

cjb's Terrain Assist for TW06

Thanks for trying my program. In this guide I will walk you through the process of acquiring the data needed to successfully start a project in Terrain Assist (TA). Without this data the program is useless and I won't kid you, it takes some time to gather. Although it's a tough read I suggest you read this entire guide before jumping in. To see what the program can do, follow the Demo Step-by-step in the TA's Help File.

What can it do?

If you've run the demo then you have seen that TA has two features that will help you quickly develop a real golf course layout in the Course Architect (CA). First you can export a Digital Elevation Model (DEM) to the CA as your starting land plot. Second you can create shapes using an aerial photo then export those shapes into their proper location on the CA plot.

What data do I need?

TA has been specifically written to use 10 and 30 Meter DEMs. The DEMs are available as free downloads from the United States Geological Survey (USGS) website. A Google search of "USGS DEM" will point you in the right direction. At the time of this writing it was here:

<http://data.geocomm.com/dem/demdownload.html> . You will need to register on the site before you can download but it's free.

DEMs are too large to be used as-is by the TA so they must first be trimmed to a smaller region that will contain the course you are working on. There are many pieces of software that will do this but the TA requires you to use 3DEM. 3DEM is also a free download and at the time of this writing it was here: <http://www.visualizationsoftware.com/3dem/downloads.html> . You will need to download and install 3DEM if you want to use TA.

Finally, you will need an image of the Topographic Map for your DEM and the best quality aerial photo of the course you can find. All of the USGS DEMs have been constructed using the topomap data so there is a high degree of correlation between the two. If you want to better understand this relationship you can read: <http://spatialnews.geocomm.com/features/childs3/> . Topographic Maps for our purposes are also known as Digital Raster Graphics (DRGs) or 1:24,000th Scale Quadrangles.

To sum up, after you install 3DEM and before you run TA, there are four pieces of data you will need to get. In no particular order:

- 1) The best quality aerial photo of the course.
- 2) A piece of the Topographic Map that contains the course.
- 3) The USGS DEM that contains the course.
- 4) Latitude on Longitude coordinates of the bottom left and top right corners of the land plot you intend to make in the CA.

When you have this data you can use it to create the two pieces of information that are required to run the TA:

- 5) A correctly scaled course photo.
- 6) A 3DEM trimmed Digital Elevation Model.

Let's go hunting, shall we?

Where in the world is Carmen Sandiego?

For demonstration purposes I will use my home course, Bartlett Country Club, to show you one method of gathering the required data. I obviously already know a lot about this course but I'll pretend I don't. A search of: <http://www.golfguideweb.com/golfcourses.html> reveals some important information:



It has given me an address and more importantly the County where the course is located. This is useful because DEM data is accessed on the USGS website by State, then County, then City.

What does Google Earth have to say about this?

If you have a broadband internet connection and haven't tried it yet I recommend installing the Google Earth viewer on your computer. The image quality is high and the latitude and longitude data is interactively displayed so you can relatively quickly cross 1) and 4) off of the list. For the rest of you I'll continue on.

1) Photos:

A good source to look for the aerial photos is the website of the State's Geographic Information System (GIS). A Google search for "NY State GIS" produced this: <http://www.nysgis.state.ny.us/>. Poking around in the "Orthoimagery" section I found this:

CITIES		
Area of Coverage	Tile Download Page	Zip File
Olean, City of	State Plane 2002 (1 ft Natural Color)	 State Plane 2002 (43.3 MB)
	State Plane 2002 (2 ft Panchromatic)	
	State Plane 2002	

In 2002 the State took hi-res photos. Here is a sample of the resolution:



Good enough for me. I downloaded all the images pertaining to my course and after a serious Photoshop cut and paste session created a very large single image. (These are the same photos as on Google Earth by the way.) Cross number 1) off the list.

2) Topographic Data:

Also Poking around the NYSGIS site I found another valuable piece of info. In the "Map Products Index" section, at the very bottom of the page was "New York State 1:24,000 Scale Quadrangles" <http://www.nysgis.state.ny.us/gisdata/quads/drg24/> . These Quads are the outlines of the DEMs. Clicking on the Olean quad (just below the g in Cattaraugus) takes us to this:

**USGS Digital Raster Graphic (DRG) Quadrangle
(1:24,000 scale - UTM Zone 17, NAD 27)**

Publication Date: 1980

[Preview image](#) (GIF - please note this is a very large file)

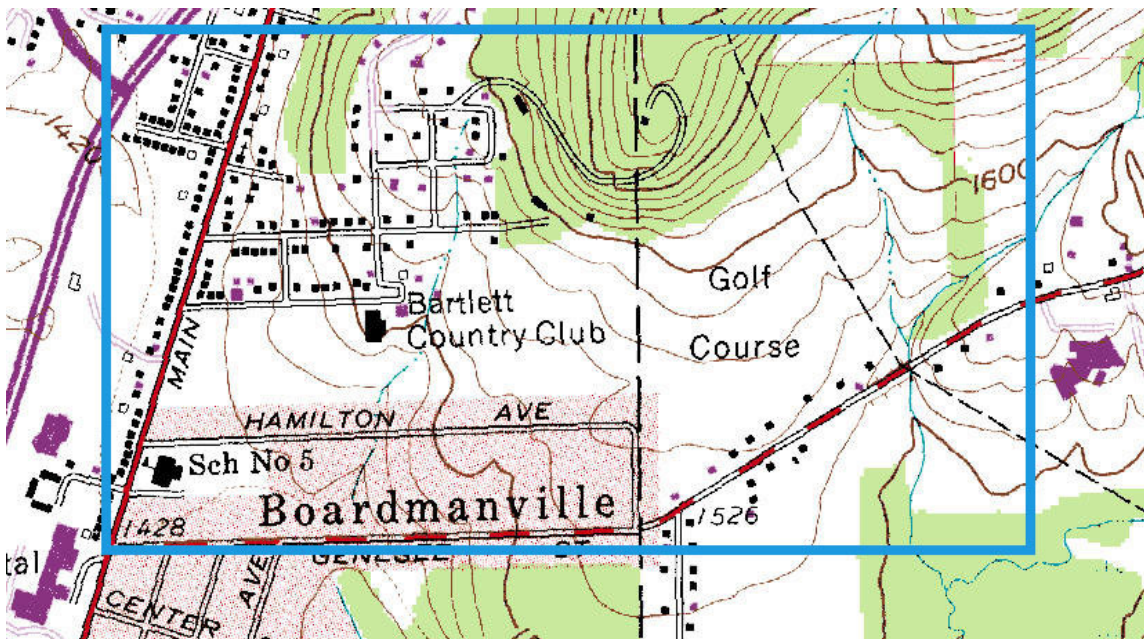
[Download quad](#)

The zipped file includes the TIFF image, plus a MapInfo format table file (.tab),

[View metadata](#)

[More about the USGS DRG Program](#)

If you are following along you can click Preview but I Downloaded the quad. This is a scan of the Topographic Map that is associated with my DEM. (The bad news is that this is just a scan and not a geotiff which has built in alignment data that 3DEM can use.) I looked over the topomap and found my target. Fortunately for me, the whole course lies in this one quad. It is possible that your course may lie on the boundaries of a quad and require four topomaps and DEMs to complete. That's just bad luck.



But what if your State doesn't have any Quad data and you are too cheap to buy them? (You can download them from the USGS site but they cost money even though it's just a buck or two.) There are still several online sights from which you can cut and paste an image. <http://www.topozone.com/> and <http://teraserver.microsoft.com/> have the largest view-ports. Like I've shown above, you just need an image that is slightly larger than the land plot you are going to make with the CA (the blue rectangle represents what I'm planning for as a starting plot – don't add it to your image). With this image in hand we can cross number 2) off of the list.

Where is all this going?

At this point it may be helpful to see where this is going. Once you have your topomap image you want to combine the photo and the topomap. The image I made below is shown here at about one tenth scale. Keep the photo at its native resolution and scale up the topomap image to match the photo. Yes, that means this is a very large image (~70 Megs). If you don't have the computing muscle to handle it then scale back accordingly but keep it as large as possible. This will help when you are digitizing shapes using the TA. In my case I had to rotate my photo slightly and distort its scale slightly. I'm OK with that because I know that it's unlikely the camera was directly overhead when the photo was snapped so I could see it being slightly distorted. Creating this image is by far the most challenging part of the process. With it complete the remaining tasks are much easier.



DEMs:

We can now go get the DEM. I logged in to my account at the USGS DEM homepage I linked at the top of this guide and then selected NY State on the map. This opened a new window that listed the County's in NY. I picked "Cattaraugus" and then "Digital Elevation Models". I then scroll down to the City, "Olean" and select the green (free) download button. I'm then presented with a choice:

Download Data


• Image Processing

NOTICE: Click [here](#) for important information regarding DEMs.

Click the links below to download.

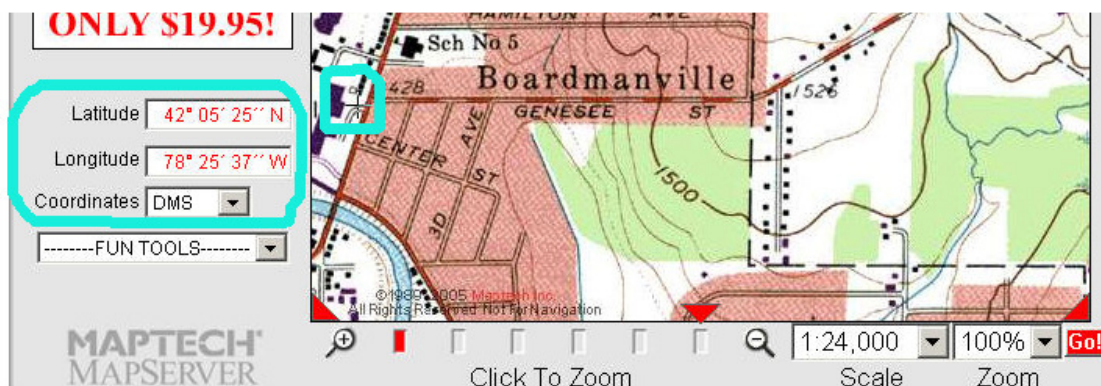
[1656094.DEM.SDTS.TAR.GZ](#) (10 meter)

[1656094.DEM.SDTS.TXT](#)

I choose the top one with the .tar.gz file extension. This is the UNIX equivalent of a zip file but 3DEM will handle it. It is not necessary to download the second .txt file. If given a choice, choose (10 meter) over (30 meter) but either way, try to remember what size you did choose because the TA will ask you for this piece of info. When this download completes cross number 3) off of the list.

Coordinate Data:

The next step is to get some geographic coordinates. If you visited the links above to TopoZone or TerraServer then you may have noticed that they have stopped using interactive topomaps on their websites. The only place I've found that still does is Maptech <http://mapserver.maptech.com/homepage/> (and of course, Google Earth). We need to locate our course on the Maptech site and get some data. Here I've highlighted in blue that I've selected "DMS" in the Coordinates pull-down and positioned my cursor approximately where I would like the bottom left corner of my CA plot to begin. Don't waste time trying to be too precise here, since the DEMs are laid out on a specific 10 or 30 meter grid we don't know exactly where the nearest grid point is until we've trimmed the DEM in the next step. We will then come back here to figure out where exactly our plot is going to start and stop. For now, record the "Latitude" and "Longitude" data then repeat for the upper right corner. (Don't be too generous with extra space around your course – remember the CA has a maximum starting plot size of 4000 x 4000 yds.)

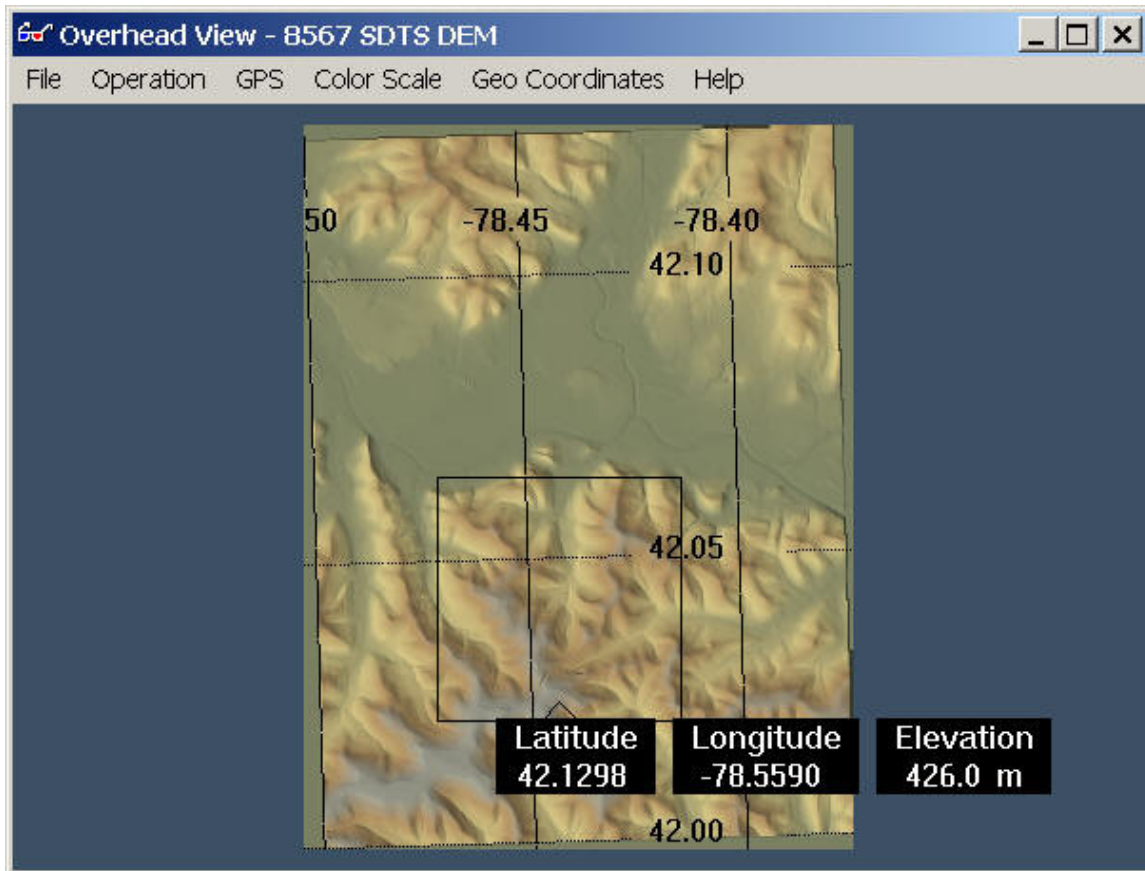


When you have recorded (I suggest writing them down) the numbers at both corners then we are ready

to move on. You will probably want to bookmark this website because we will need to come back after the next step. We can however cross number 4) off of our list.

Lets Fire Up 3DEM:

Run 3DEM and choose "File=>Load Terrain Model". On the pop-up window make sure the "USGS DEM" is selected then hit "OK". Navigate to the DEM you downloaded earlier and you should see something like this:



Our task is to trim this to the coordinates you just wrote down. It's pretty easy to do, that's part of the reason I chose 3DEM.

First make sure you are comparing apples to apples. From the "Operation=>Change Projection=>Change UTM Ellipsoid" menu make sure "NAD27" is selected, then from the "Geo Coordinates" menu choose "Minutes of Degree".

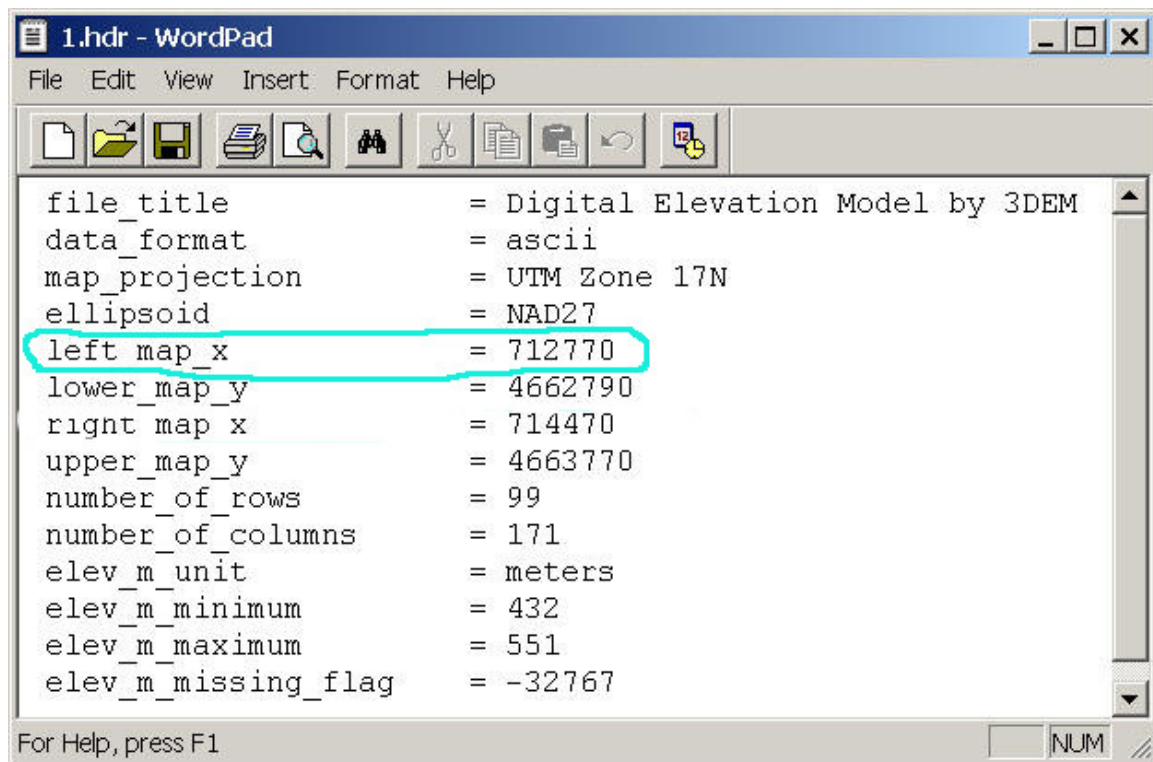
To trim the DEM just go to "Operations=>F8 Select Smaller Area" (or hit F8). Move your mouse until you locate one of your two corner coordinates. At that location press and hold down the Left Mouse Button then drag the cursor to the other corner coordinates. At that location release the mouse button and a red rectangle should be left behind indicating the new trim. If you think you've succeeded (sometimes to me it feels like the mouse has moved a little as I pushed the button down so I'm not sure if I hit what I was aiming at – you can still start over just by picking again) then hit "Enter" and the new trimmed DEM is displayed. If you can't complete this step because you find one of your corners is off of the surface then

you will need to download that DEM also. You can multi-select the DEM files when loading the terrain model to display more than one at a time. As I mentioned earlier you may need up to four DEMs to complete this task.

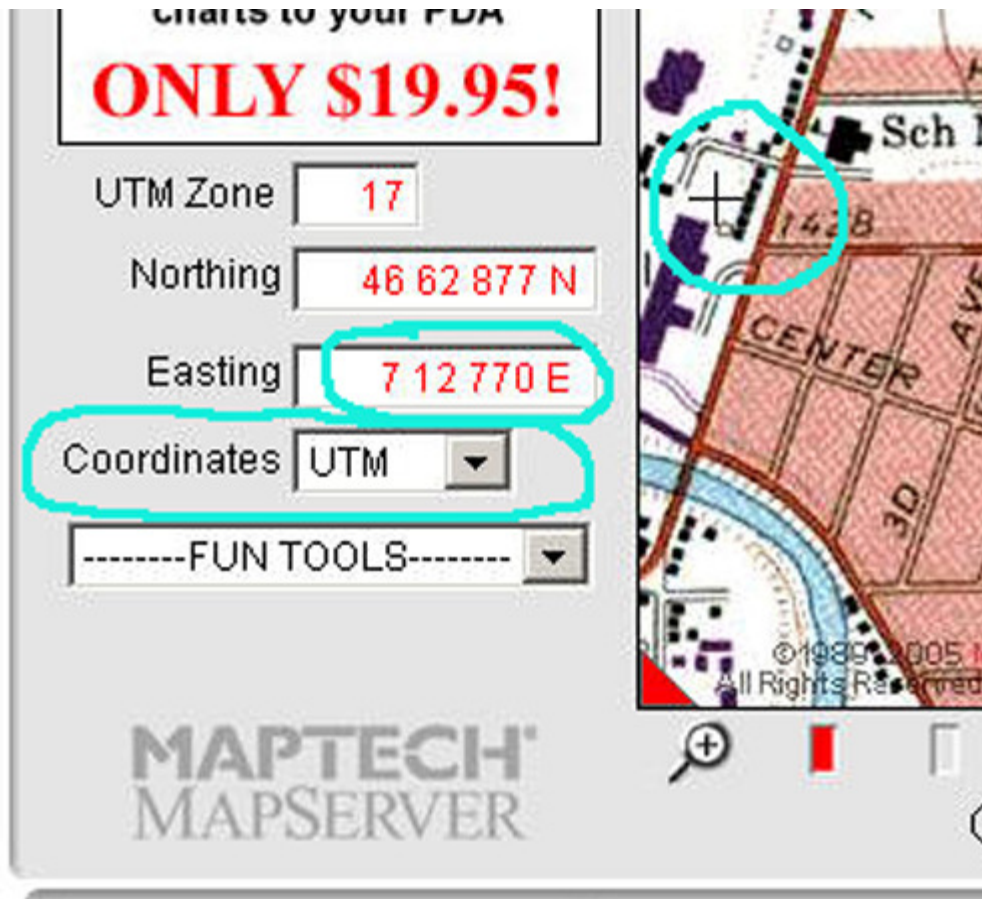
Now just go to "File=>Save Terrain Matrix" and pick the "ASCII" button then "OK". Navigate to the folder you want to save it in, give it a name and pick "Save". You can close 3DEM and cross number 6) off the list.

One Last Step:

The only thing we need to do now is complete Number 5). Remember I told you there is a high correlation between the topomap and the DEM. We want to maintain that correlation between our piece of topomap and our newly trimmed DEM. When you picked "Save" in 3DEM it created two files based on the name you keyed in. One is a .txt file and one is a .hdr file. Use Windows Wordpad to open the .hdr file and you will see something like this:



I've highlighted in blue again what we are interested in. This is the actual left edge of our 3DEM plot. (Followed by the exact bottom, right and top edges respectively.) We now want to trim the left edge of our topomap image to this value. To do that we return to Maptech and switch the units from the pull-down menu to be "UTM". We then find some feature on the topomap that corresponds to the 3DEM value. In this case it is the left edge of an open square near the intersection of Genesee an Main.



I now know that when I trim my topomap in photoshop at that location I have an exact match to my DEM. Once I have completed the remaining 3 sides using this method I know that my topomap will lie perfectly on the DEM and therefore my course photo is exactly where it needs to be and is perfect scale.

The final bit of business after all the trimming is to do a resize to a power of 2. The powers of 2 we are most likely interested in are 1024, 2048 and 4096. In my case because my plot is nearly rectangular I made my final course image 4096 x 2048 and saved it as "Bartlett.tga". The TA will recognize other image formats but it seems that Targa (.tga) images load the fastest so I recommend you use them. Yes that last step did just distort the image but the TA will resize the image back to it's proper proportions when it applies it to the terrain matrix. Just trust me on this one. We can now cross number 5) off of the list.

We did it!

I generally will put the three files we created (the two 3DEM files *.hdr and *.txt and the course image *.tga) into a single folder on my hard drive for easy access from the TA. When you run the TA just begin by selecting "New Project" then the remaining steps are the same as the demo.