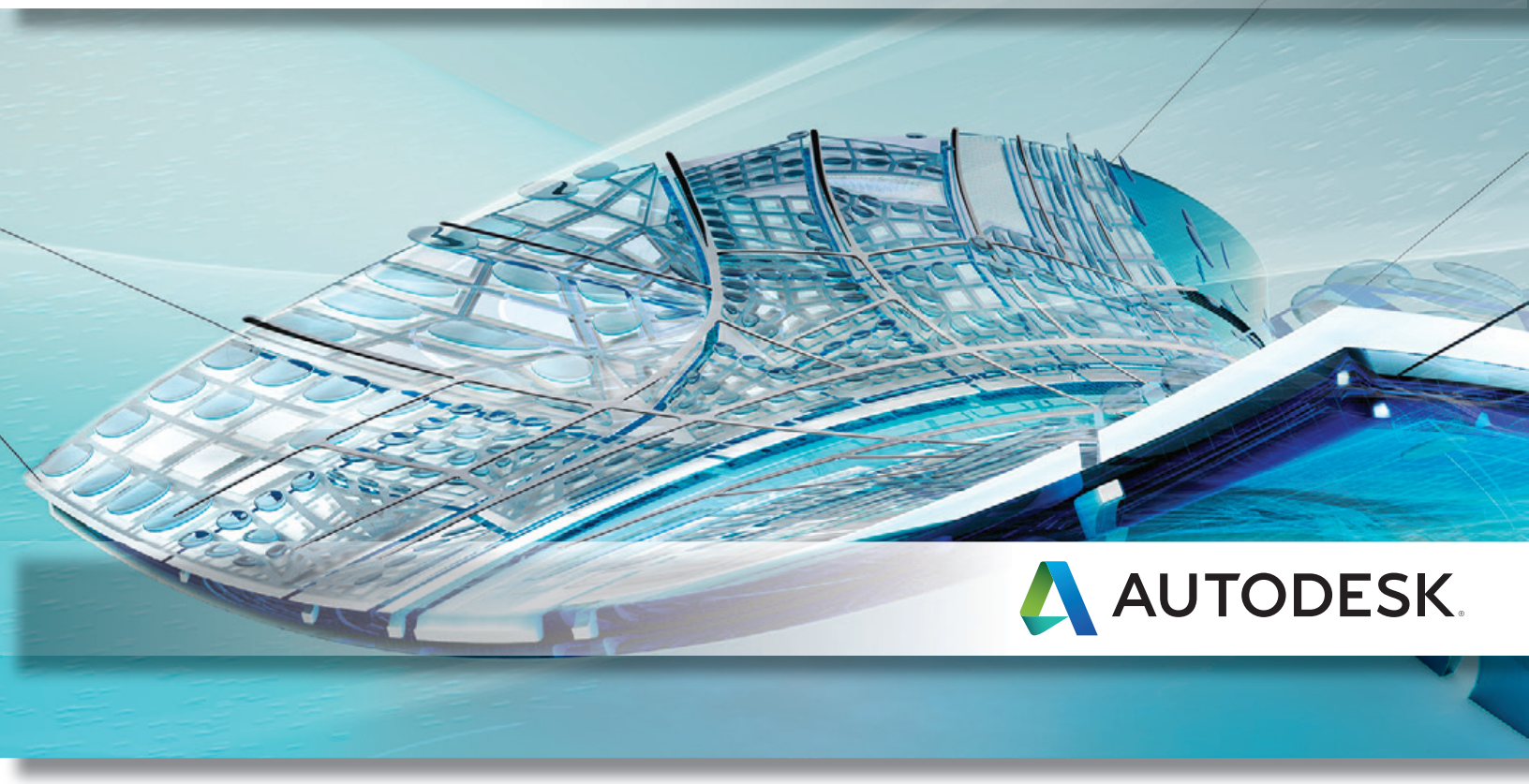
Autodesk® InfraWorks Training Guide

Finding and Importing Data for Your Model



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1 Autodesk® InfraWorks: Finding and Importing Data for Your Model

INTRODUCTION

With Autodesk® InfraWorks, you can create compelling 3D models of real places, and then sketch proposed improvements that are realistic and interactive.

This training module helps you search for, import, and configure data to build a model of your area in Autodesk® InfraWorks. Each lesson covers a specific type of data, going in the recommended order from terrain to 3D models. All the examples use the city of San Francisco, California.

WHAT NEW CONCEPTS DO I NEED TO UNDERSTAND?

GIS DATA

GIS data is intelligent data: it has a representational aspect (geometry or an image) as well as information. You import GIS data into Autodesk InfraWorks to create your base model.

There are two basic types of GIS data:

Vector data is geometry that represents real-world objects and their metadata. For example, a GIS data file for city streets would contain line geometry to represent the streets, but it would also contain attributes, such as the name of each road, when it was last maintained, the number of lanes in each direction, and so on.

- Raster data is images, such as photographs. It does not contain attributes, but the pixels in the image are "georeferenced," so they know where they are in the real world.

When you create your base model, start with the following:

- **Terrain**

The terrain establishes the elevation of the model. All other data is draped on top of it.

- **Ground imagery**

Ground imagery is usually an aerial photograph of the model area. It makes the model look realistic.

- **Transportation**

Roads, railways, bike paths, and such help you locate other features.

We recommend that you always include those three types of data. After that, you can add the following:

- **Water** (recommended for realism)
- **Buildings** (or building footprints)
- **Other ground data** (parks, zoning, parcels)
- **City furniture** (hydrants, bus shelters, and so on)
- **Utility data** (streetlights, sewer lines, storm-water lines)
- **3D models representing real-world items** (individual buildings, monuments, bridges)

COORDINATE SYSTEMS (SPATIAL REFERENCE SYSTEMS)

A coordinate system specifies how the geography was projected (from a global reality onto a flat surface) and it specifies where exactly it is located in the real world.
You don't need to know very much about coordinate systems to use Autodesk InfraWorks. **Here are a few pointers:**

- Do not specify a coordinate system for your model—Autodesk InfraWorks works best using its

native coordinate system, and will transform data into that system.

- Autodesk InfraWorks can often find the coordinate system information it needs within the data source files themselves.

However, if the Geolocation tab displays a yellow warning icon when you import the data, you will need to find out the coordinate system for the data and specify it.

- If you need to find out the coordinate system for a data source, you can check its metadata. These training exercises cover that.

METADATA

Metadata is data about data. It varies from data source to data source, but can include things like:

- What the features represent
- How they were captured
- The time period represented
- The coordinate system used
- Attributes (road names, number of lanes, who maintains them, speed limit, surface material)

Metadata is stored in XML or HTML format, so you can open it using a text editor or browser. Generally, metadata uses standards established by the Federal Geographic Data Commission or ISO.

SCALE OF DATA

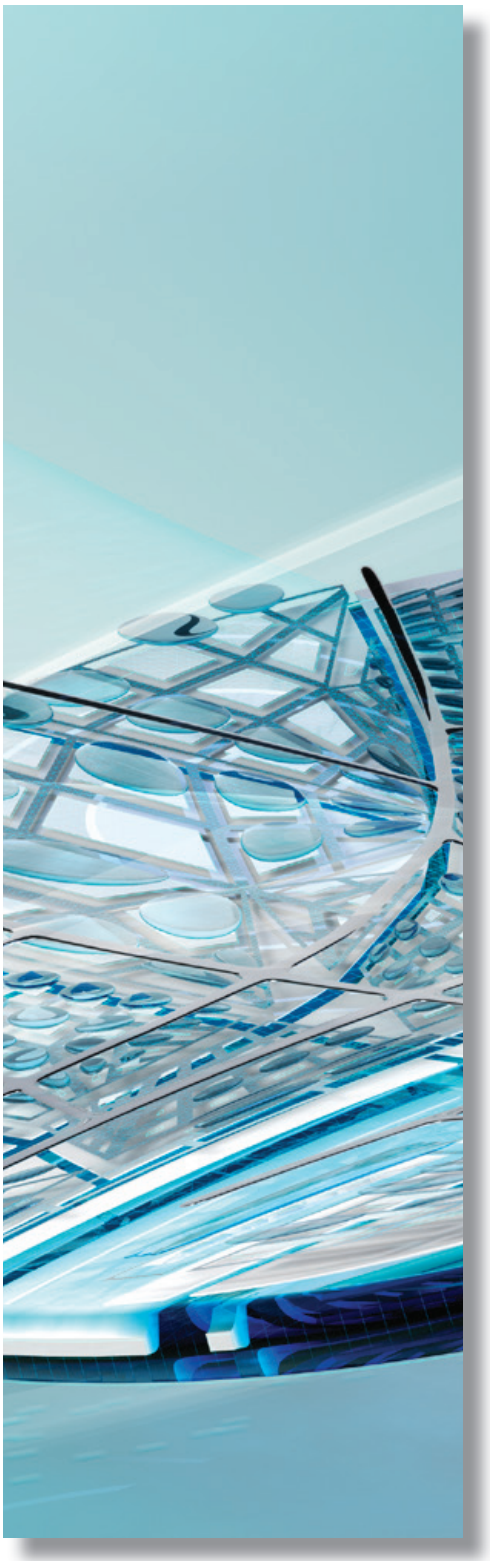
For some data, particularly ground imagery, you may have to choose between data sets that were captured at different scales. Large scale data generally covers a smaller area, but with greater detail (like a close-up). Small scale data covers a larger area with less detail (like zooming out).

DATA MAPPING

When you bring data into Autodesk InfraWorks, you map the attributes of the original data to the attributes of the Autodesk InfraWorks model. For example, when you import roads, you find the attribute that specifies the road name and map that to the Name attribute.

There is rarely a one-to-one mapping. Usually, the original data has more attributes than **Autodesk InfraWorks** supports, but it may not have the same attributes that Autodesk InfraWorks does. Once you map the attributes and import the data, you can see only the Autodesk InfraWorks attributes—you do not have access to the original data attributes any more.

There are other things you can do when you import data, such as draping the data on the terrain or creating tooltips. Most of the configuration options are covered in these training lessons.



2 About Terrain, Ground Imagery, and Roads

TERRAIN, GROUND IMAGERY, AND ROADS

The bare essentials for a model are terrain, ground imagery, and roads. Terrain establishes the underlying surface on which other data is draped. Ground imagery provides a realistic background for your model. Roads provide an easy reference point for location.

WHAT IS TERRAIN DATA?

Terrain is often called elevation or topographic data. It is usually in raster format, and includes both a picture file (such as aerial photography) and a world file (locating the picture in the real world, or georeferencing it).

NOTE:
You can also retrieve terrain data in a vector format. Such data represents the contour lines of the terrain. Autodesk® InfraWorks can create a terrain from contour lines, but you will get better results from raster data.

Be sure that you download both the image and the corresponding world file, if required. The following table shows which formats require such files.

File Format	Picture File Extension	World File Extension
ArcInfo ASCII	*.asc	
Digital Elevation Model	*.dem	
Erdas Image	*.img	*.igw
jpeg	*.jpg/*.jpeg	*.jgw
MrSID	*.sid	*.sdw
TIFF	*.tif/*.tiff	*.tfw

WHAT IS GROUND IMAGERY?

Ground imagery is often called orthophotography or aerial photography. It can include an actual photograph or a scanned topographical map or site plan. It is always in raster format, and includes both a picture file (such as aerial photography) and a world file (locating the picture in the real world, or georeferencing.

Make sure that you download both the image and the corresponding world file, if required. This table shows which formats require such files:

File Format	Picture File Extension	World File Extension
Erdas Image	*.img	*.igw
jpeg	*.jpg/*.jpeg	*.jgw
MrSID	*.sid	*.sdw
TIFF	*.tif/*.tiff	*.tfw

NOTE:
Aerial photography can be stored in very large files, so they may take a long time to download. Older images may be free, but very recent ones will probably cost money to download. Often a picture from a few years ago is sufficient for modeling purposes. Also, color imagery may be harder to find than grayscale images.

WHAT IS ROAD DATA?

Road data is always in vector format, and is often stored in ESRI Shape files. If possible, download road data in SHP format, but DXF is also supported. Shape files come in sets, and you must have these three:

File Extension	Purpose
SHP	Geometry. For roads and railways, this is linear geometry, and usually represents the center lines of the roads.
DBF	Attribute information
SHX	Links together and indexes the other two files.

Downloads may also include a PRJ file, which contains projection and coordinate system information.

HOW SHOULD I STORE MY DATA?

Use these guidelines when storing terrain data:

1. Create a **Project** folder to organize all your data.

2. Under the project folder, create a folder for each data type (Terrain, Ground Imagery, and Roads).

3. When you extract the downloaded zip file, create a target folder for it under the data type folder.

Name the target folder something recognizable, and include the source of the data—for example: **USGS SF DEMs.**

HOW DO I FIND DATA?

This lesson will use the USGS website, which is an excellent source of free data.

IMPORTANT NOTE: *Websites change frequently. Instructions here were accurate at the time of writing, but we cannot guarantee that they will remain so.*

Some sites tile the data, to make each download a more manageable size—for example, a city may be divided into multiple tiles. Some local sites link to USGS data, but have their own method for finding, selecting, downloading, and viewing the data. You can also download data directly from the USGS National Map Viewer.

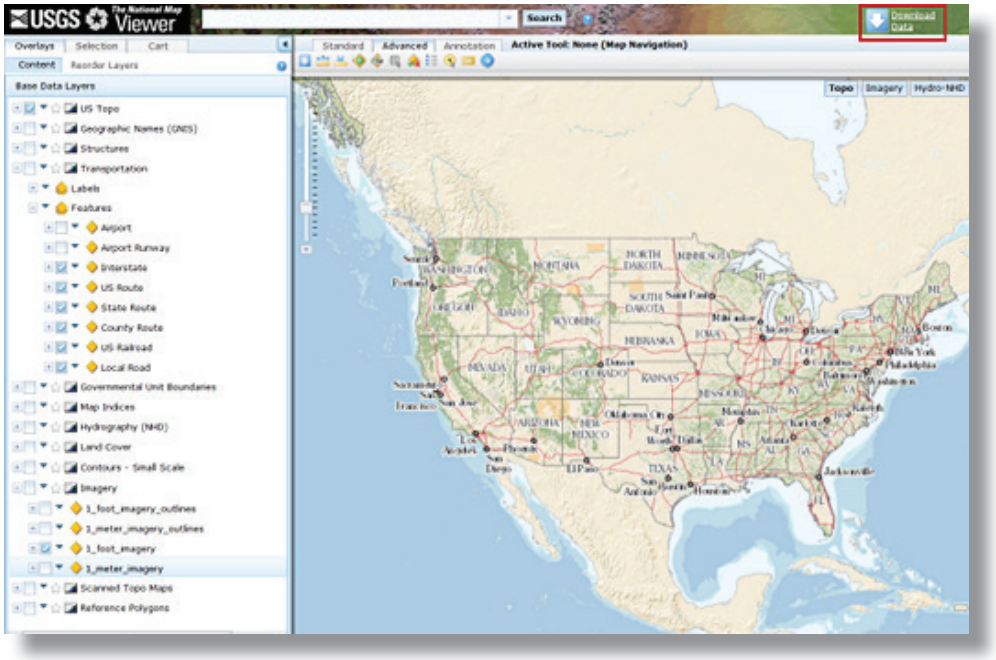
How do I retrieve terrain, ground imagery, and road data?

The USGS website has terrain, ground imagery, and transportation data for most of the United States. For other areas, you might try **www.fao.org/geonetwork** or **www.gadm.org.**

NOTE: Websites change frequently. Instructions here were accurate at the time of writing, but we cannot guarantee that they will remain so.

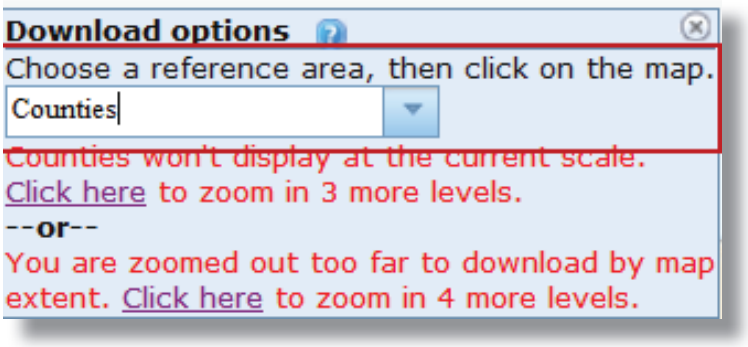
1. Go to http://viewer.nationalmap.gov/viewer/.

2. Click Download Data at the top of the window.

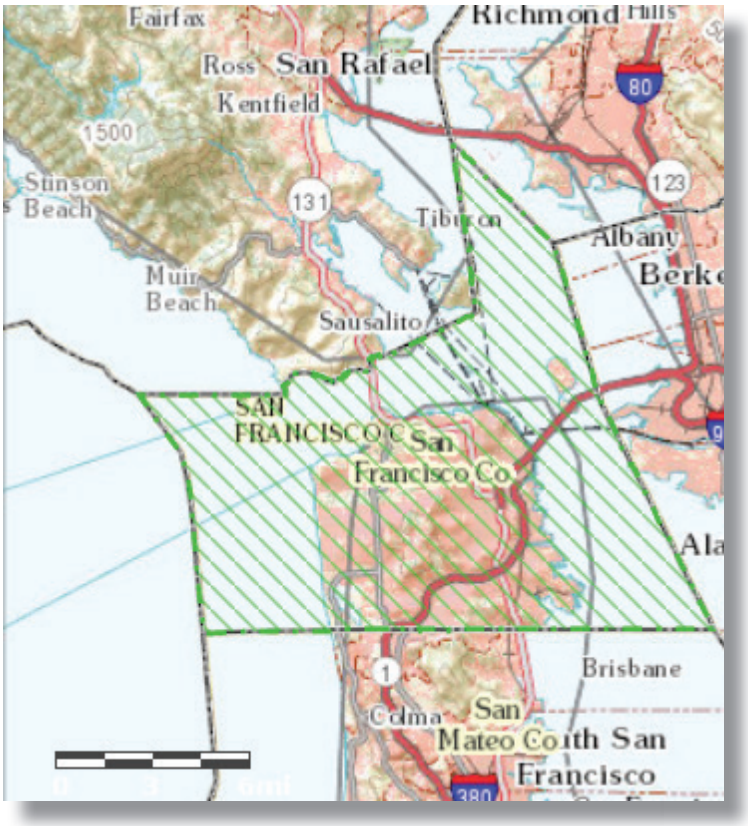


3. Under Download Options, set the reference area to Counties.

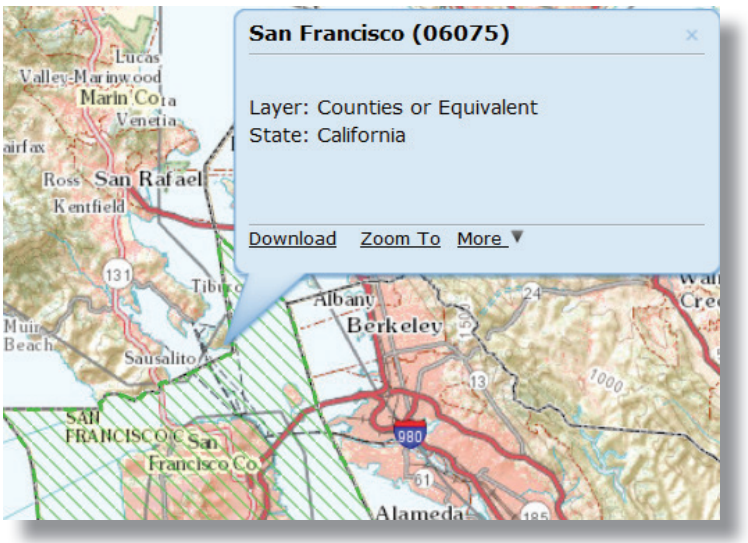
Since the city and county of San Francisco are the same geographically, we can select the entire area we want by county.



4. Zoom in to the target area by double-clicking it repeatedly, until the county outlines appear. Select the target county.

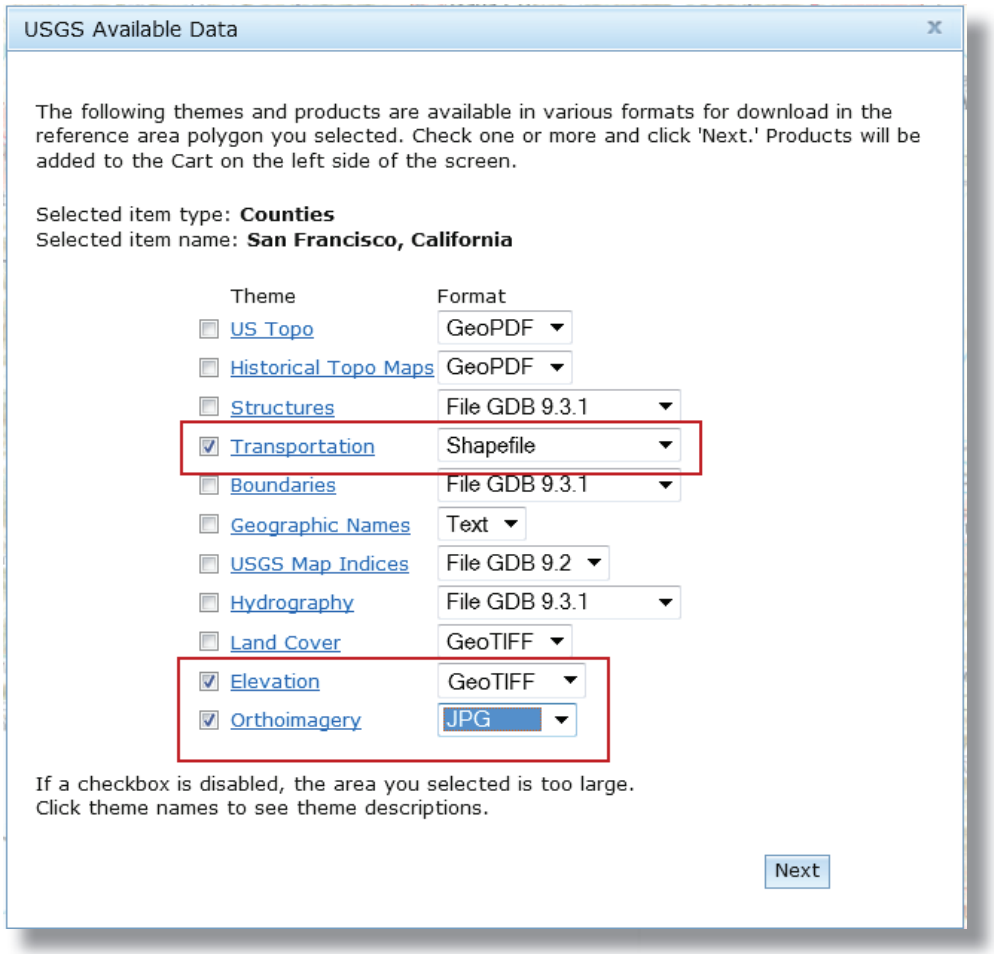


5. Click th selected county to see your options.



6. Click the Download link and select the themes and formats you need.

Theme	Format
Transportation	Shapefile
Elevation	ArcGrid
Orthoimagery	JPG

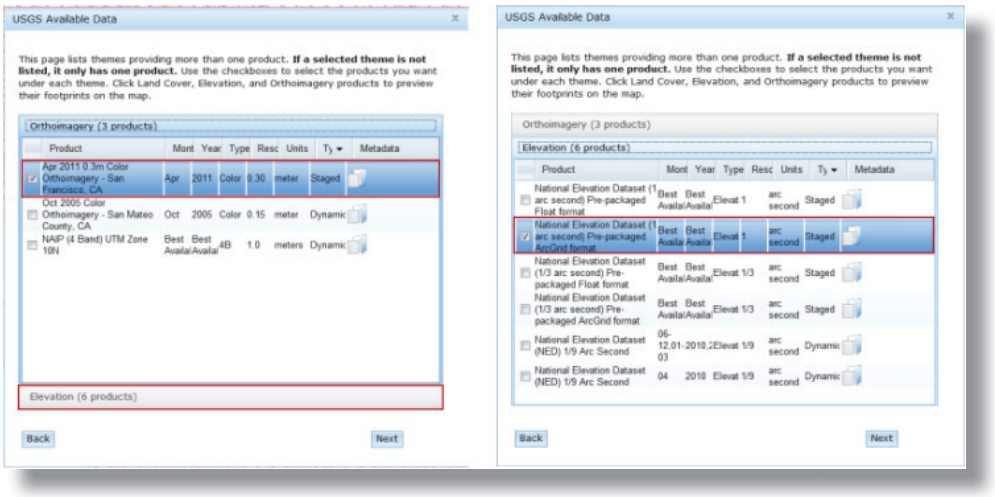


7. Click Next to select data.

For Orthoimagery, select the color images for San Francisco. Then click the Elevation header (at the bottom). For Elevation, select the ArcGrid option at 1 arc per second.

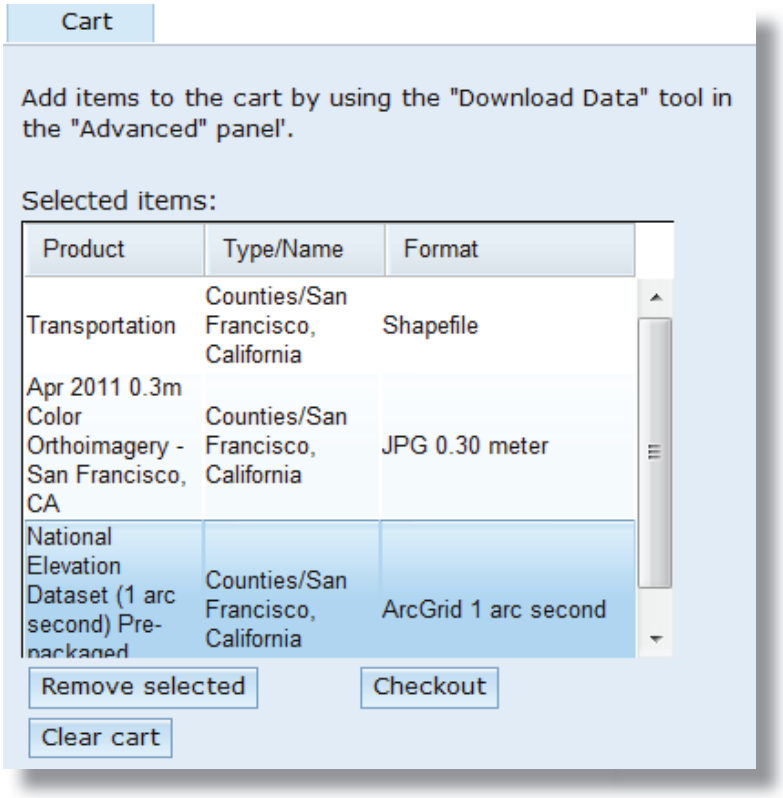
NOTE: *Generally, one arc per second is sufficiently precise. Data captured at 1/3 arc per second will be larger and will not give you much better results.*

The Transportation results are not listed because there is only one option, so there are no choices to make.

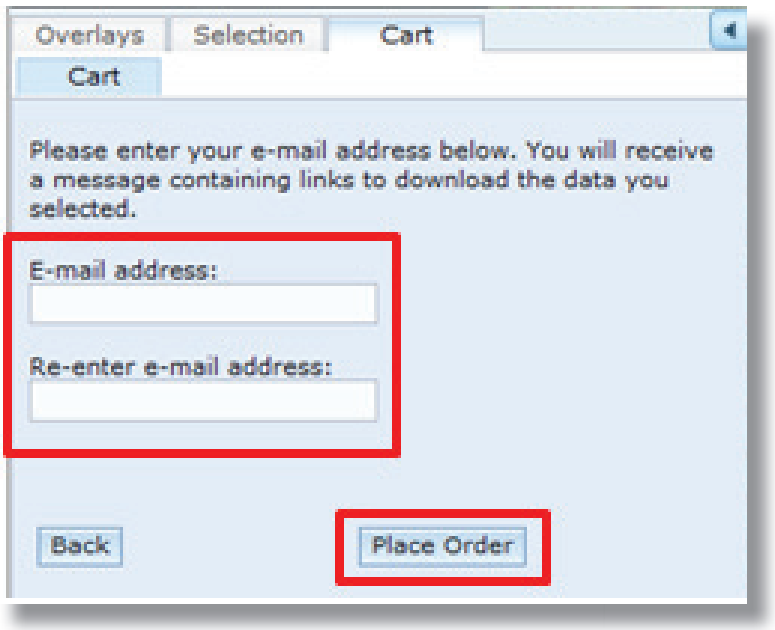


8. Click Next until the selected items are added to your cart.

Check over the contents of your cart, and then click **Checkout.**

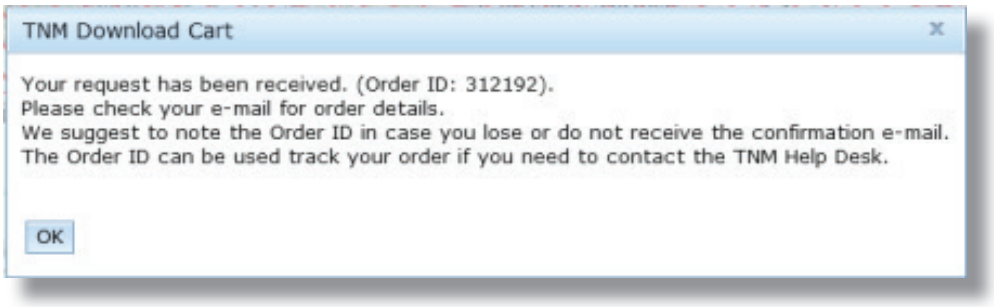


9. Provide your contact information and click **Place Order.**



Your order is acknowledged.

USGS will send you an email containing links to download the selected data.



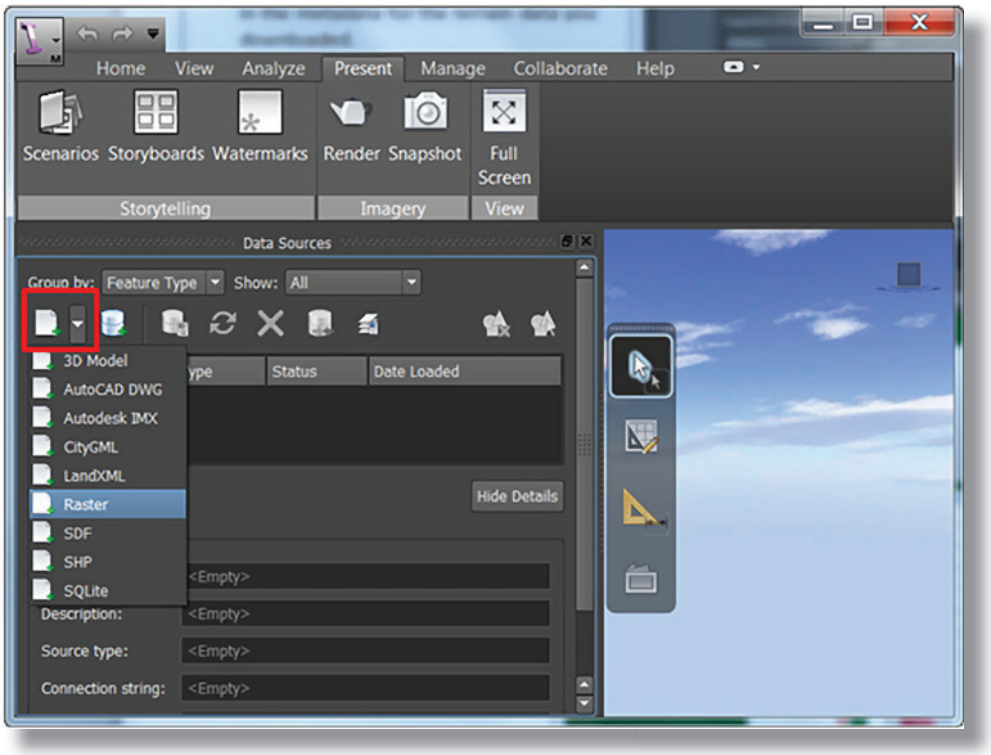
10. When you receive the email, download and unzip the files.

You can use many extraction programs (such as WinZip) to extract the compressed files. However, the built-in Windows extraction program will not extract the .gz compressed files used by USGS.

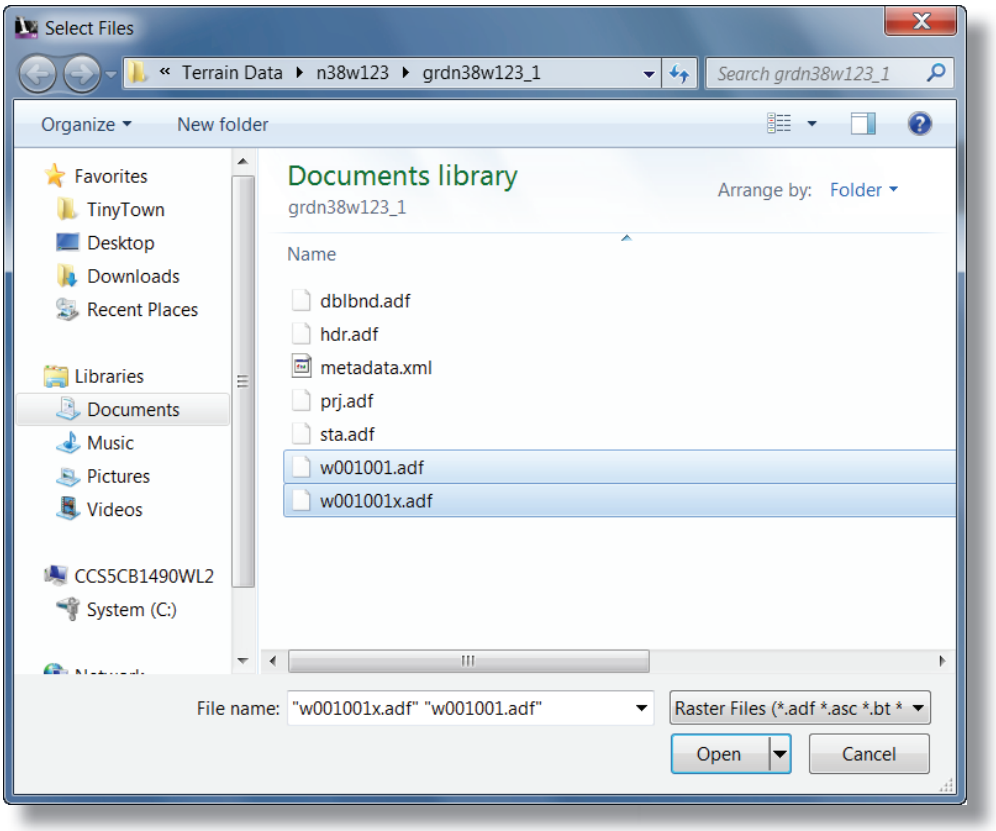
How do I get terrain data into Autodesk® InfraWorks?

Add the terrain data as a raster data source.

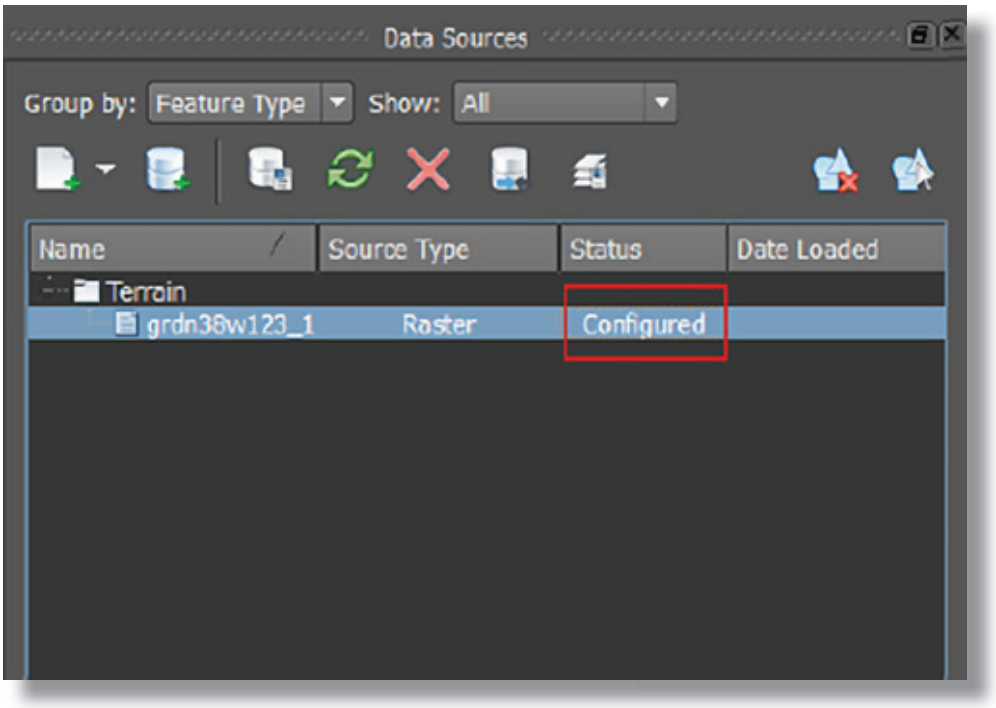
1. In the Data Sources panel, click Add File Data Source > Raster.



2. Select both extracted .adf files.

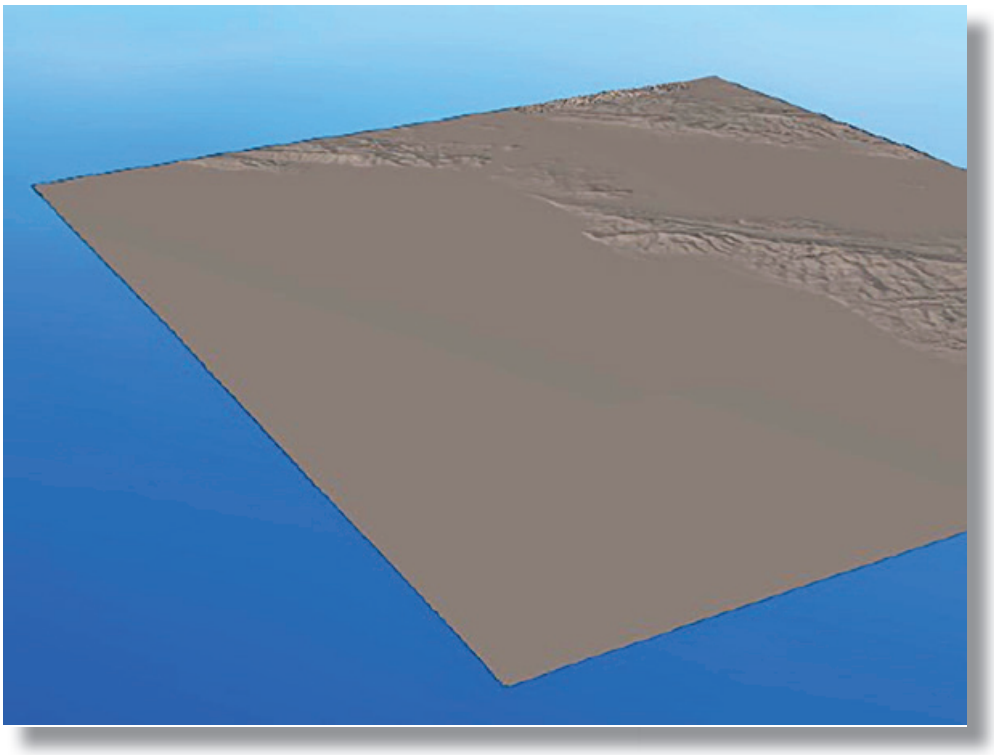


The data source is automatically configured because the data has elevation data (Z value).



3. Double-click the data source and click **Close and Refresh.**

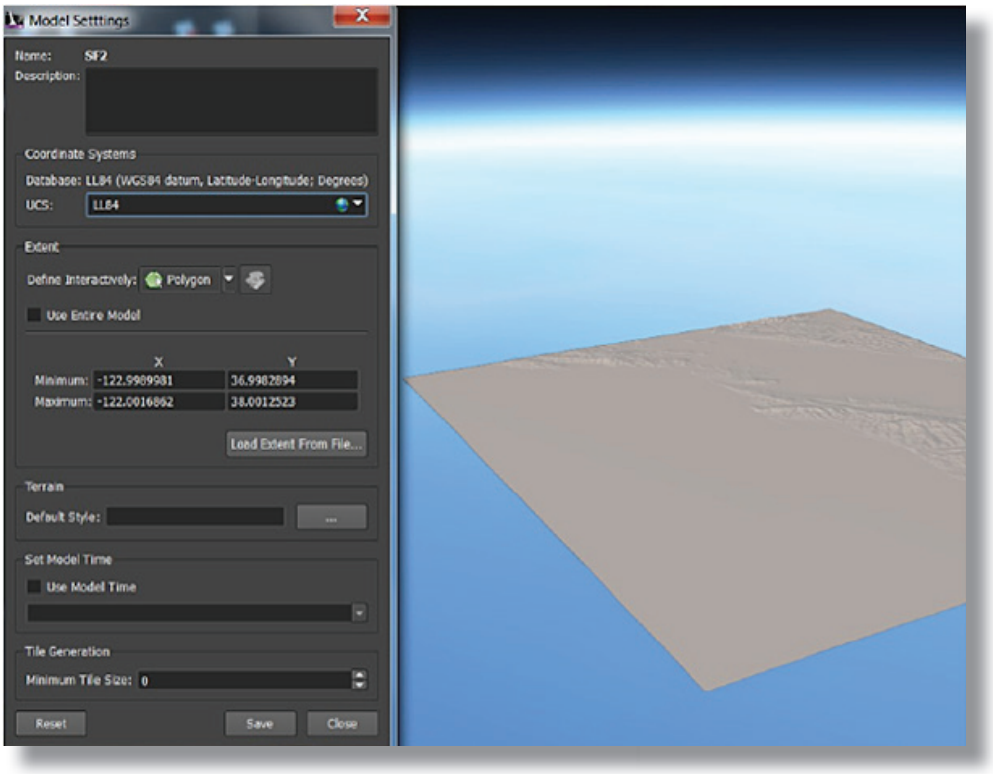
The terrain data appears in the model.



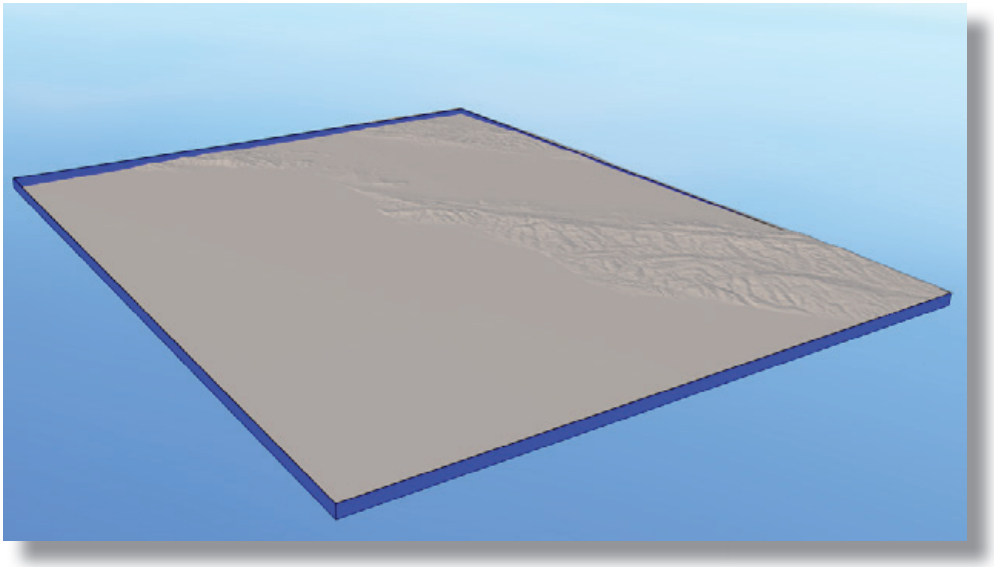
Set the model extents to match the area of your model. Then, if you bring in data that extends beyond those extents, the data will be cropped at the extents automatically.

4. Click **Manage tab > Settings panel> Model Settings** on the ribbon.

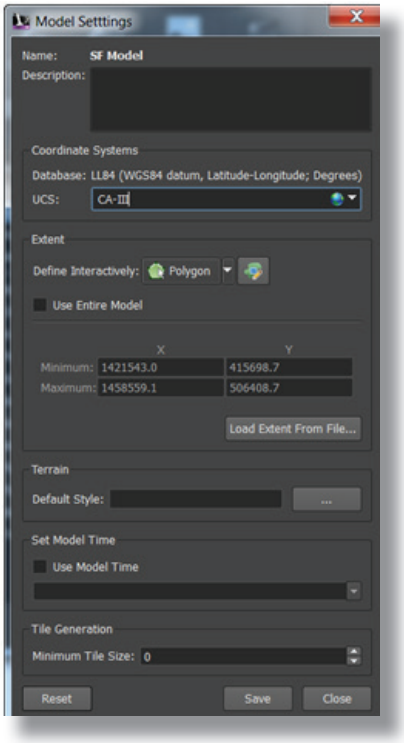
5. Under **Extent**, where you see **Defiine Interactively**, click **Polygon**.



6. Draw a polygon around the terrain data. Double-click when you are done.



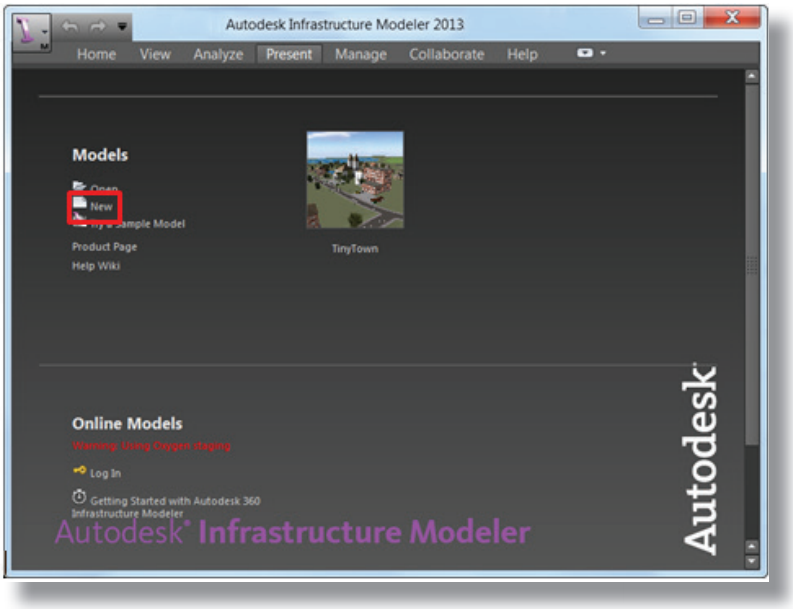
7. Click Save in the Model Settings dialog box.



How do I create a model?

Create a new model in Autodesk® InfraWorks and then import your terrain.

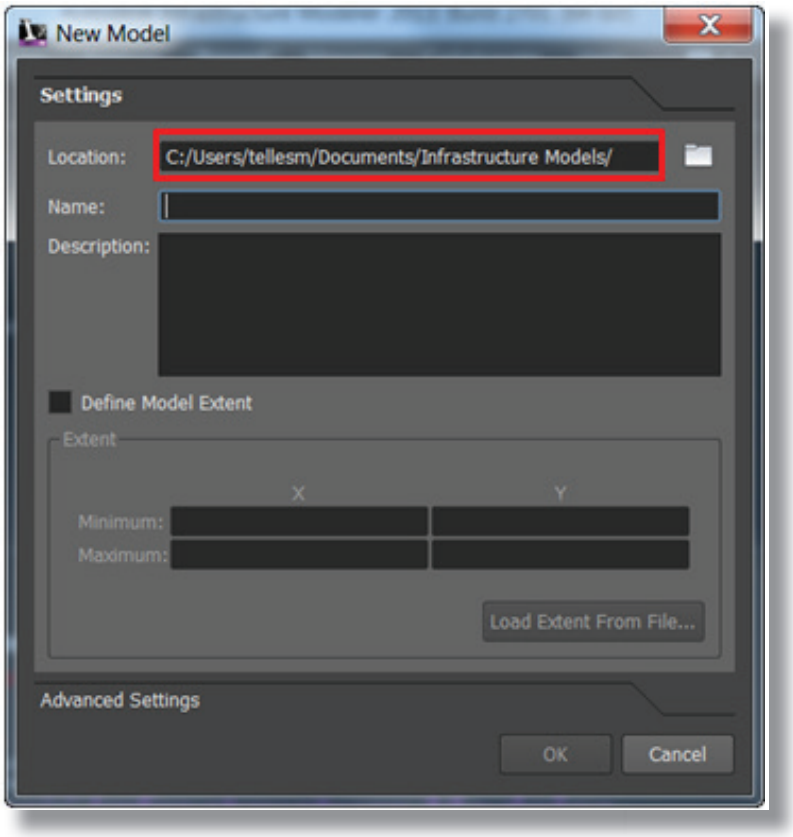
1. Click New on the Start page.



2. Enter a name.

Don't bother with schema or model extents for now.

3. Click OK.

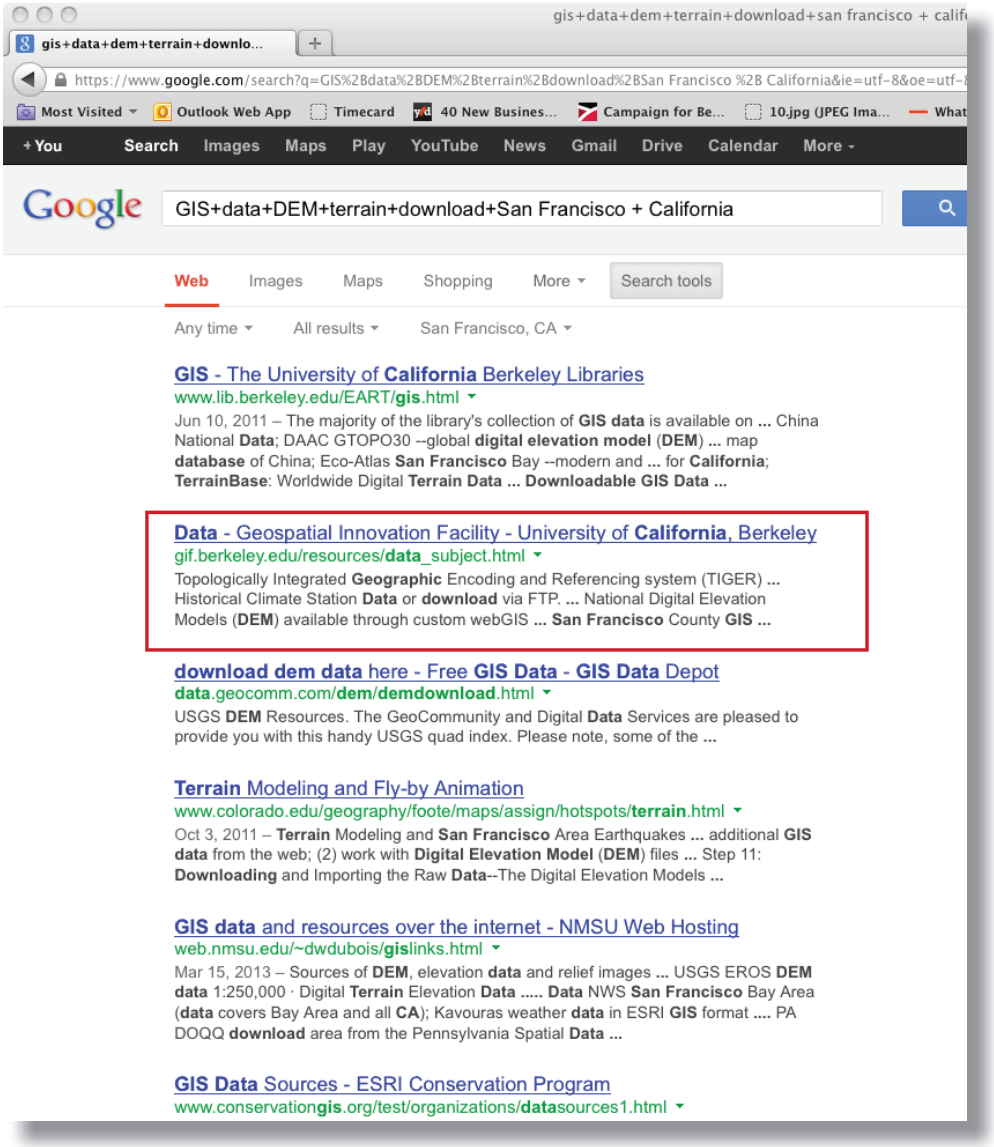


Extra Credit: How do I retrieve terrain data from a local site?

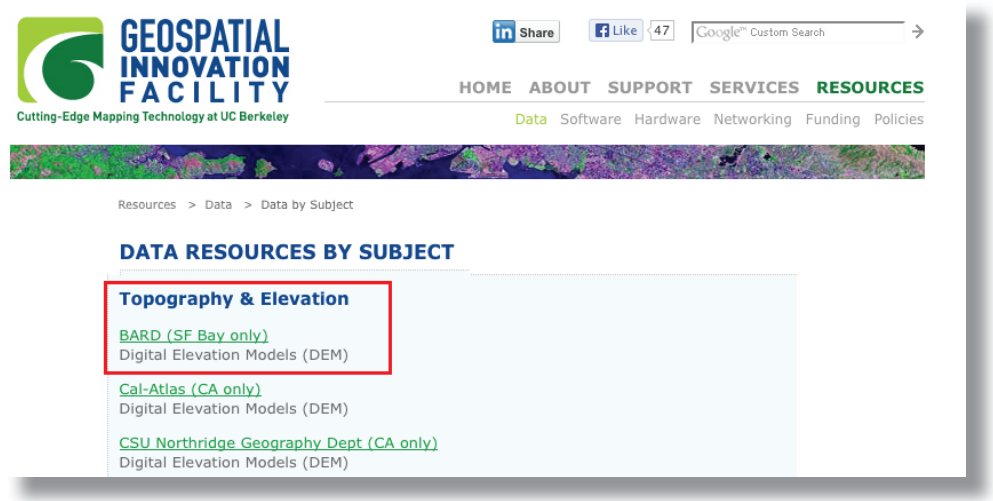
Use your search engine to find other sources of data.

1. Enter your search string in a search engine.

The search finds a site hosted by the University of California at Berkeley. It includes USGS data, as well as data from other sources.

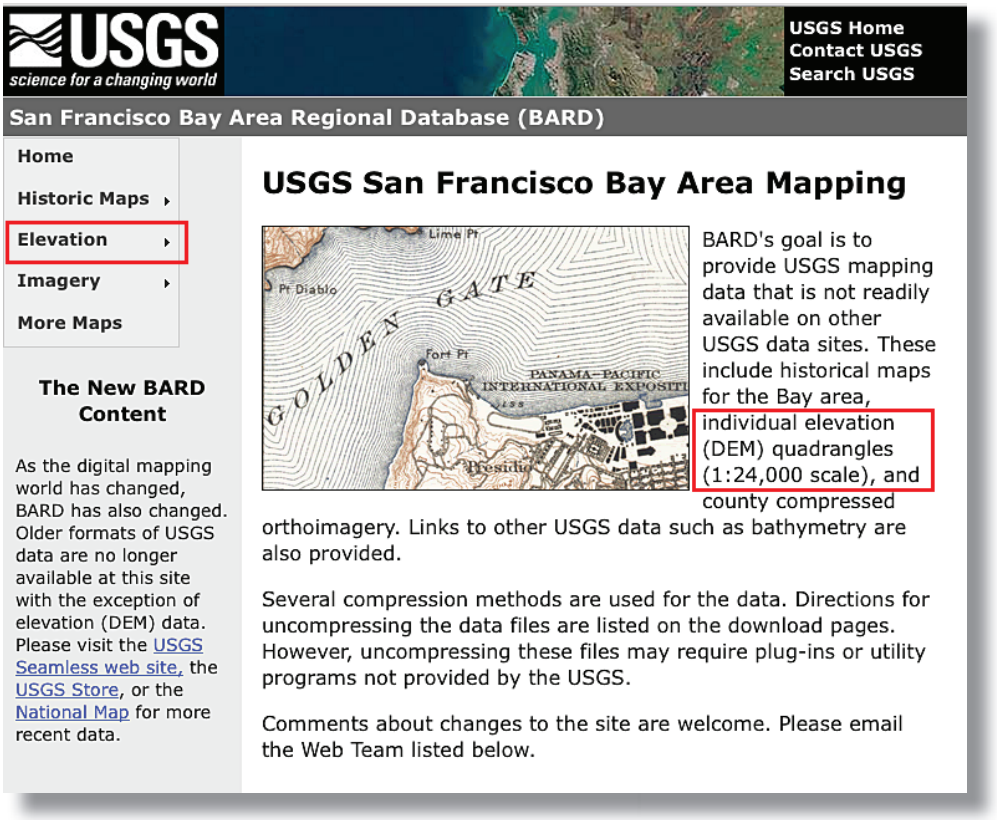


2. Scroll down on the site to look for topographical data. Click the link for your area.



3. Look for elevation data.

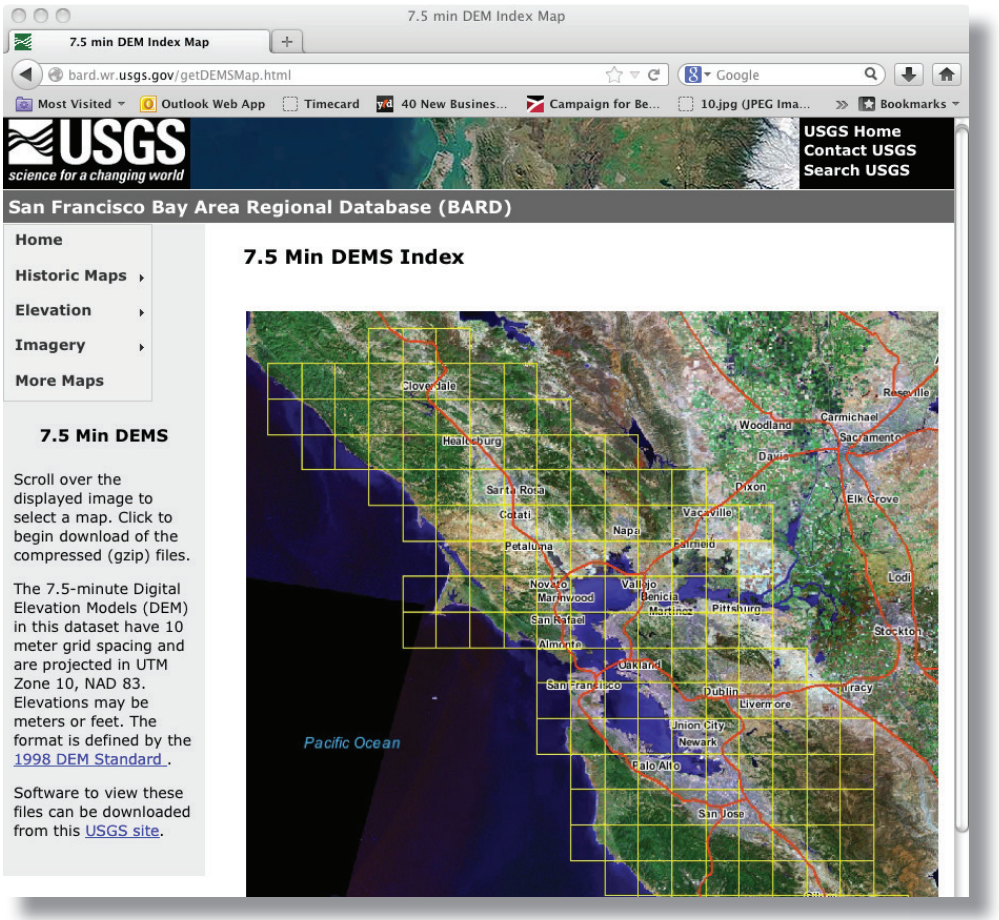
This site has DEM files, which are perfect.



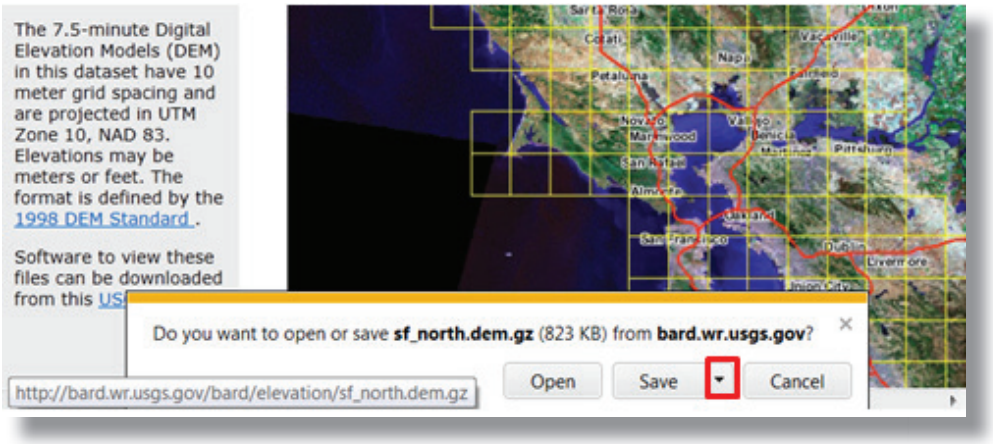
4. Click Elevation > 7.5 Min DEMS to see this tiled map of the Bay Area.

The San Francisco area is represented by 2 tiles in the lower third of the map.

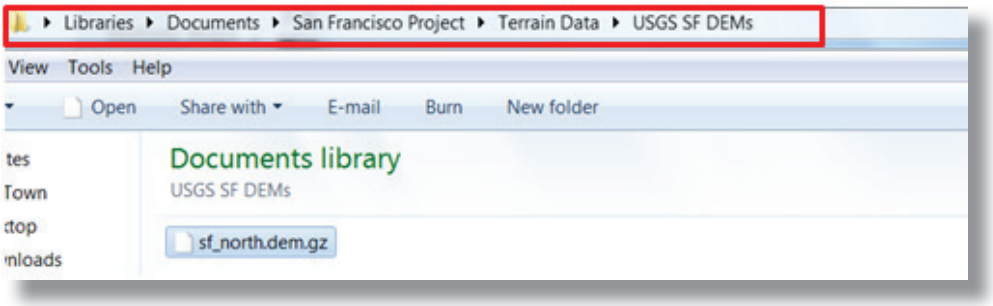
5. Click one of the tiles.



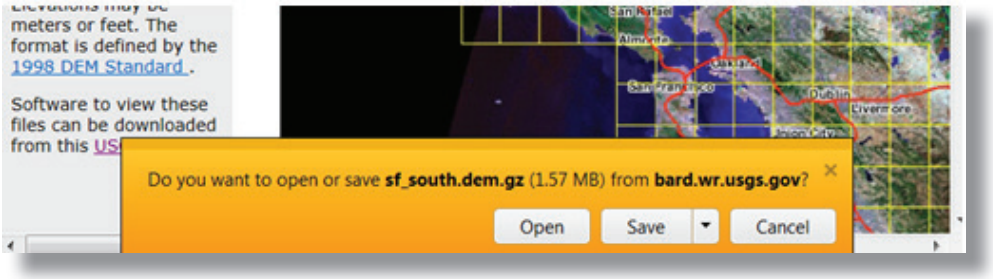
6. When prompted, use the arrow next to **Save** to select **Save As.**



7. Save the data in a sub-folder of the project file, as shown.



8. If you need more tiles, download them in the same way.



3 About Ground Imagery

WHAT IS GROUND IMAGERY?

Ground imagery is often called orthophotography or aerial photography. It can include an actual photograph or a scanned topographical map or site plan. It provides a realistic background for your model.

Ground imagery data is always in raster format, and includes both a picture file (such as aerial photography) and a world file (locating the picture in the real world, or georeferencing it).

NOTE: *Aerial photography can be stored in very large files, so they may take a long time to download. Also, older images may be free, but very recent ones will probably cost money to download. Often a picture from a few years ago is sufficient for modeling purposes. Also, color imagery may be harder to find than grayscale images.*

HOW SHOULD I STORE GROUND IMAGERY?

Use these guidelines when storing terrain data:

1. Create a **Project** folder to organize all your data.

2. Create a **Ground Cover Data** folder for each project.

3. When you extract the downloaded zip file, create a target folder for it under the Ground Cover Data folder.

Name the target folder something recognizable, and include the source and format of the data—for example: ***USGS SF TIFFs.***

HOW DO I FIND GROUND IMAGERY?

Use your web browser to find and download ground imagery. A good search string includes the following: GIS + data + color + Aerial + imagery + download + [your area name]

GIS
A Geographic Information System stores, manages, and analyzes goegraphical information.

Download
Include this term to avoid sites that merely display terrain data without the ability to download it.

Your Area Name
Start with a small area and expand from there. For example, specify your city or county name. Include the state name to make sure you get the right data.

Make sure you download both the image and the corresponding world file, if required. This table shows which formats requires such files:

File Format	Picture File Extension	World File Extension
Erdas Image	*.img	*.igw
jpeg	*.jpg/*.jpeg	*.jgw
MrSID	*.sid	*.sdw
TIFF	*.tif/*.tiff	*.tfw

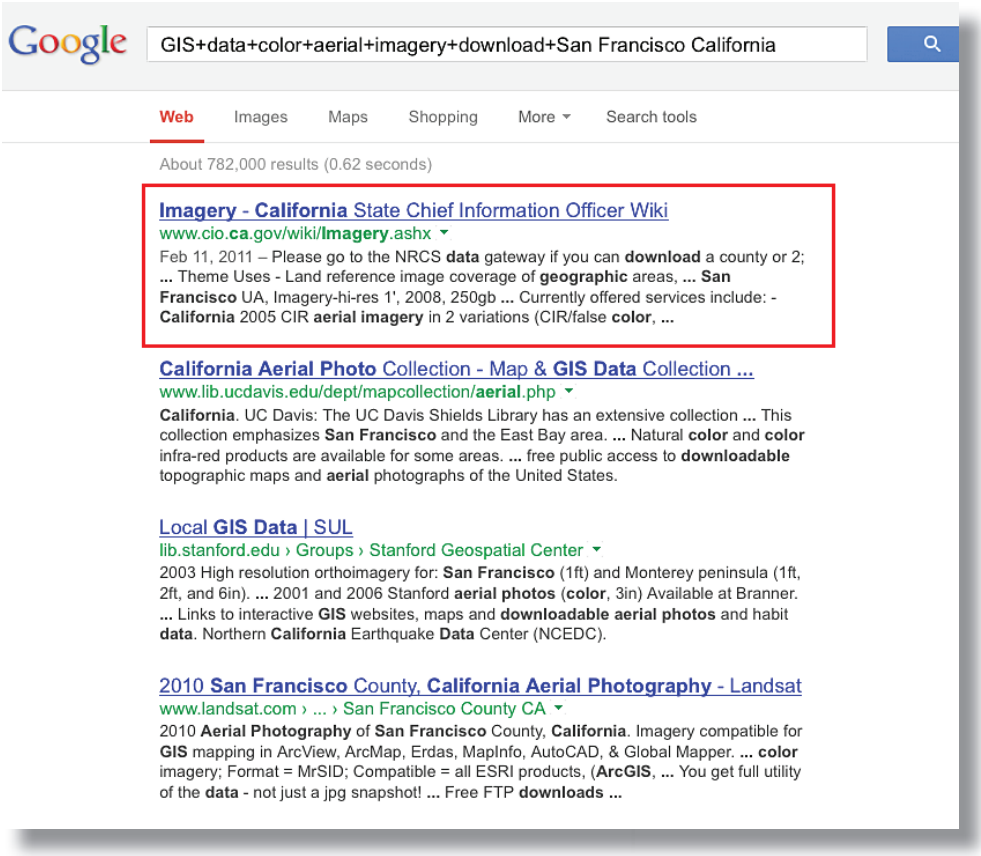
As you look for ground imagery, keep these tips in mind:

- Look for natural color orthophotography
- Follow links from one site to other sources of data
- Look for “mosaics” (titled photos by area)
- If you find imagery that is in a different coordinate system or projection, Autodesk InfraWorks will transform the incoming data to the model’s coordinate system.
- When you download and expand the zip containing the data, you will probably have a large photo file and a small world file, as well as an .aux and .txt file–you can ignore the last two.

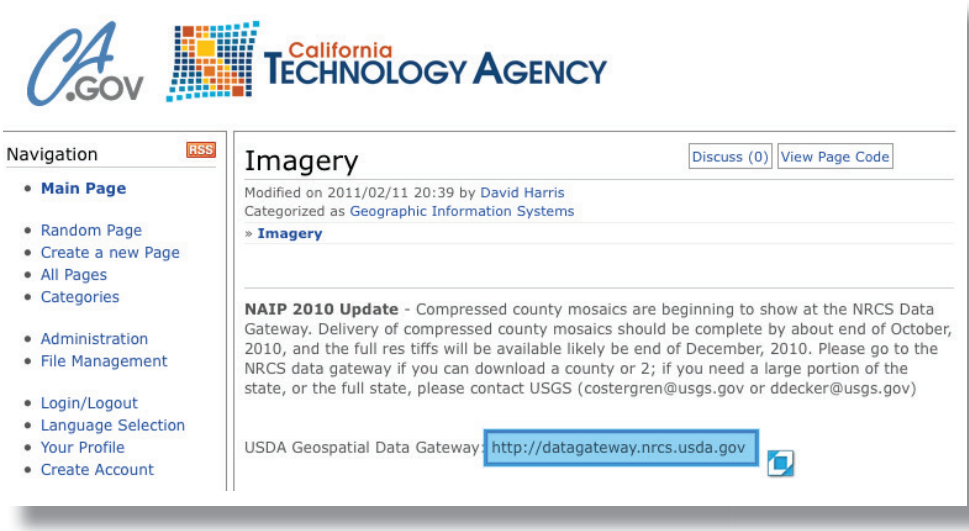
How do I retrieve ground imagery?

This exercise retrieves grayscale imagery. **See the Extra Credit exercise** for a way to download color imagery.

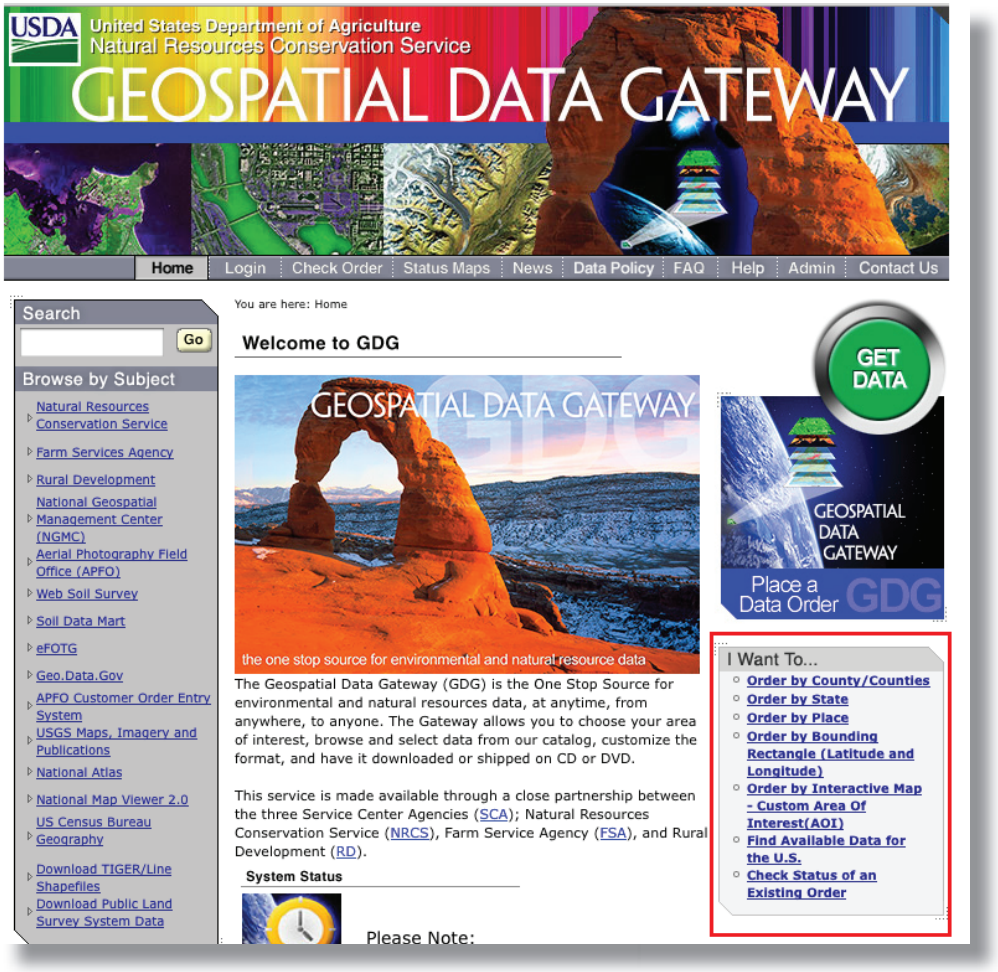
1. The California State Chief Information Officer WIKI has some promising looking data.



2. This site directs us to another location: http://datagateway.nrcs.usda.gov.

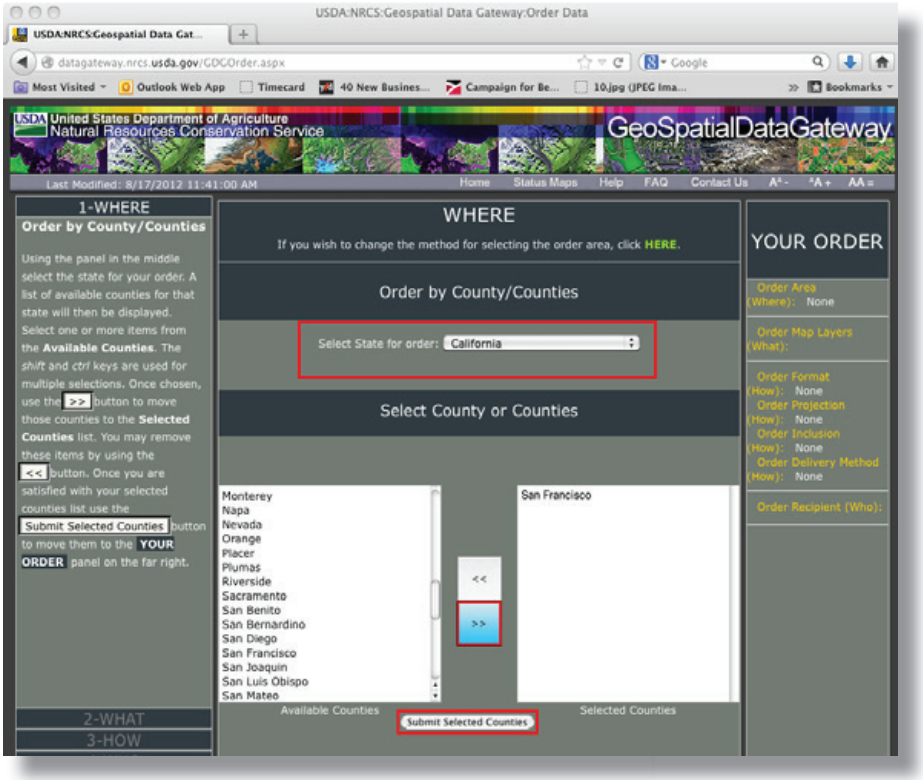


3. This site has a way to order imagery by county.



4. Select the state first, then scroll down to find the county you want.

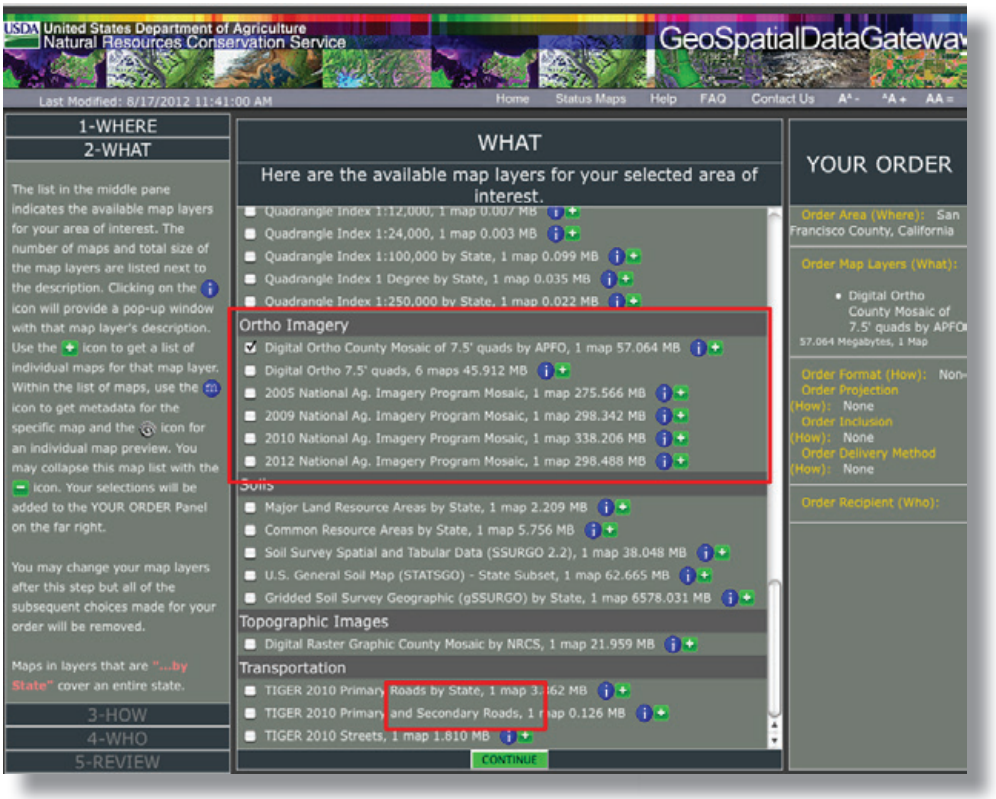
5. Click the double arrow to move the county into the Selected Counties list.



6. Submit your selection.

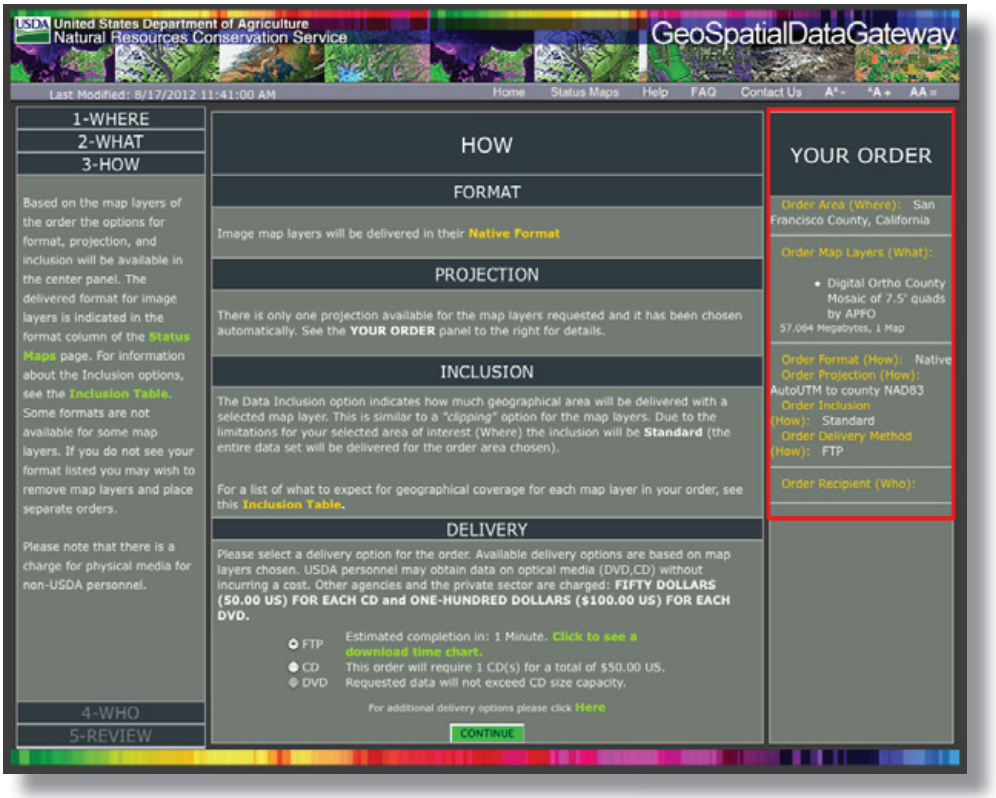
7. Scroll down to find the **Ortho Imagery** section.

8. Select an overview map and the most recent mosaic map, then click **Continue**.

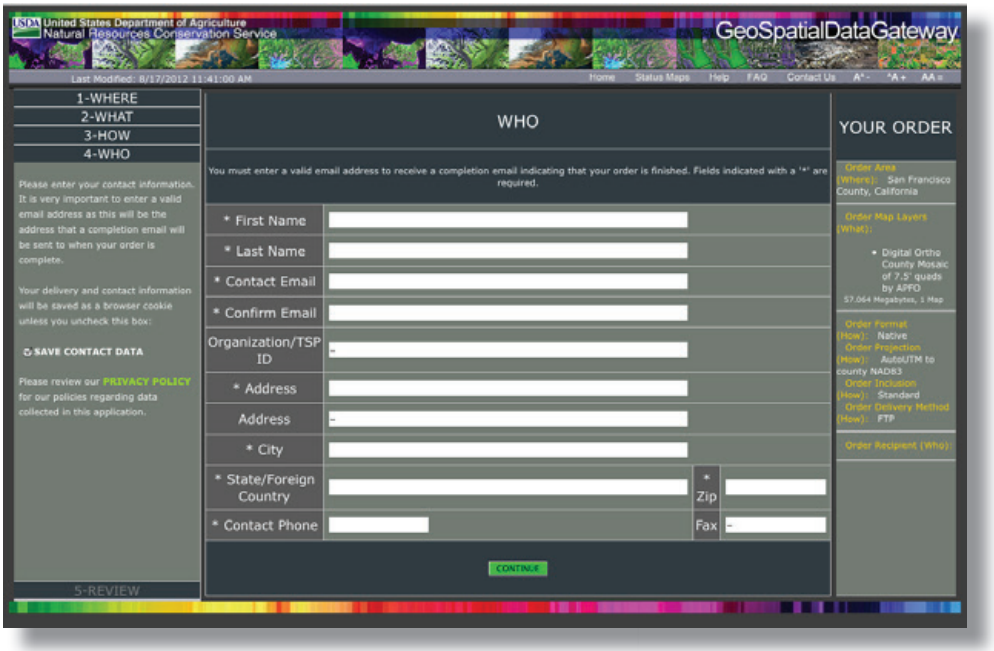


9. The site tells you the projection used for the data and how long it will take to download.

Review the information and click **Continue.**



10. Enter your contact information and click **Continue.**

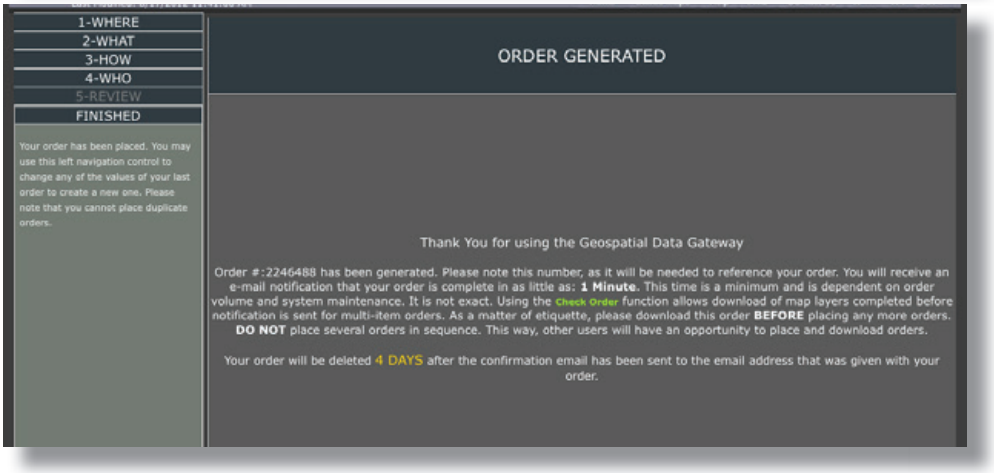


11. Review your order and click **Place Order.**

The order is generated.

You will receive an email when your order is ready to download.

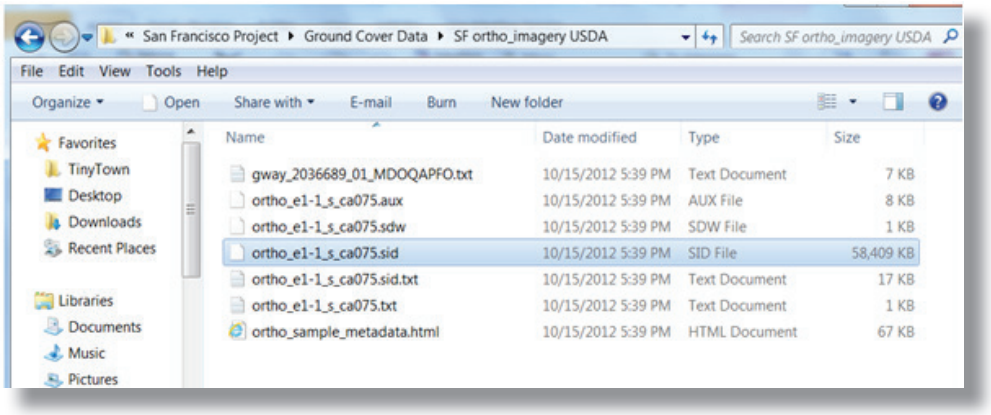
It will tell you the format of the image(s) and the projection(s) used, and gives you link(s) to



download the image(s).

12. Unzip and save the data in a sub-folder of the project file, as shown.

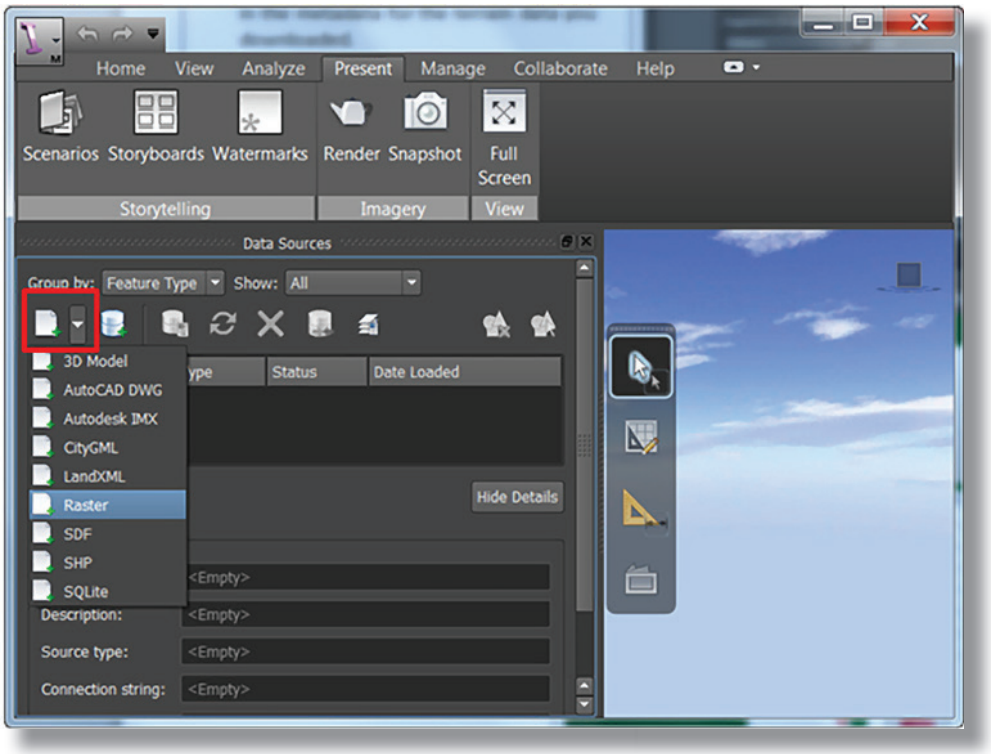
The highlighted file is the image. The .sdw file is the world file.



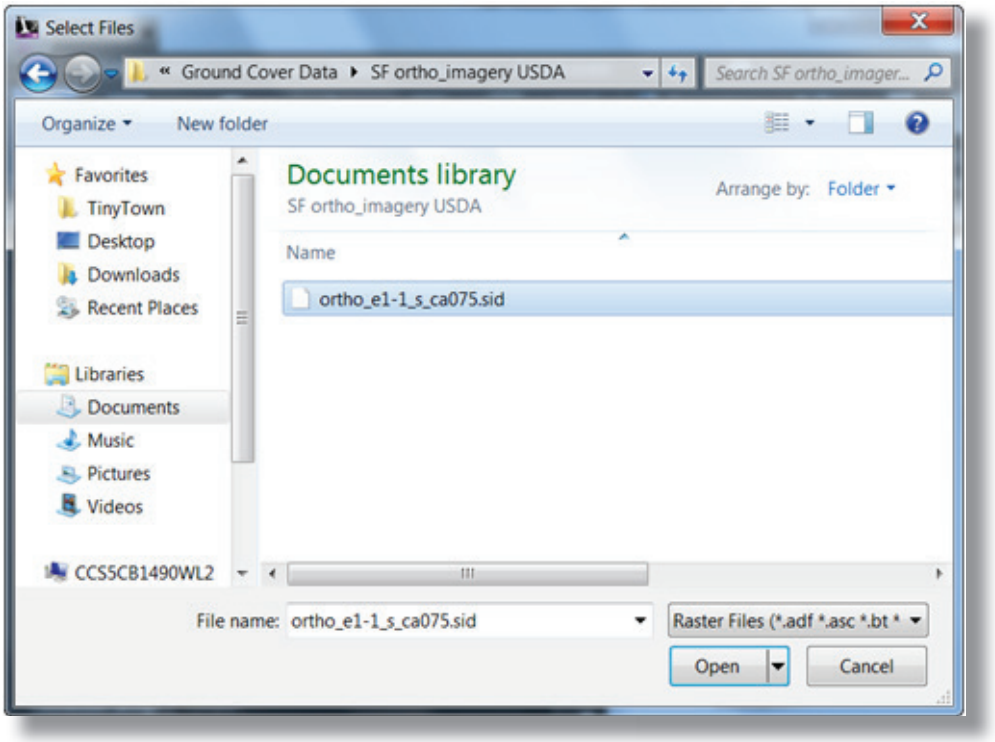
How do I get ground imagery into Autodesk® InfraWorks?

Add the ground imagery as a raster data source.

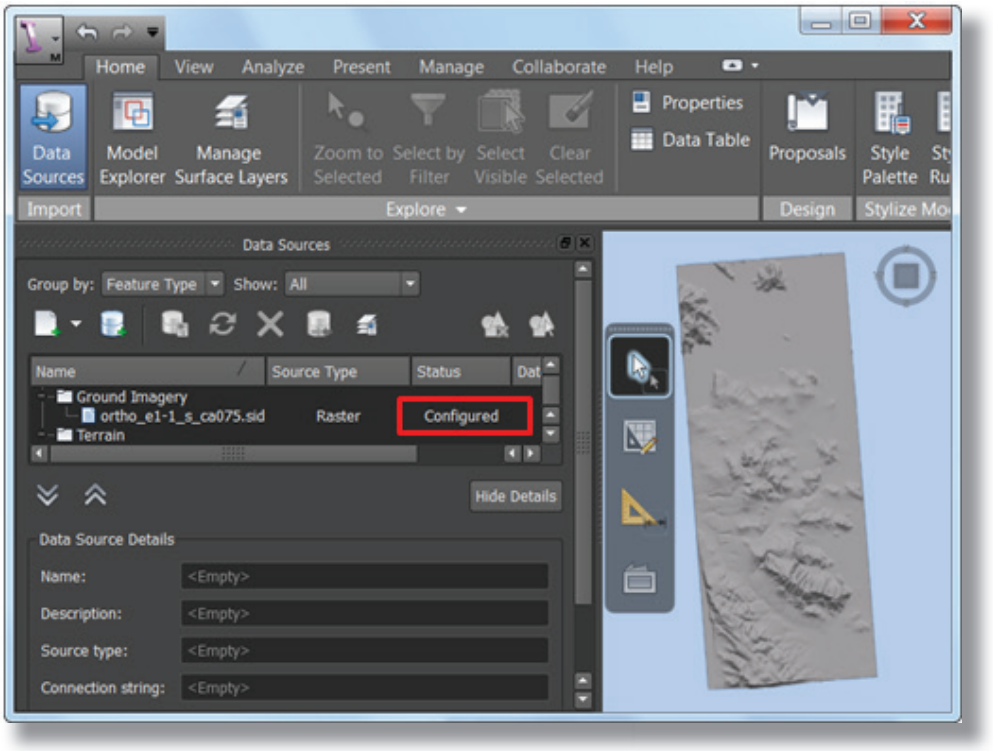
1. In the **Data Sources** panel, click **Add File Data Source > Raster.**



2. Select the .sid file.



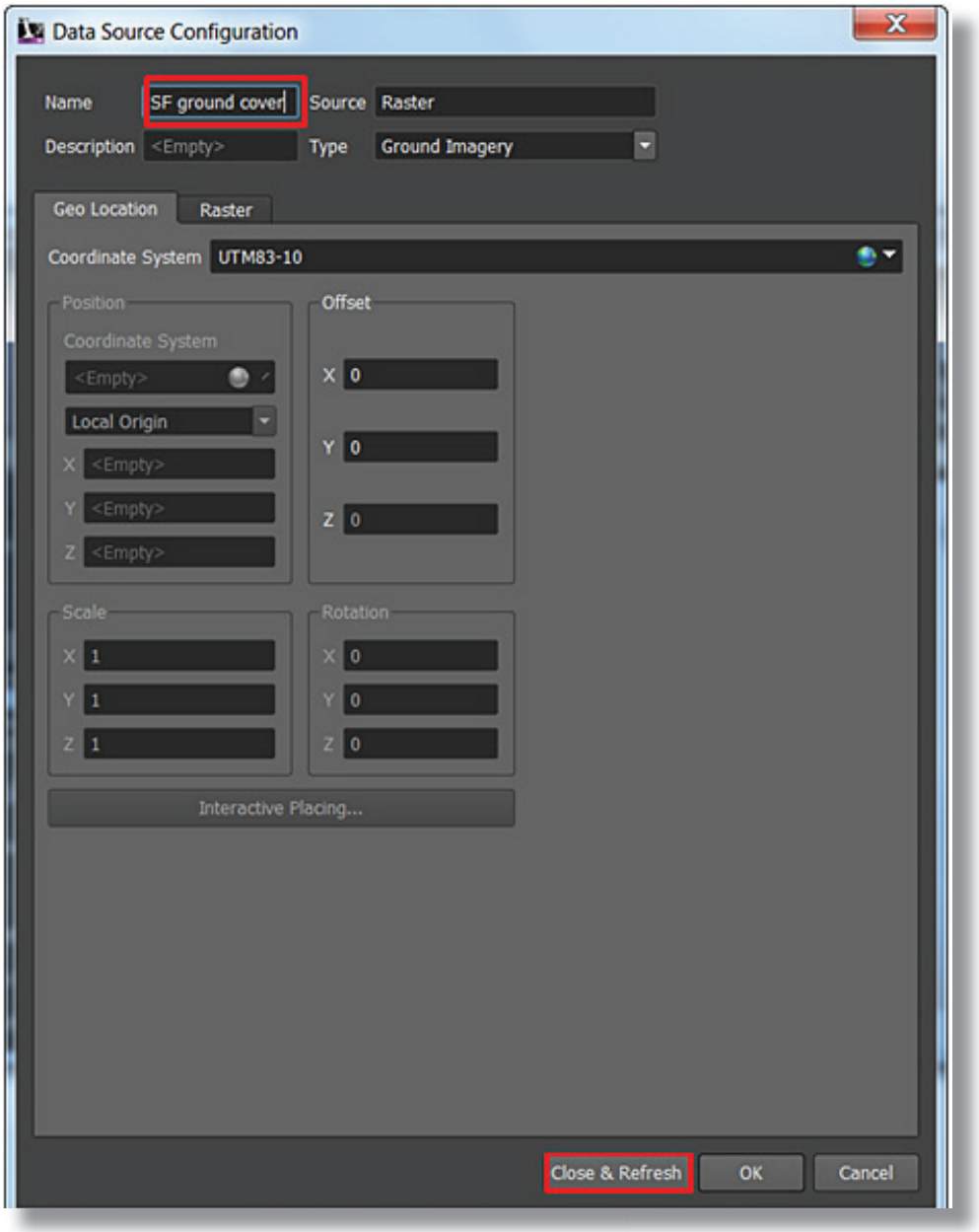
The data source is automatically configured because the data has no elevation data (Z value).

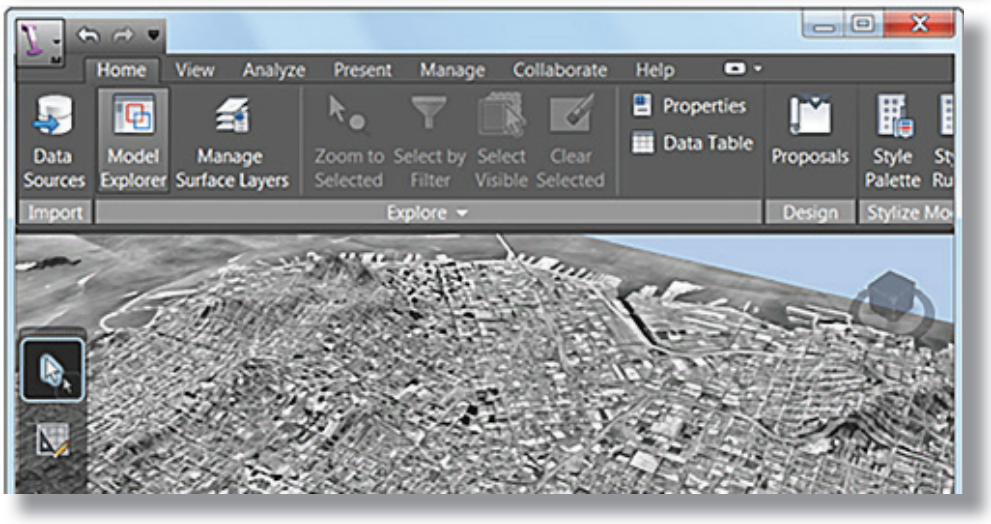


3. Double-click **the Data Source.**

4. Give the data source a more recognizable name.

5. Click **Close & Refresh.**

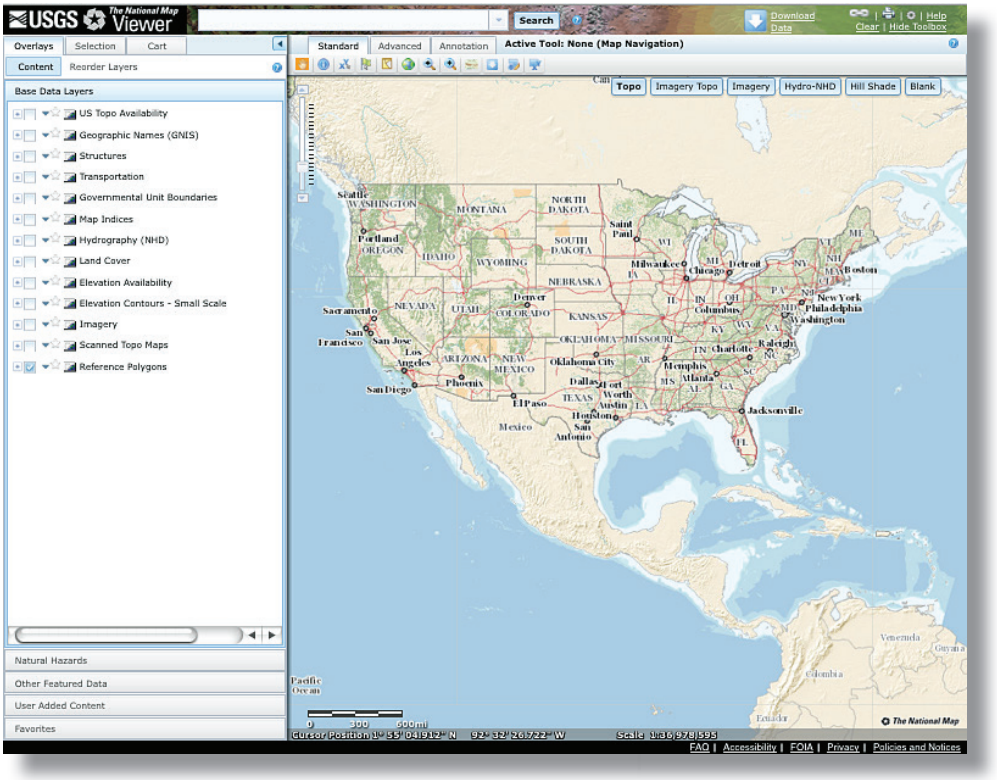




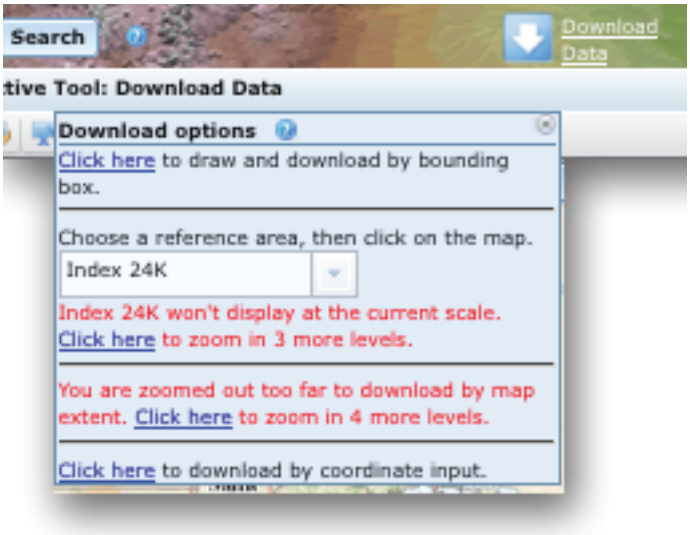
Extra Credit: How do I retrieve color imagery?

You can often retrieve free color imagery for areas in the United States from the USGS site. It is a time-consuming process, but the results make your model look far more realistic.

1. Go to http://viewer.nationalmap.gov/viewer.

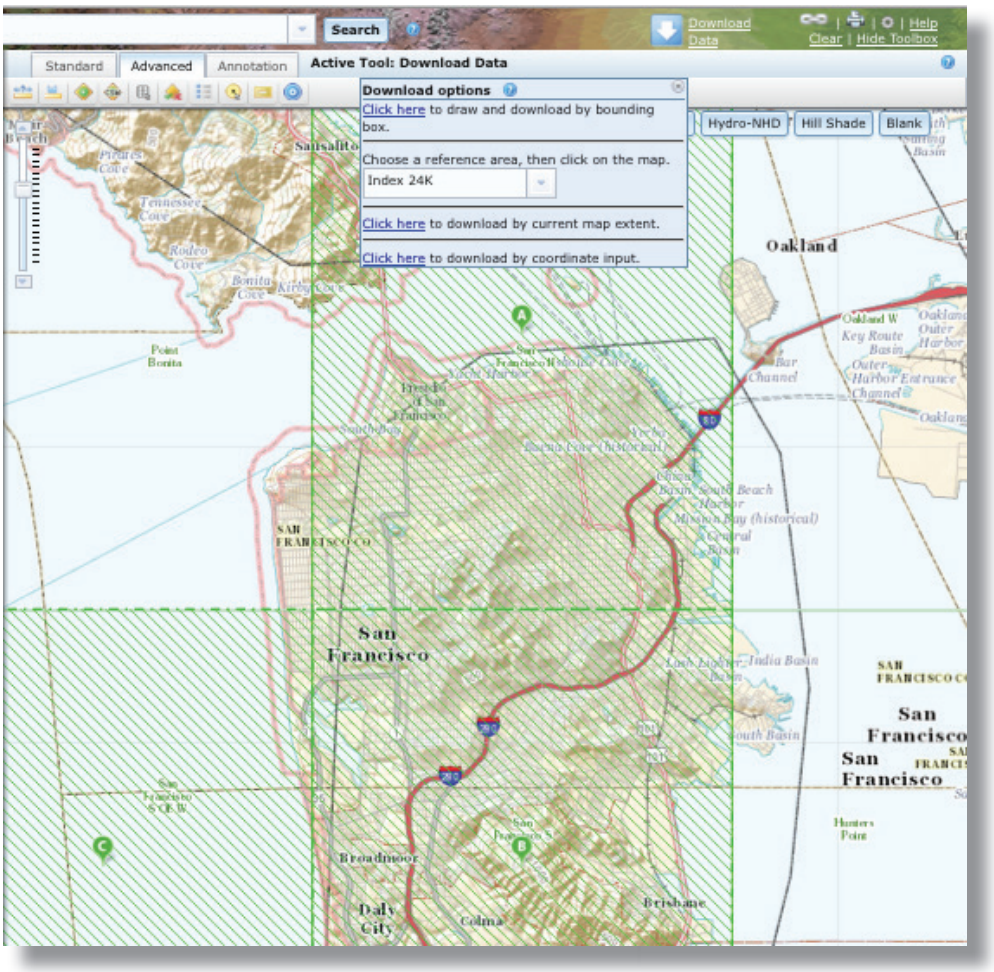


2. Click **Download Data** at the top of the screen.



3. Click **Here** to zoom in four more levels.

4. Pan to the area of interest.

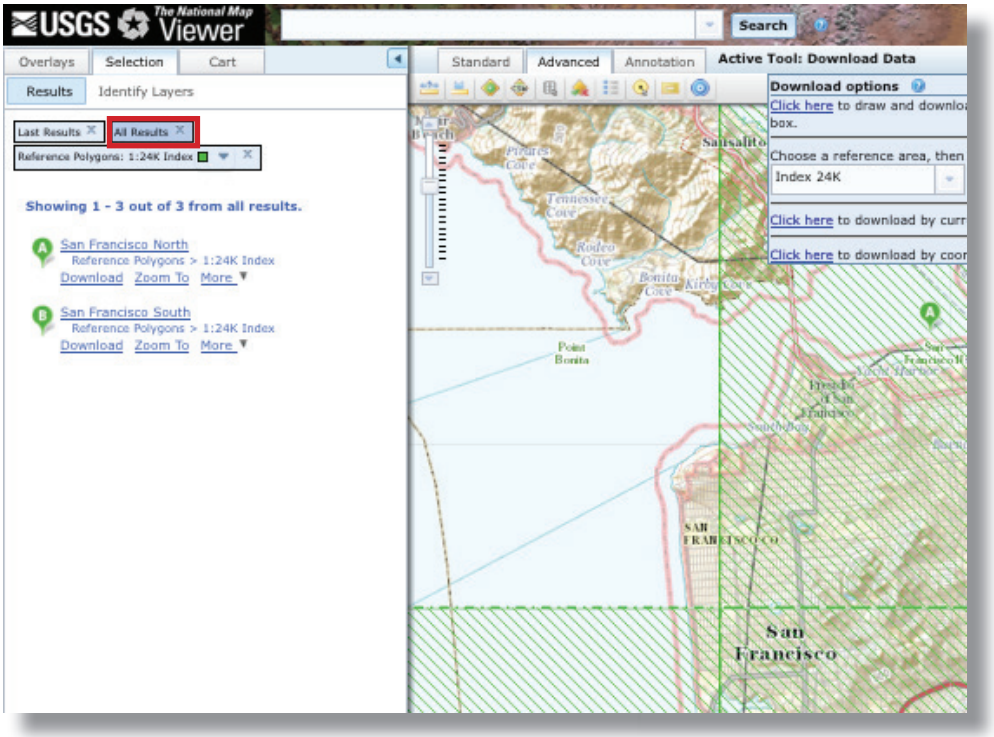


5. Select one of the gridded areas.

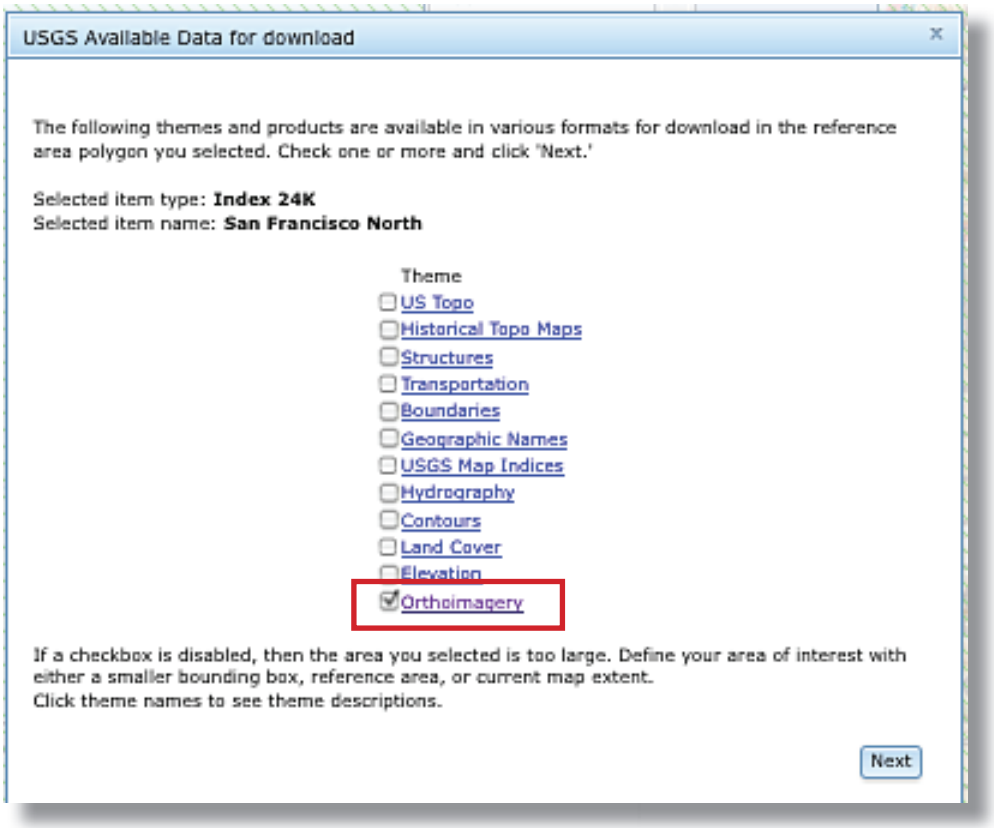
6. Select a second gridded area.

7. On the left side, click the **All Results** tab to see both selections.

8. Under the name of the first area, click the **Download** link.

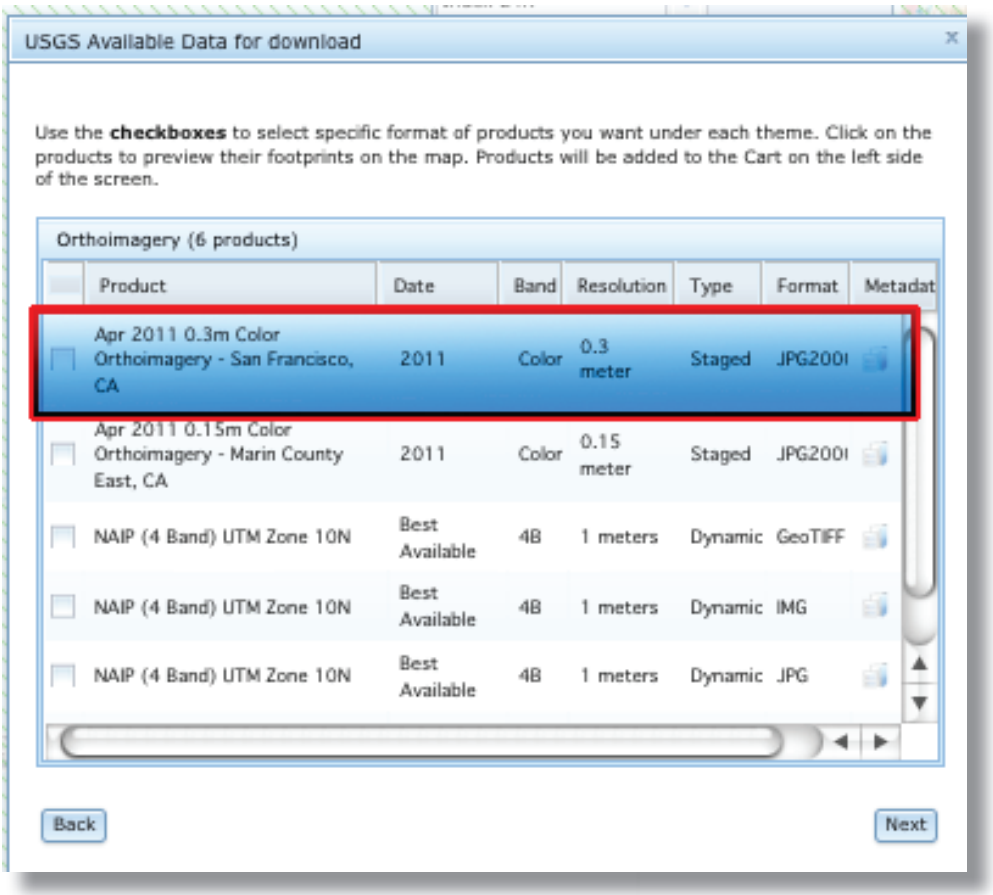


9. Select **Orthoimagery** and click **Next**.



10. Select the most recent color imagery option and click **Next**.

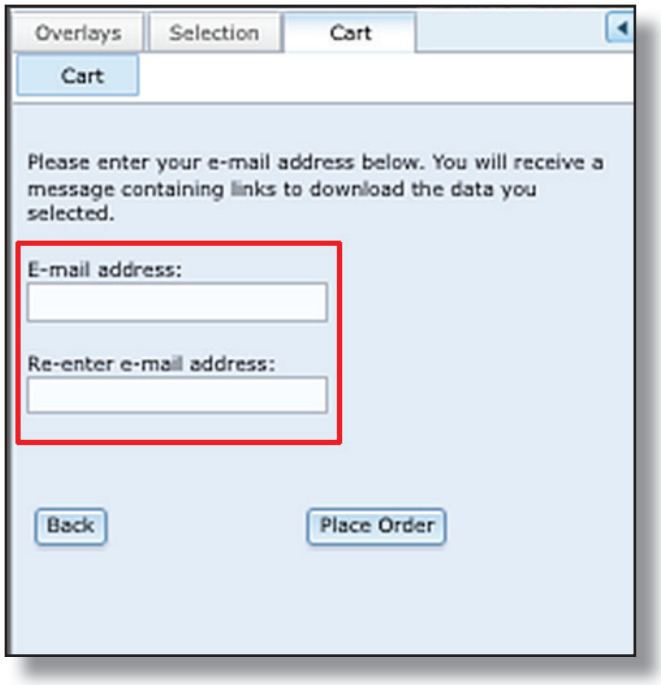
This item is added to the cart.



11. Click the **Selection** tab and **repeat steps 8 through 10** for the other selection.

12. Click **Checkout**.

13. Enter your email address and click **Place Order.**



How do I add multiple imagery files to Autodesk® InfraWorks?

When you retrieve ground imagery, it may be stored in many individual tiles. You can add all of them to Autodesk InfraWorks at one time.

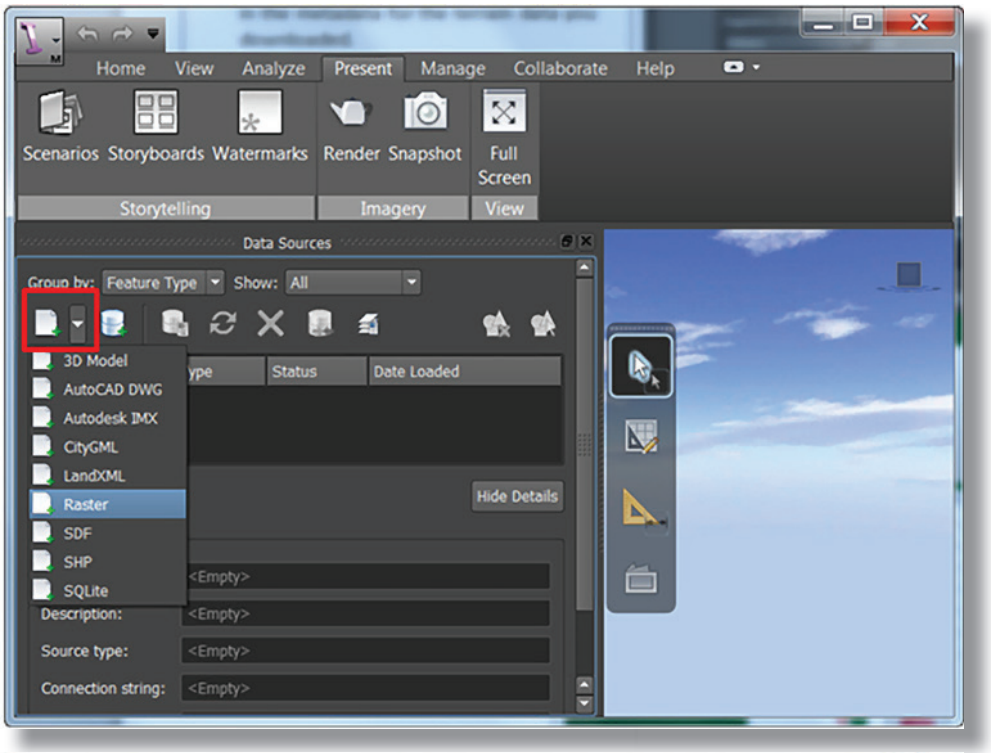
For color imagery, you receive an email listing each downloadable "chunk" of imagery. You must download all the chunks and unzip the files into a single folder.

1. For each chunk, click the link in the right-most cell.

2. Open or save each zipped file, and unzip all of the resulting files into a single folder.

3. Repeat the process for each chunk, and be sure to put ALL of them into the SAME folder as the original chunk.

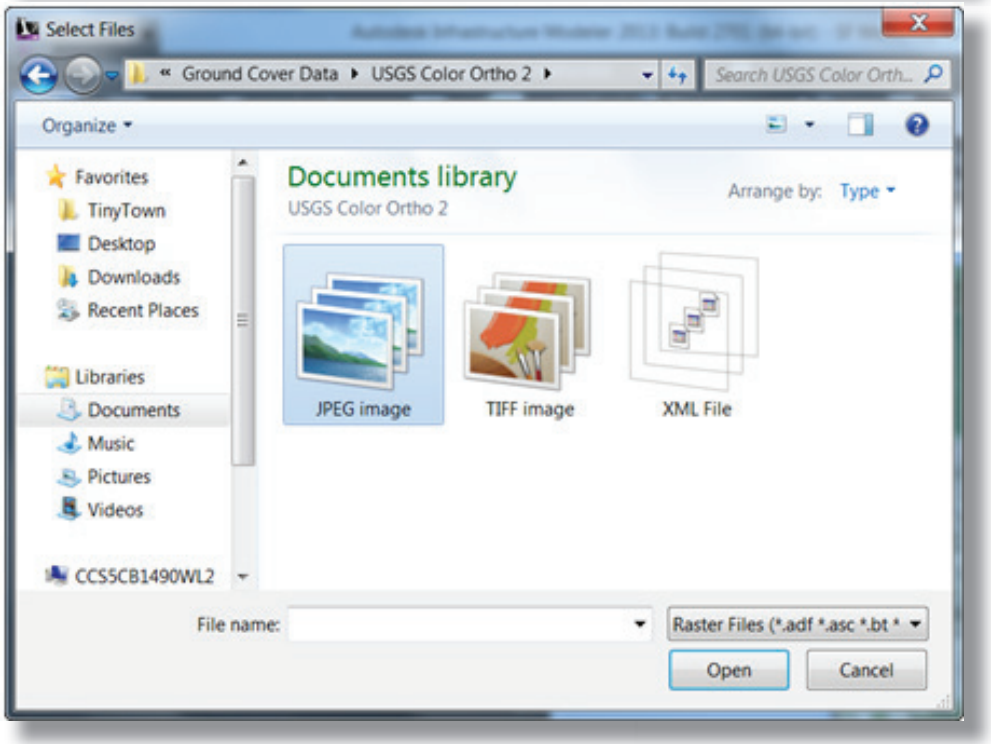
4. In Autodesk InfraWorks, in the Data Sources panel, click Add File Data Source > Raster.



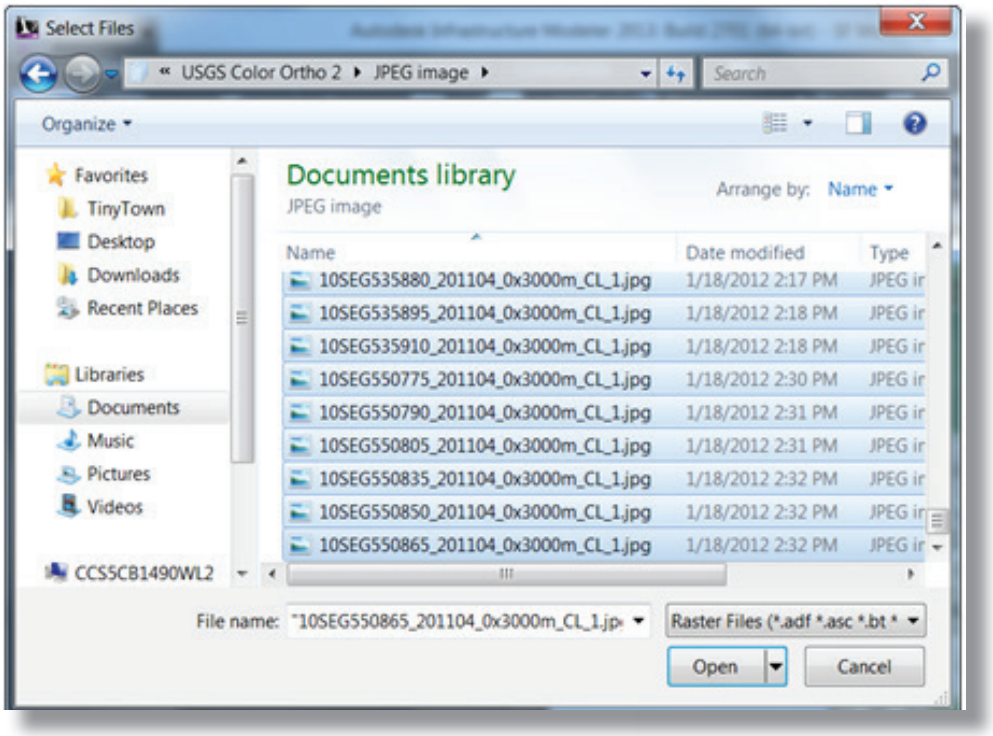
5. Navigate to the folder where you unzipped all the chunks and arrange the files by type.

6. Select the set of **JPEG or TIFF** images (either one is fine).

7. Click **Open**



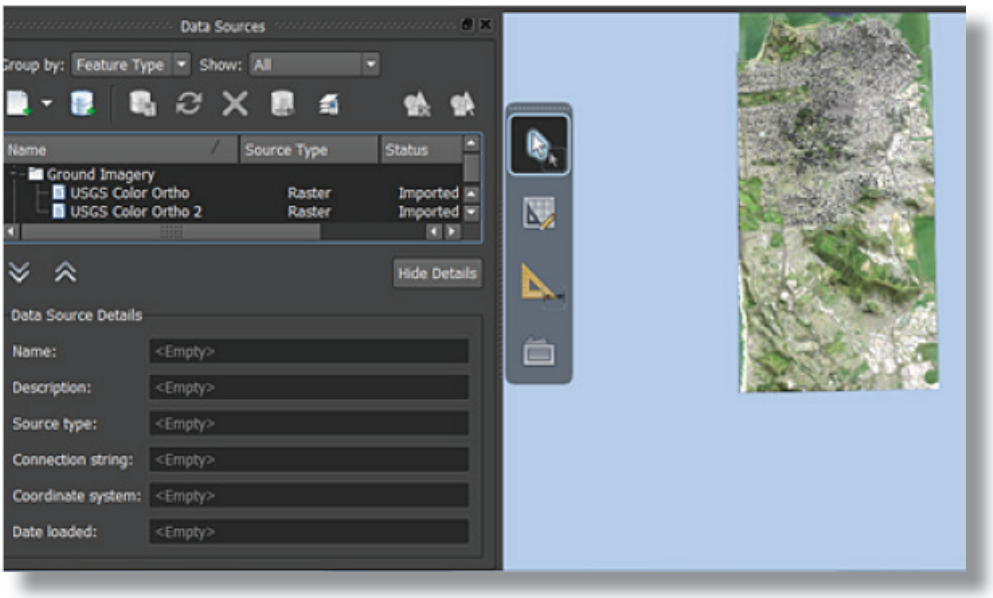
8. Select all the files in the list and click **Open.**



9. Double-click the new data source.

10. Click **Close & Refresh**.

The ground imagery appears in the model.



4 About Transportation Data

While the ground cover aerial photo might show roads, rails, and bike paths, GIS data associates information like road names, rail operators, number of lanes or tracks, and so on with the transportation geometry. This lesson covers road data, but you can also use the Extra Credit lessons to learn how to import bike paths (page 62) and railway data (page 59).

Transportation data is always in vector format, and is often stored in ESRI Shape files. Shape files come in sets, and you must have these three:

File Extension	Purpose
SHP	Geometry. For roads and railways, this is linear geometry, and usually represents the center lines of the roads.
DBF	Attribute information
SHX	Links together and indexes the other two files.

Downloads may also include a PRJ file, which contains projection and coordinate system information.

NOTE: *If possible, download transportation data in SHP format, but DXF is also supported.*

HOW SHOULD I STORE TRANSPORTATION DATA?

Use these guidelines when storing transportation data:

1. Create a **Project** folder to organize all your data.

2. Create a **Transportation Data** folder for each project.

3. When you extract the downloaded zip file, create a target folder for it under the **Transportation Data** folder.

Name the target folder something recognizable, and include the source of the data—for example: **UC Berkeley Roads.**

HOW DO I FIND ROAD DATA?

You can use your web browser search string, for example, including the following: GIS + data + download + DOT + [your area name]

GIS
A Geographic Information System stores, manages, and analyzes goegraphical information.

Download
Include this term to avoid sites that merely display terrain data without the ability to download it.

DOT
Department of Transportation sites often have road and railway data.

Your Area Name
Start with a small area and expand from there. For example, specify your city or county name. Include the state name to make sure you get the right data.

In this lesson, we will use the SFGov data site for roads. If you do the extra credit exercise, you will also use the San Francisco Metropolitan Transit Commission site, and the Cal-Atlas Geospatial Clearinghouse.

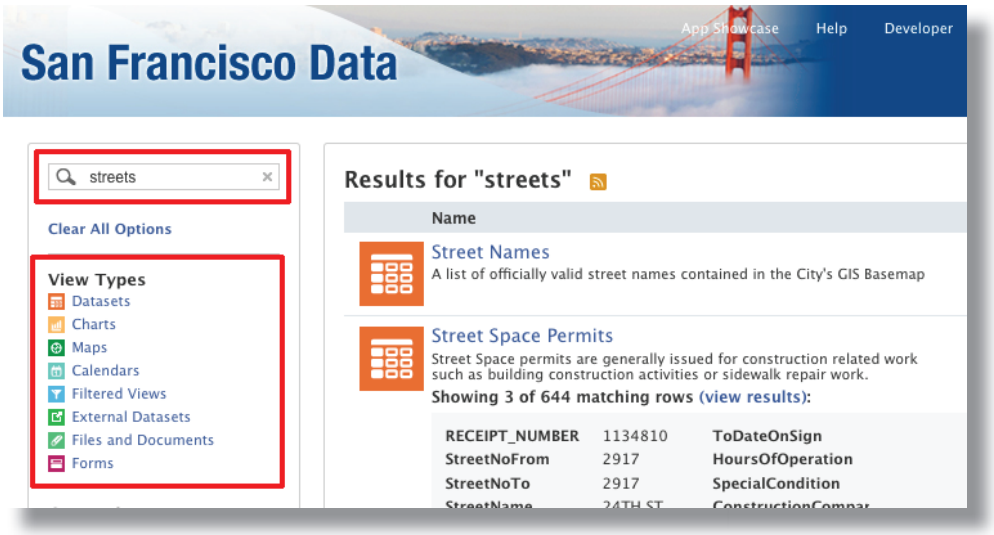
As you look for road and railway data, keep these tips in mind:

- Look for a “resources” or “interactive tools” link on the page
- Do not download maps—you need the raw resources to create a map
- Look for infrastructure data
- Check any posted metadata to find out the coordinate system for the data
- When downloading road data, look for centerline data

How do I retrieve road data?

In this exercise, you will retrieve data from a city-sponsored site.

1. Go to https://data.sfgov.org/.



2. Search for streets.

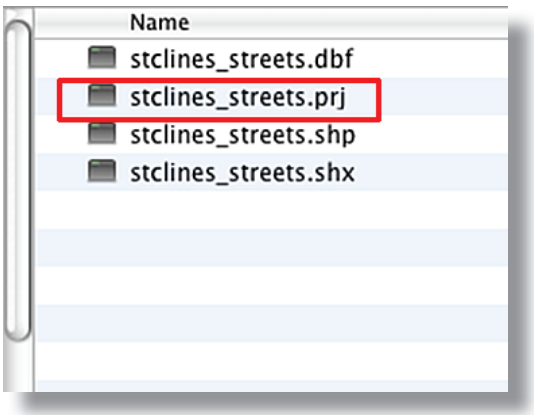
3. Scroll through the list looking for datasets and external datasets.

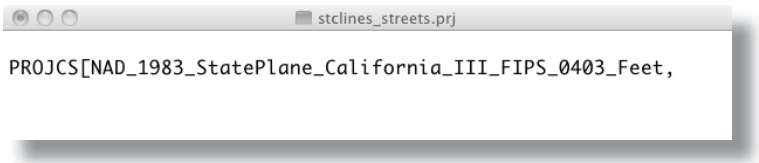
4. Click the external dataset **Streets of San Francisco.**

5. Click the **ZIP** button under **External Link.**

6. UnZip the resulting file to see the SHP files.

7. Open the .prj file with a text editor, such as Notepad, and see that the coordinate system is NAD83, CA-III and uses US feet.



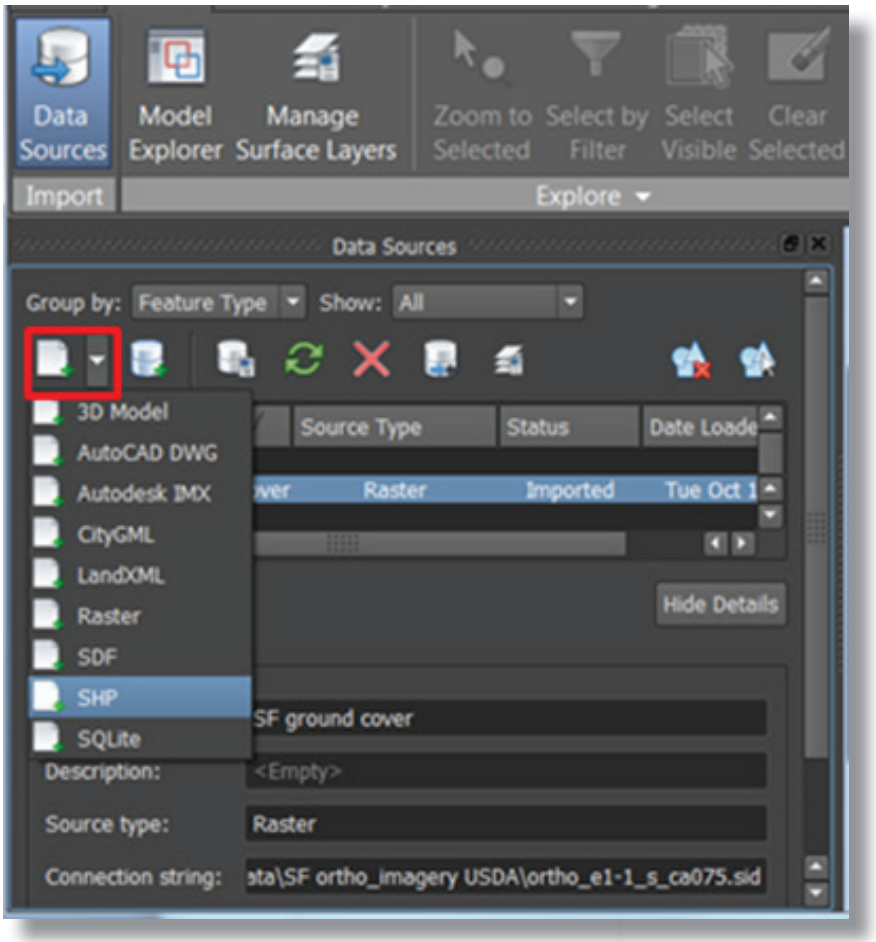


How do I get road data into Autodesk® InfraWorks?

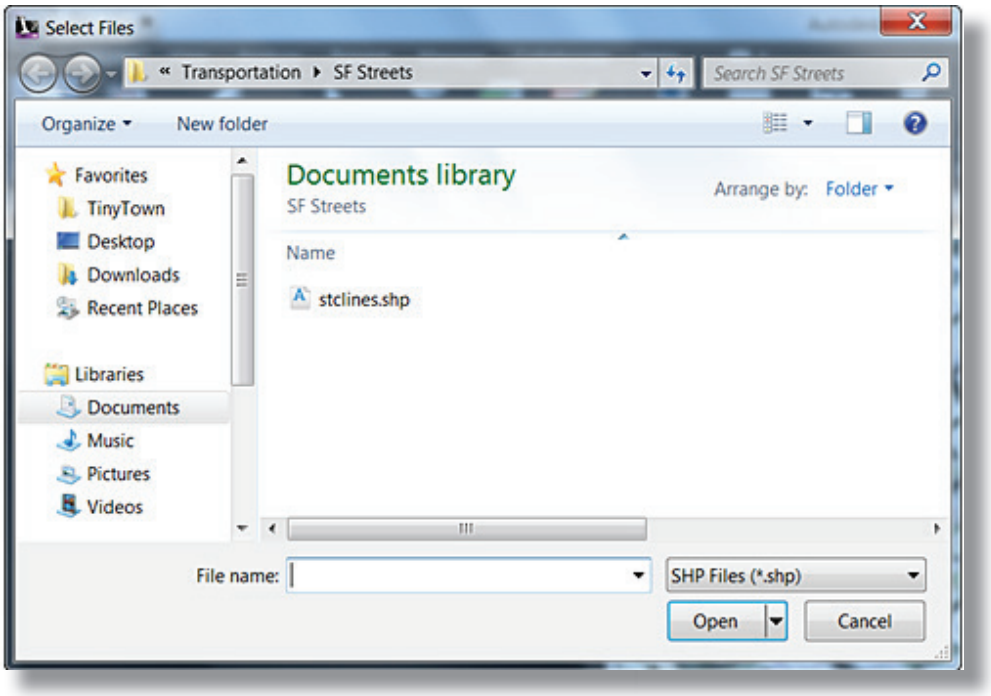
IMPORT AND CONFIGURE THE ROAD DATA

When you configure the data, you will assign a style to make it easier to see the roads. You will concatenate the street name and its suffix (for example, “Main” and “Street”) so that the street will be identified by both. When you create tooltips for the roads, the tooltips will display the concatenated street name. You must also specify the original coordinate system for the roads (the coordinate system you found in the PRJ file) so they are located accurately. You will drape the roads on the terrain so they display properly on the ground.

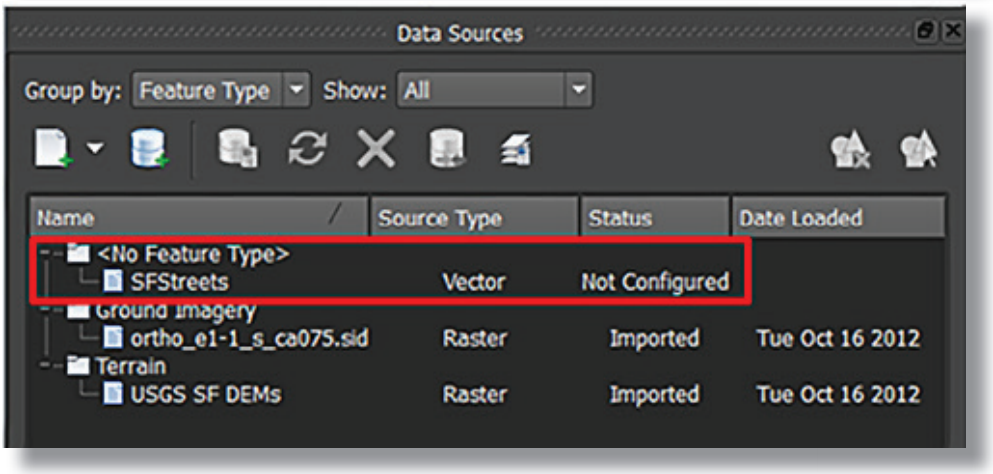
1. In the **Data Sources** panel, click **Add File Data Source > SUP.**



2. Open the .SHP file.



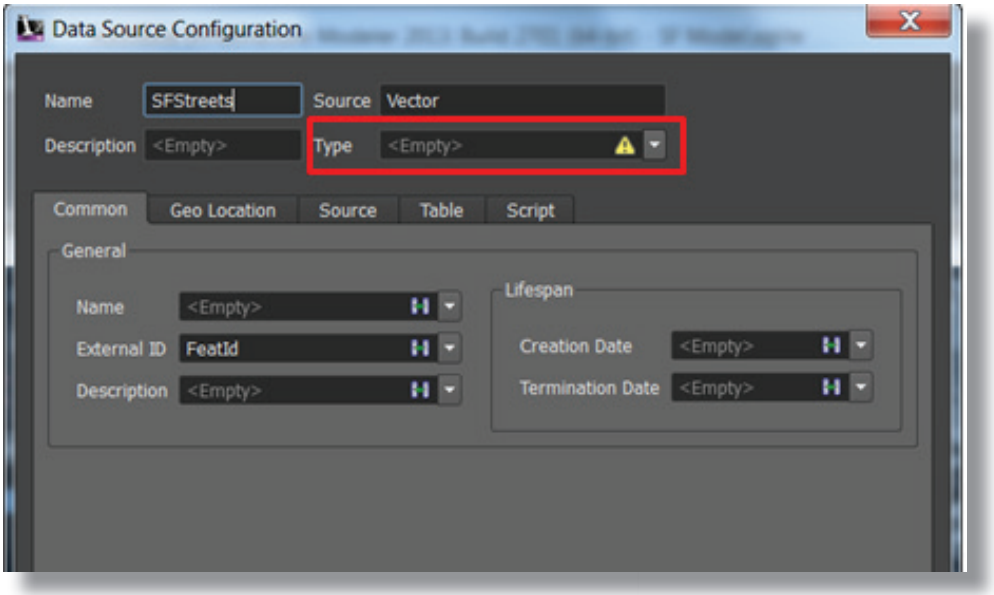
The data source is not configured because a SHP file can contain many types of data—you need to specify the data type.



3. Double-Click the data source.

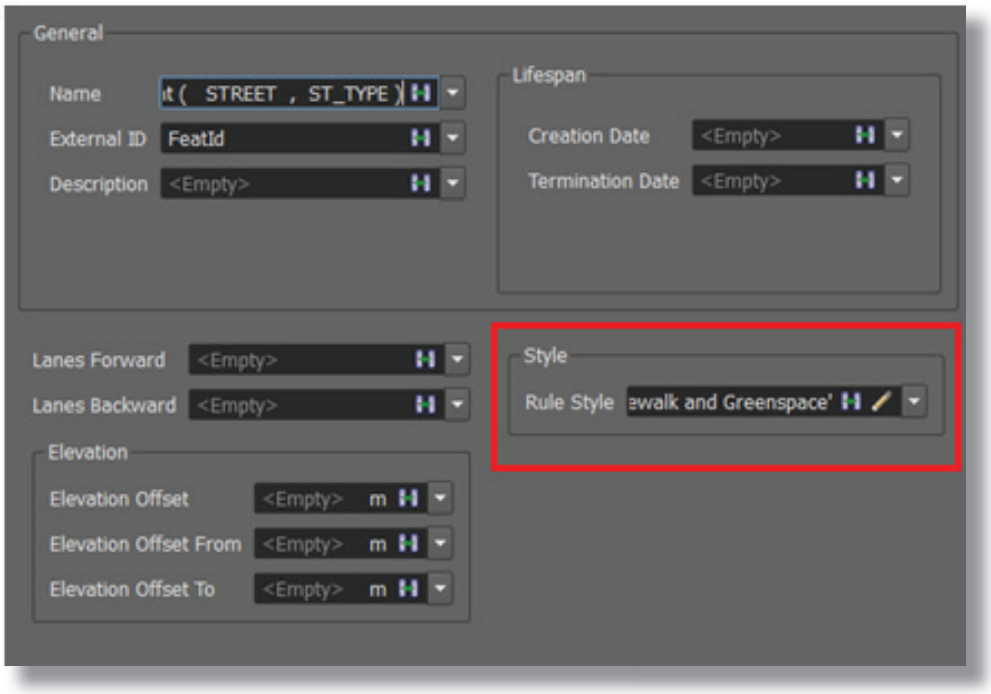
4. Give the data source a more recognizable name.

At first, the configuration screen has very little information.

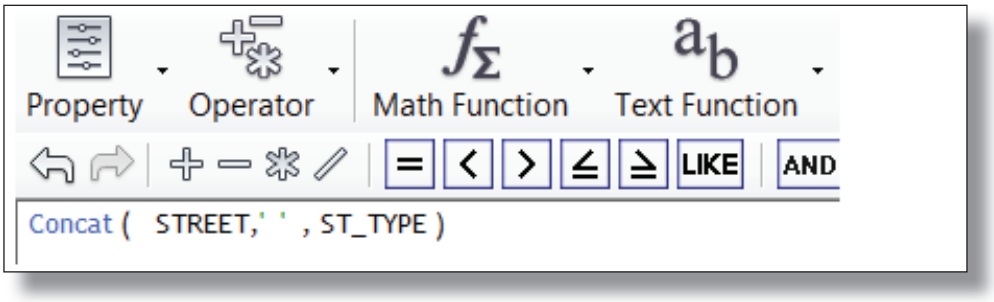


5. For Type, select **Roads** to see more fields.

6. To make the roads easier to see, click the pencil icon in the **Rule Style** field and select a visual style for the roads.



7. For the **Name** field, use the **Expression Builder** to concatenate the **STREET** attribute (the street name only) and the **ST_TYPE** attribute ("Street," "Avenue," and so on).



- Click in the **Name** field.
- From the **Text Function** drop-down, select Concat.
- Replace the property placeholders with **STREET** and **ST_TYPE** by selecting them from the Property drop-down.
- After the comma that follows the **STREET** property, enter a single quote, a space, and another single quote

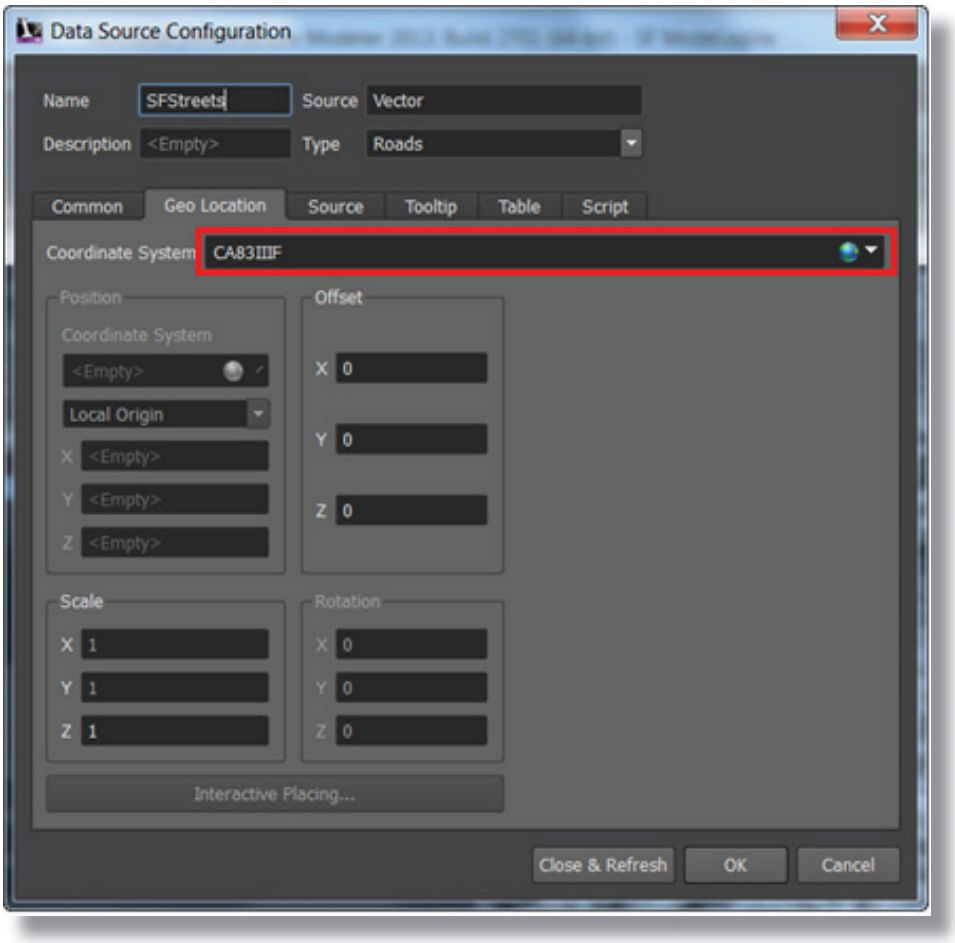
- Delete the part of the expression between the end of the **ST_TYPE** property and the end parenthesis until it looks like the illustration here.

- Click **Validate**.

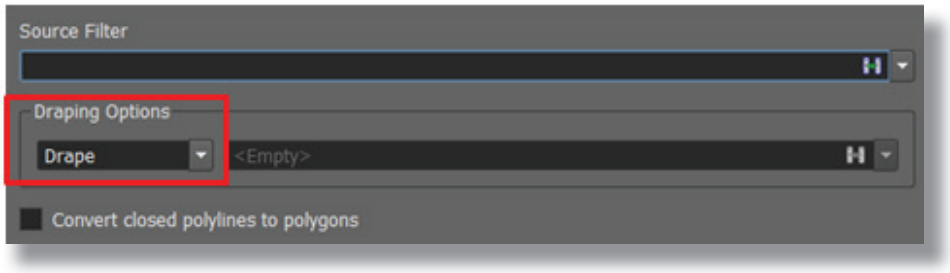
- Click **OK**.

8. Click the **Geo Location** tab.

Specify the coordinate system you found in the PDJ file. Be sure to specify the coordinate system with the **F** at the end, indicating **Feet**.



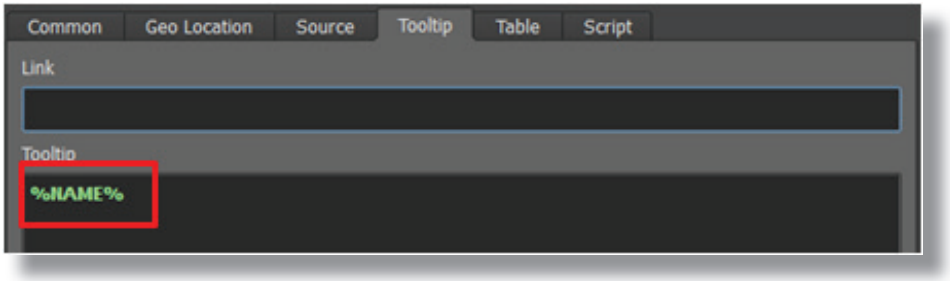
9. Click the **Source** tab and specify **Drape**.



10. Click the **Tooltip** tab and enter a tooltip.

- Type **%** to see a list of properties.

- Select the **NAME** property.



11. Click **Close & Refresh.**

When you zoom in, you can see and select individual streets.

If you right-click a street and select **Show Tooltip**, the street name displays.

Extra Credit: How do I retrieve railway data?

Use a state source to find railway data.

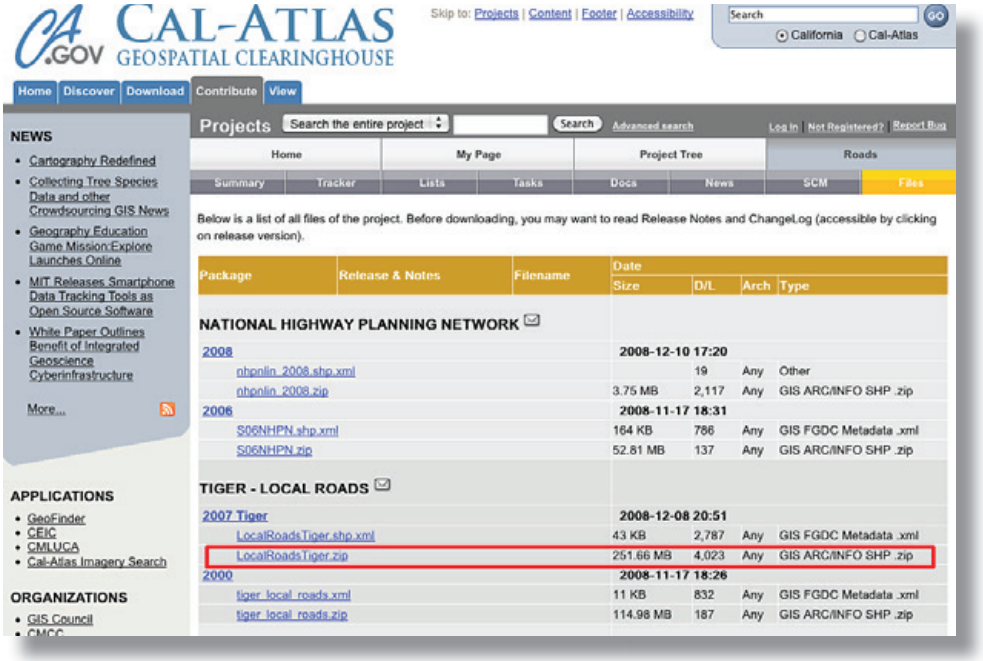
1. Use the **Cal-Atlas Geospatial Geospatial Clearinghouse** to find railway data.

Go to **https://atlas.ca.gov/frs/?group_id=135**

2. Download the **RailroadsTiger.zip** file by clicking it.

Extract the file to a sub-folder of your **Transportation** folder.

3. In Autodesk InfraWorks, use the **Data Source** panel to add **RailroadsTiger.shp.**



4. Double-click the file to configure it.

5. Set **Type** to **Railways**.

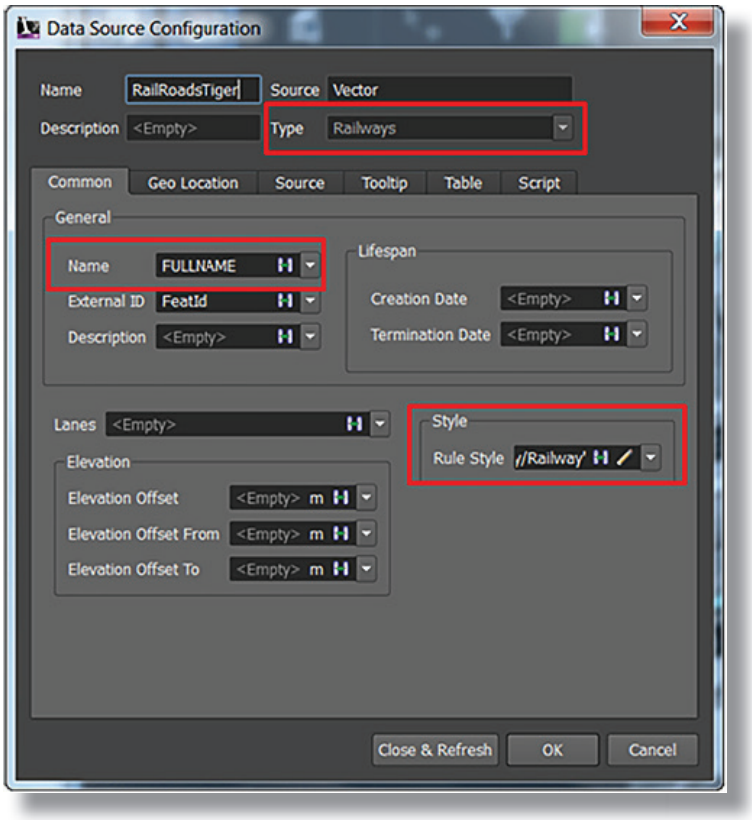
6. Map the **Name** field to **FULLNAME.**

7. Select a rail style.

8. Click **Close & Refresh.**

To see where the railways are, highlight them.

9. Close the **Data Sources** panel.



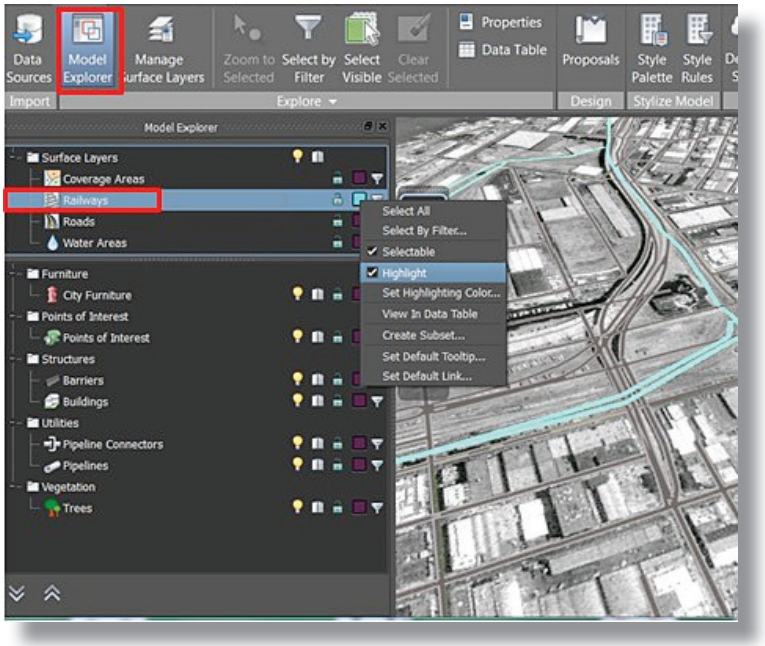
10. Display **Model Explorer.**

11. Right-click the **Railways** layer.

12. Set the **Highlighting Color**, if desired.

13. Select **Highlight**.

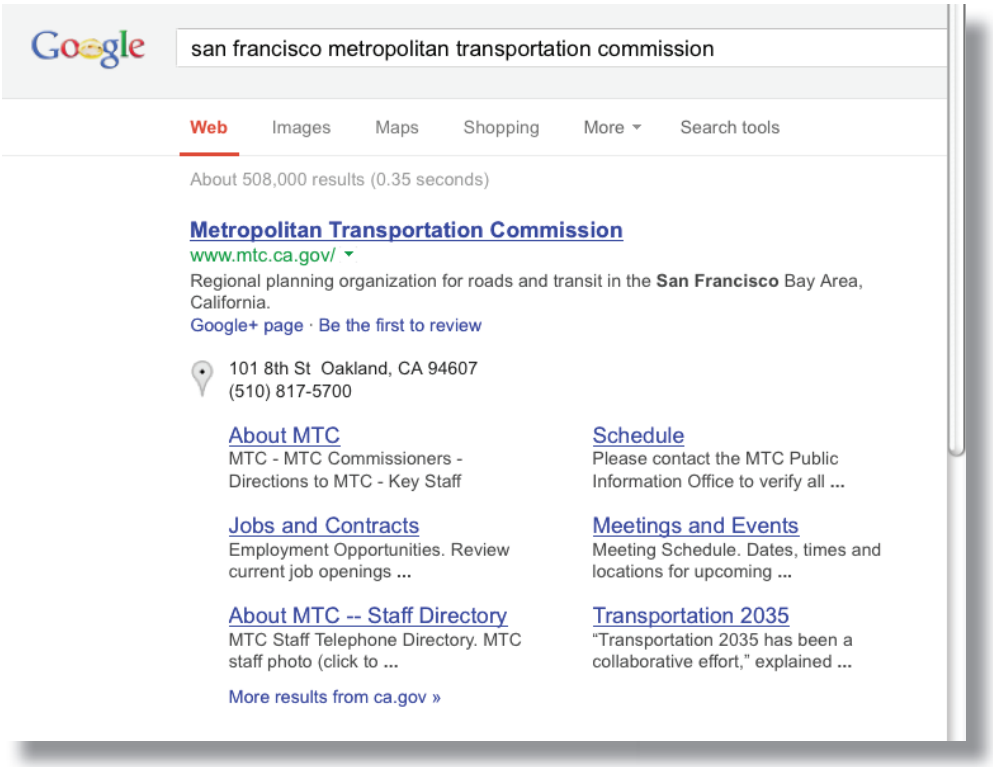
The railways are highlighted in your model.



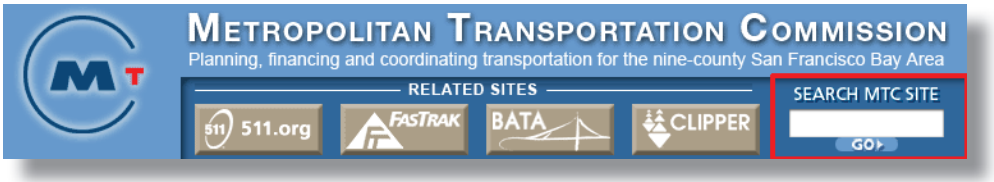
Extra Credit: How do I retrieve bike path data?

Use a state source to find bike path data.

1. Use the **San Francisco Metropolitan Transit Commission** site to find bike path data.

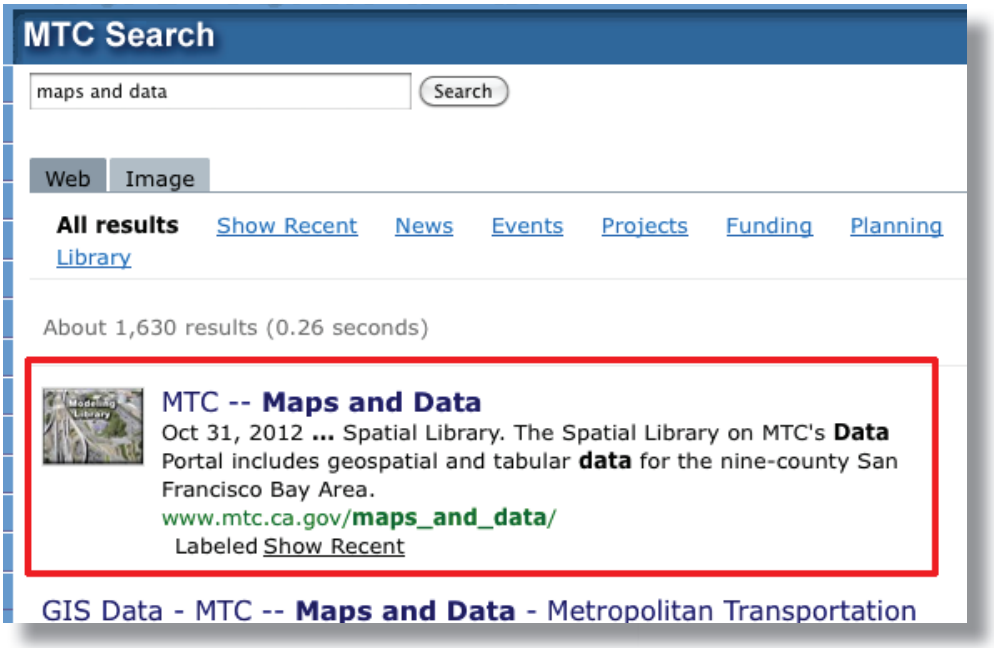


2. There are many links on the home page, but you can shortcut the process by searching directly for **Shapefiles**.



3. The first entry in the results list seems to have actual files to download.

4. Scroll down the resulting page to see transit-related files.

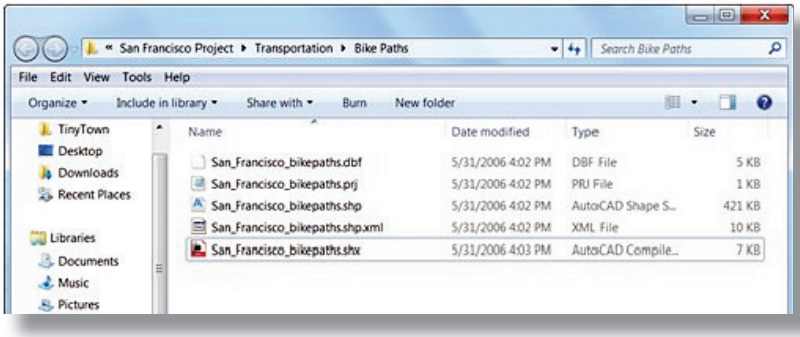


5. Click **Bay Area Bikeways in San Francisco City/County** to download the data.

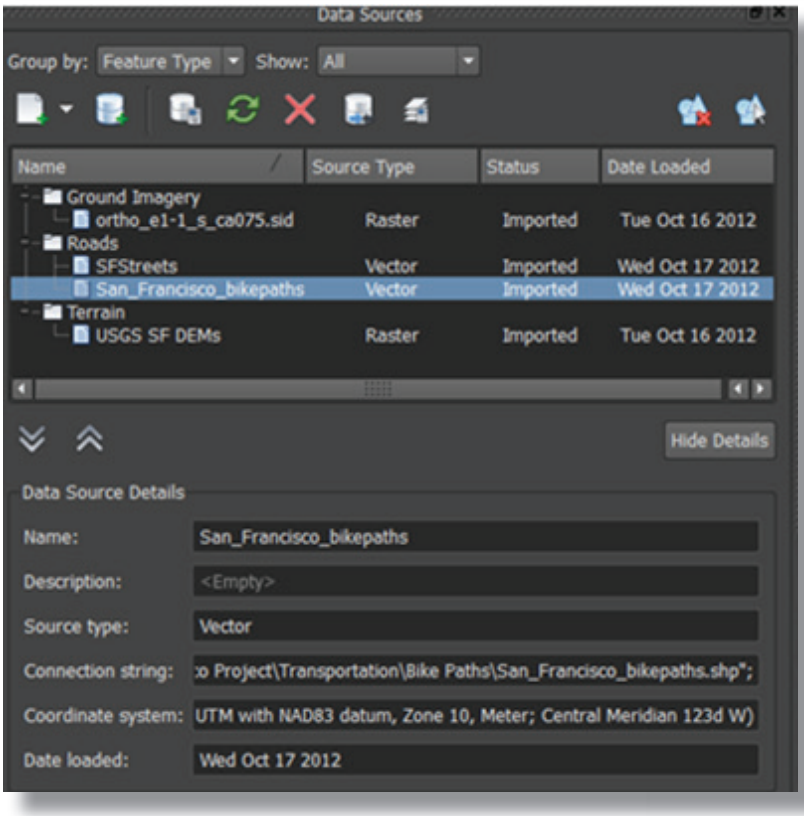
Category 2	
Bay Area Transit Geodatabase (As of November 2008)	MTC_Transit_GDB.zip
Bay Area Transit Shapefiles (As of November 2008)	Transit_DB_Shapefiles.zip
Bay Area Bikeways (all 9 counties)	Bike_9county.zip
Bay Area Bikeways in Alameda county only	Bike_Alameda.zip
Bay Area Bikeways in Contra Costa county	Bike_Contra_Costa.zip
Bay Area Bikeways in Marin county	Bike_Marin.zip
Bay Area Bikeways in Napa county	Bike_Napa.zip
Bay Area Bikeways in San Francisco city/county	Bike_San_Francisco.zip
Bay Area Bikeways in San Mateo county	Bike_San_Mateo.zip
Bay Area Bikeways in Santa Clara county	Bike_Santa_Clara.zip
Bay Area Bikeways in Solano county	Bike_Solano.zip
Bay Area Bikeways in Sonoma county	Bike_Sonoma.zip

6. Extract the data to a sub-folder of your **Transportation** folder.

These files had names that were not very descriptive, so we renamed them to include the term **"bikepaths."**



7. Bring the data into Autodesk InfraWorks using the same methods you used for streets.



5 About Water Data

Water data is also called hydro or hydrology data.

Water data is always in vector format, and is often stored in ESRI Shape files. Shape files come in sets, and you must have these three:

File Extension	Purpose
SHP	Geometry. For water, this is line geometry or polygon geometry, but polygon geometry is preferred because it looks more realistic.
DBF	Attribute information
SHX	Links together and indexes the other two files.

Downloads may also include a PRJ file, which contains projection and coordinate system information.

HOW SHOULD I STORE WATER DATA?

Use these guidelines when storing water data:

1. Create a **Project** folder to organize all your data.

2. Create a **Water Data** folder for each project.

3. When you extract the download zip file, create a target folder for it under the Water Data folder.

Name the target folder something recognizable, and include the source of the data – for example: **SF City Water Data.**

You can use your web browser search string, for example, including the following: GIS + data + download + water + [your area name]

GIS
A **Geographic Information System** stores, manages, and analyzes geographical information.

Download
Include this term to avoid sites that merely display terrain data without the ability to download it.

Your Area Name
Start with a small area and expand from there. For example, specify your city or county name. Include the state name to make sure you get the right data.

In this lesson, we will use data from the City of San Francisco. The Extra Credit exercise uses a service called WeoGeo.

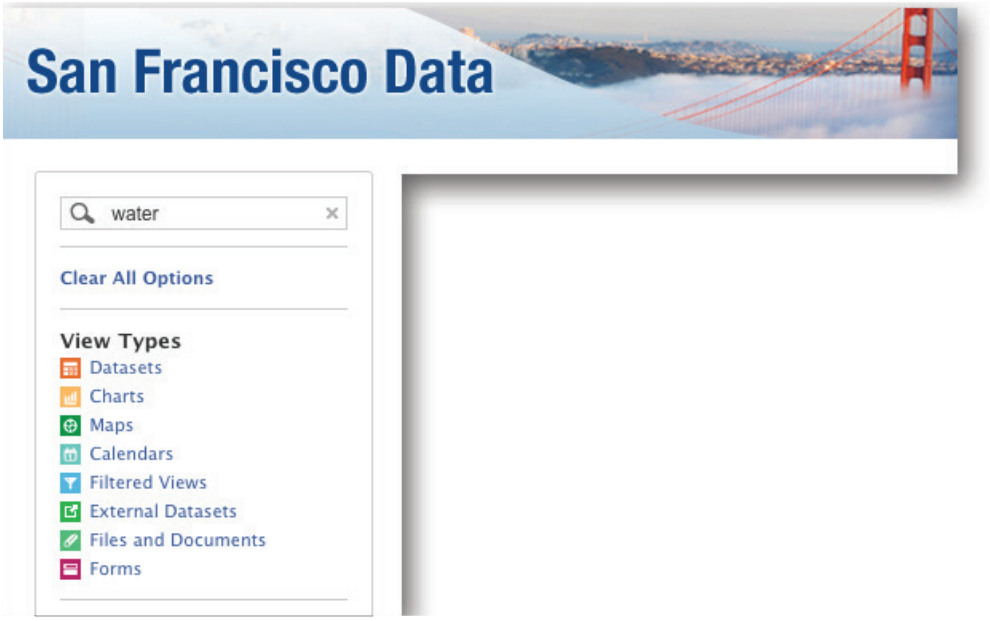
As you look for water data, keep these tips in mind:

- Look for a “resources” or “interactive tools” link on the page
- Do not download maps—you need the raw resources to create a map
- Look for hydrology data
- Check any posted metadata to find out the coordinate system for the data
- If data is tiled, check on an overview map to see which tiles you want

How do I retrieve water data?

1. Go to www.data.sfgov.org.

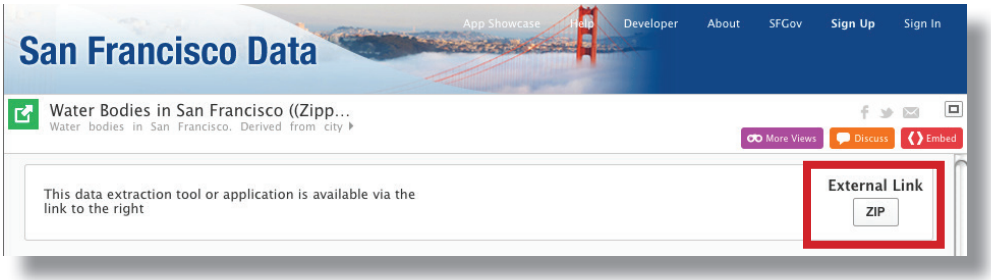
2. On the left of the page you'll find the search field. In the search field, type **Water.**



3. The first entry in the results is what we want. Click its title.

4. On the resulting page, click the **ZIP** button to download the water SHP file.

5. Save the file to your local drive.



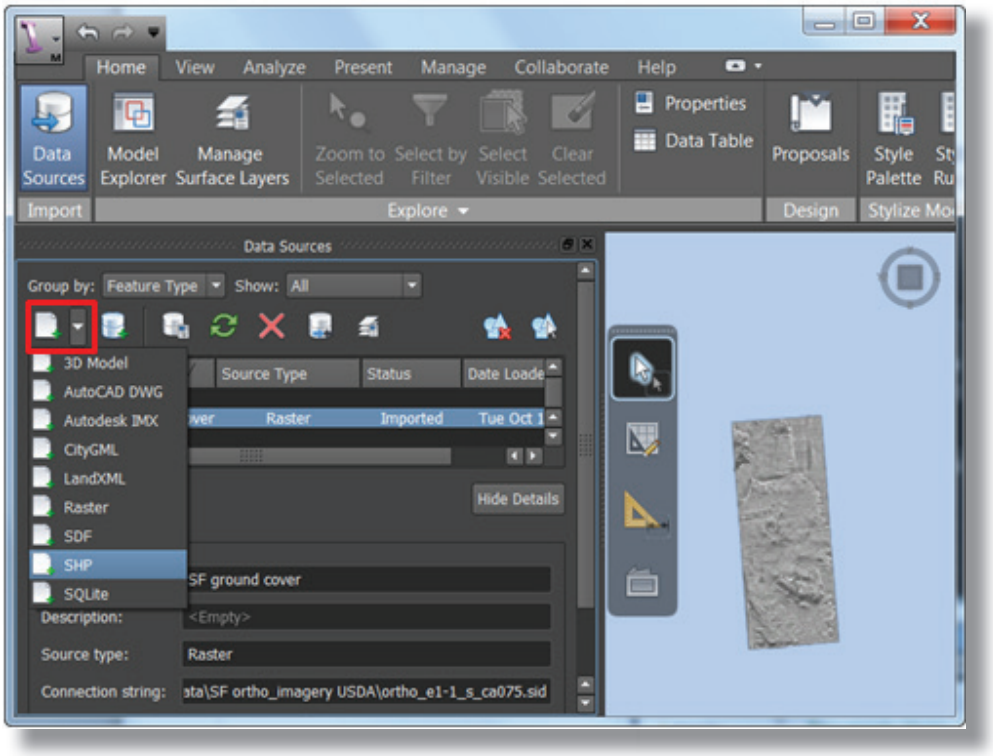
How do I get water data into Autodesk® InfraWorks?

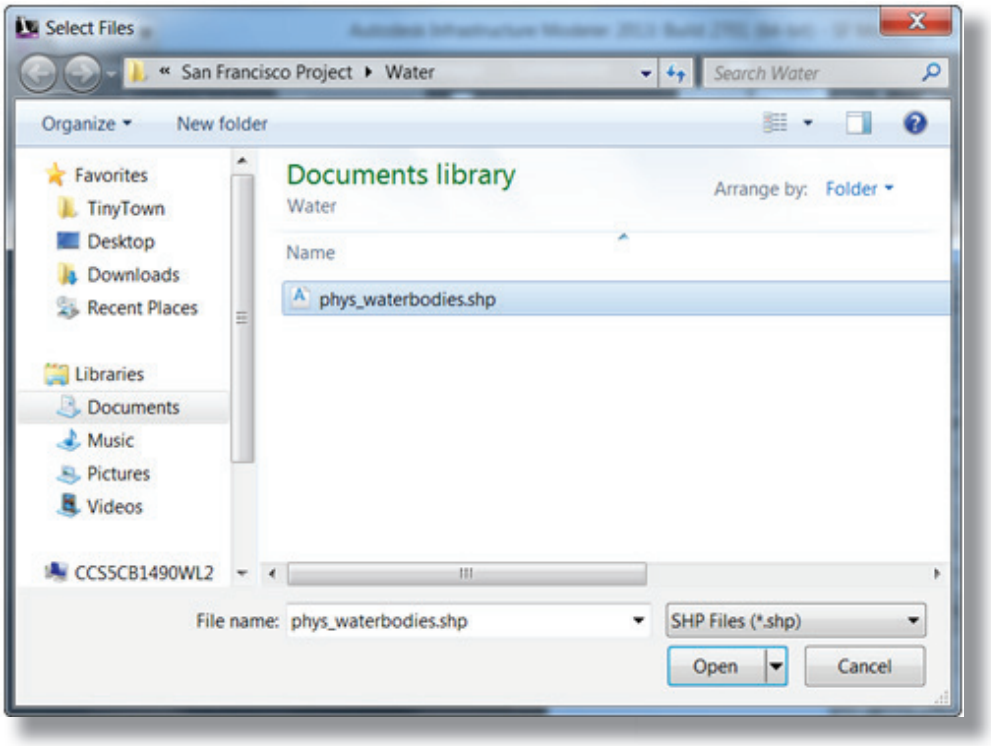
Import and configure the water data, much as you did for the transportation data. In this case, you do not need to specify the coordinate system—Autodesk InfraWorks is able to determine it from the data source.

1. In the Data Sources panel, click **Add File Data Source > SHP**

2. Open the .SHP file.

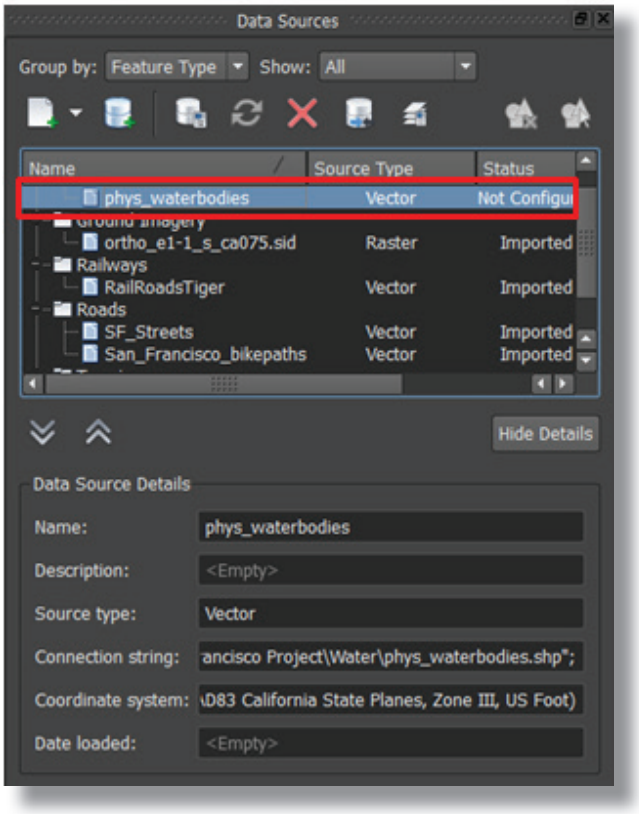
The data source is not configured because a SHP file can contain many types of data — you need to specify the data type.



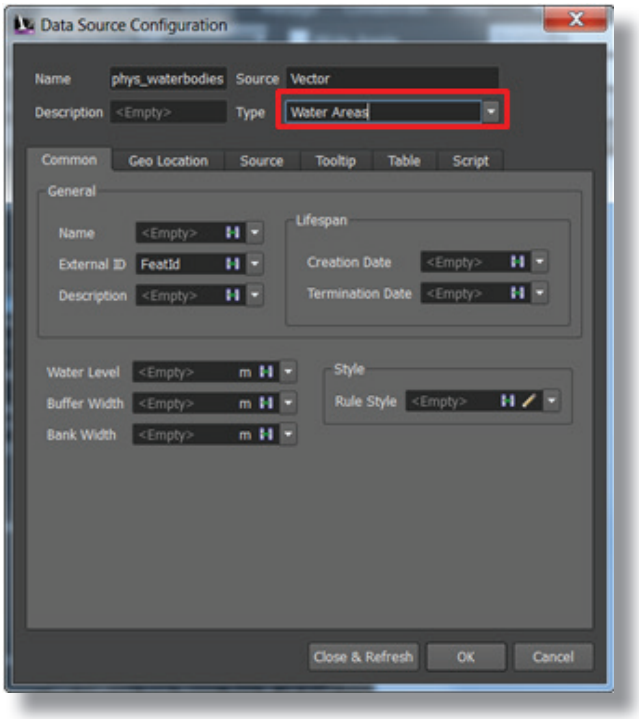


3. Double-click the data source.

4. Give the data source a more recognizable name.



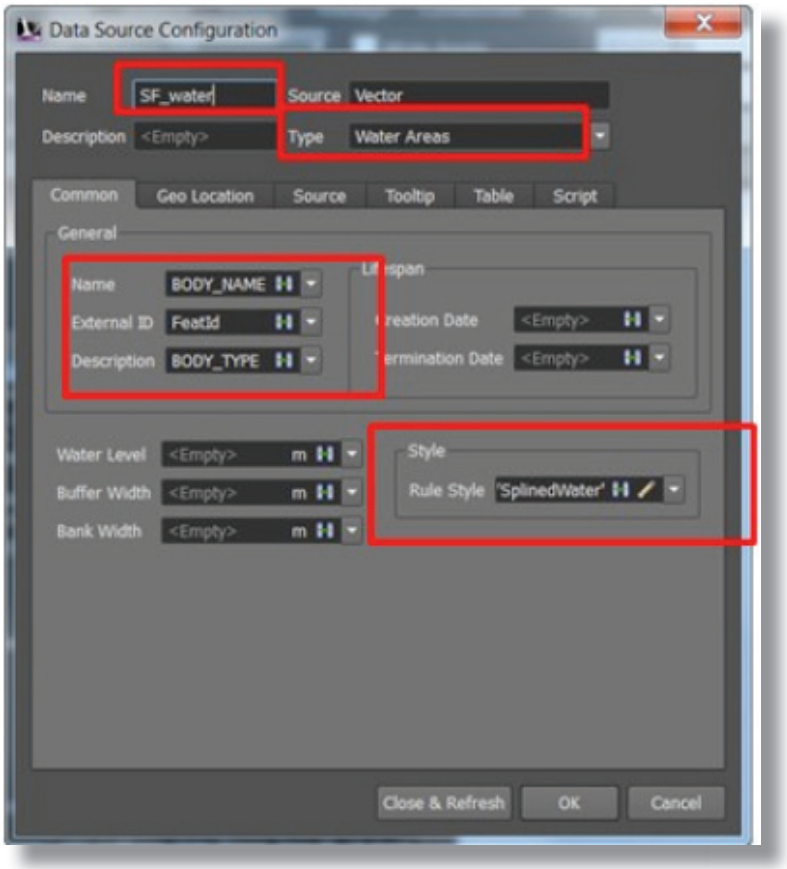
5. For Type, select **Water** to see more fields.



6. Use the drop-down lists next to each field to map the attributes in the SHP file to the attributes in the model.

For example, this SHP file has an attribute called **BODY_NAME**. You can map that to the Name field for Water in the model.

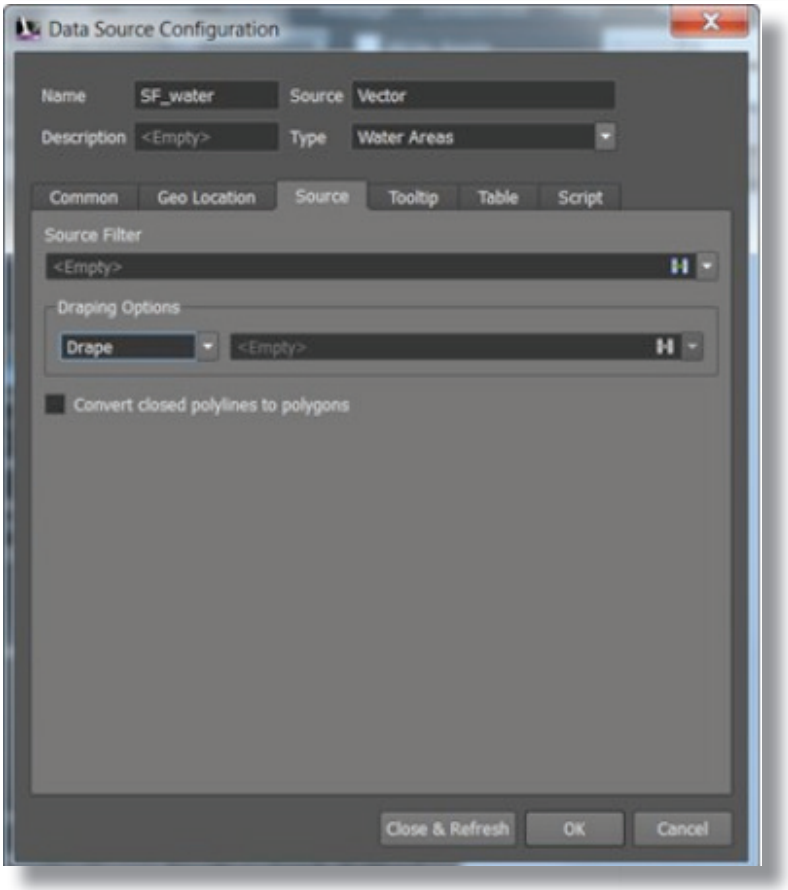
For any fields that don't have equivalents in the SHP, leave the value blank.



7. To make the water more realistic, click the pencil icon in the **Rule Style** field and select a visual style for the water.

8. Click the source tab and specify **Drape.**

9. Click **Close & Refresh.**



When you zoom in, you can see the styled water.

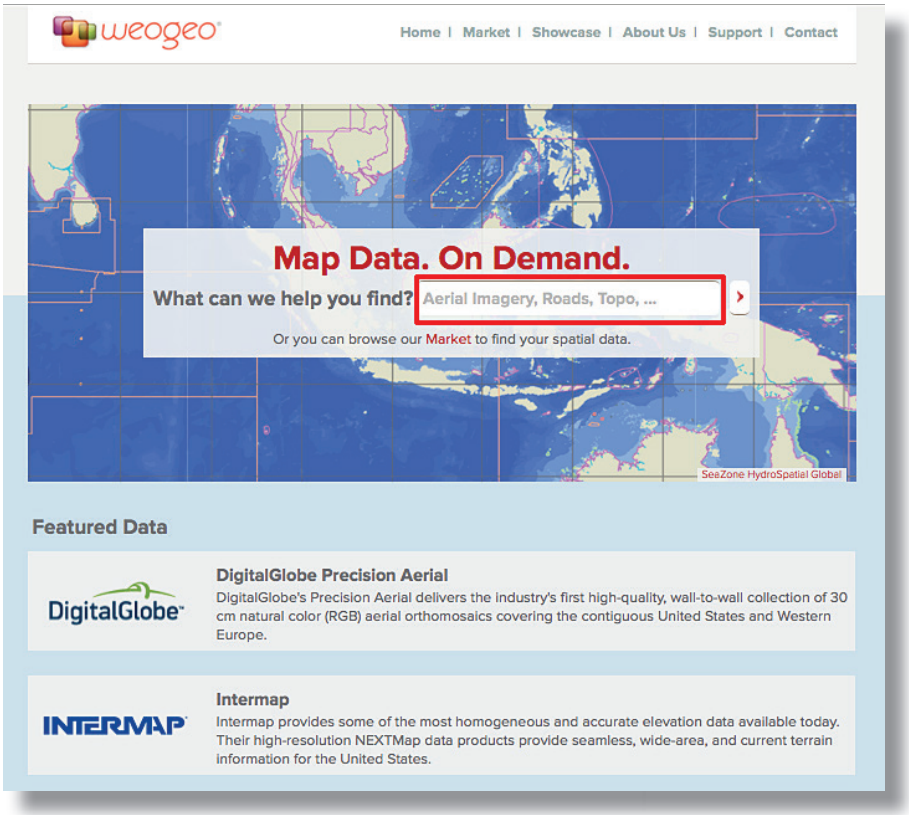
Extra Credit: How do I use WeoGeo service to retrieve water data?

The WeoGeo service aggregates GIS data in a single portal, making it easier to find the available data for a particular area. Some of the data is free and some of is fee-based.

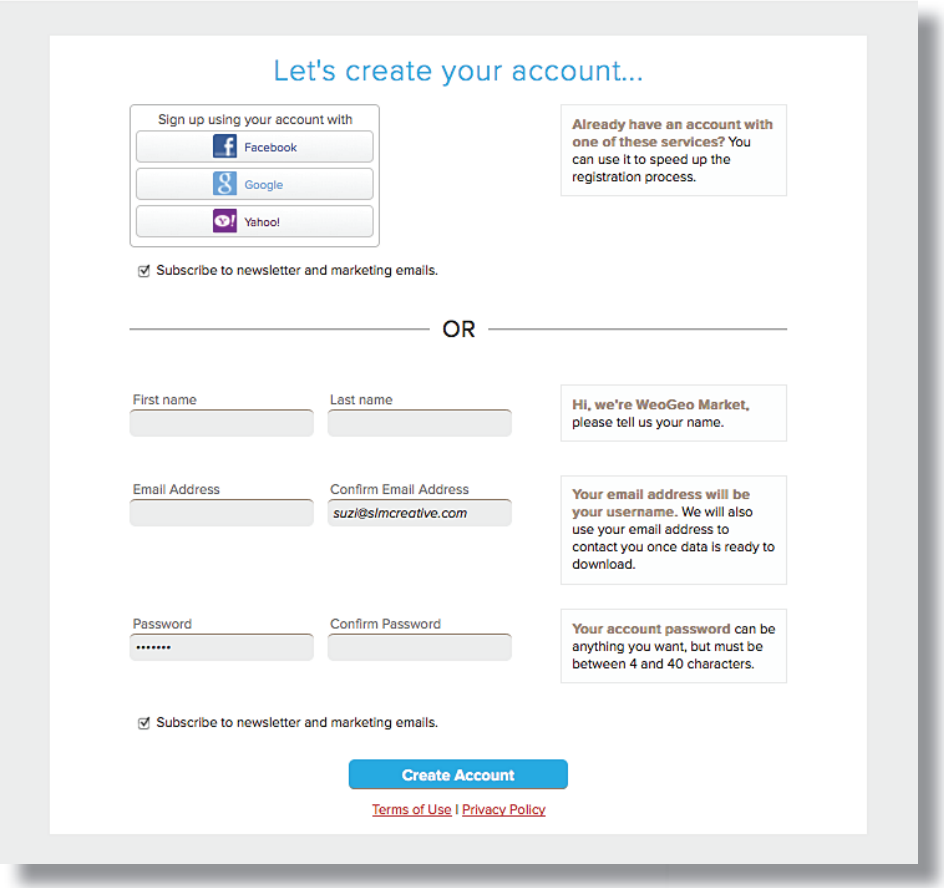
1. Go to **http://www.weogeo.com.**

2. In the **Search** field, type **San Francisco.**

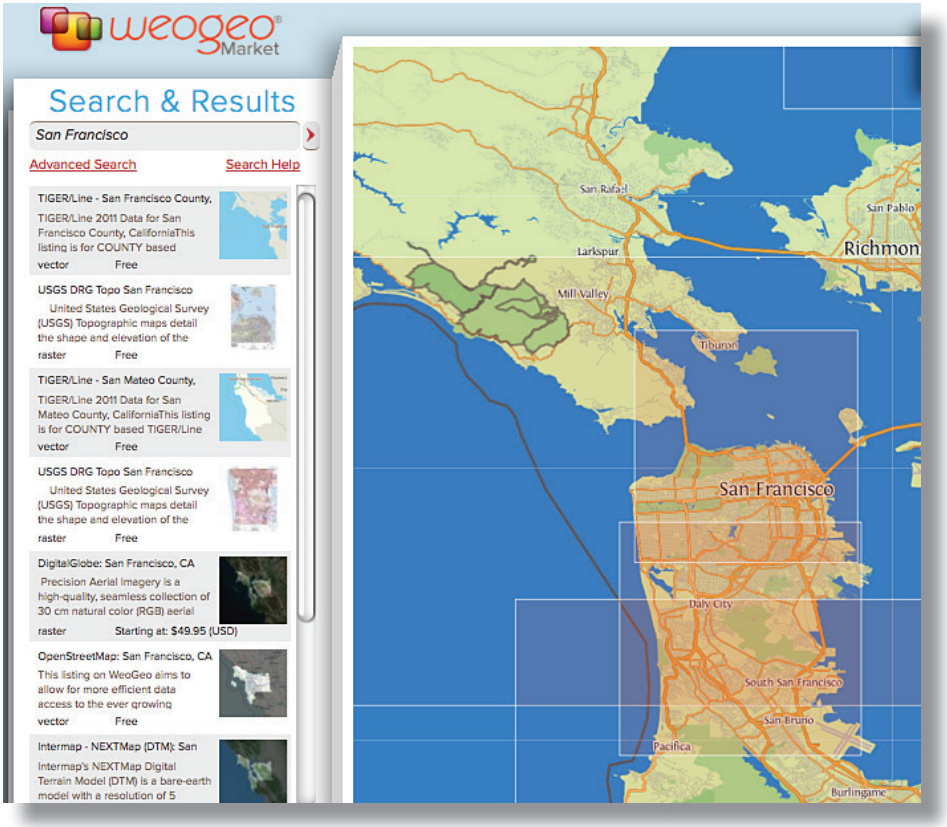
3. Register with the service so you can download data.



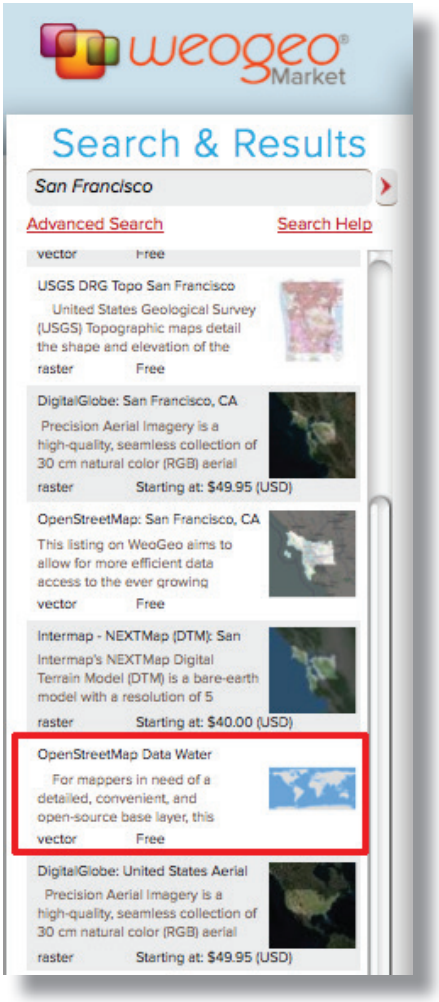
4. Enter your information and click **Create Account.** When you receive confirmation, sign in with your new credentials.



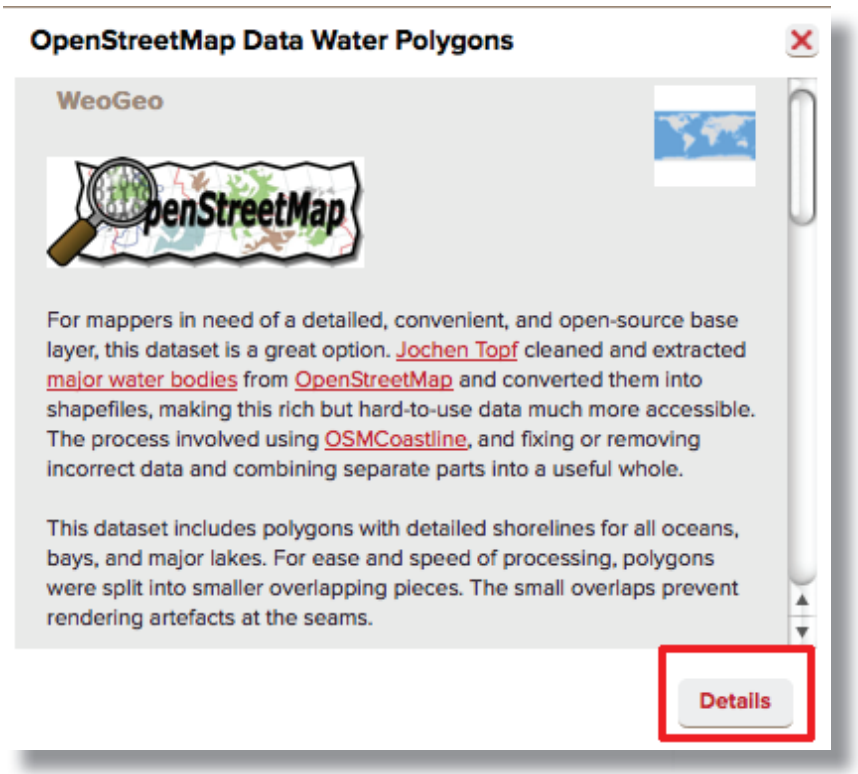
5. Double-click to zoom into the San Francisco area to see the available datasets.



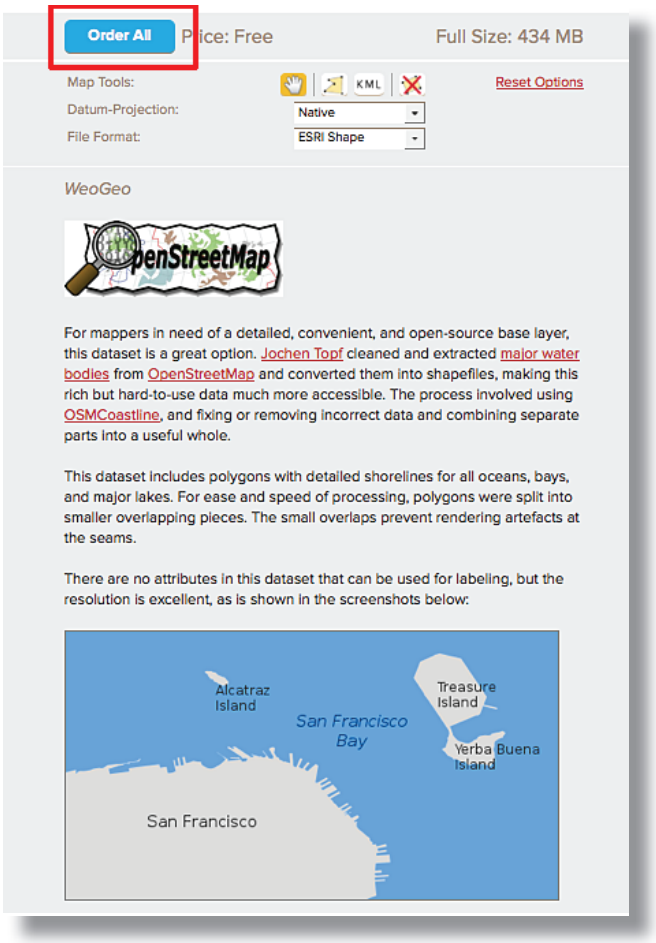
6. The last item on the list is water polygons. Click it to see information about it.



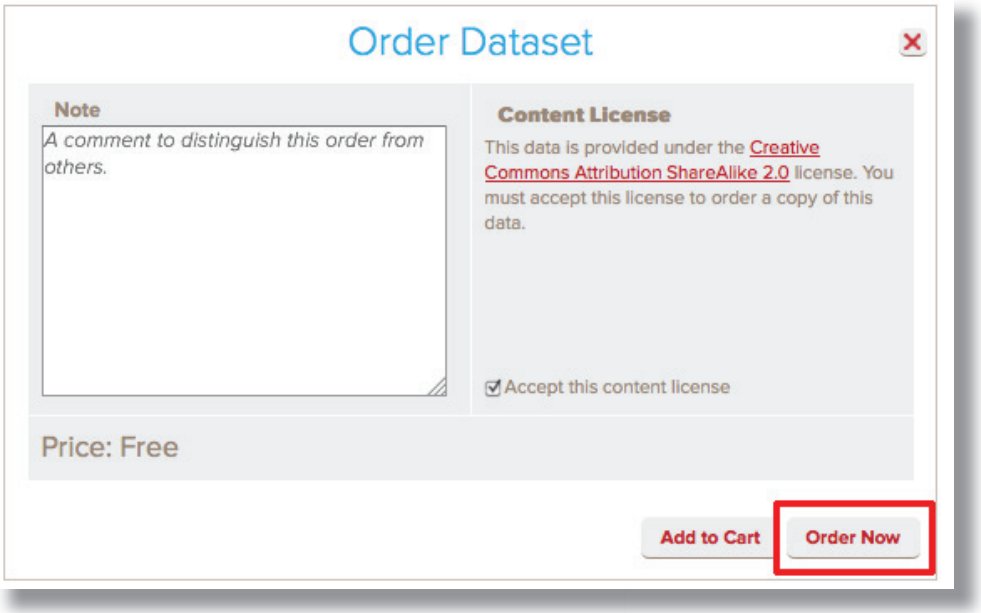
7. Click the **Details** button.



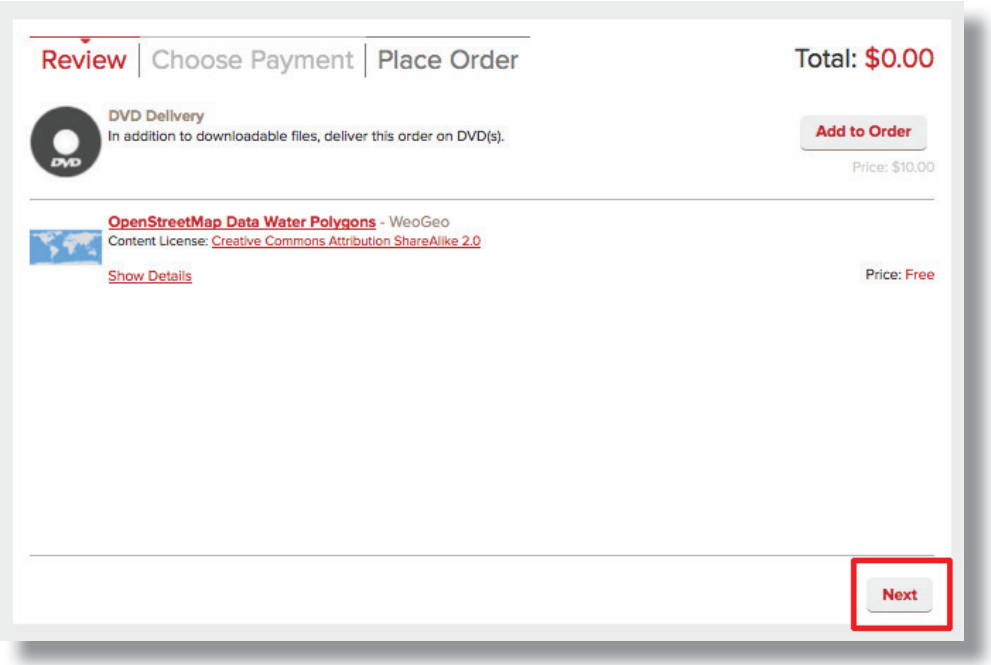
8. Read the description and click **Order All.**



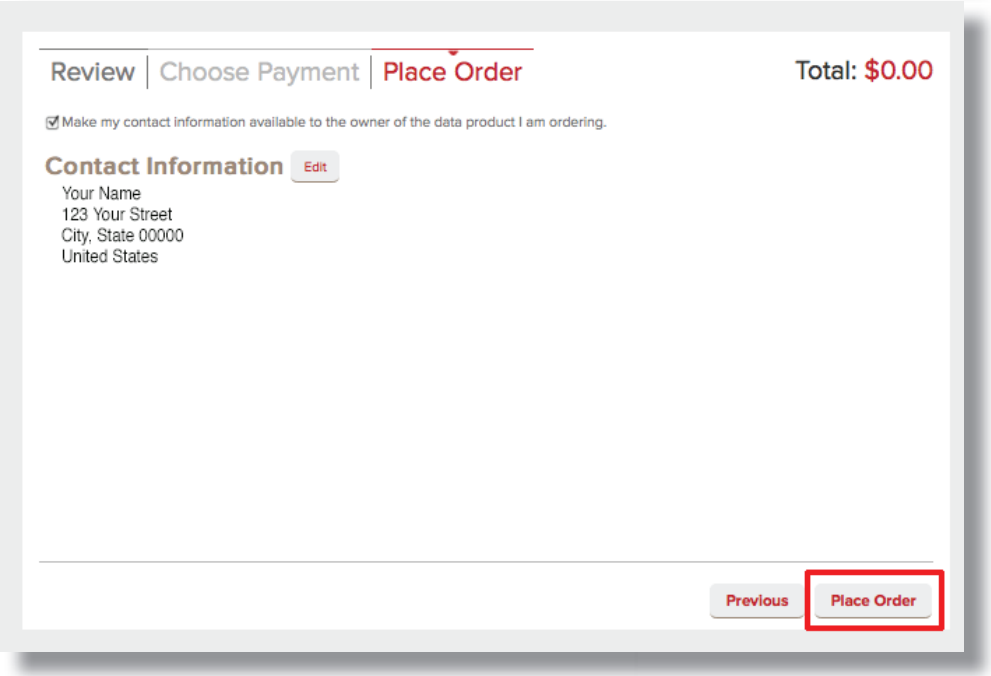
9. Fill out the form, accept the terms, and click **Order Now.**



10. Review your order and Click **Next.**

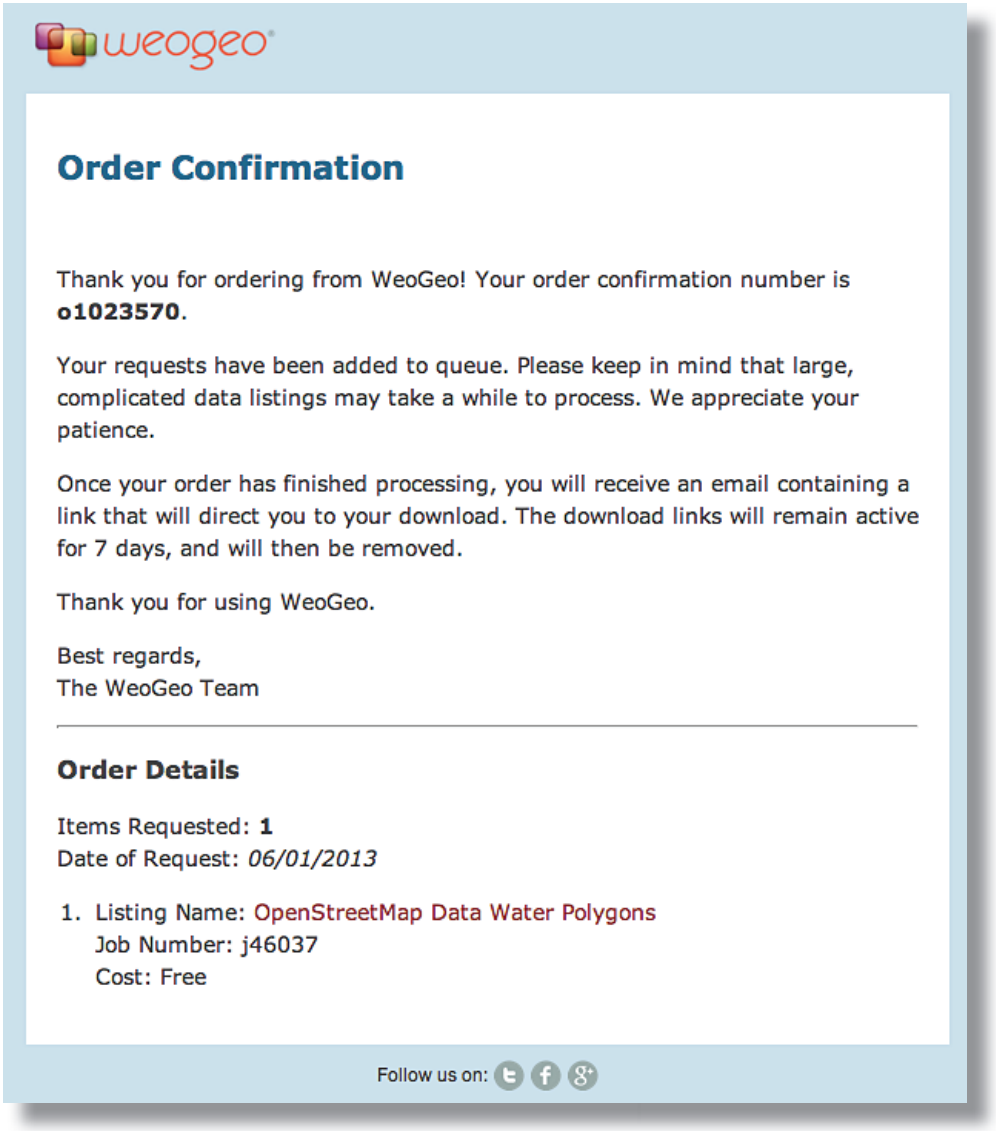


11. Click Place Order.



You will receive a confirmation of your order, and then another email with a link to download the data.

12. Unzip the contents of the downloaded file to the **Water** folder in your project folder.



weogeo

Order Confirmation

Thank you for ordering from WeoGeo! Your order confirmation number is **o1023570**.

Your requests have been added to queue. Please keep in mind that large, complicated data listings may take a while to process. We appreciate your patience.

Once your order has finished processing, you will receive an email containing a link that will direct you to your download. The download links will remain active for 7 days, and will then be removed.

Thank you for using WeoGeo.

Best regards,
The WeoGeo Team

Order Details

Items Requested: **1**
Date of Request: *06/01/2013*

1. Listing Name: OpenStreetMap Data Water Polygons
   Job Number: j46037
   Cost: Free

Follow us on:

6 About Building Data

You can download building footprint data, and then style it to resemble actual buildings. While the footprint data shows the building foundations only, Autodesk InfraWorks can display three-dimensional buildings based on data in the files or in styling information that you provide

Building data is always in vector format, and is often stored in ESRI Shape files. Shape files come in sets, and you must have these three:

File Extension	Purpose
SHP	Geometry. For Buildings, this is polygon geometry.
DBF	Attribute information
SHX	Links together and indexes the other two files.

Downloads may also include a PRJ file, which contains projection and coordinate system information.

HOW SHOULD I STORE BUILDING DATA?

Use these guidelines when storing building data:

1. Create a **Project** folder to organize all your data.

2. Create a **Building Data** folder for each project.

3. When you extract the download zip file, create a target folder for it under the Building Data folder.

Name the target folder something recognizable, and include the source of the data – for example: **SFData Buildings.**

HOW DO I FIND BUILDING DATA?

You can use a web browser search string, for example, including the following: GIS + data + download + buildings + [your area name]

GIS
A **Geographic Information System** stores, manages, and analyzes geographical information.

Download
Include this term to avoid sites that merely display terrain data without the ability to download it.

Your Area Name
Start with a small area and expand from there. For example, specify your city or county name. Include the state name to make sure you get the right data.

In this lesson, , we will use a City of San Francisco site for buildings.

As you look for water data, keep these tips in mind:

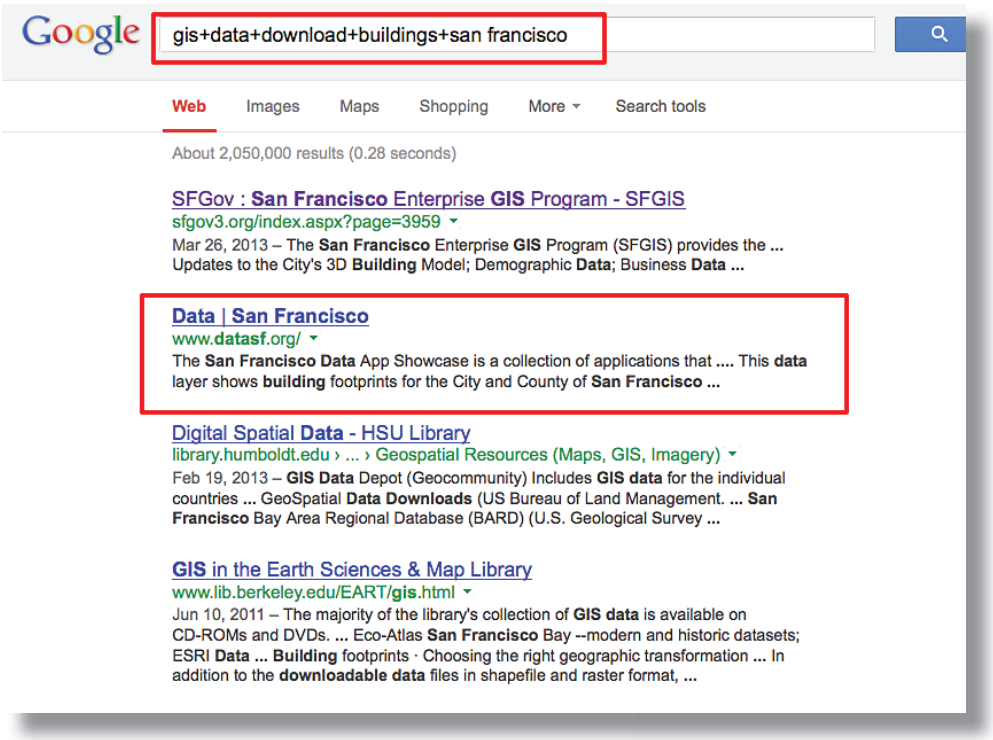
- Look for a “resources” or “interactive tools” link on the page
- Do not download maps—you need the raw resources to create a map
- Check any posted metadata to find out the coordinate system for the data
- Check the metadata for attribute data as well. If the attribute data is stored in a linked database, you will not get information like height, roof type, etc., but only the shape of the building’s footprint. The attribute data will make it possible to create much more realistic buildings.
- If data is tiled, check on an overview map to see which tiles you want.

How do I retrieve building data?

In this exercise, you will retrieve data from a city-sponsored site.

1. Begin your search by entering the search string in your browser.

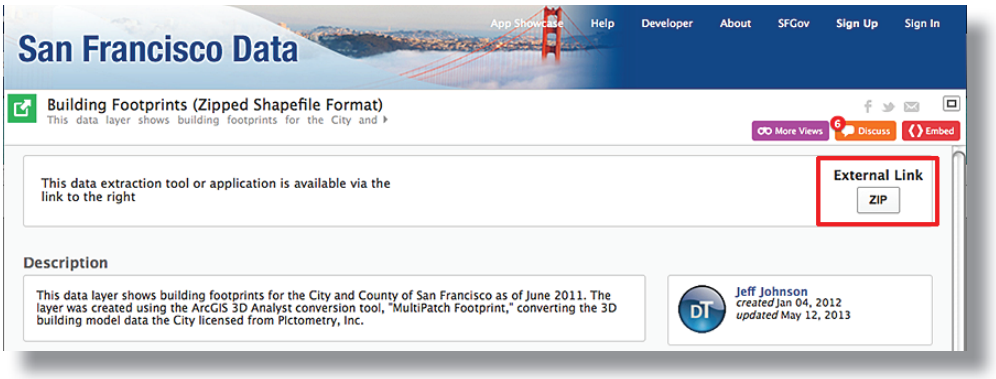
It looks like the City of San Francisco has some downloadable data.



2. Search for building footprints.

3. The result we want is **Building Footprints (Zipped Shapefile Format).** Click its title.

4. On the resulting page, click the **ZIP** button to download the building SHP file.



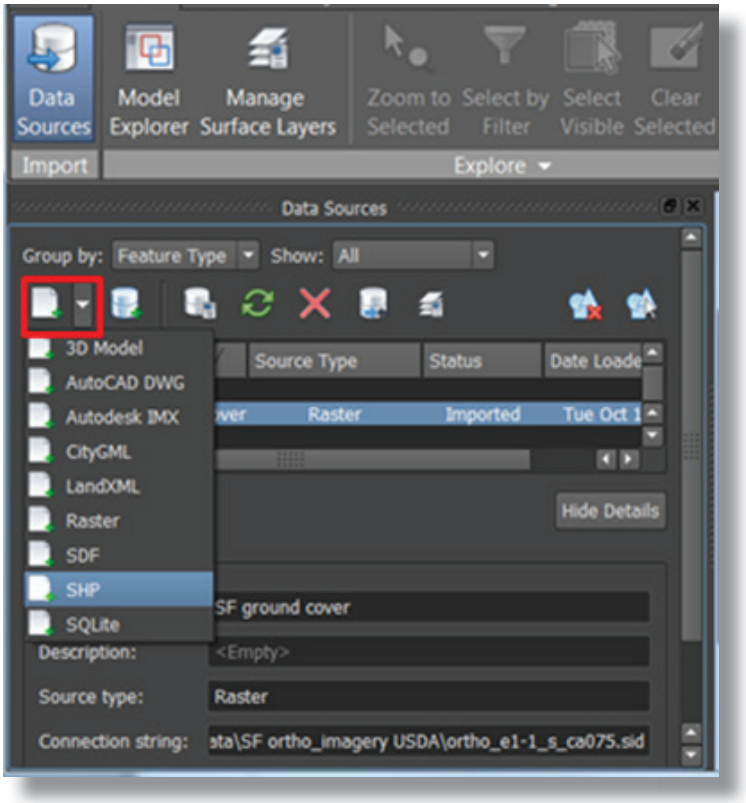
How do I get building data into Autodesk® InfraWorks?

Import and configure the building data.

When you configure the data, you will use one of the building attributes to determine the height of each building. You may need to contact someone familiar with the data to find out which attribute represents building height.

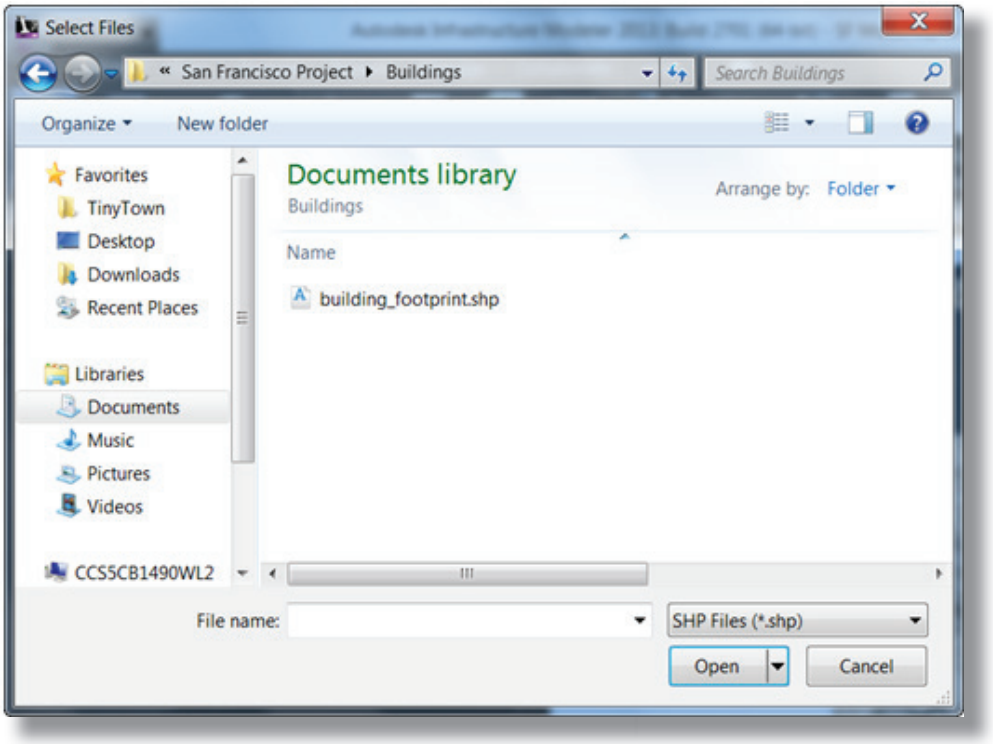
You will also assign a style to make the buildings look more realistic. All buildings will use the same style initially, but as you import 3D models (in the next lesson), you can replace some generic-looking buildings with models that represent the actual buildings.

1. In the **Data Sources** panel, click **Add File Data Source > SHP.**

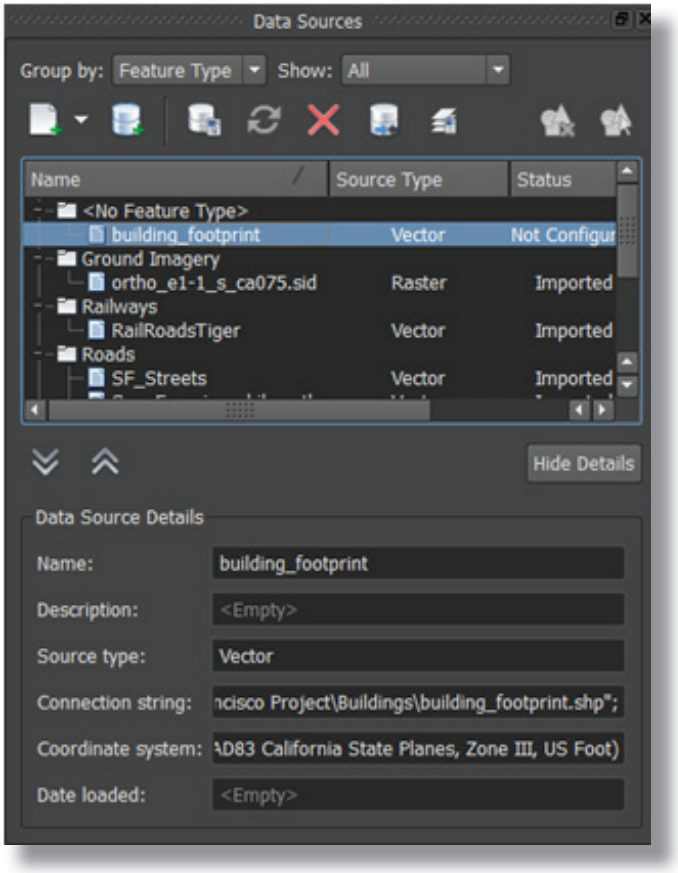


2. Open the .SHP file.

The data source is not configured because a SHP file can contain many types of data—you need to specify the data type.

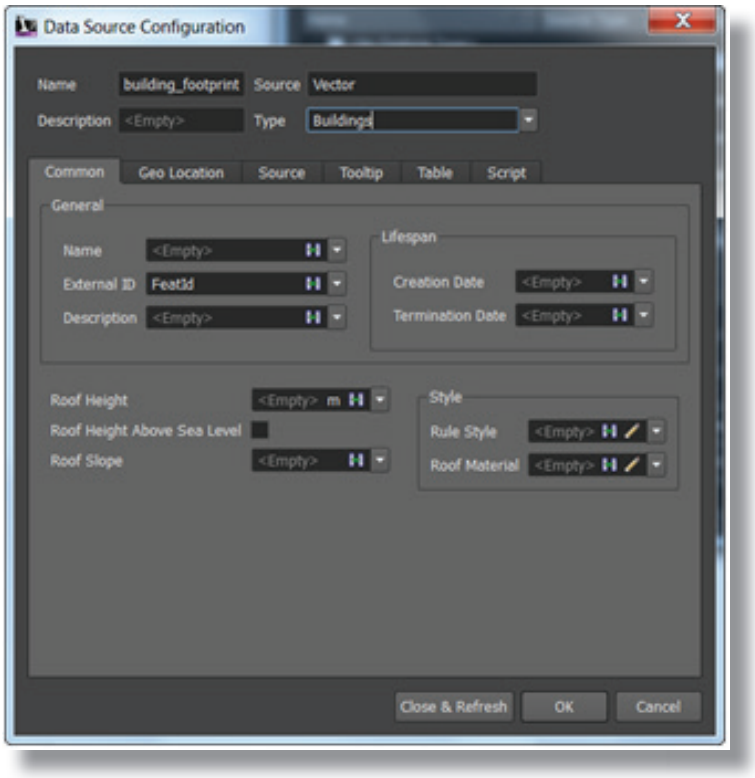


3. Double-click the data source.



4. For Type, select **Buildings** to see more fields.

5. Give the data source a more recognizable name.

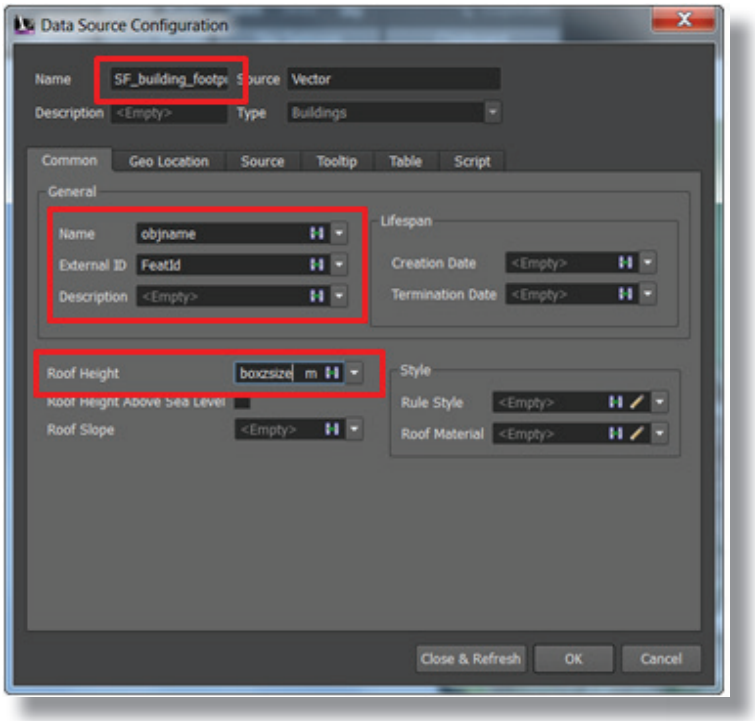


6. Use the drop-down lists next to each field to map the attributes in the SHP file to the attributes in the model.

- For example, this SHP file has an attribute called **jobname**. You can map that to the **Name**.

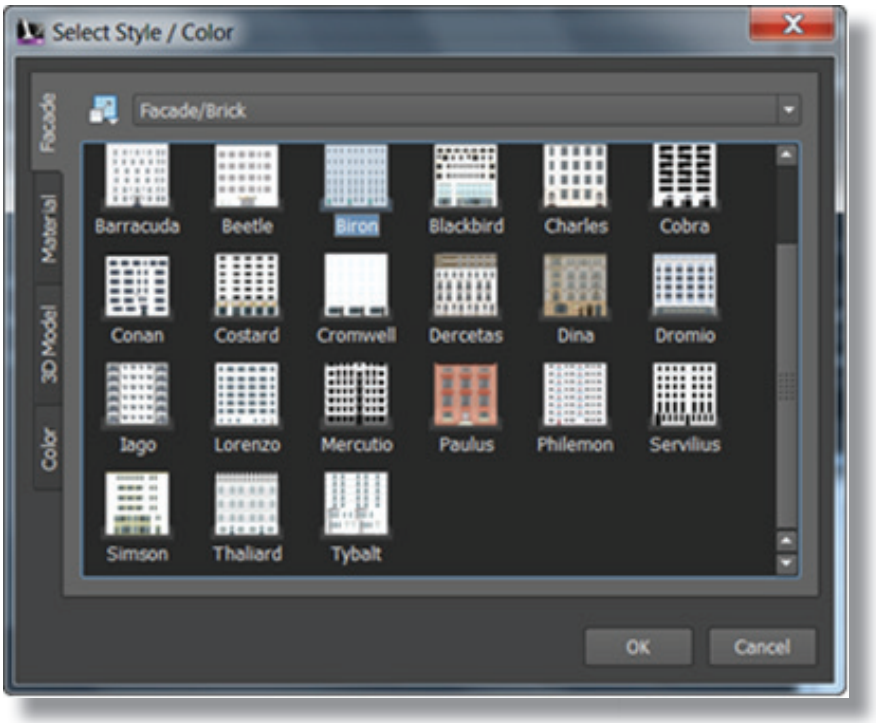
- Map the **BoxZSize** attribute to **Roof Height** to vary the heights of the buildings.

For any fields that don't have equivalents in the SHP, leave the value blank.

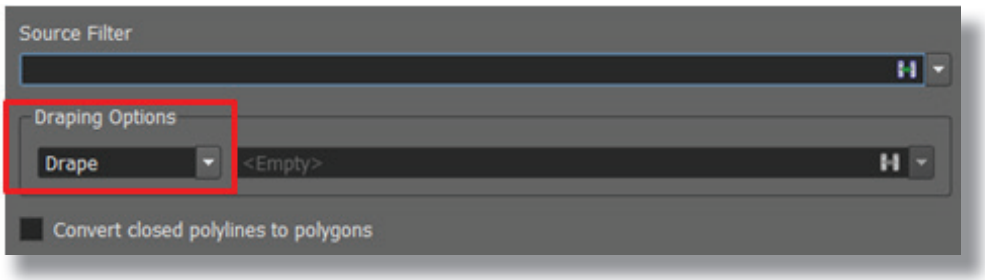


7. To make the building facades more realistic, click the pencil icon in the Rule Style field and select a visual style.

NOTE: *Since we don't have attributes for these items, all buildings will use the same facades and roofs.*

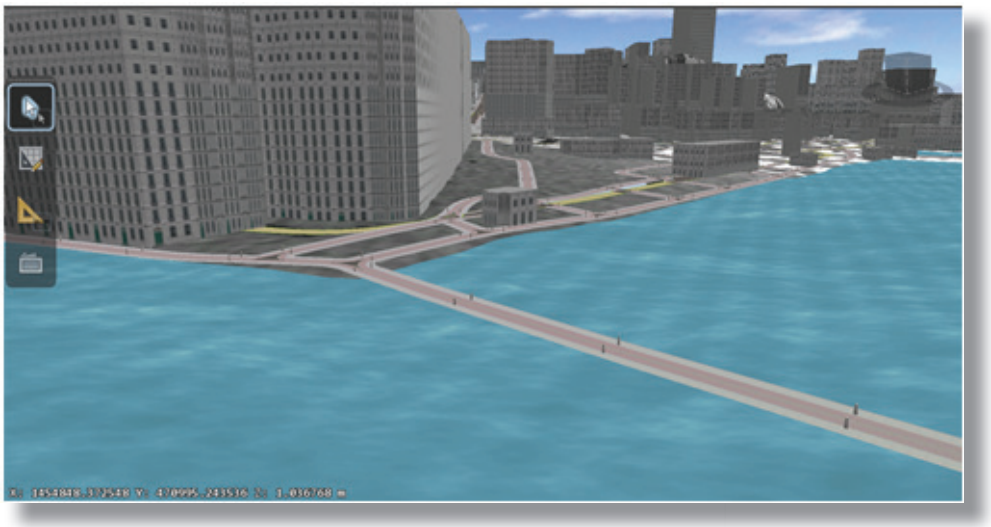


8. Click the **Source tab** and specify **Drape.**



9. Click **Close & Refresh.**

When you zoom in, you can see and select individual buildings.



7 About 3D Models

Three-dimensional models are real-world representations of individual objects. For example, you can find 3D models that represent real buildings in your area, or generalized models for city furniture, such as bus shelters or park benches.

3D models are often stored in the FBX format, which is the main exchange format used by Autodesk Revit, Inventor, and Civil 3D. You can also find 3D models in the 3DS format used by 3ds Max or 3ds Max Design, as well as in DXF, OBJ, and DAE (Collada) files.

HOW SHOULD I STORE 3D MODELS?

Use these guidelines when storing 3D models:

1. Create a **Project** folder to organize all your data.

2. Create a **3D Models** folder for each project.

3. When you extract the downloaded zip file, create a target folder for it under the 3D Models folder.

Name the target folder something recognizable, and include the source of the data—for example: **TurboSquid Building Models.**

HOW DO I FIND 3D MODELS?

You can use a web browser search string, for example, including the following: Free + "3D models" + download

As you look for 3D model data, keep these tips in mind:

- The TurboSquid and Google Sketchup 3D Warehouse sites are good sources for architectural models. TurboSquid can be expensive for building models.

- If you are preparing a model for a client, that organization may have 3D models in-house. Ask if you can use them for the project.

- In the Google warehouse, search by area to see what's available.

  - Click a model to view it.

  - Select **3D View** to orbit it.
  - Make a note of the creator so you can credit that person.

  - Click **Download** to see available formats and download

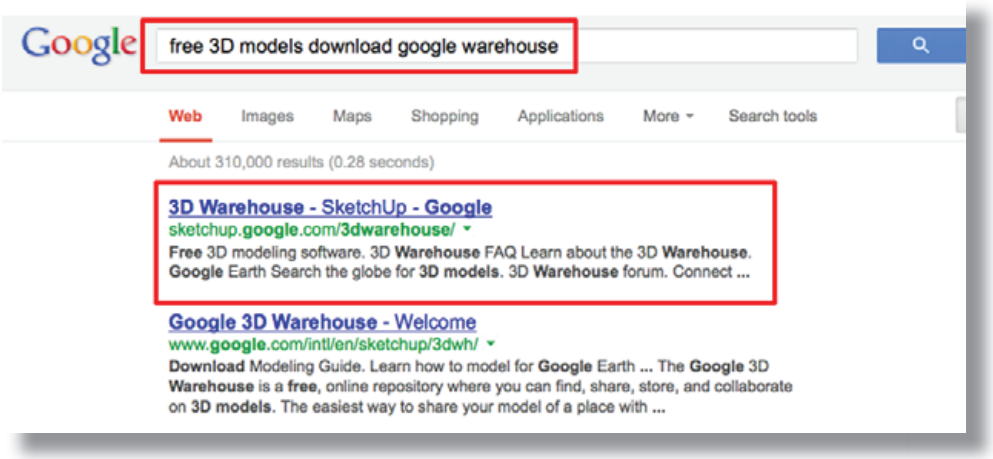
  - Click **Map** tab to see location of model in the city and what other models are available in that area

How do I retrieve 3D models?

There are many sources for 3D models, but finding them in the right format and at no cost is challenging. The example here was on the Google warehouse site at the time of this writing, but the contents of the site change frequently.

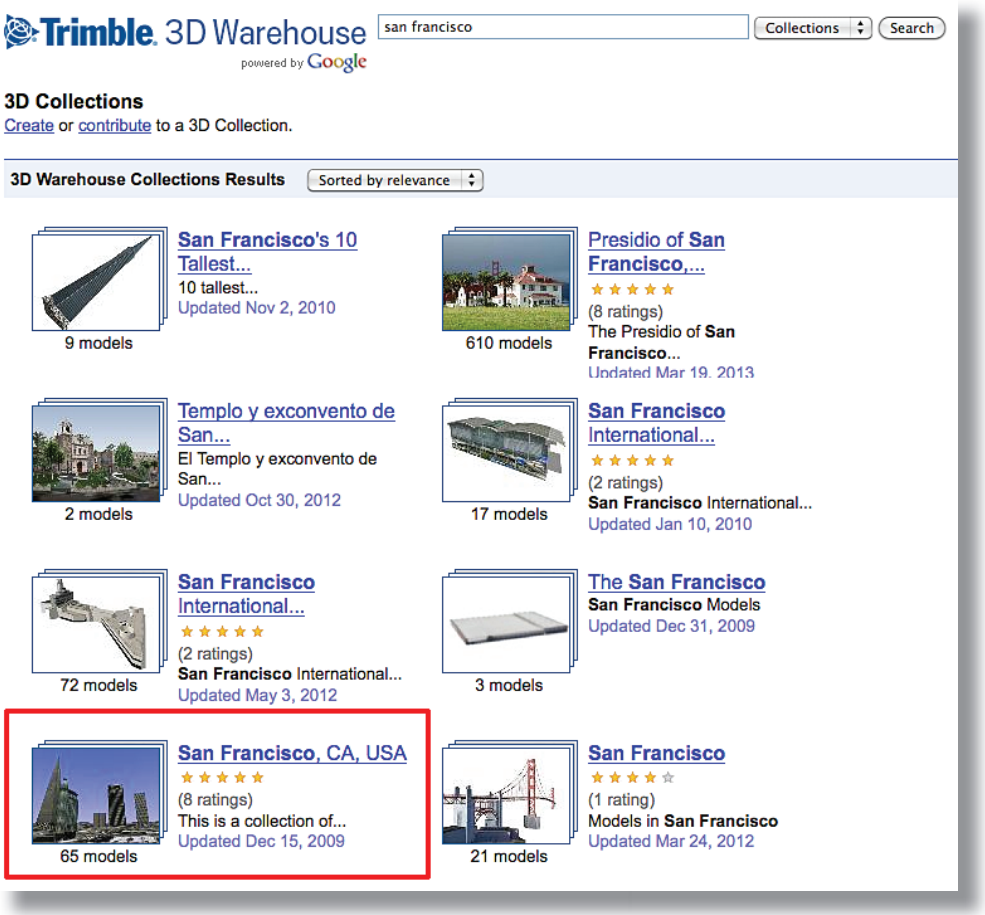
1. Begin your search by entering the search string in your browser.

We'll go directly to the 3D Warehouse.

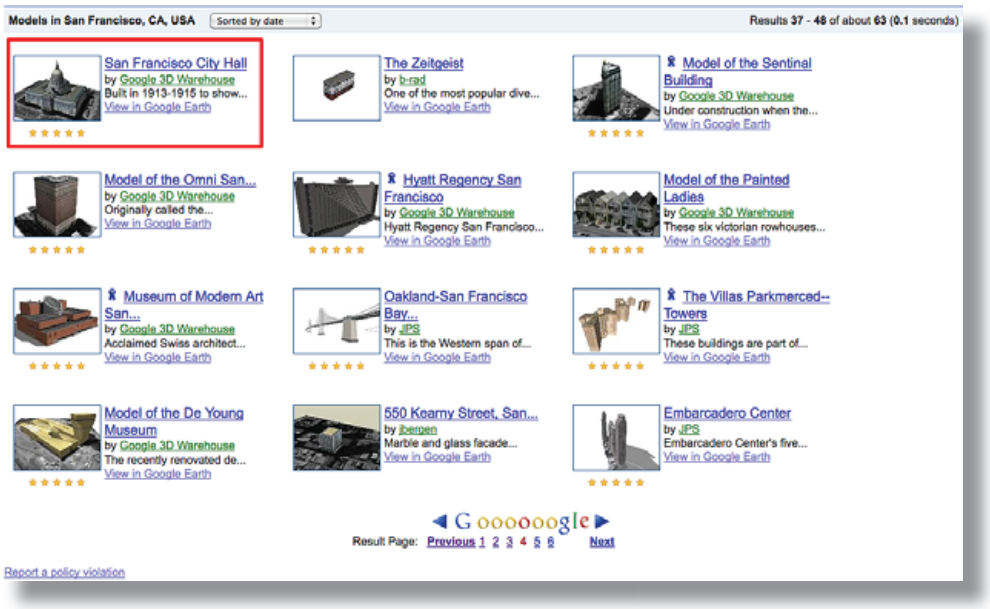


2. Search by collections to find multiple buildings. Enter the search string for your area.

3. Try the large collection of buildings called San Francisco, CA USA.



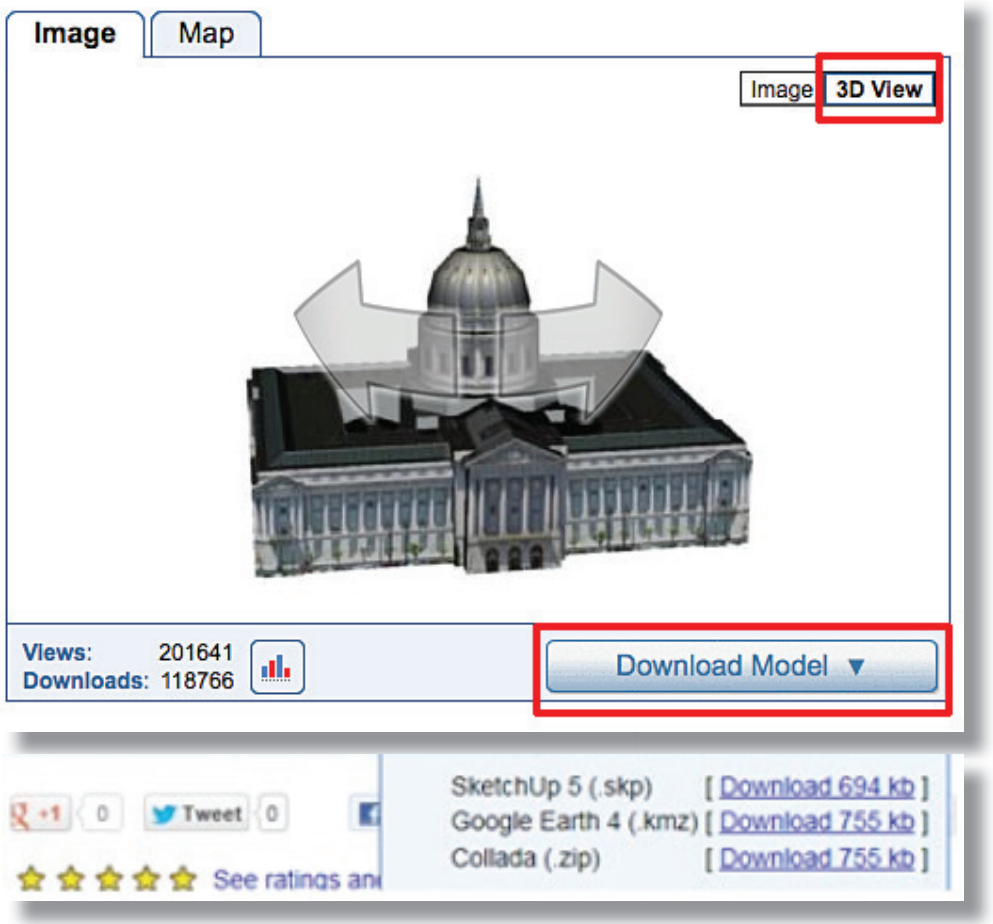
4. On the fourth page, click the San Francisco City Hall model to view it.



5. Click **3D View** to rotate and view it from all sides.

6. Click **Download Model** to save it to your local drive. Use the Collada format.

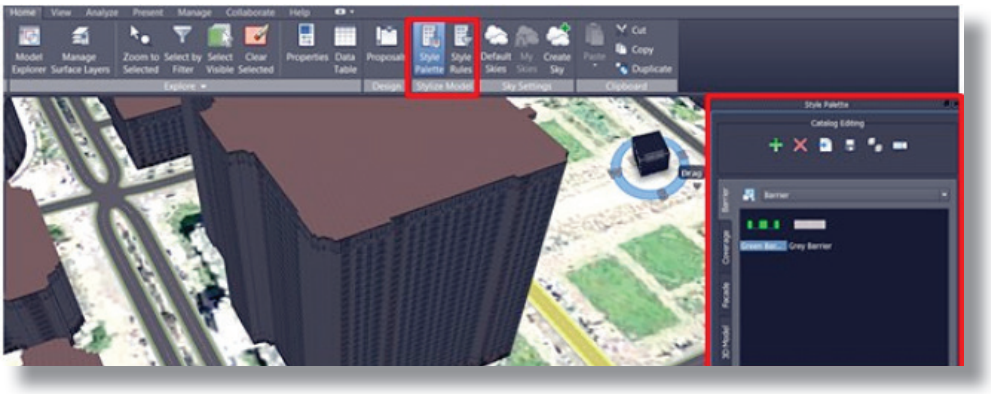
7. save and unzip the contents of the downloaded file to the **3D Models** folder in your project folder.



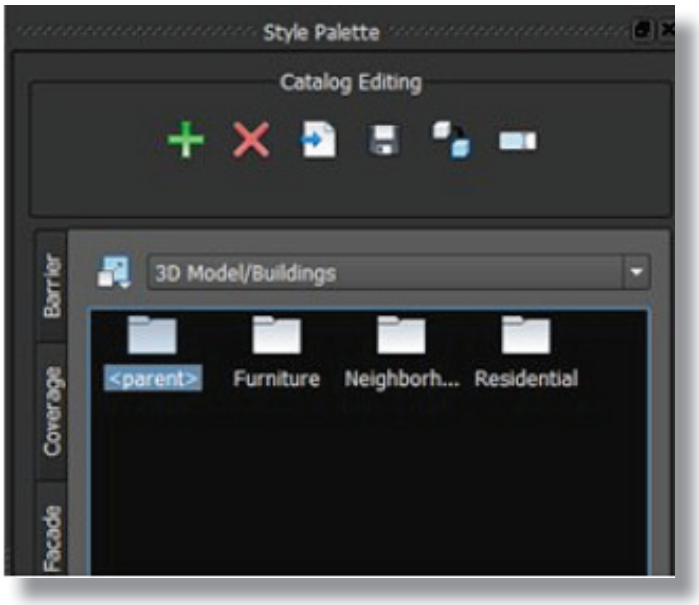
How do I get a 3D model into Autodesk® InfraWorks?

We are going to use the 3D model we found to replace the generic building it represents. In order to do that, we must import the 3D model as a style in the **Style Palette.** Then we can apply the style to the building.

1. In the ribbon, click Home tab > Stylize Model panel > Style Palette.

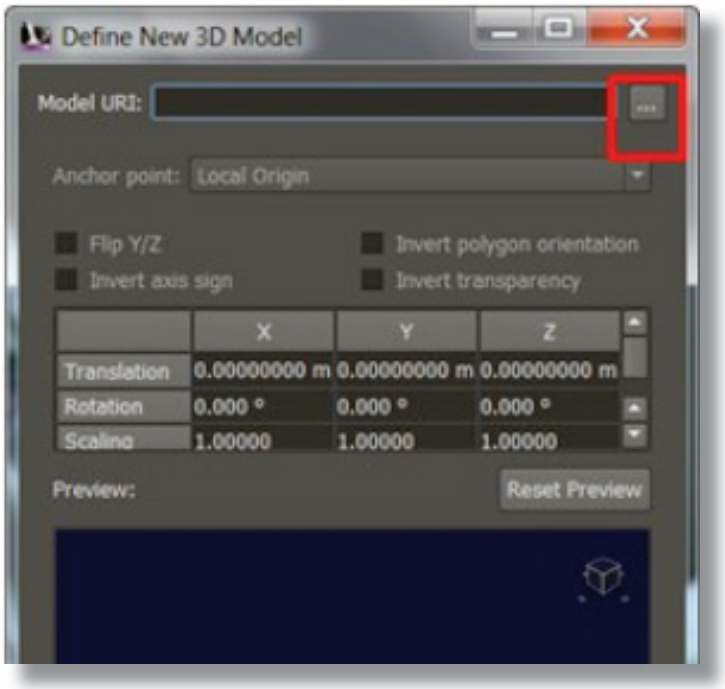


2. In the **Style Palette,** click the **3D Model** tab.



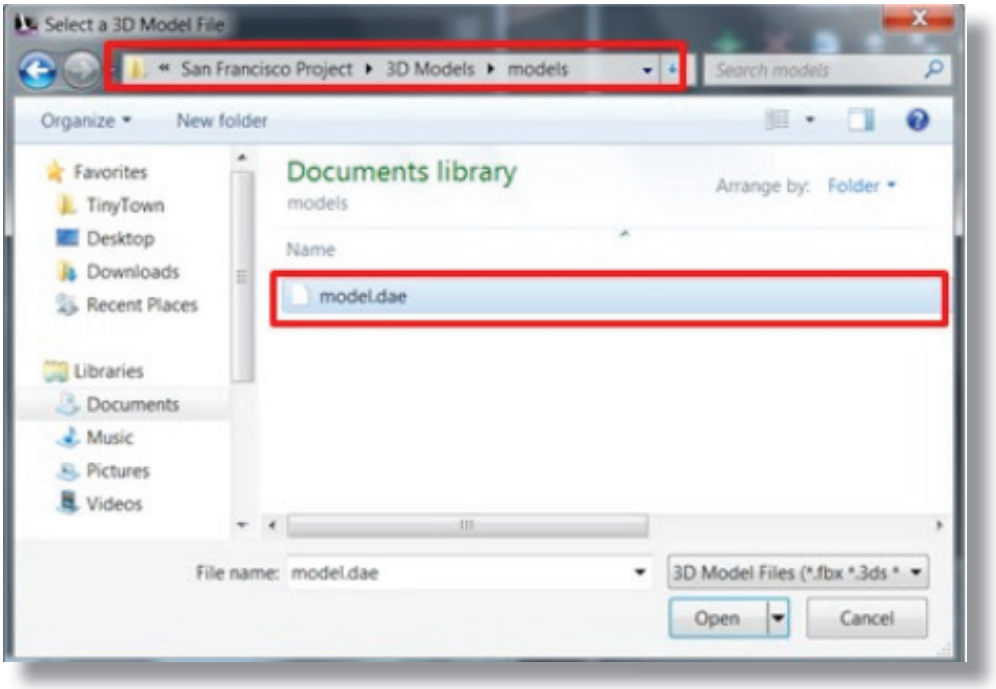
3. Click the plus sign at the bottom of the **Style Palette.**

4. Click the ellipsis button next to **Model URI.**

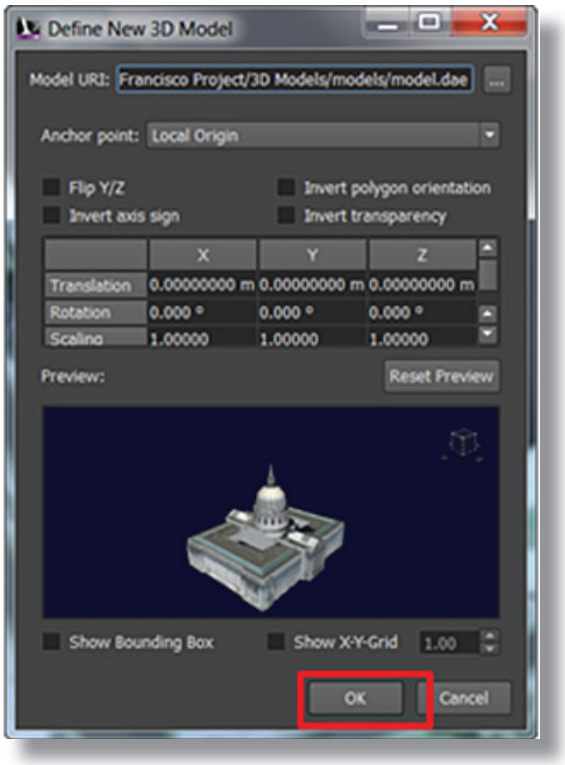


5. Navigate to the folder storing the 3D model.

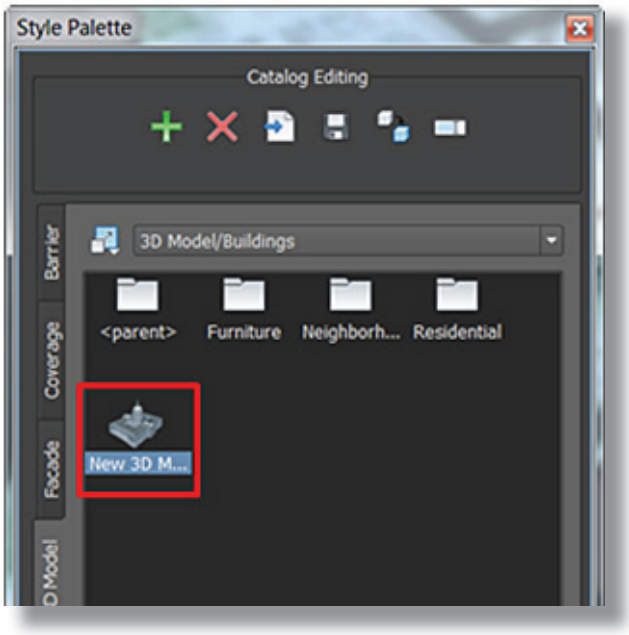
6. Select the model and click **Open**.



7. Click **OK** in the **Define New 3D Model** dialog box.



8. The new model appears in the **Style Palette.**

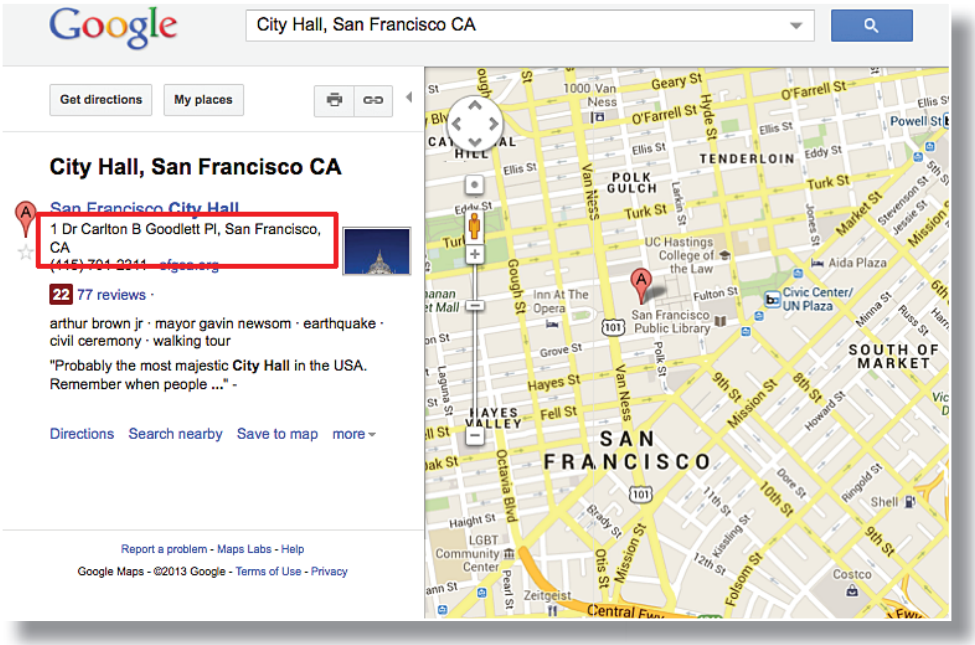


How do I use a 3D model to replace the building it represents?

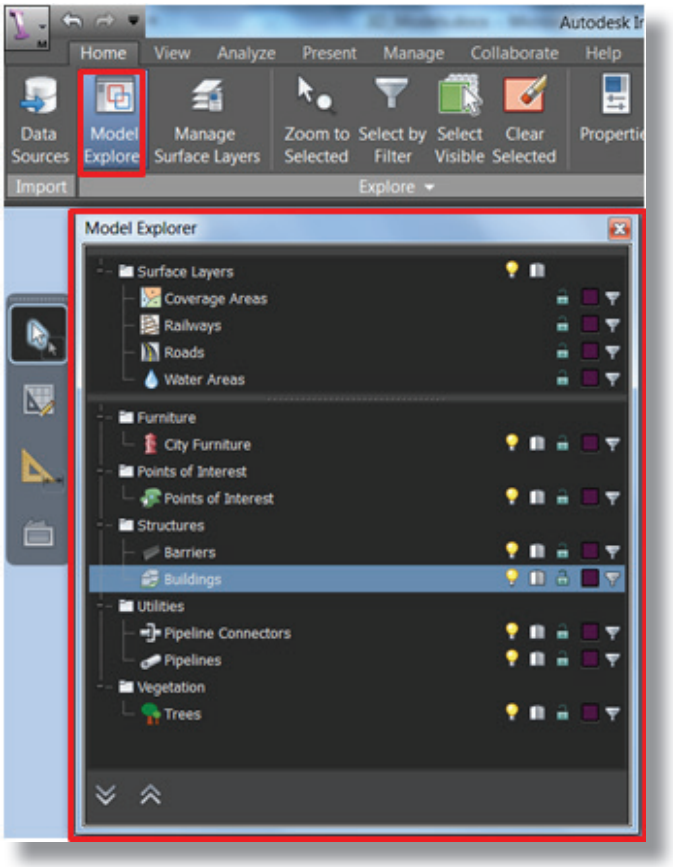
You replace a building with a 3D model by applying the 3D model to the building as a style. First, locate the building to replace, then apply the style.

1. To find the building, first look up its address. The address of City Hall is 1 Polk Street.

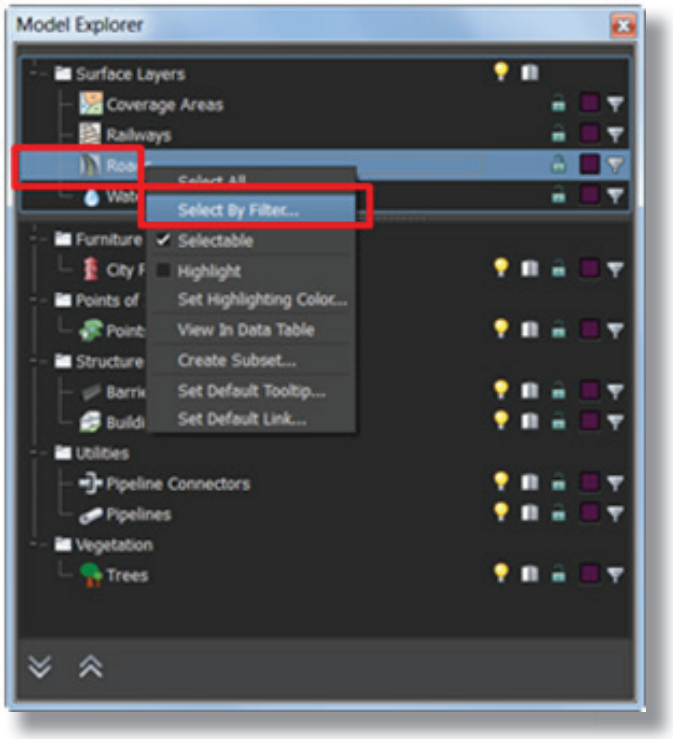
Looking at the map, we can see that City Hall is on Polk between McAllister and Grove. We can also see that this section of Polk is actually called De Carleton B. Goodlett Place.



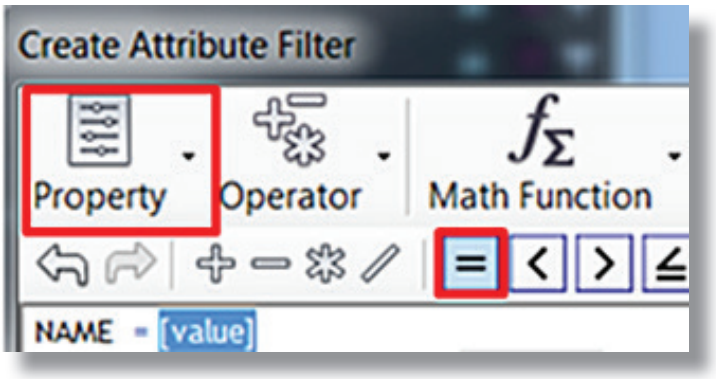
2. Click Home tab > Explore panel > Model Explorer to see the Model Explorer.



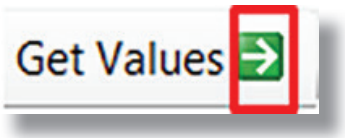
3. Right-click the **Roads** layer and click Select **By Filter.**



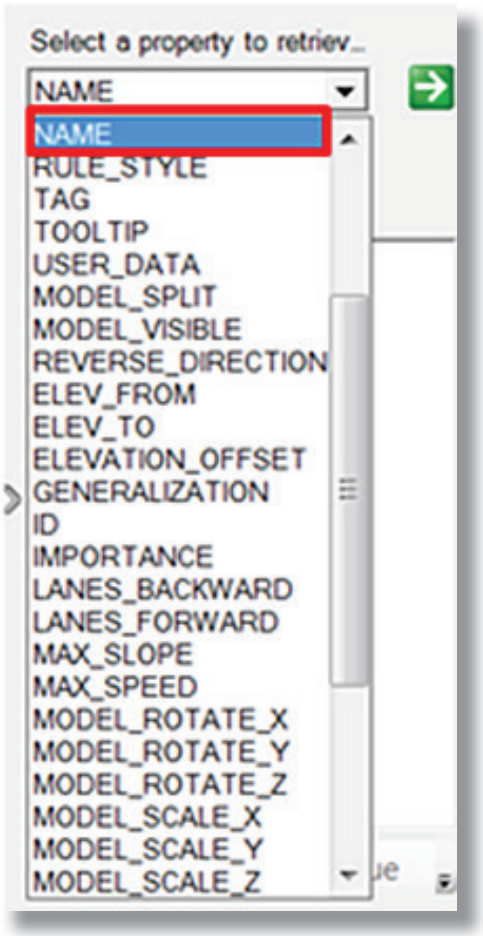
4. From the Property drop-down, select NAME, and then click the equals sign.



5. Click the green arrow next to **Get Values.**

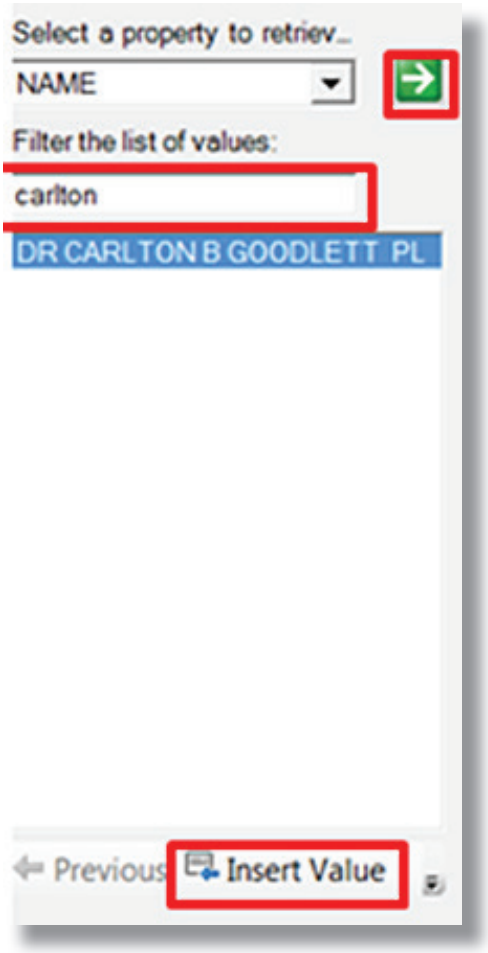


6. From the drop-down list, select **Name.**



7. In the filter **THE LIST OF VALUES** field, enter **Carlton** and click the green arrow again.

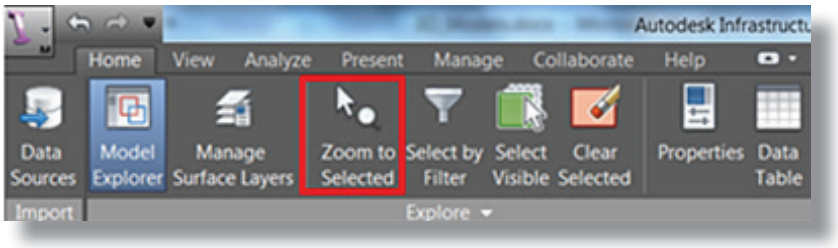
8. Click **Insert Value.**



9. Click **Validate.**

10. Click **OK.**

11. Click Home tab > Explore panel > Zoom To Selected.



The view changes to show Dr. Carlton B. Goodlett Place. The building next to it is City Hall.

12. Drag the model from the Style Palette and drop it onto City Hall.

13. You can view City Hall from any angle.

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