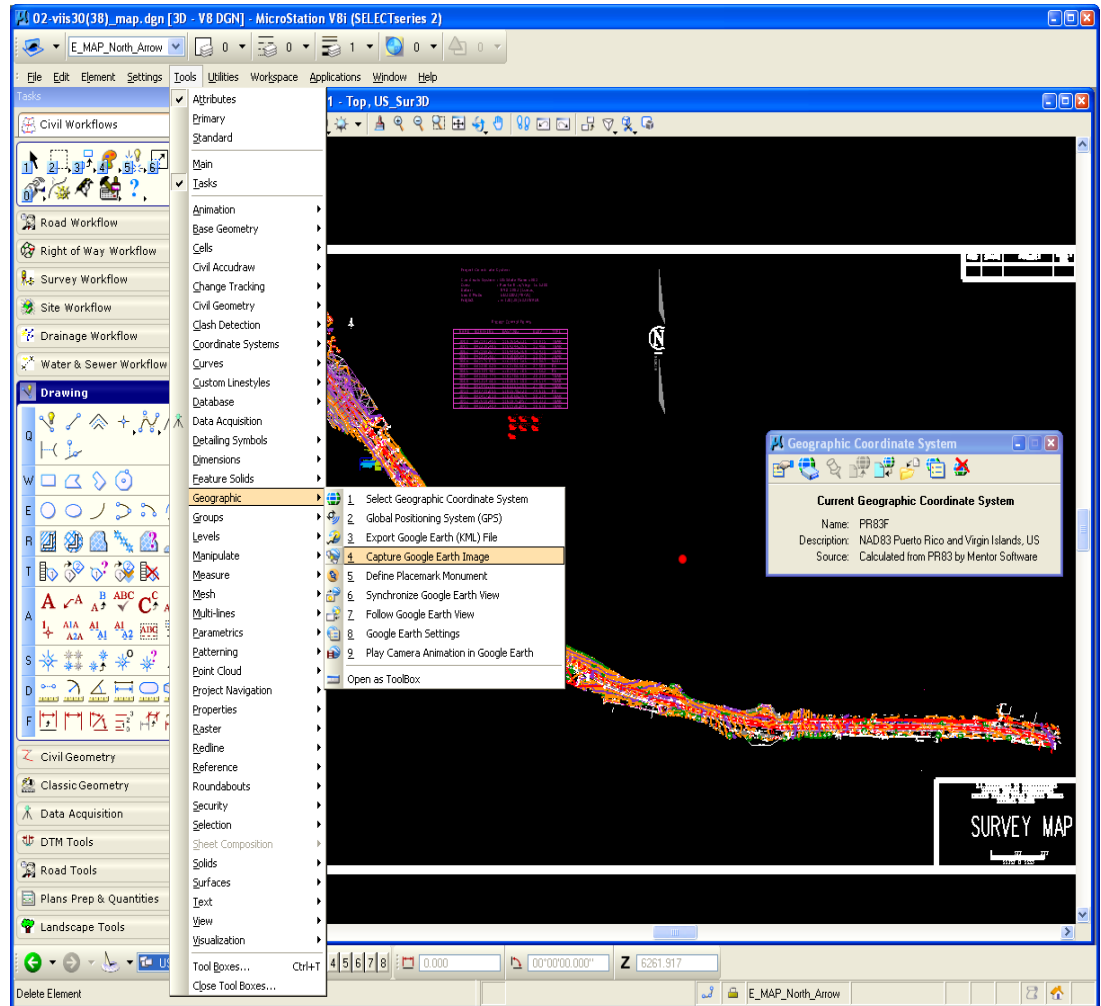


This tool uses the coordinate system you’ve selected along with the current view in Microstation and will then “fly to” the same location in Google Earth.

To import the image into your dgn file, Go to **Tools > Geographic > Capture Google Earth Image**.

The Microstation prompt (at the bottom of your cadd window) instructs you to “Enter datapoint to capture the current Google Earth view”

Datapoint in the view.

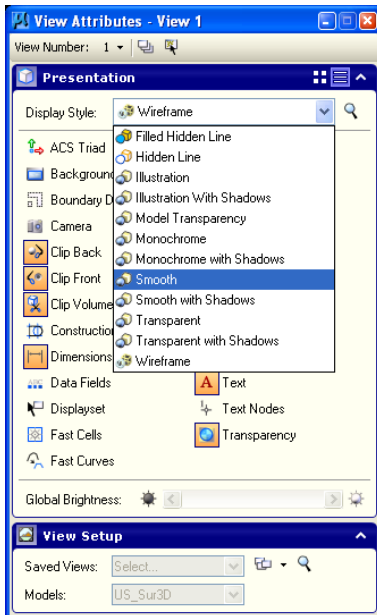
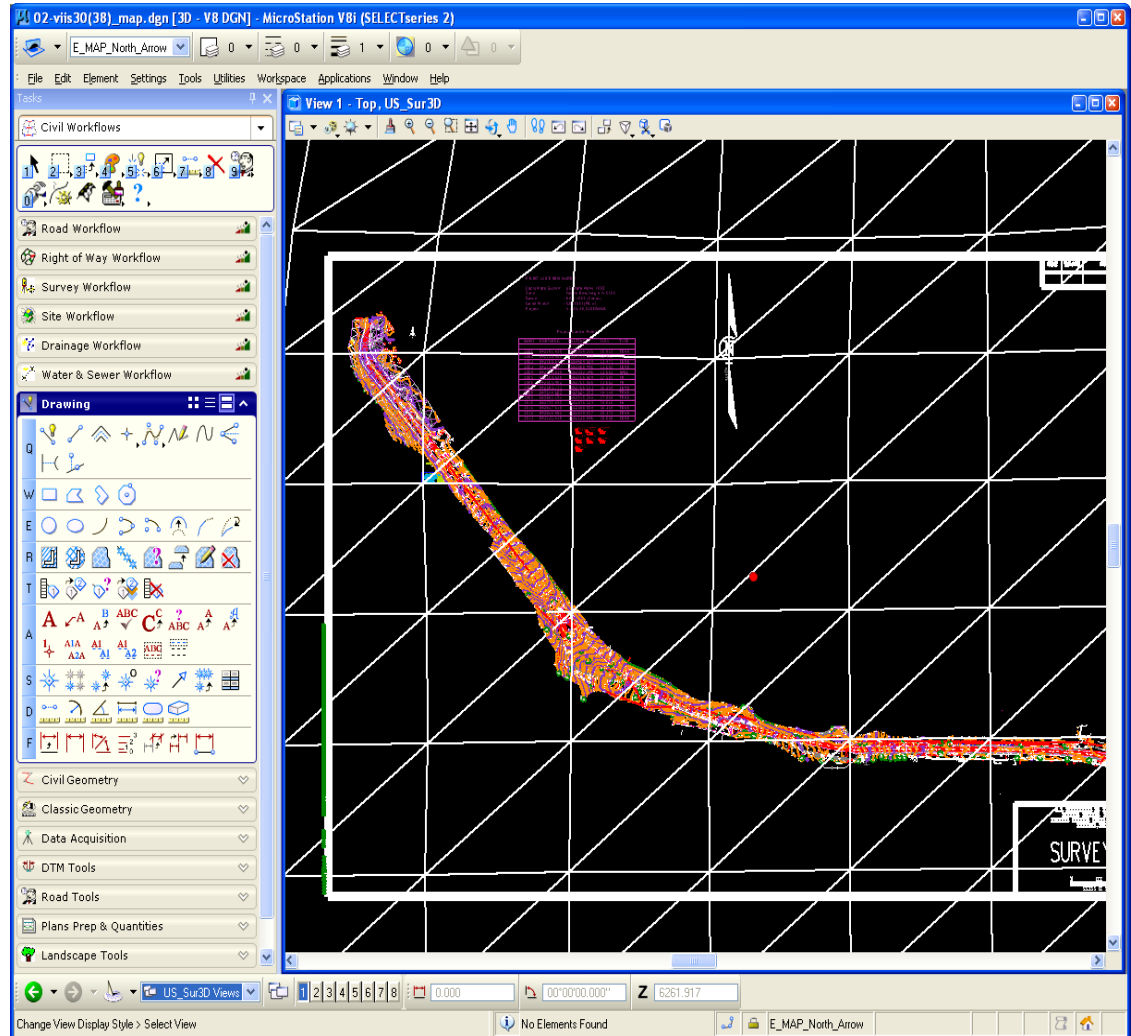


A grid will appear showing the limits of the Google Earth image.

(If the grid is not within the limits of the project, an incorrect coordinate system was probably used.)

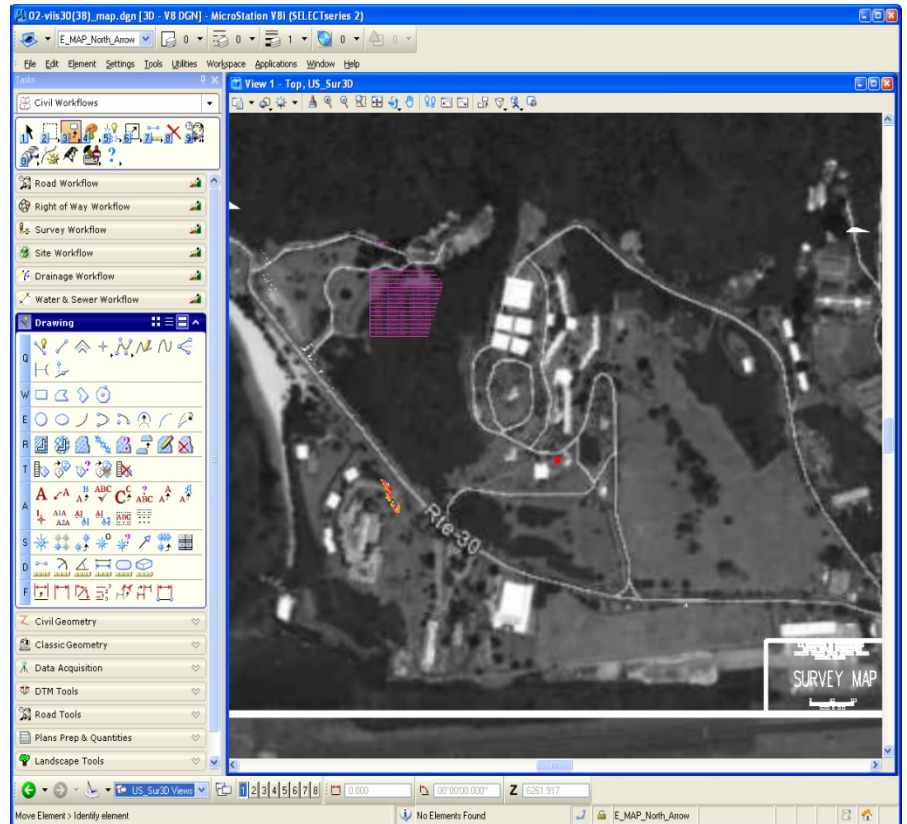
Go to **Settings > View Attributes**.

Open the Display Style drop down and select **SMOOTH**.



The Google image is now showing, georeferenced into the cadd file at the correct coordinates, scale, projection and rotation.

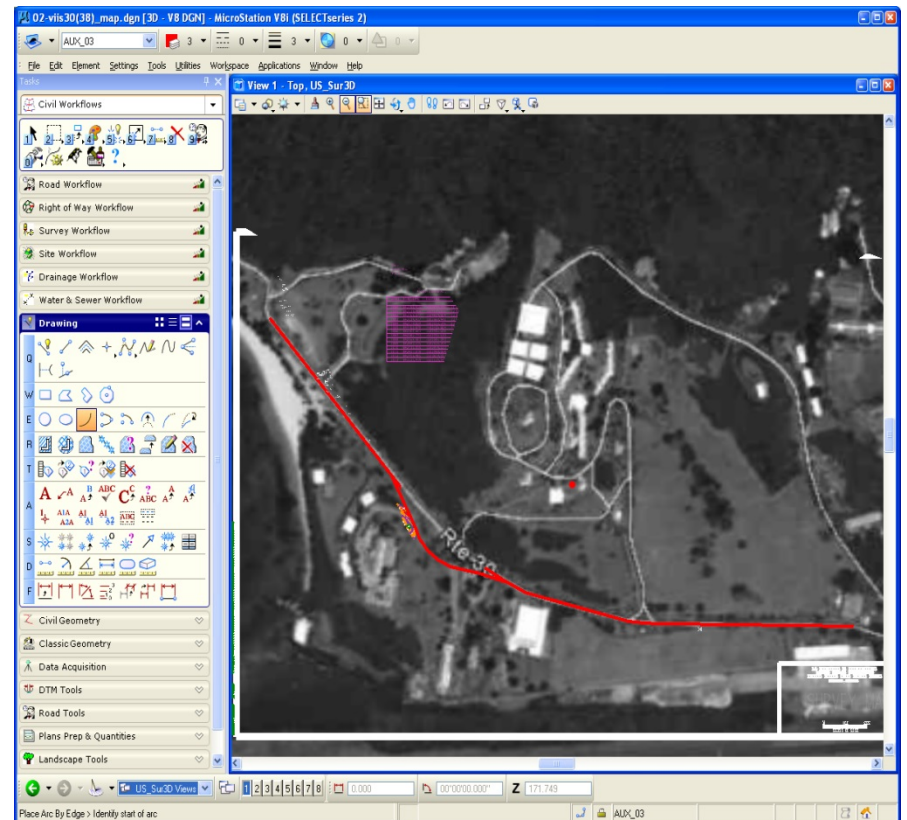
If your dgn/model had mapping or alignments active or referenced, the Google image may be on top of those elements. You may not be able to see them.



The reason you may not see your active dgn elements is that the 3D Google image you just referenced is at a HIGHER “Z” elevation than the active elements.

To correct this, fit the area in View 2 (the ISO view). You will see the grid in isometric view.

MOVE the grid to a lower elevation by using the AccuDraw Tool.



Select the grid with the MOVE command.

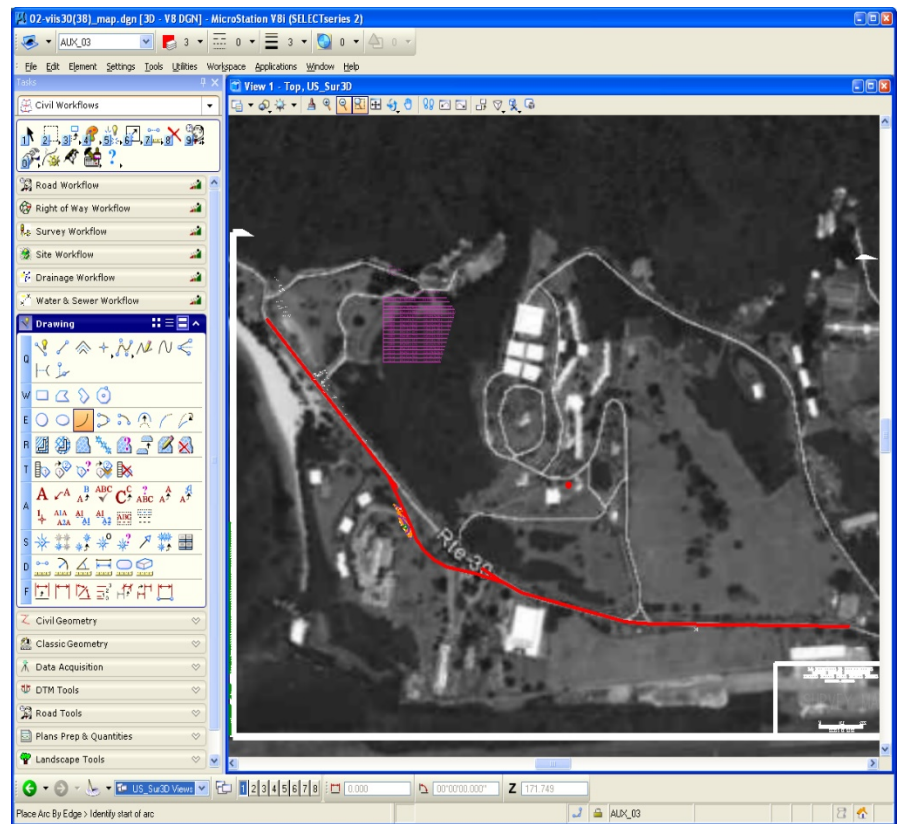
Hit “T” (for Top).

Enter value 0 in the X field, 0 in the Y field and -50 in the Z field.

This should move the referenced image BELOW your active elements.

WARNING:

Because of moving the image, you should not use the georeferenced image for identifying or labeling elevations.



4.3 – View Geotagged Photos in Google Earth

What is a geotagged photo?

A geotagged photo is a photo taken with a camera that has a GPS function that is turned on at the time the photo is taken, so that the geographic coordinates of the photo location are saved in the photo's data file.

To check whether a photo is geotagged, right-click on the photo name in Windows Explorer and select **Properties** from the drop-down menu. Click on the **Details** tab in the photo properties dialogue box that opens.

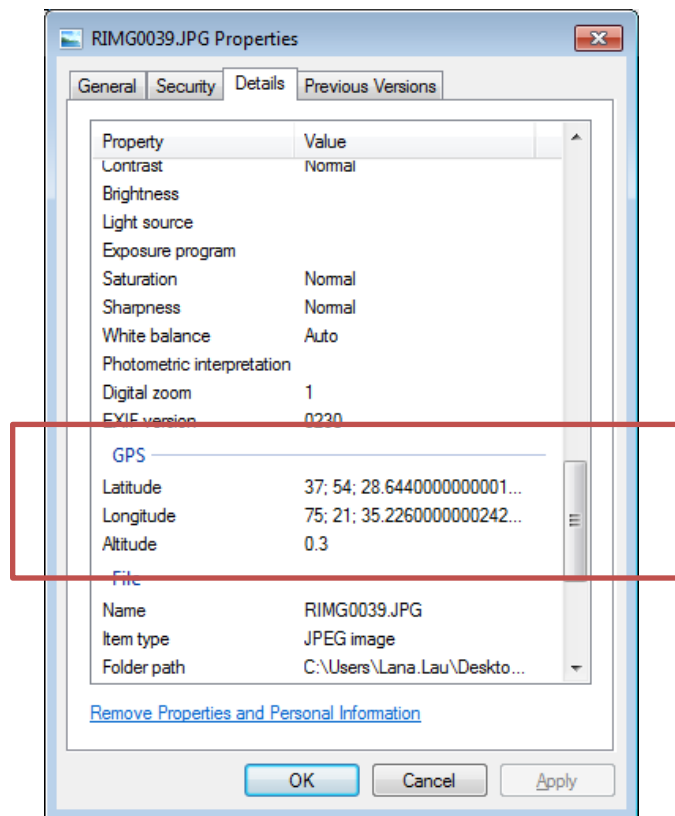


Figure A-1

When you scroll down through the available Detail information, if your photo has latitude and longitude information (Figure A-1), it is a geotagged photo and can be used to create a shapefile.

A. Create a Shapefile from Geotagged Photos

1. Open ArcMap (either create a new map, or use an existing map).
2. Make sure that ArcCatalog has a connection to the folder where you saved the photos. To create a new folder connection, click on the icon at the top of the Catalog window that looks like a yellow folder with a plus sign (where the red arrow is pointing in Figure B-1).

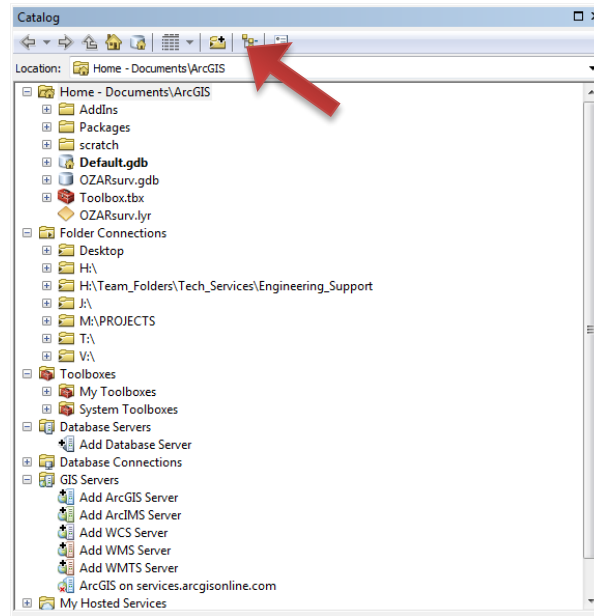


Figure B-1

Navigate to the folder you want to connect to and click on it (the folder's file path appears in the Folder entry box). Click OK. (Figure B-2)

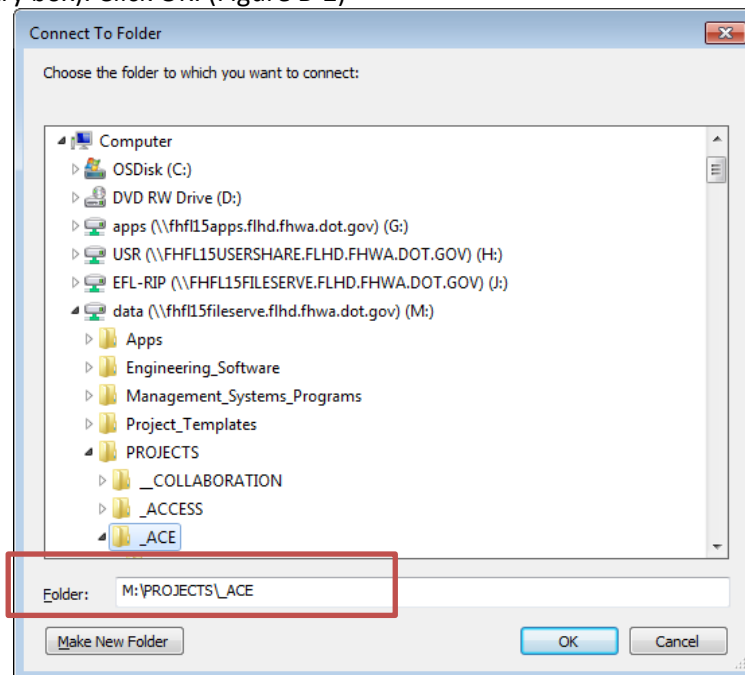


Figure B-2

3. Open the **GeoTagged Photos to Points** tool in ArcToolbox by navigating to the tool in Data Management Tools → Photos, and double-clicking on the tool (Figure B-3).

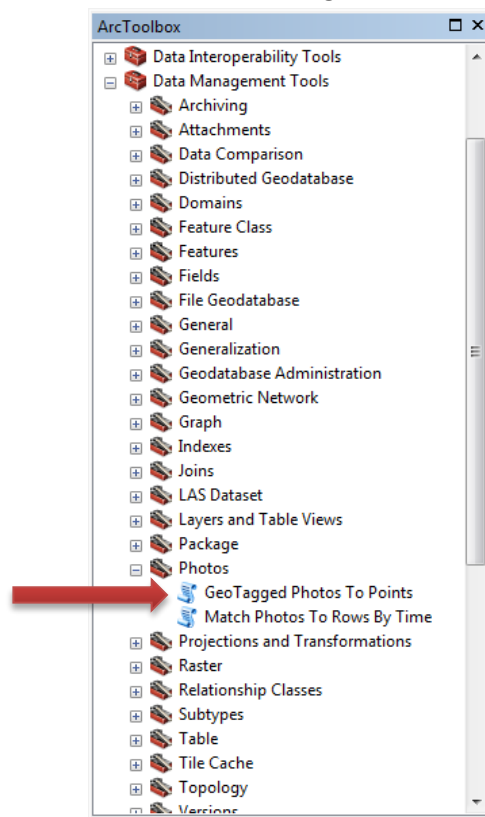


Figure B-3

Click on the folder icon next to the Input Folder entry box (Figure B-4) and navigate to the folder where your geotagged photos are saved. Click once on the folder so that the folder name appears in the Name box, and click Add (Figure B-5).

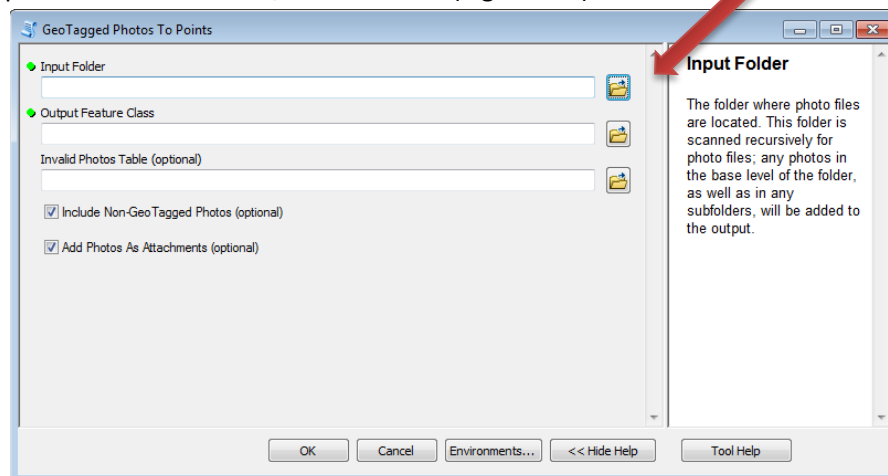


Figure B-4

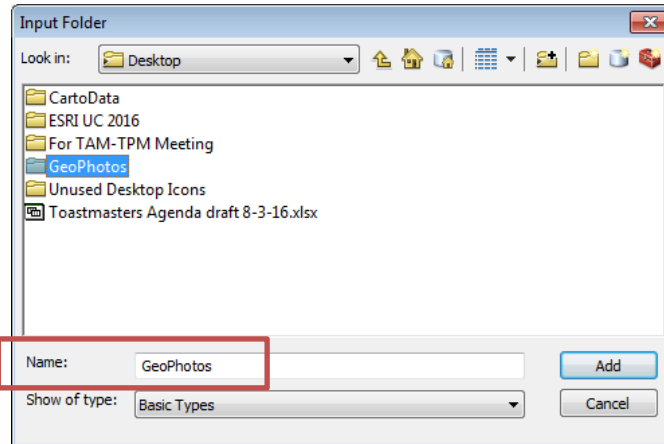


Figure B-5

For the Output Feature Class entry box, select the folder where you want your new shapefile to be saved, and enter a name for your shapefile (Figure B-6). Click Save.

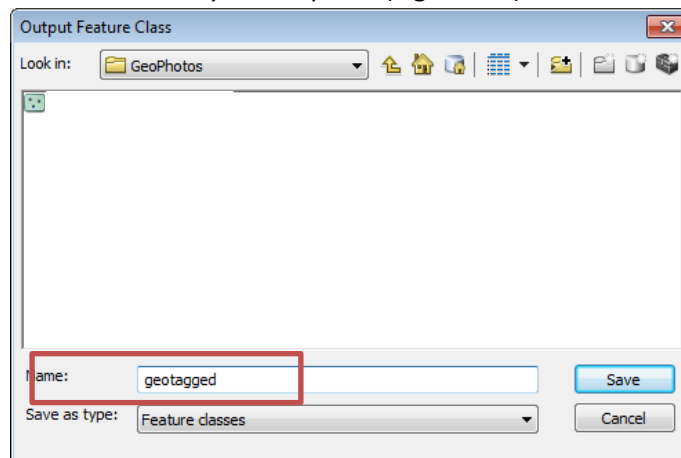


Figure B-6

In the GeoTagged Photos to Points dialog box, decide whether you want to include non-geo tagged photos in your shapefile, and check/uncheck the box accordingly (Figure B-7). Click OK to run the tool.

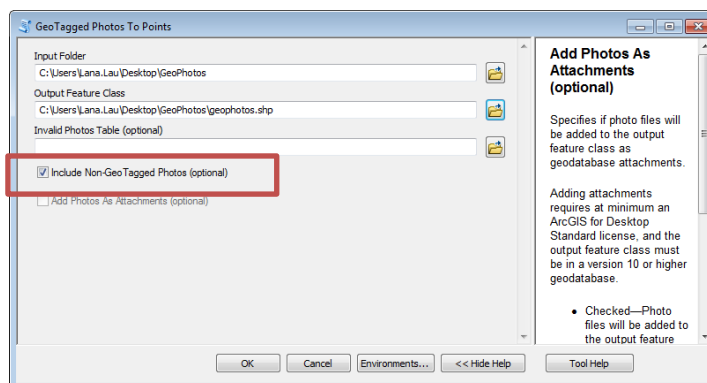


Figure B-7

When the tool finishes processing, your new shapefile should have been added to your map in the Table of Contents, and you will see some points on your map (Figure B-8).

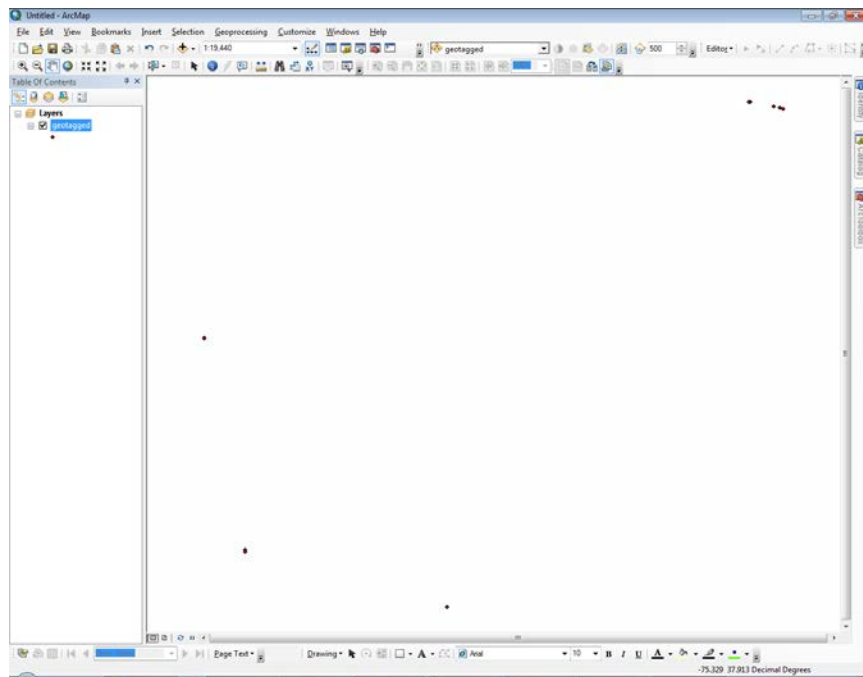


Figure B-8

4. You can add a basemap layer to check that your photos have been placed in the correct locations.

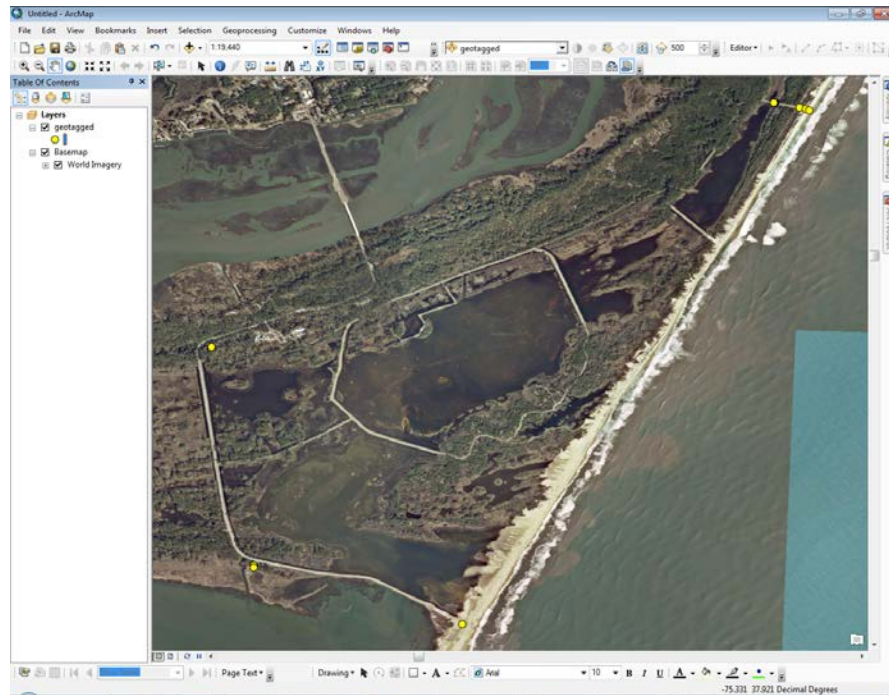


Figure B-9

5. Add new fields (columns) in the attribute table for latitude and longitude information, and photo description (optional). Open the attribute table by right-clicking on the shapefile name in the Table of Contents and selecting Open Attribute Table from the drop-down menu. Click on the icon located in the top left of the attribute table, and select Add Field... from the drop-down menu (figure B-10).

FID	Shape	Path	Name	DateTime	Direction	LatDD	LongDD	Descr
0	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0039.JPG	RIMG0039.JPG	2016-03-01 16:02:33	194.1	37.908	-75.3598	Pool location with trees
1	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0040.JPG	RIMG0040.JPG	2016-03-01 16:02:44	30.79	37.8894	-75.3431	Sandy beach where FWS is con
2	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0041.JPG	RIMG0041.JPG	2016-03-01 16:14:11	142.75	37.8934	-75.357	
3	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0042.JPG	RIMG0042.JPG	2016-03-01 16:14:18	197.39	37.8934	-75.357	
4	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0043.JPG	RIMG0043.JPG	2016-03-01 16:15:14	250.63	37.8932	-75.357	
5	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0044.JPG	RIMG0044.JPG	2016-03-01 16:15:18	280.55	37.8932	-75.357	
6	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0045.JPG	RIMG0045.JPG	2016-03-01 16:15:32	205.73	37.8932	-75.357	
7	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0046.JPG	RIMG0046.JPG	2016-03-01 16:17:15	224.87	37.8932	-75.357	
8	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0047.JPG	RIMG0047.JPG	2016-03-01 16:25:09	269.87	37.8932	-75.357	
9	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0048.JPG	RIMG0048.JPG	2016-03-01 16:25:17	269.33	37.8932	-75.357	
10	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0049.JPG	RIMG0049.JPG	2016-03-01 16:25:31	176.31	37.8932	-75.357	
11	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0050.JPG	RIMG0050.JPG	2016-03-01 16:25:43	262.99	37.8932	-75.357	
12	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0051.JPG	RIMG0051.JPG	2016-03-01 16:25:50	182.26	37.8932	-75.357	
13	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0052.JPG	RIMG0052.JPG	2016-03-01 16:53:00	227.83	37.9242	-75.3222	
14	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0053.JPG	RIMG0053.JPG	2016-03-01 16:53:05	129.59	37.9242	-75.3222	
15	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0054.JPG	RIMG0054.JPG	2016-03-01 16:53:14	239.33	37.9242	-75.3222	
16	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0055.JPG	RIMG0055.JPG	2016-03-01 16:53:25	344.33	37.9242	-75.3222	
17	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0056.JPG	RIMG0056.JPG	2016-03-01 16:53:31	205.33	37.9242	-75.3222	
18	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0057.JPG	RIMG0057.JPG	2016-03-01 16:56:01	161.68	37.9242	-75.3222	
19	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0058.JPG	RIMG0058.JPG	2016-03-01 16:56:36	246.31	37.9239	-75.3205	
20	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0059.JPG	RIMG0059.JPG	2016-03-01 16:56:58	193.97	37.9239	-75.3205	
21	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0060.JPG	RIMG0060.JPG	2016-03-01 16:57:02	121.71	37.9239	-75.3205	
22	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0061.JPG	RIMG0061.JPG	2016-03-01 16:57:15	147.71	37.9238	-75.3201	
23	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0062.JPG	RIMG0062.JPG	2016-03-01 16:58:34	205.61	37.9238	-75.3201	
24	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0063.JPG	RIMG0063.JPG	2016-03-01 16:58:42	214.98	37.9237	-75.3199	
25	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0064.JPG	RIMG0064.JPG	2016-03-01 16:58:48	193.98	37.9237	-75.3199	
26	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0065.JPG	RIMG0065.JPG	2016-03-01 16:58:52	221.36	37.9237	-75.3199	
27	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0066.JPG	RIMG0066.JPG	2016-03-01 17:07:58	206.57	37.9242	-75.3223	
28	Point ZM	C:\Users\Lana.Lau\Desktop\GeoPhotos\RIMG0067.JPG	RIMG0067.JPG	2016-03-01 17:08:06	206.53	37.9242	-75.3223	

Figure B-10

Enter LatDD for the field Name (for latitude in decimal degrees) and select the Type: Float (Figure B-11). Click OK. [N.B. Do not use spaces in the field names. You may use underscores.]

Figure B-11

Repeat for the LongDD field (longitude in decimal degrees). For the Description field, enter **Descr** for the field Name, and select the Type: Text. You must enter in the maximum number of characters that will be allowed in the Description field (e.g. 100 characters). This cannot be changed once the

field is created, but a larger number will increase the amount of disk space your shapefile will occupy. Therefore, carefully consider what is most appropriate for the character limit (Figure B-12).

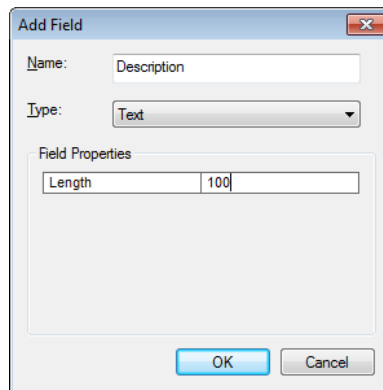


Figure B-12

6. Use ArcMap to **populate the latitude/longitude information in the attribute table**. ArcMap knows the lat/long of your pictures, since it has accurately placed them on the map. However, you need to direct ArcMap to “calculate” these values to fill in the attribute table.

Right-click on the latitude column header, LatDD, and select Calculate Geometry from the drop-down menu. You will receive a reminder that you are about to calculate outside an edit session. Click Yes. Make sure that the Property is set to “Y Coordinate of Point” (since you are calculating the latitude). The units will be in decimal degrees because of the coordinate system from the GPS camera (Figure B-13). Click OK. The LatDD column will be filled with the latitude information. Repeat these steps for the LongDD field, making sure that the Property is set to “X Coordinate of Point.”

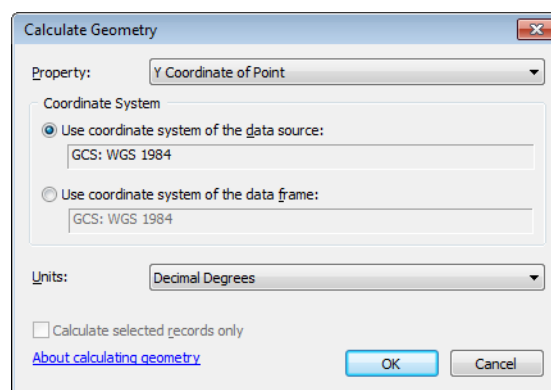


Figure B-13

7. **Enter photo description information.** To add photo description information to the attribute table, you must start an edit session. Right click on the shapefile name in the Table of Contents and move your cursor down to Edit Features, then select Start Editing.

If the Editor toolbar does not appear automatically, click on the Customize menu at the top of the ArcMap window and place your cursor over Toolbars. If the Editor toolbar is unchecked, click to check it. The Editor toolbar will appear (Figure B-14).



Figure B-14

Now you can edit information in your attribute table. Double-click on any row in the Description column, and a cursor will appear indicating that you can enter information.

Once you have completed all your edits, click on the Editor dropdown menu in the Editor toolbar, and select Stop Editing. If you have unsaved edits, the program will prompt you by asking whether you would like to save your edits. Click either Yes or No to stop editing.

1. The Identify tool (Figure B-15) can be used to see the attribute information for any point (photo location). Click on the Identify tool to activate it (Figure B-15).

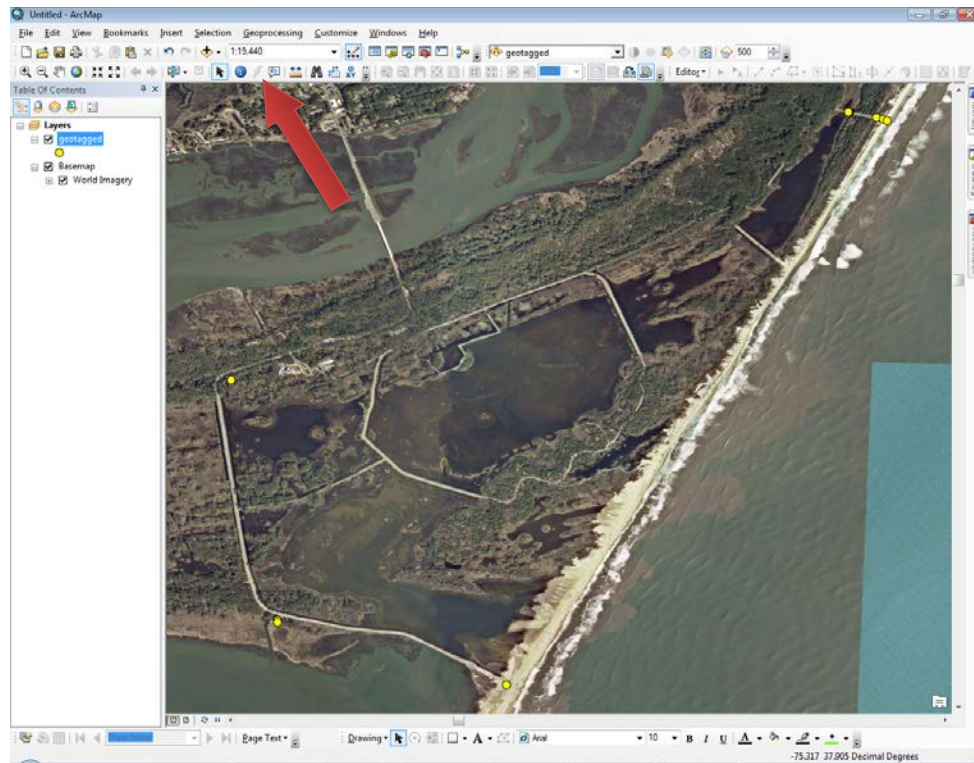


Figure B-15

The Identify window will open, containing attribute information for the point you clicked on (Figure B-16).

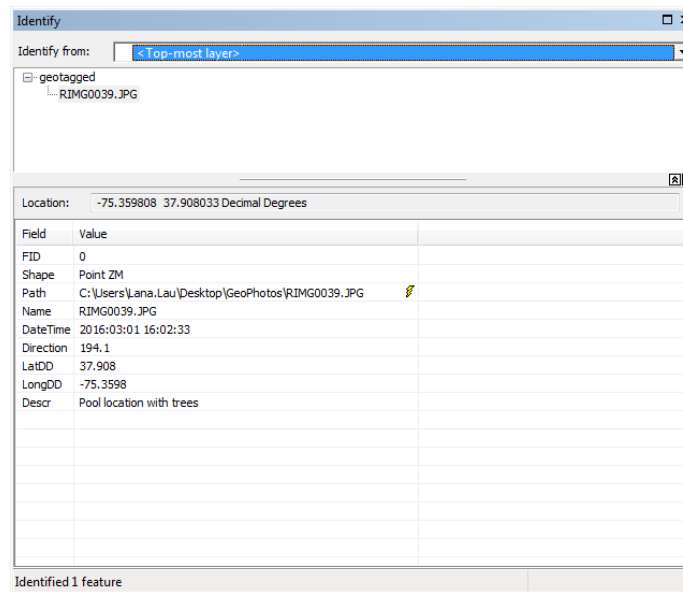


Figure B-16

C. **Creating a KMZ for Display in GoogleEarth**

1. Locate the **Layer to KML** tool in ArcToolbox → Conversion Tools → To KML → Layer to KML. Double-click on the tool to open the dialogue box. Select your shapefile (with the photo locations) from the Layer dropdown menu (or navigate to its location by clicking on the folder icon). (Figure C-1)

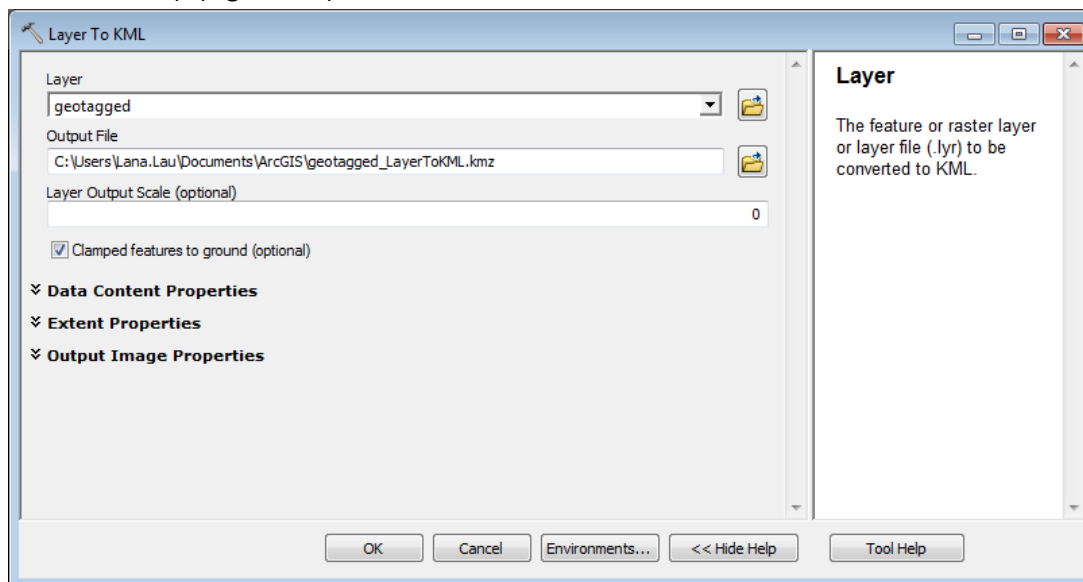
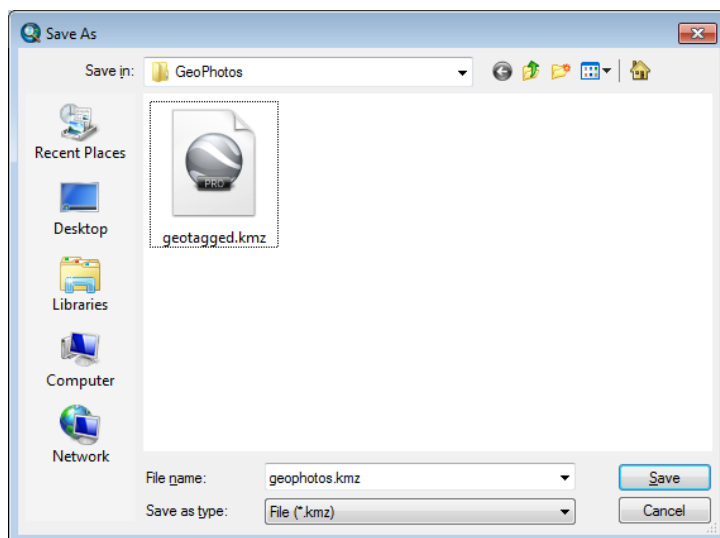


Figure C-1

2. Click on the folder icon next to the Output File entry box and navigate to the folder location where you would like to save your KMZ. Enter a name for your KMZ file into the file name box (Figure C-2). Click Save.



3. In Windows Explorer, navigate to the folder where you saved the KMZ file. Double-click the KMZ file to launch GoogleEarth. Your photo locations will be shown as points. If you click on one of the points, a pop-up window will open containing the same information that was in the attribute table (Figure C-3).

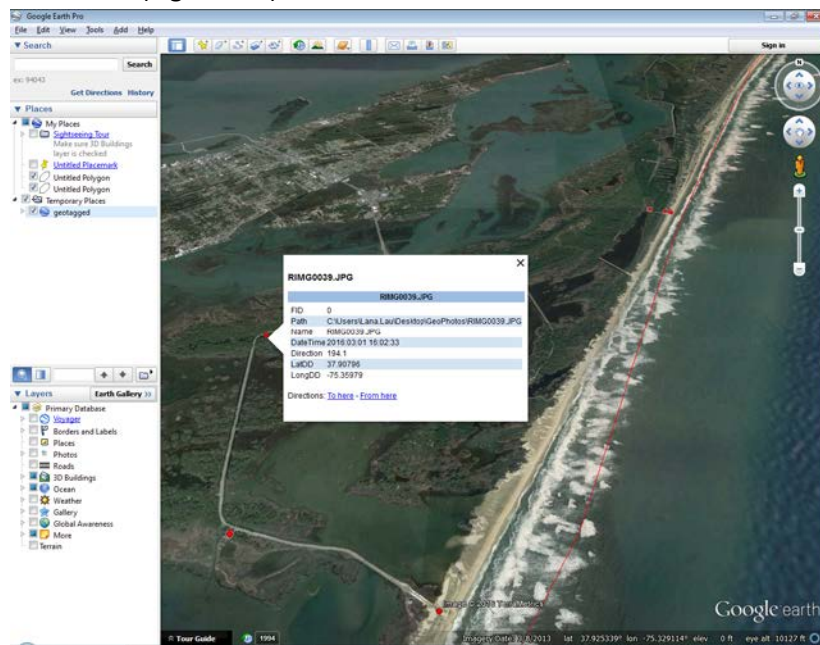


Figure C-3

It is possible to create a KMZ so that the **photo** appears in the GoogleEarth pop-up window when you click on a point. As this process is considerably more complicated, please contact Engineering Support for assistance if you would like to do that.

4.4 – Visualize the Horizontal Alignment (Chain) in Google Earth

Follow these steps to georeference the centerline chain in GoogleEarth;

In the Microstation design file that has the alignment centerline, set/verify that there is a geographic coordinate system (GCS) assigned to the drawing.

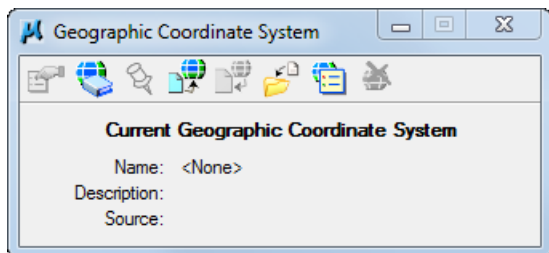
In the CADD file, go to **File > Geographic > Open as ToolBox**. The **Geographic** menu appears.

Select the globe icon to Select Geographic Coordinate System.



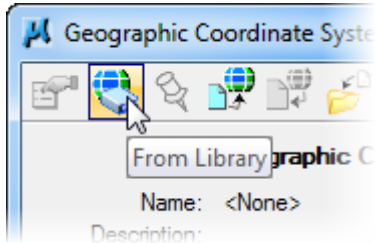
The **Geographic Coordinate System** menu appears. Note the dialog below shows that a GCS has not been assigned. There are several methods to select a GCS. The following three are described below:

- [From Library](#)
- [From Reference](#)
- [From File](#)

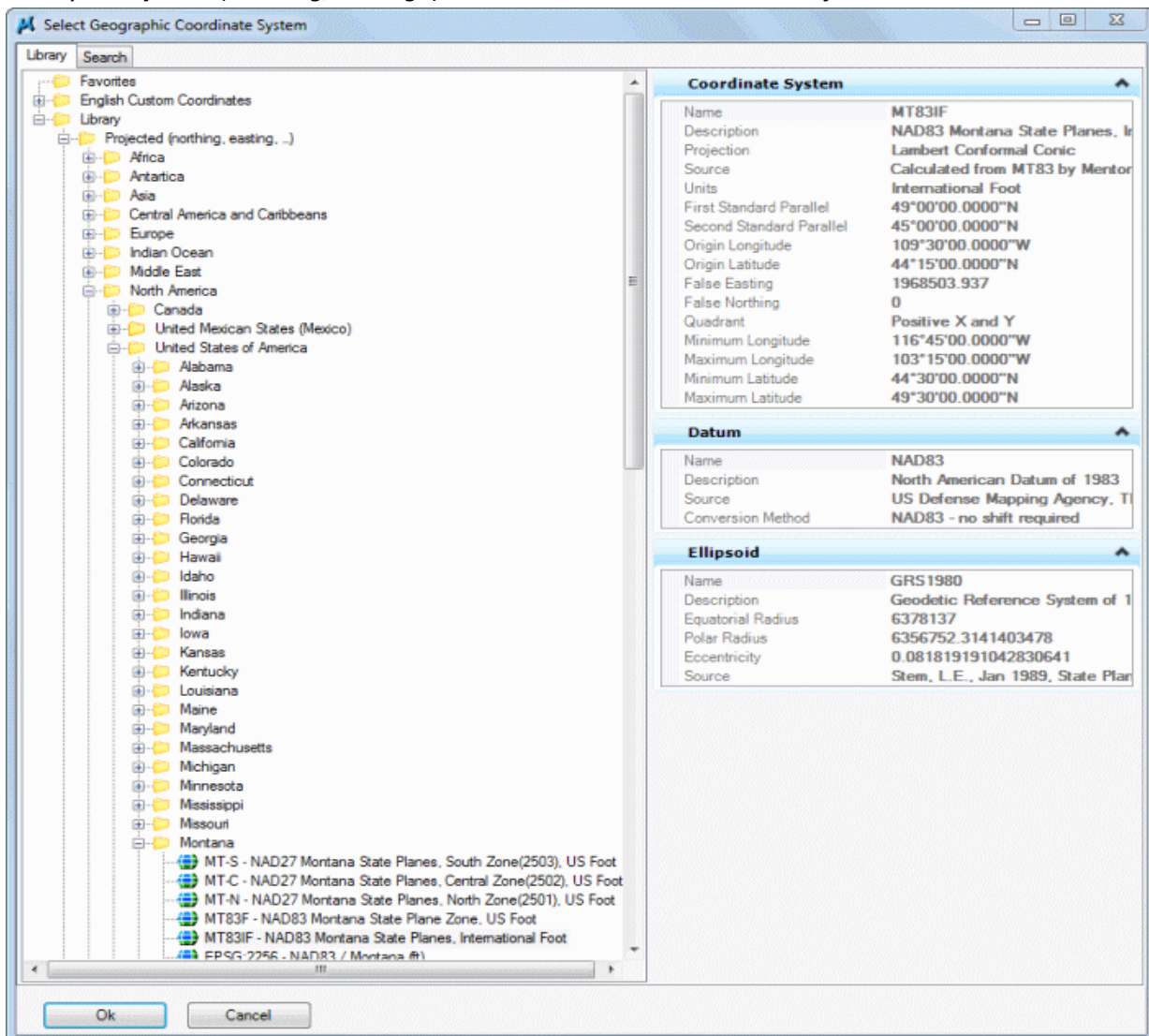


From Library;

The **From Library** method involves choosing a GCS from a large library. **Consult the Survey and Mapping office or the delivered mapping .dgn to identify the proper GCS.**



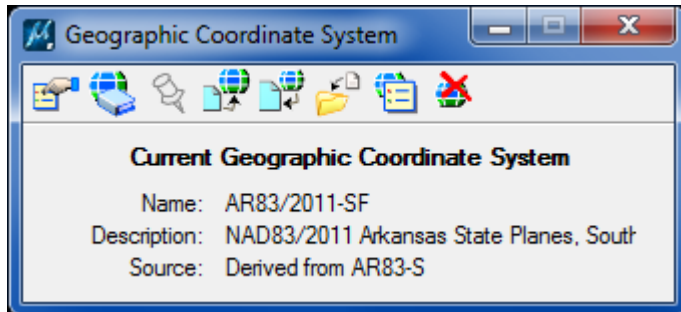
Below is an example of GCS list for the state of Montana. Generally, systems used will be from the *Library > Projected (northing, easting -) > North America > United States of America > State.*



Hit OK.

Verification

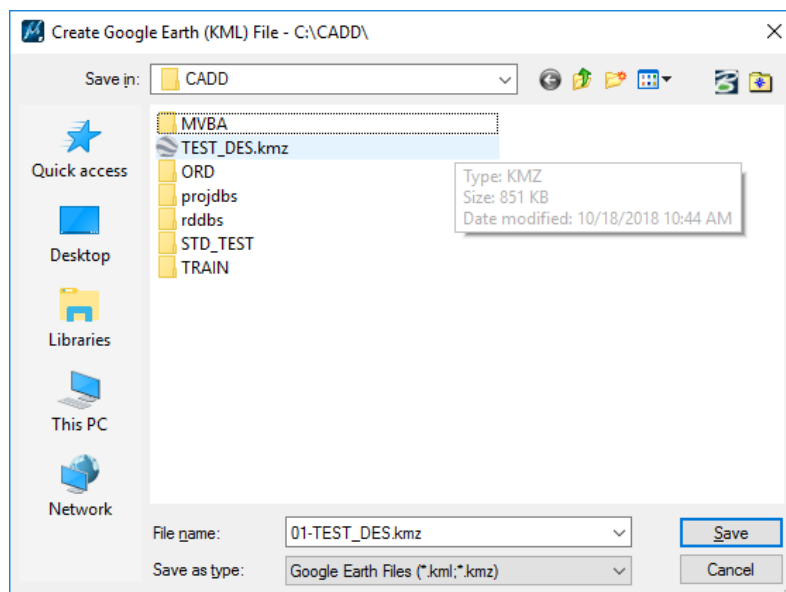
Once a GCS has been selected, the Geographic Coordinate System menu should be populated and appear similar to the dialog below.



Now, fit the alignment centerline in the Microstation view.

Turn off any Reference File display and/or Levels of any elements you do not want shown in GoogleEarth.

Go to File > Export > GoogleEarth > Navigate to the destination path for the .kmzr.



Hit Save and GoogleEarth is opened and it zooms to the coordinates of the design file.

