Overview

As of early 2015, Google Earth Pro, which used to be a $400 product, is now free. This is a simple yet powerful tool for viewing information geographically—whether it is for viewing climate information, analyzing change over time, or tracing routes from your vacation. In this tutorial, you will learn how to create placemarks (points of interest), analyze elevation changes over the landscape, import images and shapefiles, utilize the built-in library (3D buildings, weather, photo gallery, etc.), view historical imagery, navigate to a city with the directions module, geocode addresses, and create a route.

Getting Started

Once you open Google Earth Pro, you will be taken to the default screen. Take a moment to become familiar with the different parts of Google Earth Pro. If you look on the top left of the page, the sidebar contains a few different modules.

- **Search** module which can be used to search for locations by using various methods, such as latitude/longitude, cities, provinces/states, nations, administrative boundaries, and addresses. To clear search results, click on 'X' on the bottom right of the Search module as indicated in the blue box (Figure 1).
- In the middle is the **Places** module where locational information gets saved and organized as indicated in the red box (Figure 1).
- At the bottom is the **Layers** module, which contains a variety of information, or layers, created by the Google Earth community that can be checked on and off for viewing purposes. Examples of these layers include photos, weather, labels, demographics (US only), and 3D buildings as indicated in the green box (Figure 1).
- The **toolbar** at the top of the Google Earth interface gives access to a variety of features provided within Google Earth, including Place marks, creating polygons, image overlays, historical imagery, and so forth as indicated in the yellow box (Figure 1).

- The bottom of the screen provides helpful information such as the current coordinates for latitude and longitude and elevation of where your cursor is pointing. Off to the right you can also find the Eye altitude, or the altitude of which the Google Earth is currently viewing the world from as indicated in the purple box (Figure 1).

Note: Remember to constantly save your project when you work on this tutorial to avoid losing your work progress if Google Earth window or your computer suddenly shuts down. To save a project click ***File*** *on the top left of the window and then select* ***Save -> Save Place As…*** *(Figure 1) Once you select it, a pop-up window will appear. Then you browse to a folder that you want to save your project at. After you determine the location for storing your project and enter the name of the project in* ***File name*** *box, click* ***Save****.*

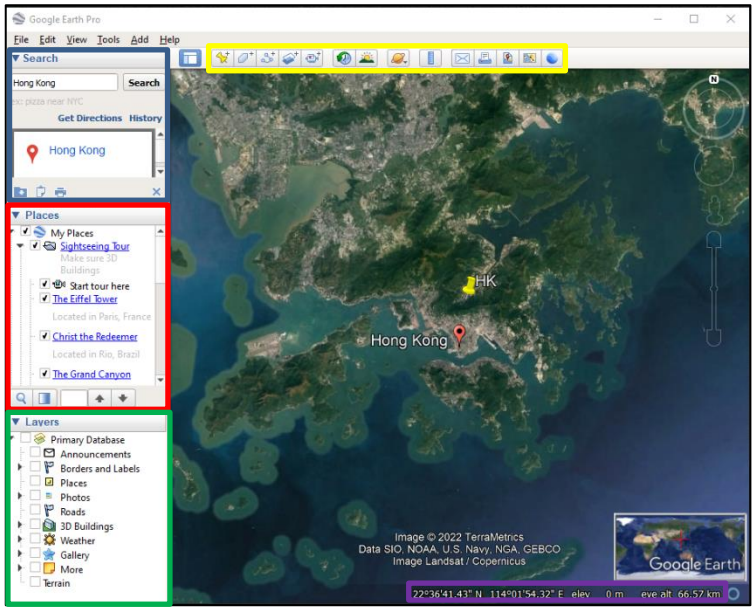

Figure 1

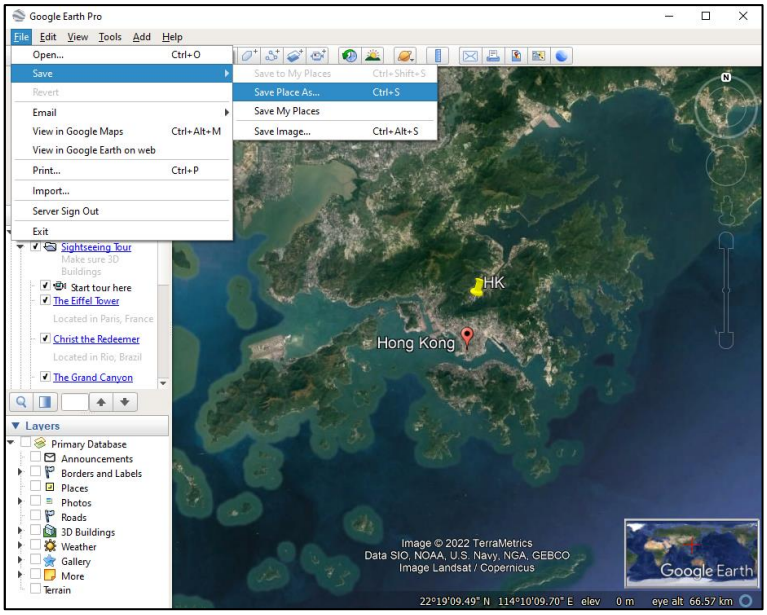

Figure 2

Navigational Tips

Google Earth has numerous methods of navigating physical space on your screen, including non-mouse controllers such as keyboards, touchpads, and joysticks. Depending on your device, the methods may vary slightly from one to another. The two most common platforms, however, are Macs and PCs.

Command	Windows Keystroke(s)	Mac Keystroke(s)	Result
Linear movement	Left, right, up, or down arrow	Left, right, up, or down arrow	Moves the viewer in the direction of the arrow.
Rotate (perimeter)	Shift + left, right, up, or down arrow	Shift + left, right, up, or down arrow	Rotates the view around the map's perimeter.
Rotate (on-the-spot)	Ctrl + left, right, up, or down arrow	⌘ + left, right, up, or down arrow	Rotates the view from the current position.
Tilt	Shift + up or down arrow	⌘ + up or down arrow	Tilts the viewer to/from "horizon" or "top-down"
Look	Ctrl + left mouse button + drag	⌘ + mouse button + drag	View changes to mimic head movement.
Stop current motion	Spacebar	Spacebar	Stops movement when viewer is in motion.
Return to "North-up" view	N	N	Rotates view back to North-up.
Return to "Top-down" view	U	U	Resets tilt to "top-down" or Up mode.
Reset tilt and compass view	R	R	Resets tilt and rotation to default positions.
Show/hide Overview	Ctrl + M	Shift + Option (Alt) + + M	Displays or closes overview window.
Tip: When rotating the view (perimeter or on-the-spot), use the up or down arrow to fluidly tilt the view while rotating.			
Tip: Use the Alt key together with most of these keystrokes to slow down the motion of your desired movement.			

Learning Objective

For this tutorial, you will be creating a walking tour of the surrounding area of the Empire State Building in New York City. You will learn how to create Place marks (points of interest) with descriptions and supplemental information both by hand and geocoding and then to create a route connecting all your Place marks. You will also learn how to automate this tour with a video recording of your animated map, as well as adding ESRI shape files to enhance your end product.

The first step in working with Google Earth will be to choose a location to work in. For thisguide, we will use Madison Square Park. Before getting started, you will need to create your ownfolder. To do so click on **Add -> Folder** (Figure 3), enter folder name as "My Tour" and click **OK** (Figure 4). This will come in handy later when you are doing multiple steps. In the Search box, type in Madison Square Park and select the "Madison Square Park, Madison Avenue, New York, NY, USA" option.

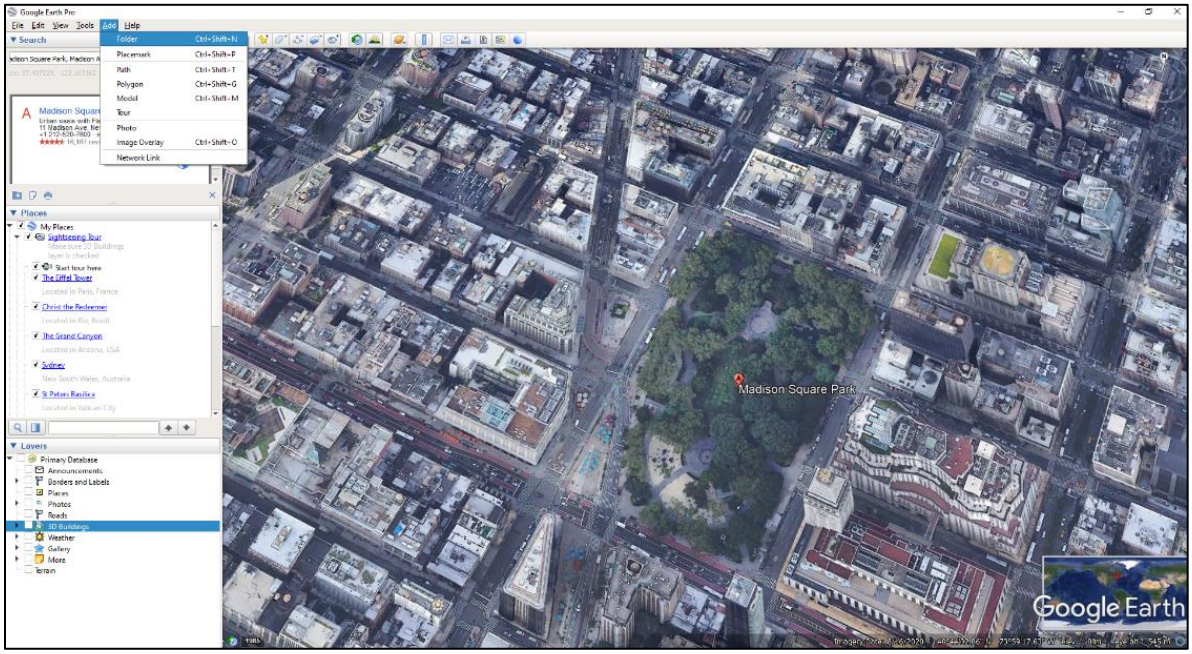

Figure 3

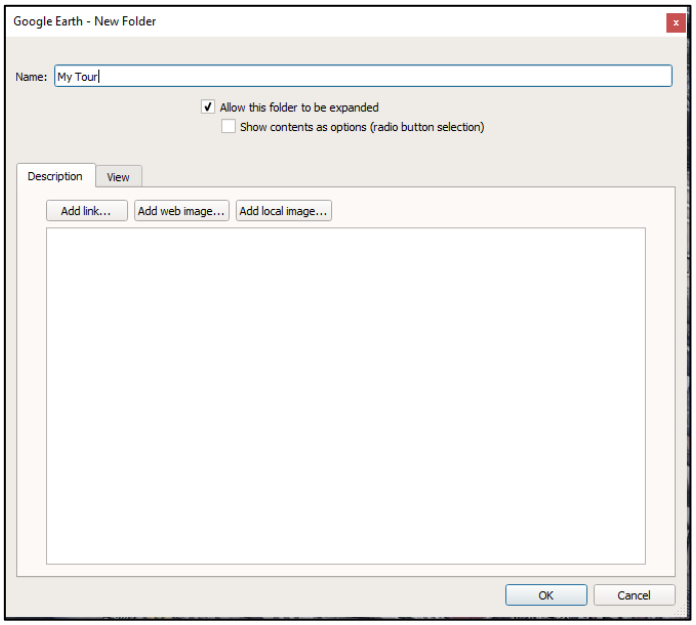

Figure 4

Step 1: Historical Imagery

First, we will look at Historical Imagery for this location. The Historical Imagery can be a very useful tool when utilized in the right circumstance. It enables the user to analyze change in the landscape overtime. For example, we can use the historical imagery to view the changes of Times Square over the years.

After searching 'Madison Park Square', select the **Show historical imagery** button in the upper middle area of the screen just above the map as seen in Figure 5.

A scroll bar will appear on the top left of your screen in the map window. Use it to scroll through imagery from different dates. You can see the before and after imagery from the event. Feel free to examine other areas of interest to see what imagery is available and how much the land has changed.

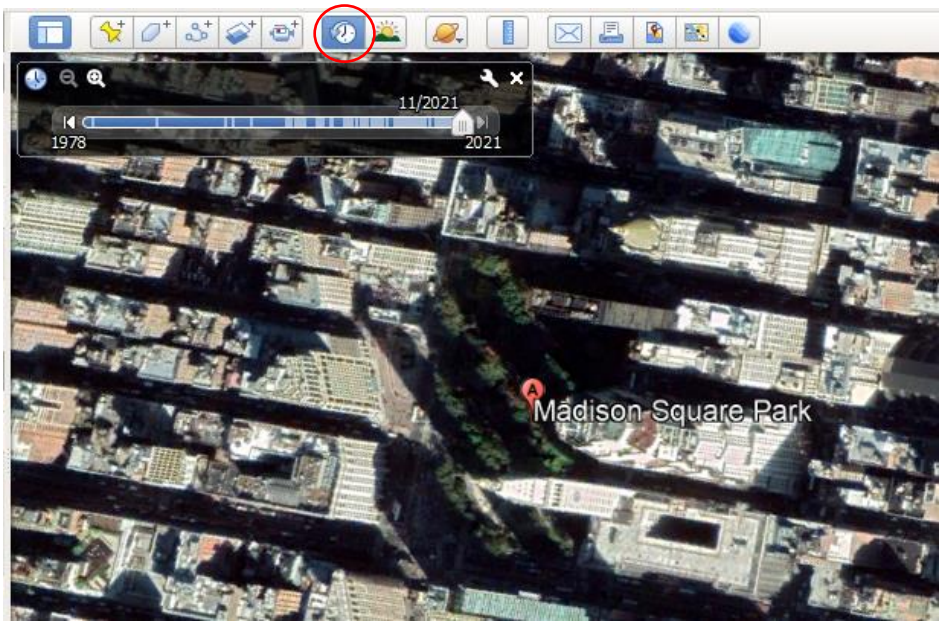

Figure 5

Step 2: Creating a Placemark

Placemarks have a variety of uses in Google Earth but are essentially used to represent Points of Interest you can refer to. Attributes such as address, accommodations, continental breakfast hours, video tours, floor plans, photos, etc.

A) After searching 'Madison Square Park', click the **Add Placemark** button in the toolbar (yellow push pin button). This will open the New Placemark window. In the **Name** field, type "Madison Square Park" and leave the other options as their defaults (Figure 6). Drag the pin to position the place mark between the two fountains, then click **OK** to create your new Placemark.

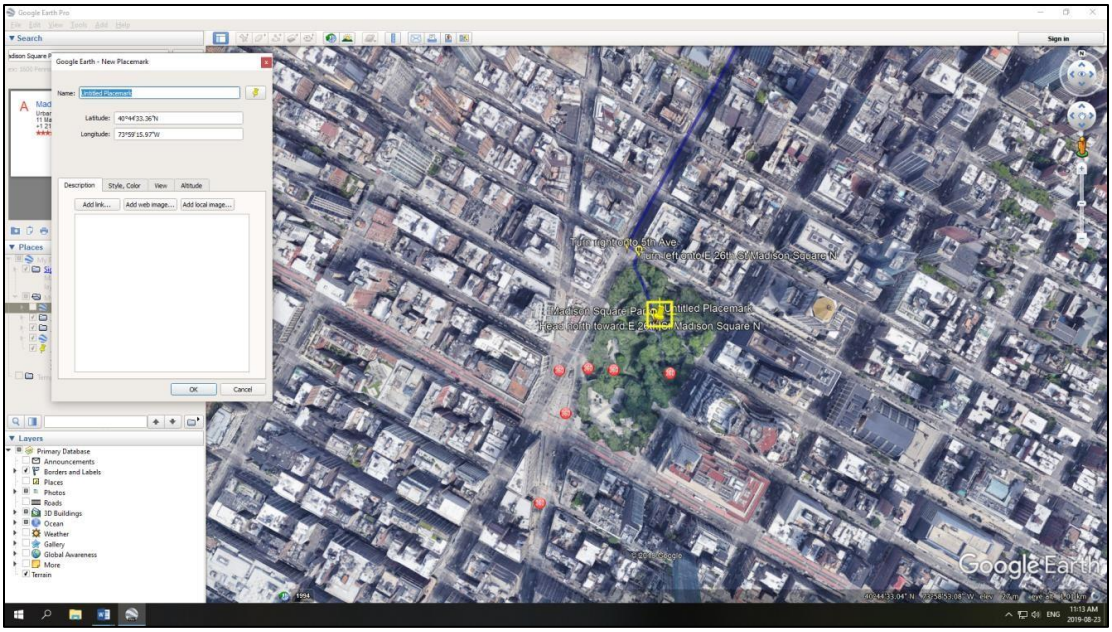

Figure 6

B) Now we will be describing the Placemark, which can be done through right clicking the Placemark and choosing **Properties**. In the **Edit** Placemark window, click inside the description box and type anything you wish about the location (Figure 7).

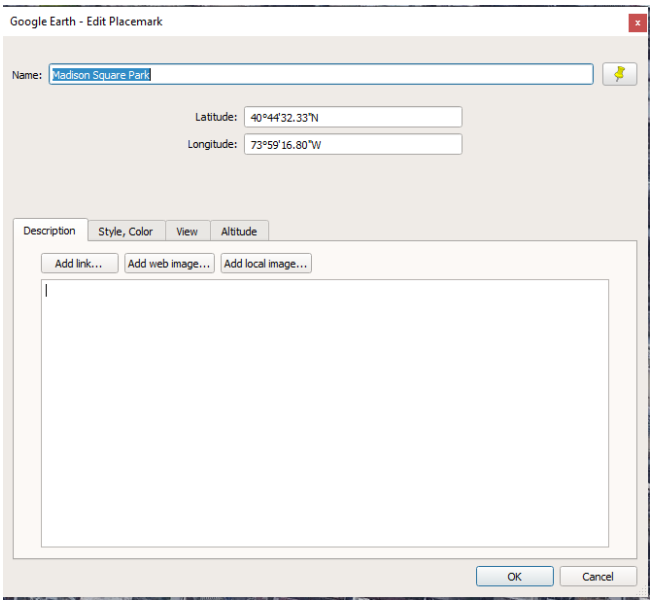

Figure 7

C) The last step is adding your own photo, which can be done through clicking on **Add-> Photo** (Figure 8). The New Photo Overlay window opens (Figure 9), where you can enter the photo name ("Madison Square Park") and make any necessary adjustments. Browse to the photo you would like to use and keep the default settings.

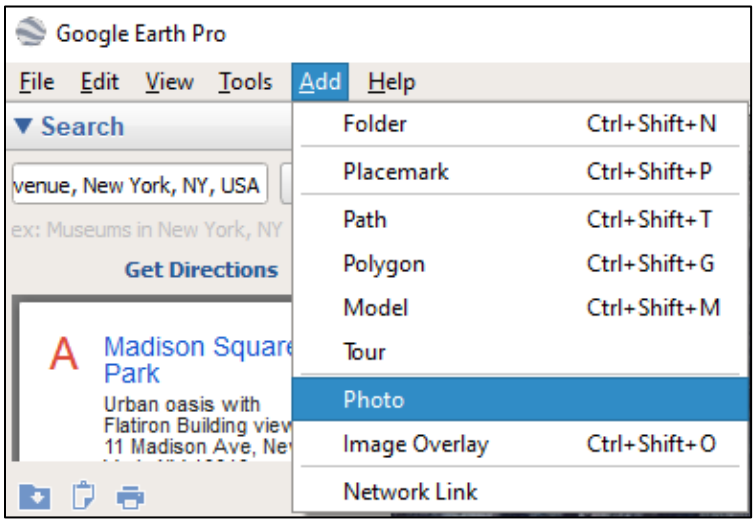

Figure 8

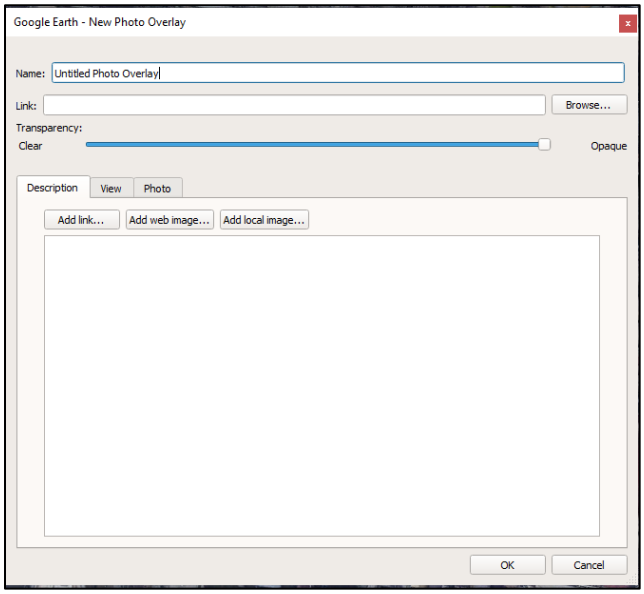

Figure 9

*** At this point, make sure to check that all your files are under the 'My Tour' folder that was created earlier (located under the Places module). So far, the folder should include, the Placemark and your own image (Figure 10).

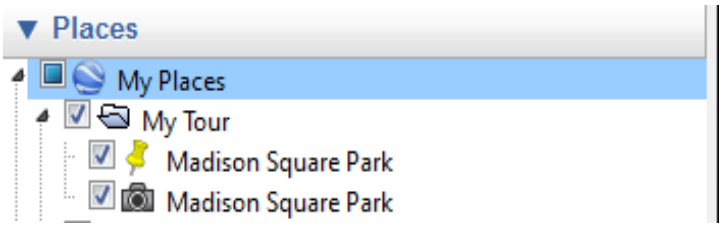

Figure 10

Step 3: Adding CSV Data

Before proceeding to create a walking tour, you will need to create and describe two more Placemarks for Empire State Building and Madison Square Garden. To add these two placemarks, we are going to do what is referred to as Geocoding. This is the process of converting tabular data containing street addresses into georeferenced point locational data that can be easily mapped.

A) Drag and drop the file Addresses_NY.csv from the tutorial package into Google Earth Pro. The Data Import Wizard window opens. If you are repeating the process of adding markers without Lat/Long then just apply a style template.

B) Click **Next** on the first screen (Figure 11) and ensure that the second screen has the option "This dataset does not contain latitude/longitude information, but street addresses" checked off (Figure 12).

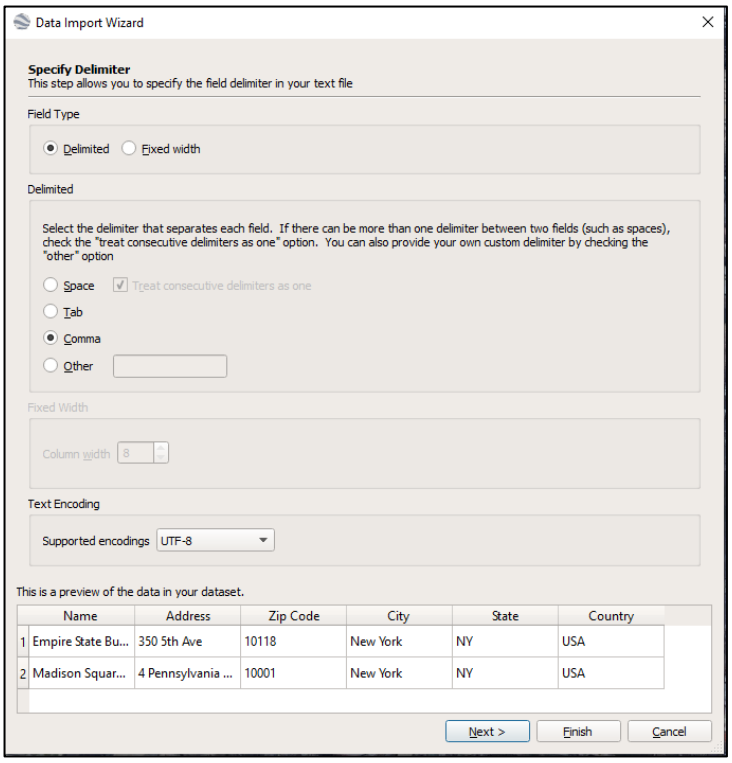

Figure 11

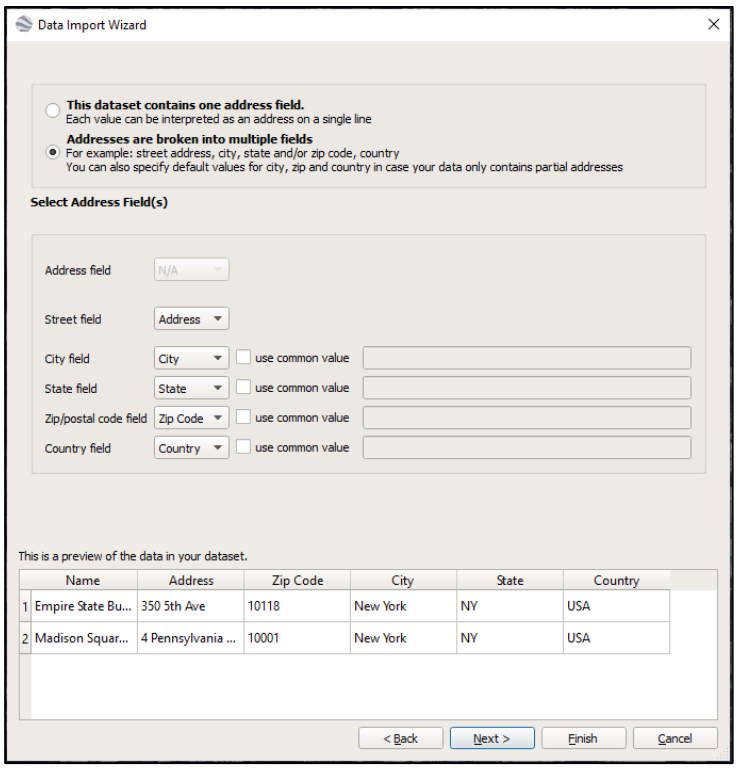

Figure 12

C) Set the fields as: City field = CITY, State field = STATE, Zip/postal code =ZIP CODE, and Country field = COUNTRY. Then click **Finish** (Figure 13).

D) When Google Earth asks you if you wish to apply a Style template, click **Yes**. Set the name field to be "NAME_" on the Name tab and choose the colour and icon style that you want, and then click **OK** (Figure 14). Now it will ask you to save that file that was just created, put it in a folder.

E) Click and drag the .csv file that has been created into the 'My Tour' folder to ensure that they get saved into the My Places folder. Add information as we did in the Madison Square Park steps.

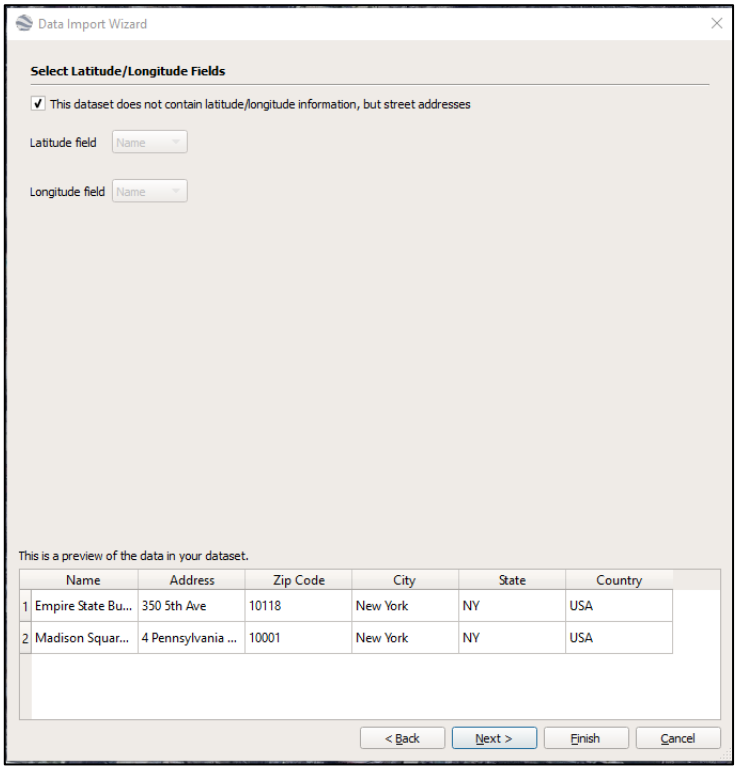

Figure 13

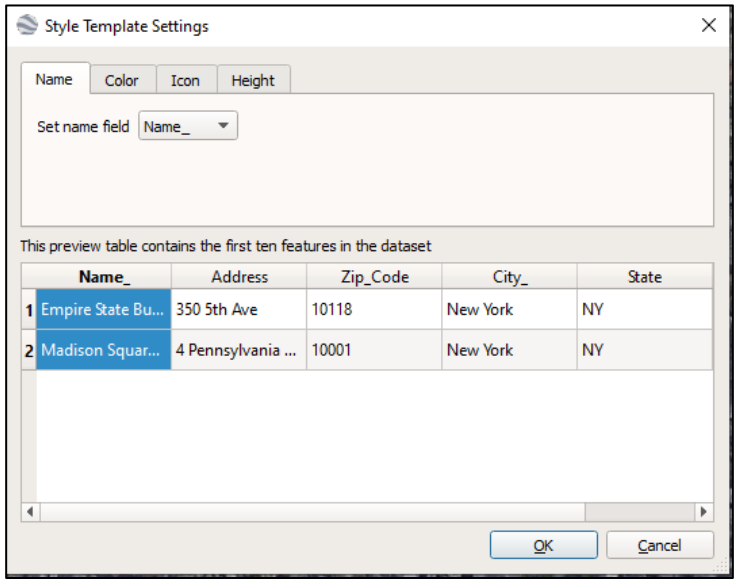

Figure 14

Step 4: Creating a Walking Tour

The direction tool can be used to navigate from one position quickly and efficiently to another by car, bike, walking or public transit. The objective here is to use the tool to create a walking route connecting all three Placemarks.

A) Begin by creating a walking path connecting Madison Square Park to the Empire State Building. To draw the route, you will need to *right-click* the 'Madison Square Park' Placemark and select **Directions from here** (Figure 15). This makes it your starting

point. Now *right-click* 'The Empire State Building' Placemark and make it your destination by selecting **Directions to here** (Figure 16).

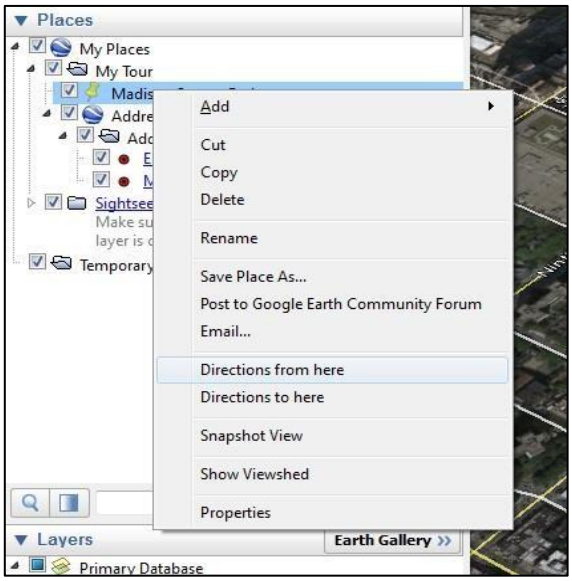

Figure 15

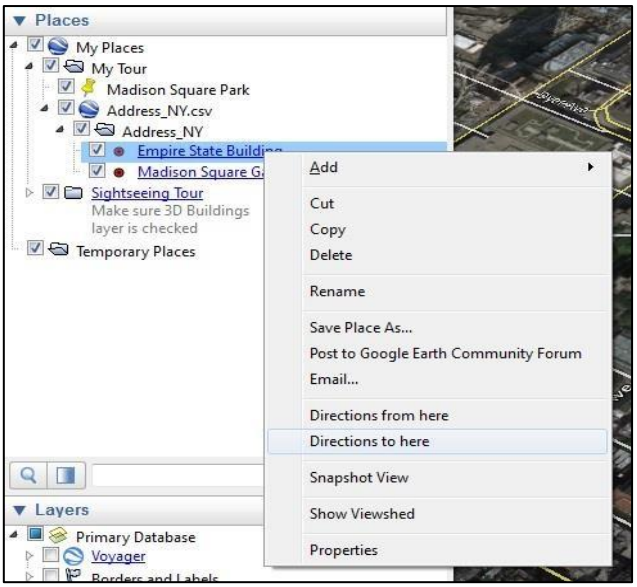

Figure 16

You now see the route Google Earth has plotted from A to B. Normally, the default is for walking. Since this is a walking tour, you don't need to change the method of transit. However, since Google Earth suggests the route that uses the least amount of time, the default is sometimes public transit. In this case, you can change the method of transit to walking by clicking on the appropriate icon (Figure 17-18). You will notice the transit route along using streets will be changed to a walking route using sidewalks.

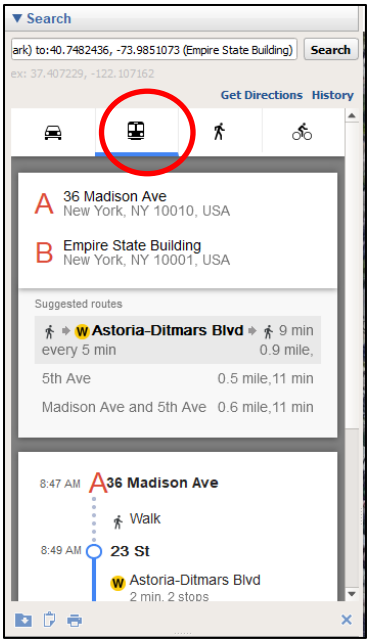

Figure 17

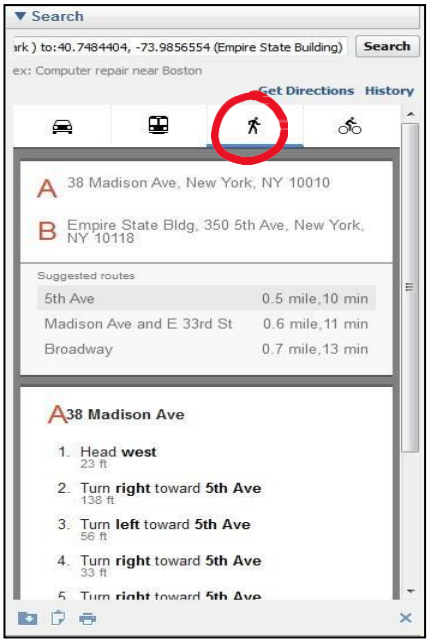

Figure 18

B) Next you will need to save the route to "My Places". Underneath the directions in the side panel, click the icon to save the route to My Places. Once the folder is saved, you will notice three sub items under the folder that you just saved. Remove and and any other folders that aren't named '5th Ave' by pressing **Ctrl** while selecting those items. Afterwards, *right-click* any of the selected items and select **Delete** (Figure 19). At the end, you should only have one sub folder named **"5th Ave"** left under the main folder for the walking tour. Afterwards, drag the sub folder into the folder you created (My Tour) and rename the sub folder to "Madison Square Park to Empire State" (Figure 20).

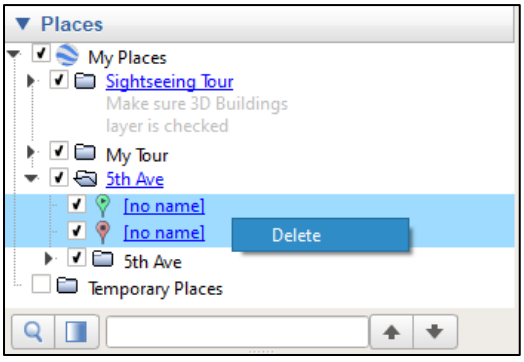

Figure 19

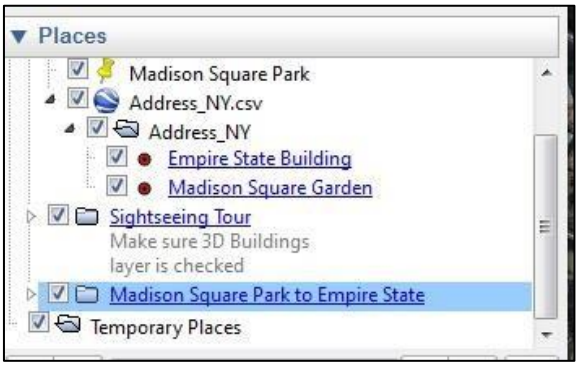

Figure 20

C) You can expand the folder and uncheck the intermediate pushpins telling you to turn if you wish. Repeat these steps to create a new walking route from The Empire State Building to Madison Square Garden. The final walking route (the two walking routes you just created combined) should look something like Figure 21 below. You can change the color of the route by opening the properties of the Route object in the folder subtree.

Figure 21

Step 5: Creating a Narrative and Animated Tour

At this stage, you will create and record a tour that navigates your route in Google Earth's 3D environment. You can also add audio commentary to your tour.

A) To start, Click the Madison Placemark, which will be the starting point for the tour. In the Layers panel, turn on the **Photos** and **3D Buildings** layers (Figure 22). Then click the **Record a Tour** button in the toolbar or select **Tour** from the Add menu. The tour recording tools appear in the lower-left corner of the window (Figure 23).

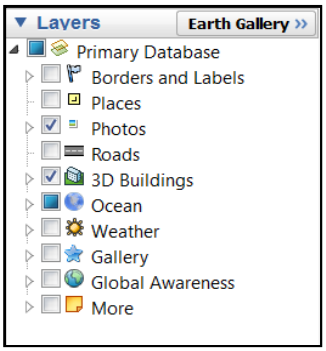

Figure 22

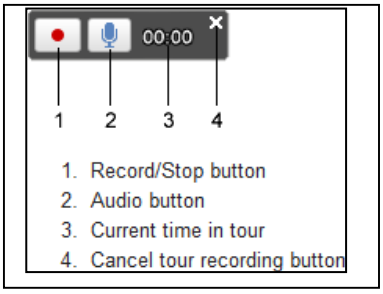

Figure 23

B) Click the **Record** button to start recording your actions and movements in Google Earth. The button changes to red and the time counter begins counting, showing the duration of your current tour. You will notice there is a 3D building for the Eleven Madison Park in the 3D viewer (Figure 24). Use the Navigation Controls in the top right corner and your mouse to move, tilt, rotate the globe and zoom in around the area (Figure 25).

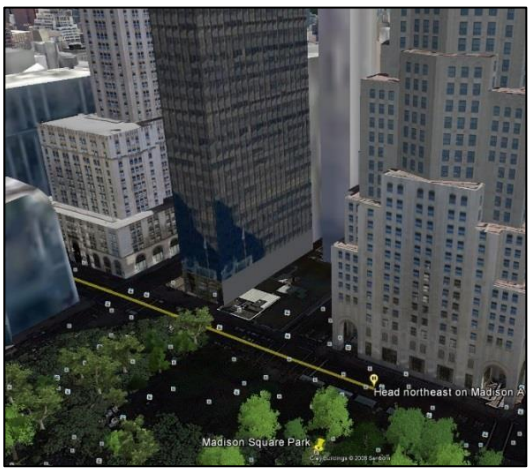

Figure 24

Figure 25

C) Once the 360-degree view of the Madison Square Park is finished, you can press the stop

recording button. Tour Player appears in the bottom-left corner of the 3D viewer (Figure 26-27). You can play the tour after the recording is done.

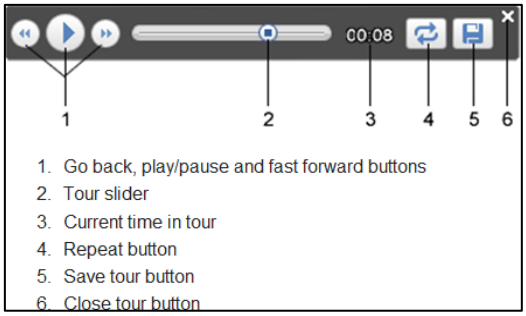

Figure 26

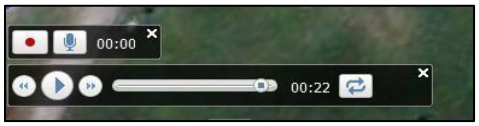

Figure 27

D) To save the tour, click the Save to File button in the Tour Player, and give it a name. The new KML file will be saved in "My Places". Drag it into the "My Tour" Folder.

Step 6: Re-record a Tour to Add New Actions

You can modify and extend a previous tour by re- recording a new tour while playing back the original tour. The new tour will add a new action to move around the routes you created in Step 4. You are also going to create a 360-degree pan around the two museums.

A) To add a new action into the existing tour, click the Record a Tour button as demonstrated in Step 5A.

B) Next, click the Record/Stop button (Figure 23) to start recording a new tour, then play the tour that you just created by double clicking it in 'My Places'. Wait until the original tour finishes playing back.

C) Since you are still recording, you can continue to add new actions. Click the 'Madison Square Park to the Empire State Building' route file in the 'My Places' panel and then click 'Play Tour' button as seen in Figure 26-27. This allows you to add a tour along a route. Repeat the same procedure to play a tour along the two-museum route.

D) Next, double click the 'Empire State Building and Madison Square Garden' route file in the 'My Places' panel and switch to Google Street View mode by dragging to place it at either one of the two locations. On the Navigation Controls in the top right corner (Figure 25), and using your mouse to pan, create a 360-degree pan view of the area.

E) Once this is done, you can press the stop recording button and click the Save tour button in the Tour Player (Figure 26) and give the new tour a name (e.g. “Walking tour new”). What many students have done in the past is add text like ‘PAUSE HERE’ for the user to pause the video and click on certain icons themselves. Others have created multiple tours which makes creating them more manageable.

Step 7: Recording Audio Commentary

Once the tour has been created, you can add an audio recording. Adding an audio clip in this way is easy. You must have a microphone linked to your computer.

A) First you will play the tour recording again as demonstrated in Step 6 to figure out how long each segment of the tour takes. A segment could be a 360-degree view of the Flat Iron Building

B) Write a script exactly for what you will say in the time that each segment takes, for instance “We are now walking around the location of the Madison Square Park…”. Test your comments to see they fit the time slot.

C) Now click on **Record a Tour** button as demonstrated in Step 5. Click the microphone button  instead of the record button. Click on Record/Stop button (Figure 23) to stop recording audio when you finish.

D) Once you’re finished, click the **Save tour** button in the Record Tour Controls (Figure 26) to save the tour. A pop-up window will show up after you click on the Save tour button. Enter a meaningful name for your walking tour and click **OK** (Figure 28). The saved walking tour will appear under ‘My places’. Audio recorded through your microphone is captured as an .mp3 file when you save the entire folder under ‘My Places’ as a KMZ file.

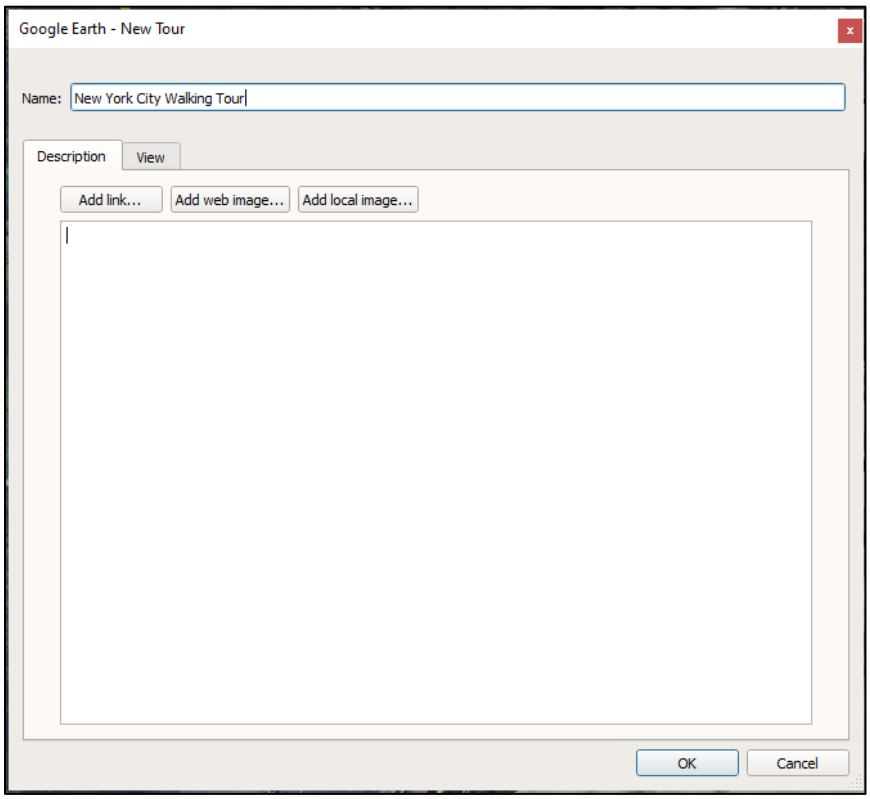

Figure 28

Step 9: Add a Legend or Screen Overlay

You will learn how to add a legend/logo on the Google Earth screen by creating an image file and a simple screen overlay KML file.

A) First you will need to find a computer program which can be used to create drawings on either a blank drawing area or an existing image (e.g. Microsoft Paint). Once completed, you will save the image file as either JPEG or PNG format to your computer.

B) Next you will need to create a simple screen overlay KML file as shown below. Please save your KML file and your photo into the same folder.

a. <?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
<ScreenOverlay>
<name>Absolute Positioning: Top left</name>
<visibility>1</visibility>
<Icon>
<href> AddYourImage.jpg </href>
</Icon>
<overlayXY x="0" y="1" xunits="fraction" yunits="fraction"/>
<screenXY x="0" y="1" xunits="fraction" yunits="fraction"/>
<rotationXY x="0" y="0" xunits="fraction" yunits="fraction"/>
<size x="0" y="0" xunits="fraction" yunits="fraction"/>
</ScreenOverlay>
</kml>

b. This Placemark KML file contains the following key elements:

- <name> this is used as the label for the Placemark
- <Icon> icon that appears in the screen overlay.
- overlayXY and screenXY controls the location of the legend on the screen
- Specifies the size of the image for the screen overlay

More explanation on how to create a screen overlay KML file can be found through the link below:

https://www.google.com/earth/outreach/learn/adding-legends-logos-and-banners-to-google-earth-with- screen-overlays/

Note: To save the code above in Notepad, click **File -> Save As…** (Figure 29). Enter an appropriate name for the KML file and remember to add **.kml** extension after the file name and select **All Files** for the "Save as type:" field and click **Save** (Figure 30).

Figure 29

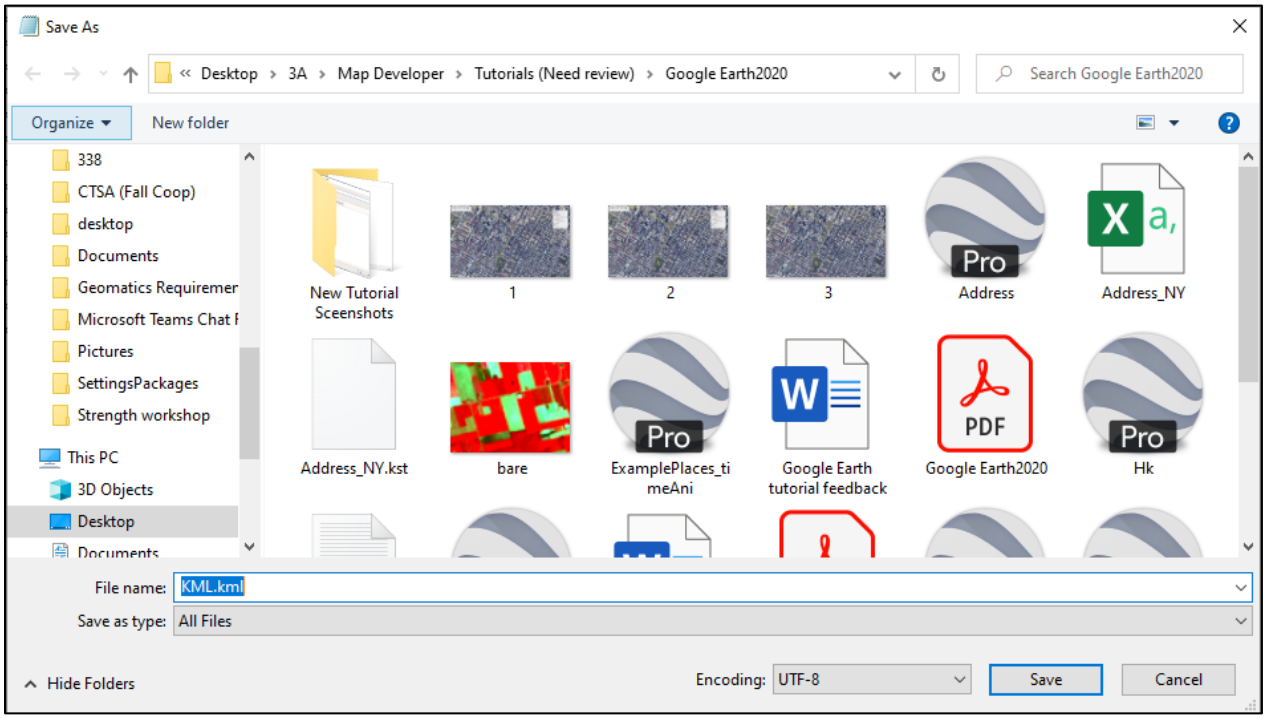

Figure 30

OPTIONAL: Measurements

In Google Earth Pro, you get a few more options for finding information about an area, including the Measurement tool. In the standard release of Google Earth, only linear measurements are allowed. In Pro, you can find out the area by drawing a polygon, either a square or free-form. Also, you can measure the height or vertical cross-sectional area of any buildings by drawing a 3D path or a 3D polygon. To use the Measure tool, click the ruler button in the toolbar. 

Step 10: Saving

You may want to add a title for this walking tour. The easiest way to add a title is to create a Placemark, then remove its icon.

A) Click the **Add Placemark** button (yellow push pin button in the toolbar). Drag the new Placemark so that it points approximately at the route you just added.

B) Enter a descriptive title for the map (i.e "A Short Walking Tour of Three Academic Institutes"). Click the Icon button, just to the right of the Name field. At the bottom of the new dialogue box, click **No Icon** to remove it from view (Figure 31).

C) Right click on the walking trip folder in 'My Places' and select 'Save Place As' to create a KMZ file, which contains all information in the folder and can be shared with others via e-mail, Facebook, or Twitter. Whoever receives the file will see exactly what you see when opening it up in Google Earth.

If you would like to save an image of your area, follow these steps:

1) Go to **File -> Save**, and on the menu that expands, click **Save Image…**

2) A toolbar on the top of the main viewing window appears (Figure 32), as well as a legend and map title. The toolbar controls everything that exports out into the image and the image exporting itself.

3) If you want to get rid of the legend and other map elements, click on Map Options in the new toolbar and uncheck all the elements. If you want to get rid of the icons on the map and only leave the imagery, then uncheck the undesired layer in the Layers pane at the

bottom left of the main window.

4) Adjust the resolution in the new toolbar to your liking and specifications. If you are unsure about your desired resolution, leave it as default.

5) When you are satisfied with how your image will come out, click the **Save Image…** button on the toolbar. Select your destination and name. Your creation will export as a .jpg image.

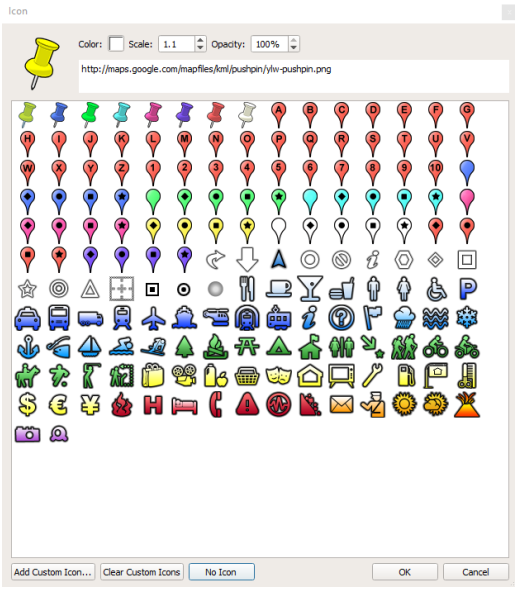

Figure 31

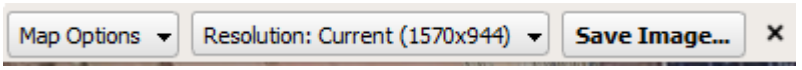

Figure 32

OPTIONAL: Explore Google Earth on the Web

You don't need to install Google Earth Pro to use what you've learned in this tutorial; Google Earth is now on your browser! Access it from https://earth.google.com/web and explore the places you love with a lot of new features.

- Explore new tours and guides created by users and curated by editors.
- Make your own project and save it directly onto your Google Drive. You can make presentations out of your tours now and tell your audience a real story!

- Use the Voyager feature to see tours, quizzes, and guides that stand out and can help inspire you on your mapping journey.

- Make places and features, then export directly as KML just from your browser.

To learn more about Google Earth online, this appendix will walk you through making a presentation of select areas.

1) Go to https://earth.google.com/web.

2) Click the  button at the top left of the screen and log into/register a new Google account. Note that if you do not want to use a Google account, it is possible to export your results as KML.

3) In the same menu, click on **Projects -> New Project -> Create project in Google Drive** to create a new project. It will be saved in your Google Drive.

4) Click on **Untitled Project** to give your new project a name and description. This will be saved and help organize it within your Google Drive.

5) You are going to make a presentation about some sites on UW Campus. To start, click on **New Feature** and then click **Search to Add Place**. Look up "University of Waterloo" and click the appropriate result. The Earth will zoom to campus. Click **Add to Project** on the right pane to add this view to your presentation. Click on the back button on the upper left of the window when the place is added to your project.

6) Give some context to your presentation by adding a Fullscreen Slide to it (**New feature -> Fullscreen Slide**). Edit the slide's color and text so that it is visually appealing and informs the audience of what they are looking at and should pay attention to. When you finish, click on the back button to return to the previous menu.

7) Draw attention to a certain point using a Placemark. Drop your placemark on the ground or on the 3D model (**New feature -> Add Placemark**) and edit the name and description. Choose from a selection of custom placemarks to draw attention to your point. If you have some pictures or videos of the point on the placemark, you can add them on the left pane so that it pops up!

8) Add in some paths and shapes to show some boundaries and areas of interest to your viewers. You can customize the colour and width of your lines to draw your viewers' attention to a central feature. Try drawing the path you take to get to class using the line

tool (New feature -> Draw line or shape), and draw a shape representing the building that your class is in.

9) Keep adding in slides, paths, and placemarks until your presentation is complete. Make your descriptions useful since they will pop up during the presentation. Use photos to add more detail about locations and to liven up your presentation.

10) When finished, your project autosaves to your Google drive, but you can also export the project to KML using the ⋮ button at the top of the projects pane.

11) Click the Present button when you want to start presenting. If you want to share the presentation with someone else, copy the link from your Google Drive and send it to the other person.

OPTIONAL: Edit the KML of a Layer You Made to Make a Time Animation

One of the most important things you need to know about Google Earth Pro is that most of the features that let you make a customized layer and specific use-case is not given in the Google EarthPro GUI, but rather in the KML that underlies the features. KML stands for Keyhole Markup Language and is the language that tells the program how, where, and when to display a feature on the map. You are going to explore this functionality by making a series of placemarks that fade into view as an animation over time. This feature is generally reserved for points made by a GPS, but using KML, you can do the same presentation of the data with just your computer. You can find all the documentation that you might need about KML (and specifically about the time attributes that you will be using) on the documentation website:

https://developers.google.com/kml/documentation/time#time-stamps-and-gps-data

1) Make a series of placemarks. Arrange them so that the progression over time would look natural and easy for the viewer to follow.

2) Add a folder in the Places pane and move all of your placemarks into that folder.

3) Right-click your folder and click Save Place As…, then save the file to a place you can easily remember. Make sure to switch the file type to KML, not KMZ.

4) Find the place you saved your KML and open it in a text editor such as Notepad. For this tutorial, it is recommended you use one with HTML/XML/KML tag highlighting, like

Notepad++ (though this feature is optional).

5) Find a <Placemark> tag inside of your KML file and identify which one the placemark you found is (use a name you gave it, for example). In between the <Placemark> and </Placemark> tags, put a <TimeStamp> and </TimeStamp> tag. Make sure these two tags are next to each other. In-between these two tags, put <when> and </when>.

    a. Like most markup languages, KML uses tags to define elements. Elements start with a beginning tag (denoted by <, followed by the name, and then >) and an ending tag (denoted by </, the same name as the beginning tag, then >). Other tags and elements can go in-between beginning and end tags (as evident by the fact that inside your KML file, your <Placemark> element has many elements and tags in-between its tags), but they must have beginning and end tags. There are exceptions to this rule that you can learn more about in the abundant HTML tutorials that are found online.

    b. There is another element type for time inside KML known as <TimeSpan>. Timespan uses a <begin> element and <end> element and defines a *range* of time for which the feature would be displayed. This is to be contrasted with <TimeStamp> which starts appearing at the specified time. Consult the documentation at the link above for more information and examples on using <TimeSpan>. If you suspect that an example KML file in the link above is broken, right-click on it and Save Link As… onto your computer.

6) Define a time for your timestamp by putting it in between the when tags. Time and date is to be formatted in XML schema time, which is yyyy-mm-dd. You can leave out time elements that you don't need (for example, the format stated in this step excludes time altogether and only keeps date – yet is a completely valid XML schema time statement. If you wanted to add time to it, the schema is yyyy-mm-ddThh:mm:ssZ, where T is a constant (it only denotes that time is being stated) and Z is a constant (used to tell the program that Universal Coordinated Time is being used). See the documentation at the link above to learn more about XML schema time.

7) Repeat these steps for the rest of your placemarks. Stagger your timestamps so that some appear after others. Remember that with timestamps, placemarks that have appeared do not disappear since they do not have an end time. If you want your placemark to disappear after a while, use a timespan.

8) Once you've finished adding timestamps, and you are sure there are no errors in your markup, save your code. The steps for saving your code in a text editor is demonstrated in the note section of Step 9B of the tutorial. Move your KML back into Google Earth Pro.

9) You will notice that a new time slider appears when your layer is added. Move the right

bound of the slider all the way to the left. Press the time animation button to start playing your animation and watch your layer play through time.

An example of a time animation playthrough, which is the KML that this tutorial comes with, below.

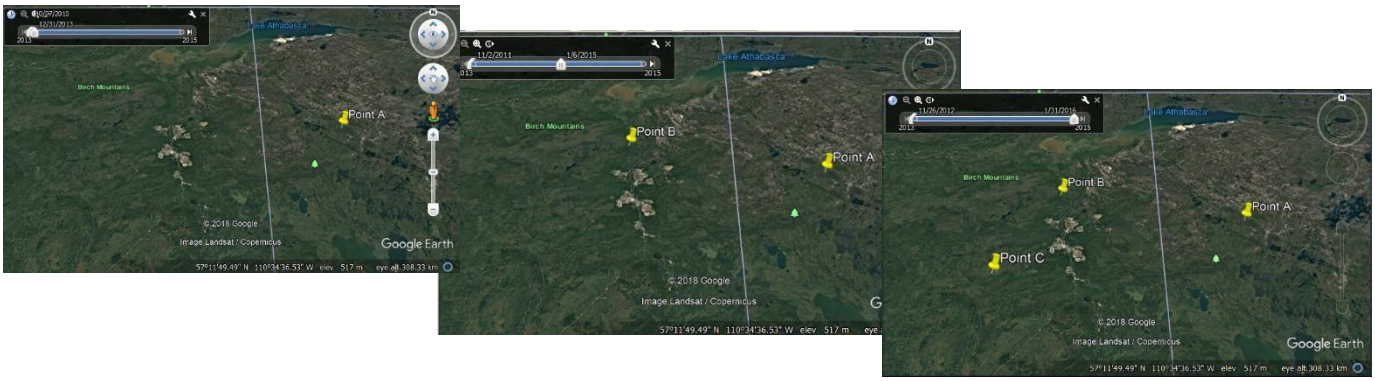

Figure 33 – Time Animation of Three Points

References

- Creating a Narrated Tour in Google Earth: http://www.google.com/earth/outreach/tutorials/kmltours.html
- Navigating on the Earth http://support.google.com/earth/bin/answer.py?hl=en&answer=176674
- Creating Tours How To 3: Adding Audio http://googleearthdesign.blogspot.ca/2009/08/creating-tours-howto-3-adding-audio.html