FAQ: Using Local Coordinate Systems in MobileMapper Office

By: Mark Silver, ms@igage.com

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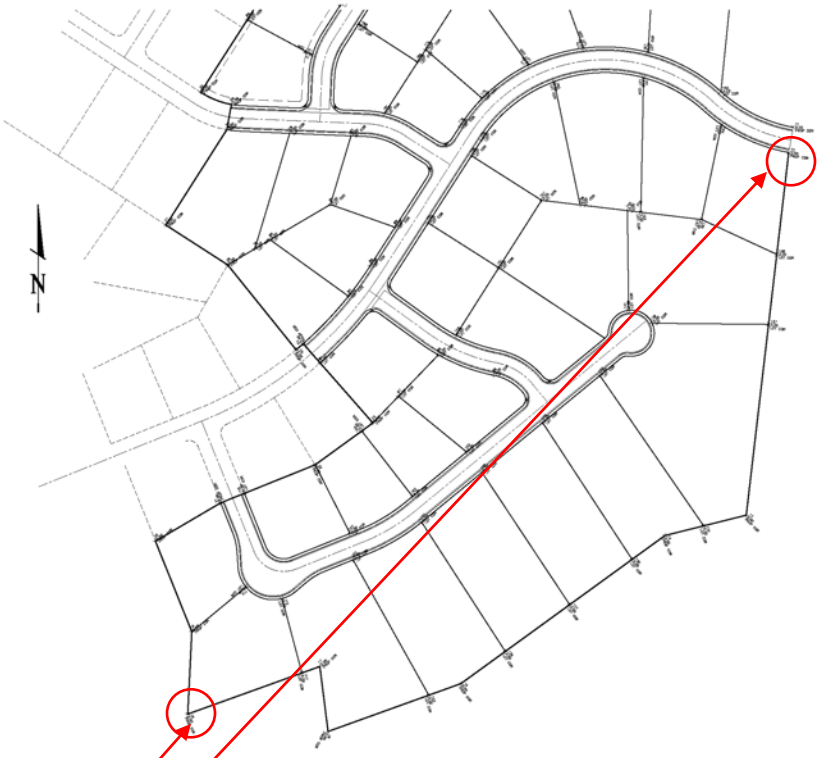
Thesis:

On occasion a MobileMapper user may be confronted with a 'Local Coordinate System'. This FAQ shows how to compute a local coordinate system for use with MMO.

Since this is a fairly complex issue, a complete worked example is presented. It is assumed that the reader knows how to convert from geographic coordinates to state plane coordinate.

Example:

(The files used in this example are included in a ZIP file ASHDN.ZIP)



Find two points on opposite corners of a job. I prefer to use the south west most point and the north west most point. In this example:

Desc	PtID	Lat	Lon	SPX	SPY	LocalX	LocalY
LowerLeft	18	37 42 41.29161	113 02 19.92664	1195280.30	10226593.80	121799.88	119533.38
UpperRight	12	37 42 49.97054	113 02 08.22120	1196235.20	10227456.10	122739.81	120411.85

SPX, SPY, LocalX and LocalY are given in US Survey Feet.

1. We need to compute the effective combined scale factor that the local coordinate system is using to convert from grid to ground coordinates. This scale factor is the distance from point 18 to point 12 grid coordinates divided by the distance from point 18 to point 12 local coordinates:

$$K = 1286.62 / 1286.91 = 0.999773875$$

2. MobileMapper needs coordinate values in meters so we need the state plane and local coordinates computed in Meters for the base point "18":

37 42 41.29161 -113 2 19.92664 NAD83	(geographic)
1195280.3 SFt E 10226593.8 SFt N UTS NAD83	(UTS NAD83 Survey Ft)
364322.2 M E 3117072.0 M N UTS NAD83	(UTS NAD83 Meters)

In addition we need the local coordinates for this point in meters. Be sure to use the correct constant for survey feet to meters (YES: 0.30480060960122; ~~WRONG 0.3048~~)!:

121799.88 sft East 119533.38sft North	(local survey feet)
37124.38 meters East 36434.00 meters North	(local meters)

3. Compute the rotation from state plane grid to local coordinate grid. (Don't forget to compute result in Degrees ~~NOT Radians~~):

Vector from 18 to 12 in state plane:

ArcTan(dy, dx) = 42.082873 degrees

Vector from 18 to 12 in local coordinates:

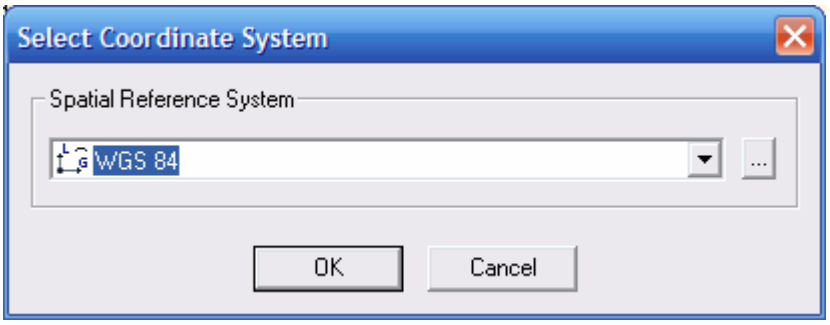
ArcTan(dy, dx) = 43.017515

Local coordinates are rotated 0.93464233 west of state plane. i.e. "the basis of bearings for local coordinates is 0.93 degrees west of state plane north."

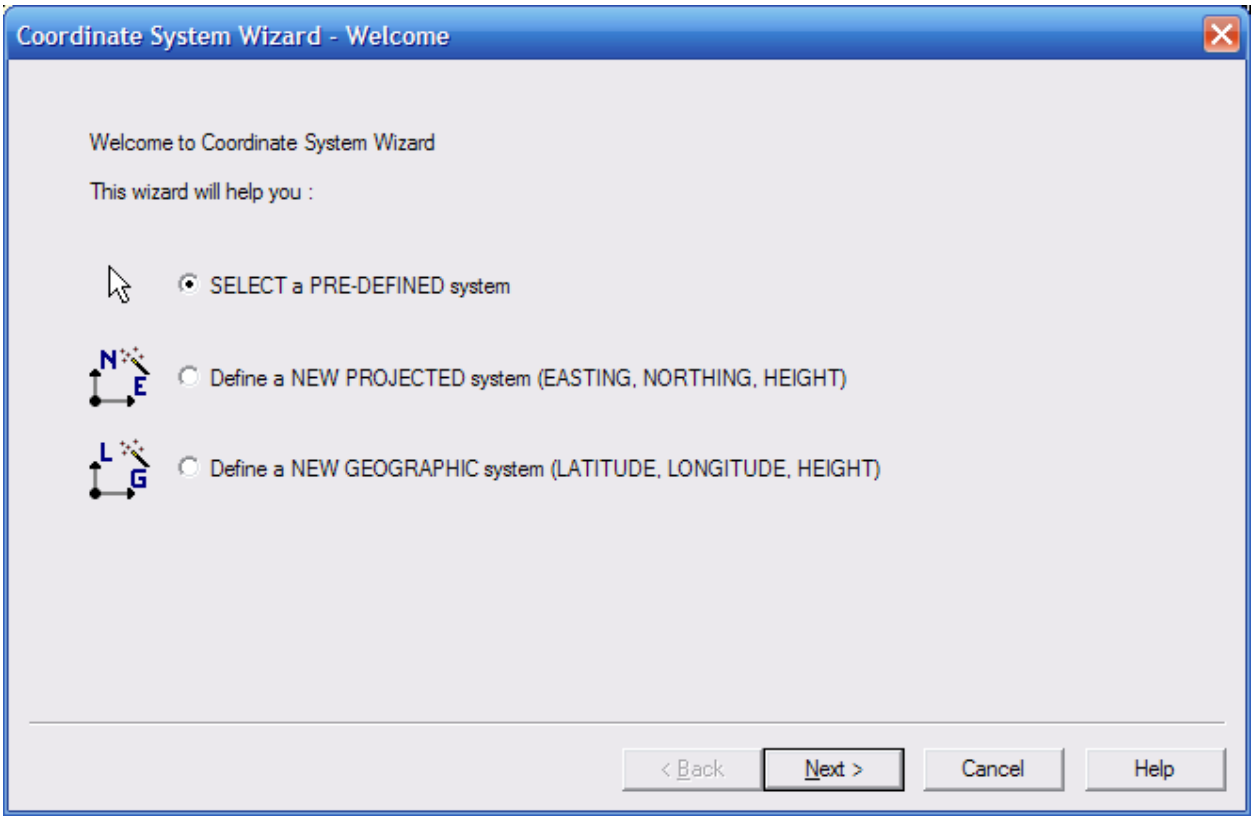
Convert rotation in decimal degrees to dms:

0.93464233 degrees is 0 degrees 56 minutes 4.71 seconds.

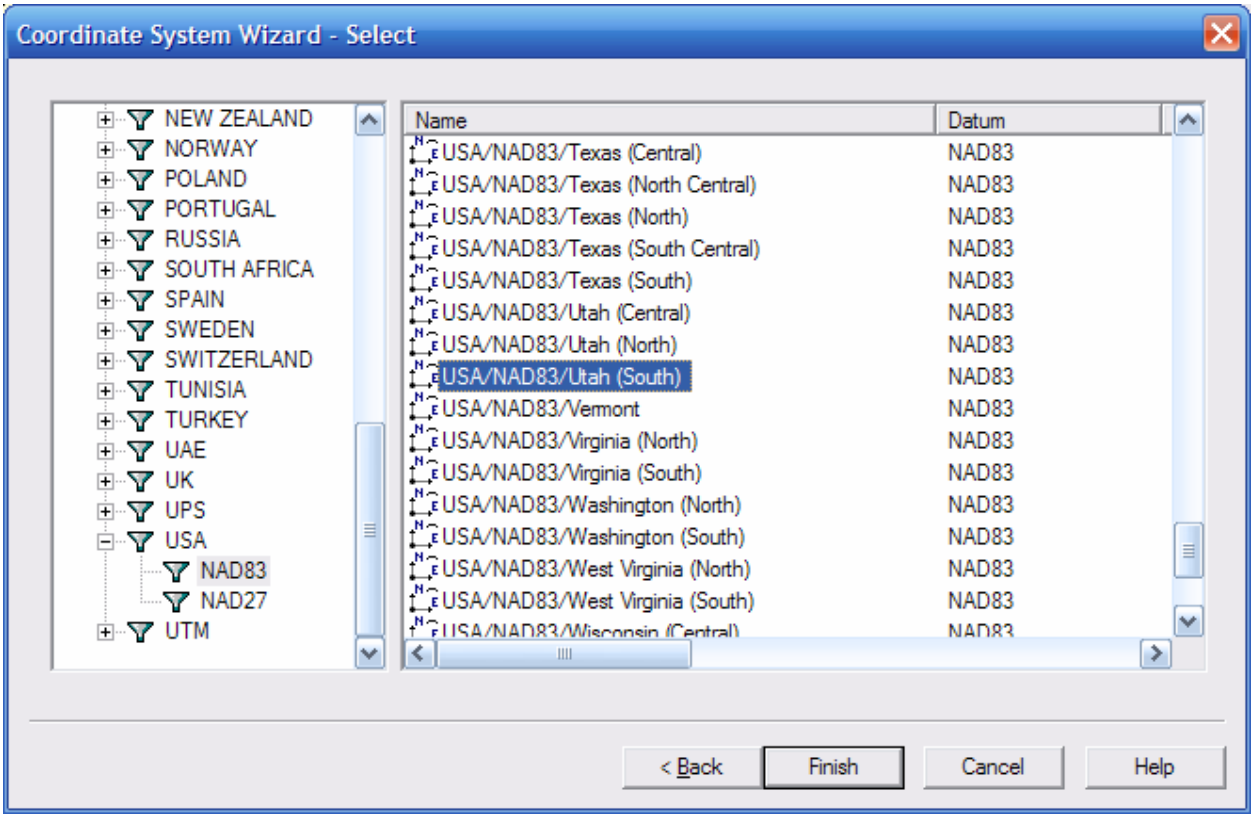
4. Now we need to define a local coordinate system in Mobile Mapper Office. Open MobileMapper with no job. Select "Options: Select Coordinate System...":



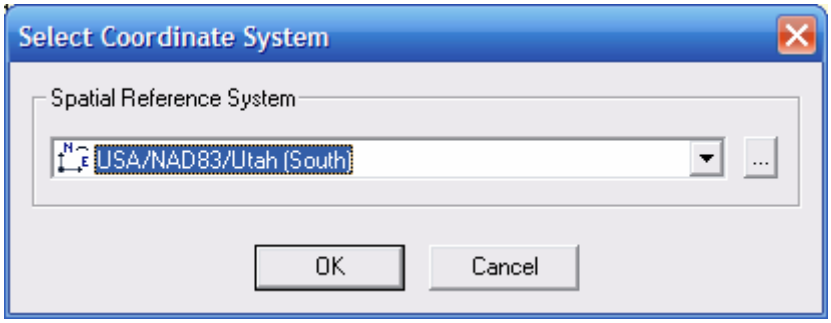
Press the drop arrow to the right of "WGS 84" and select "<New>":



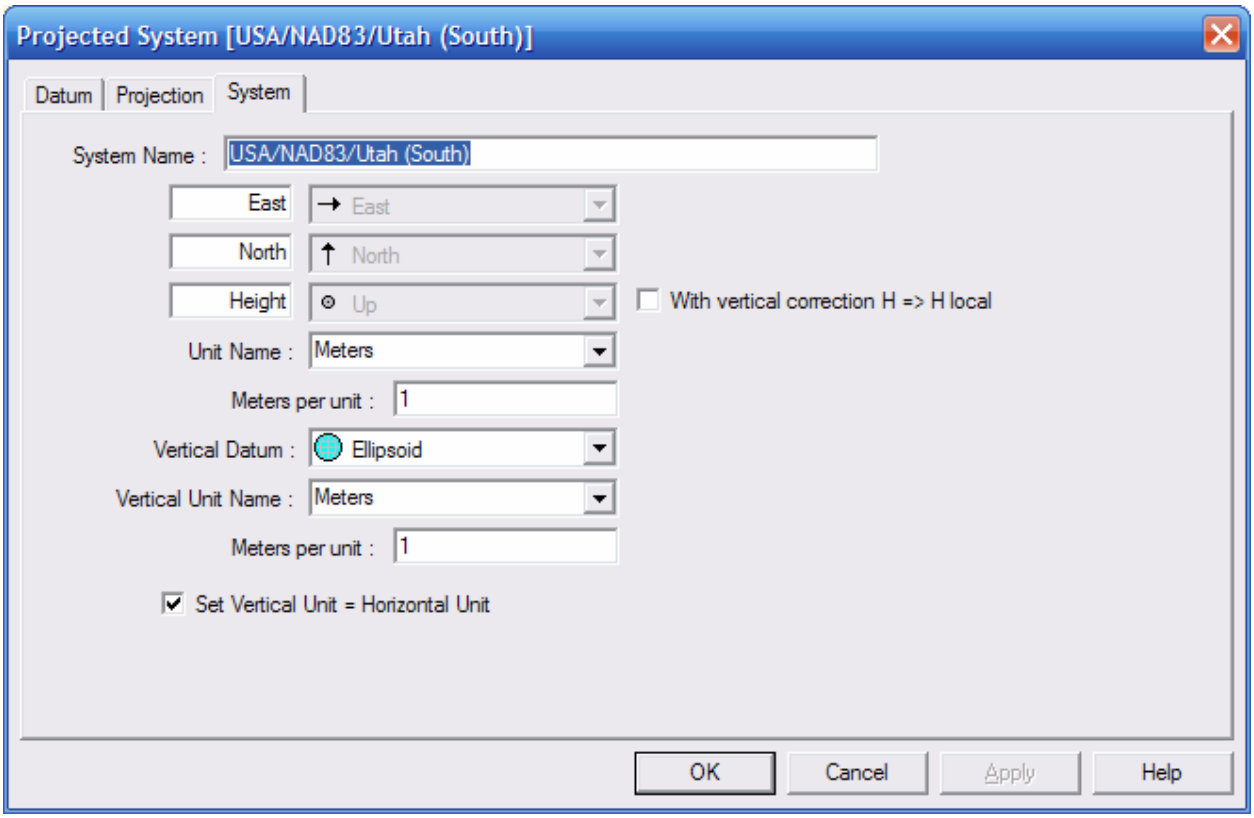
With "Select a Pre-Defined system" selected Press "Next". Select "USA" and then pick the state plane coordinate system that makes sense for the job you are working with. In this case we computed offsets from Utah South NAD83 so you need to pick "NAD83" in the left box and "USA/NAD83/Utah (South)" in the right-hand box:



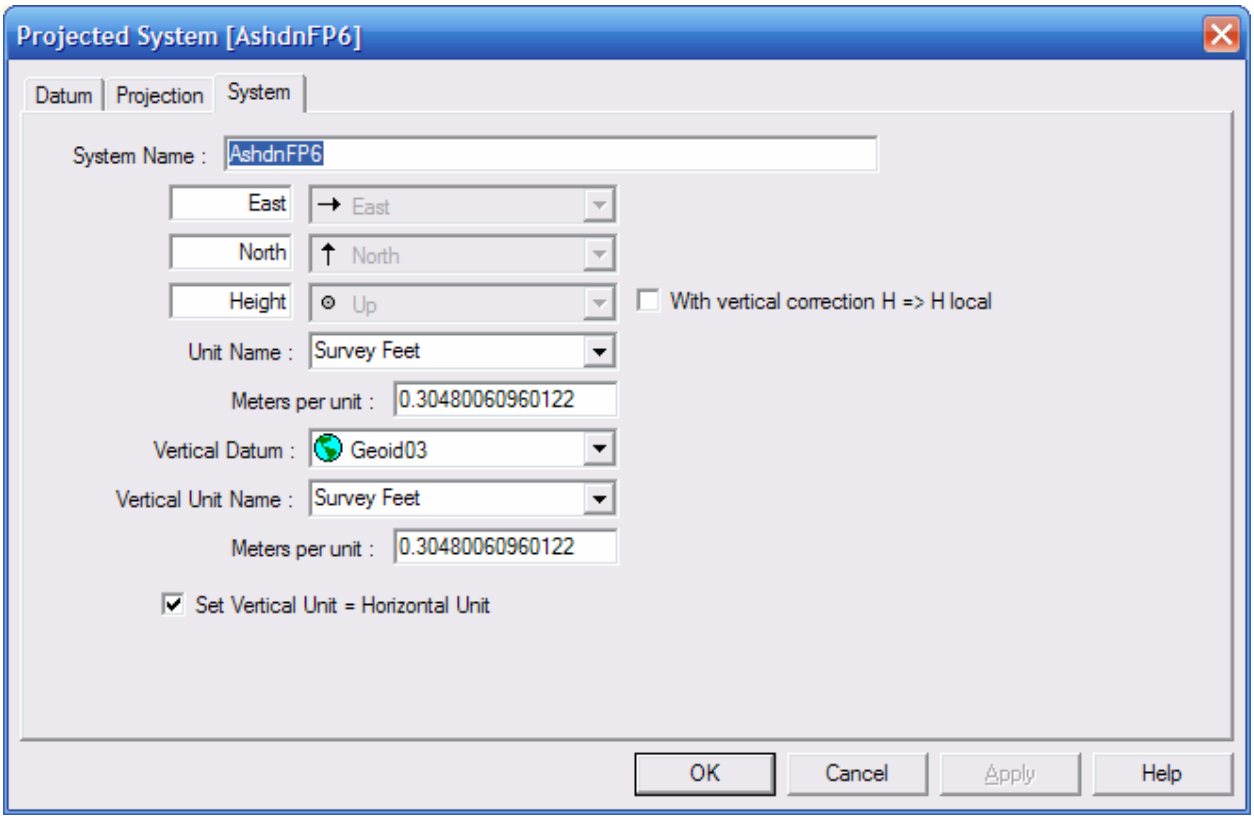
Press “Finish”:



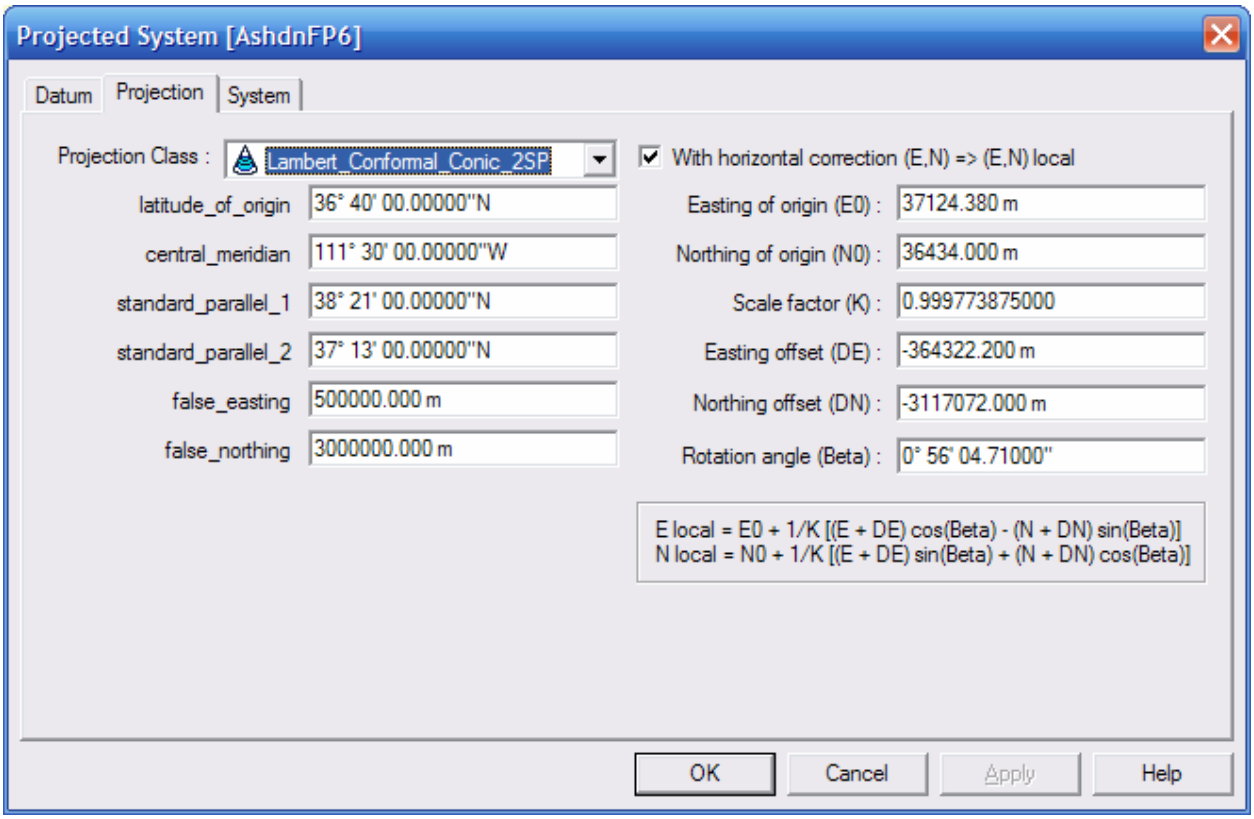
Now press the “...” button to the right of “USA/NAD83/Utah (South):



Change the “System Name” to something that makes sense for your job. In this case I use “AshdnFP6”, choose the Units that you want for displayed coordinates “Survey Feet”:

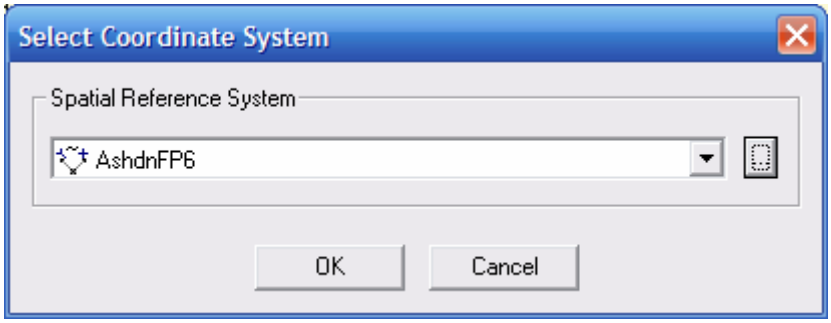


Now select the Projection tab, check the 'With horizontal correction (E,N) => (E,N) local' and enter all of the numbers that we computed above:

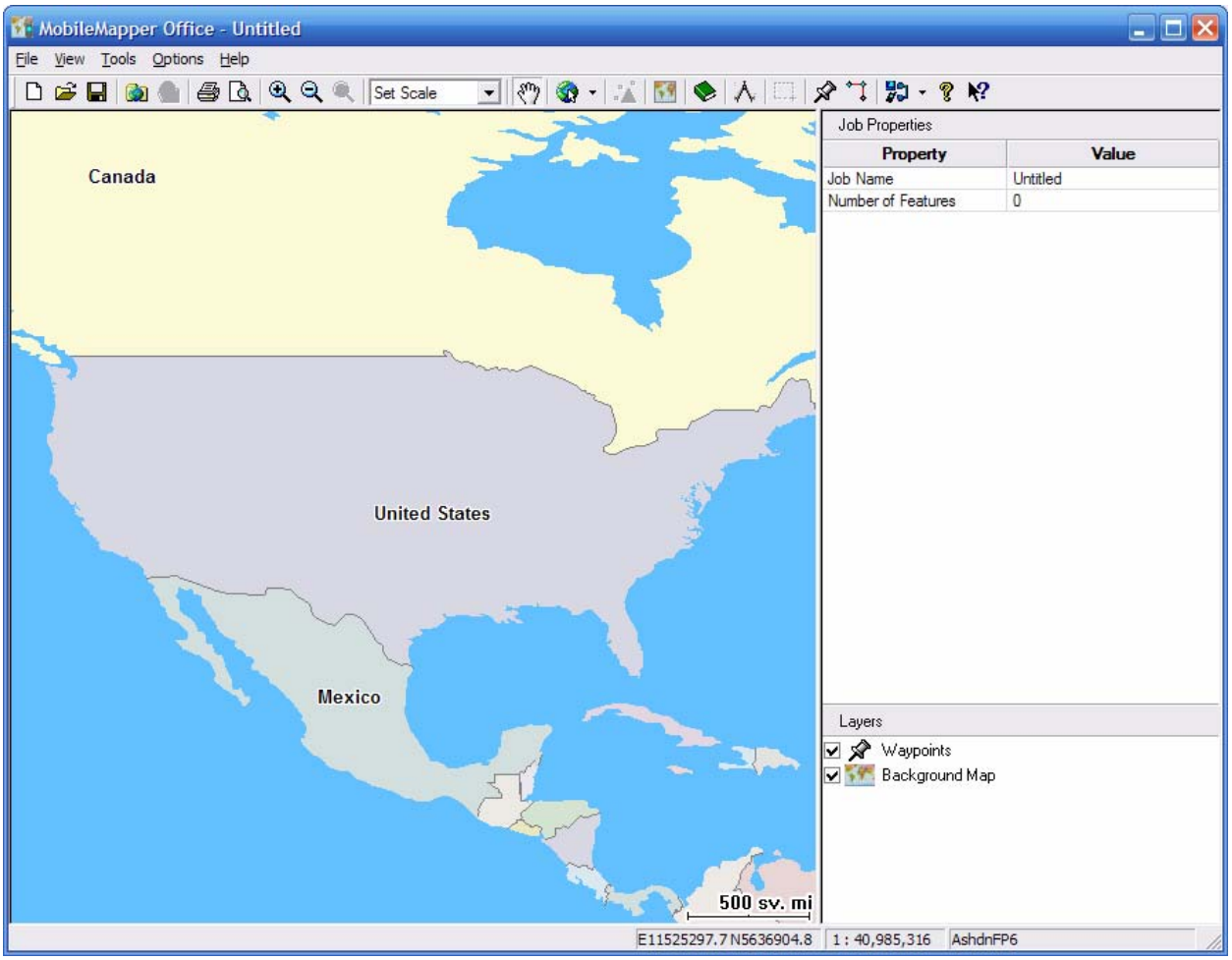


Note that the Easting Offset and Northing Offsets need to be negative (if the state plane coordinates are positive).

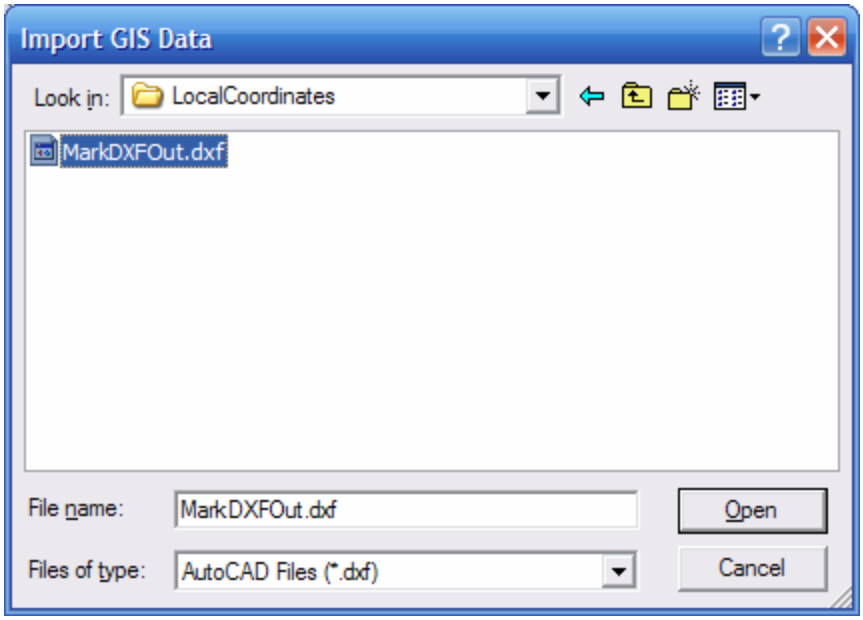
Press OK:



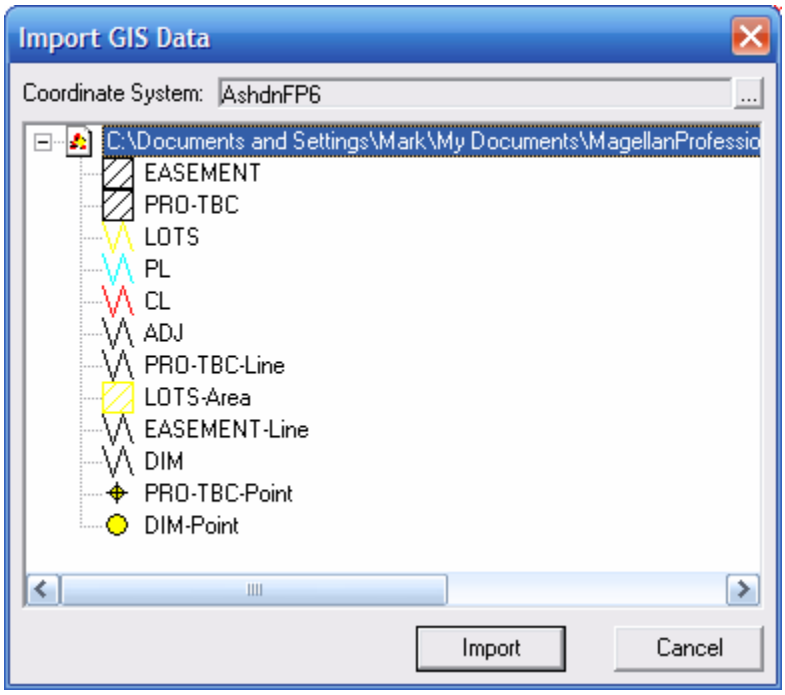
Finally press OK to return to the map display screen:



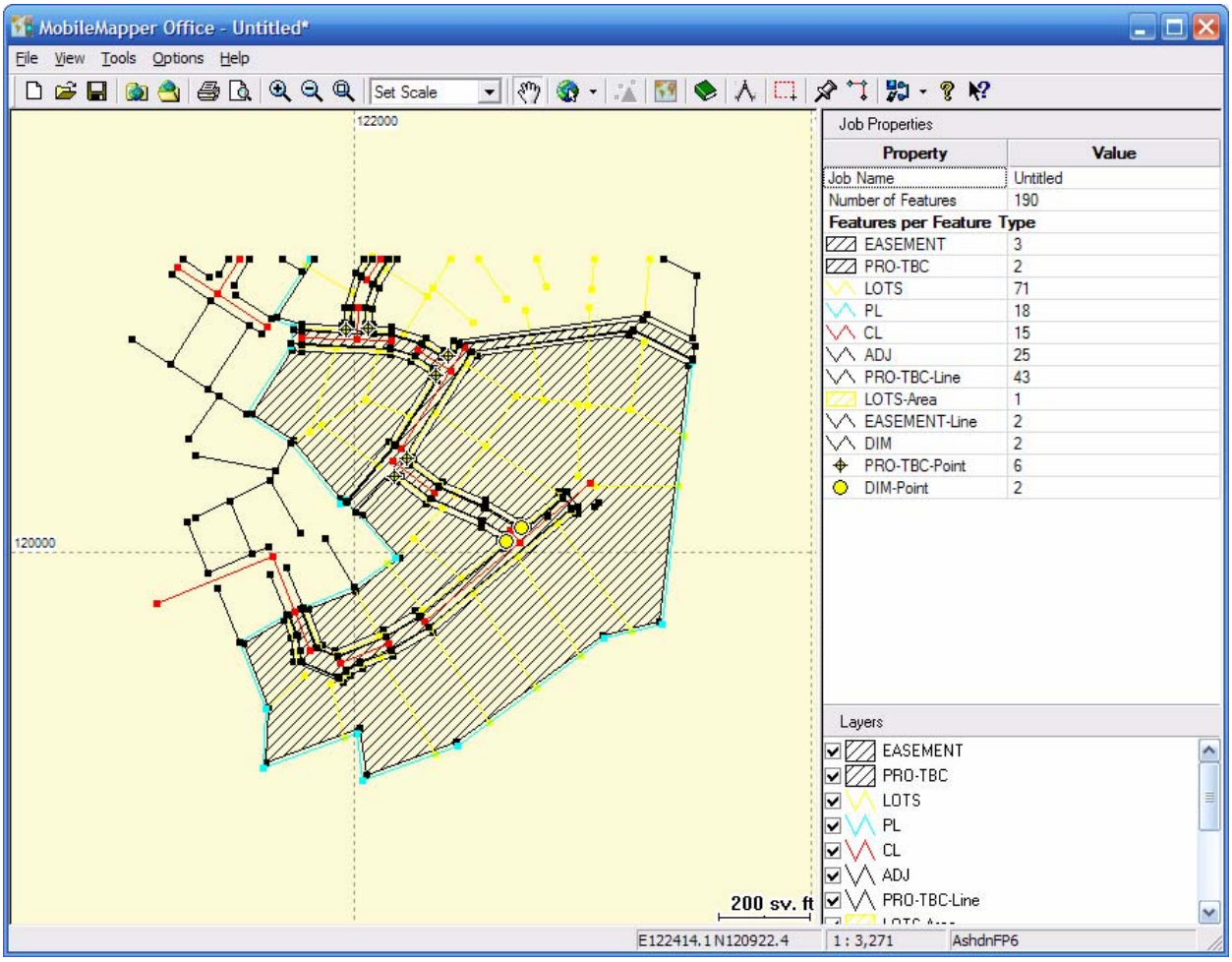
Now we can test our new local coordinate system by importing a DXF that uses the defined coordinate system. Select “File: Import” and browse for the DXF file (in this case it is named MarkDXFOut.dxf):



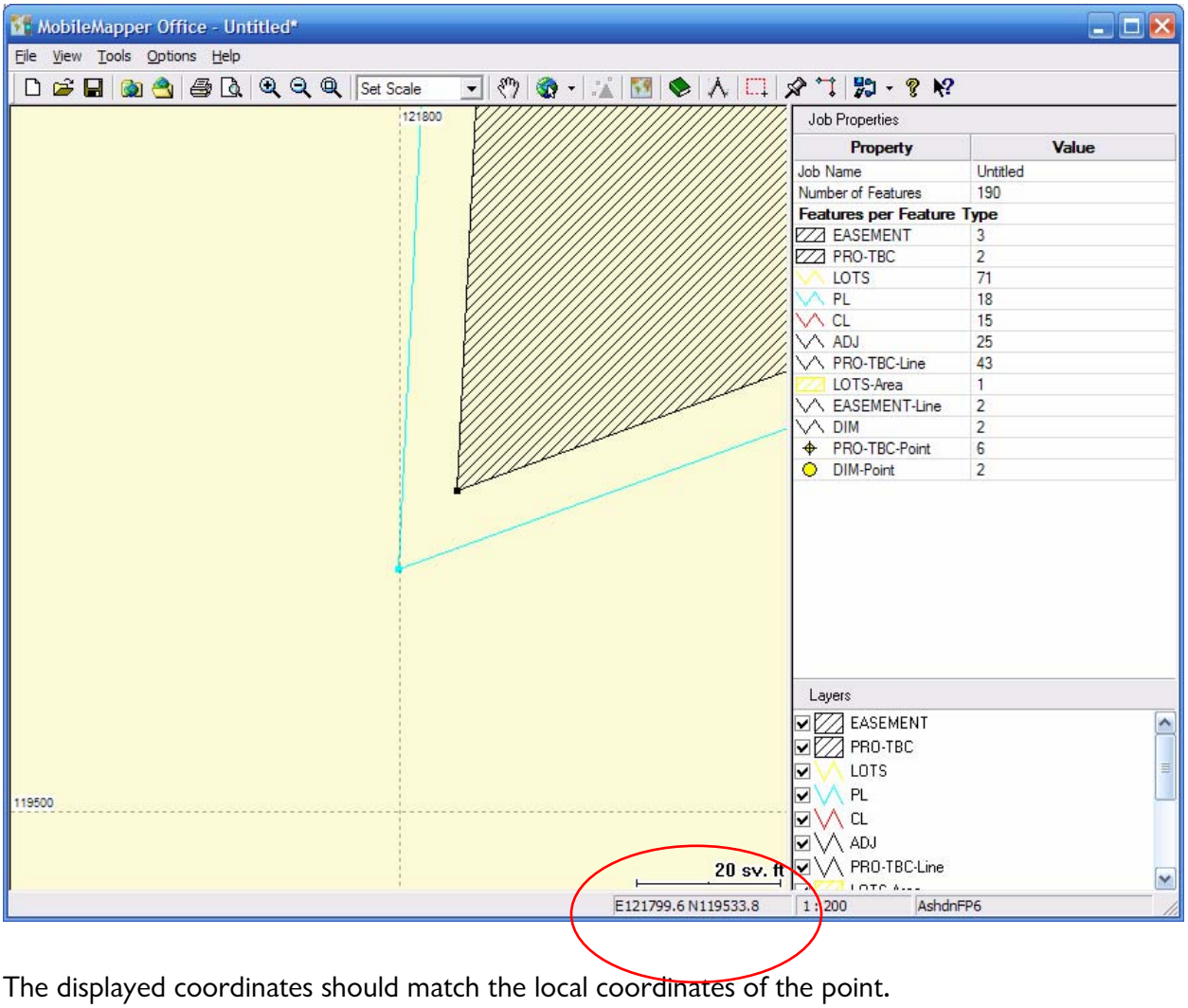
Press 'Open', MMO will show you the layers it found in the dxf:



Finally press ‘Import’:

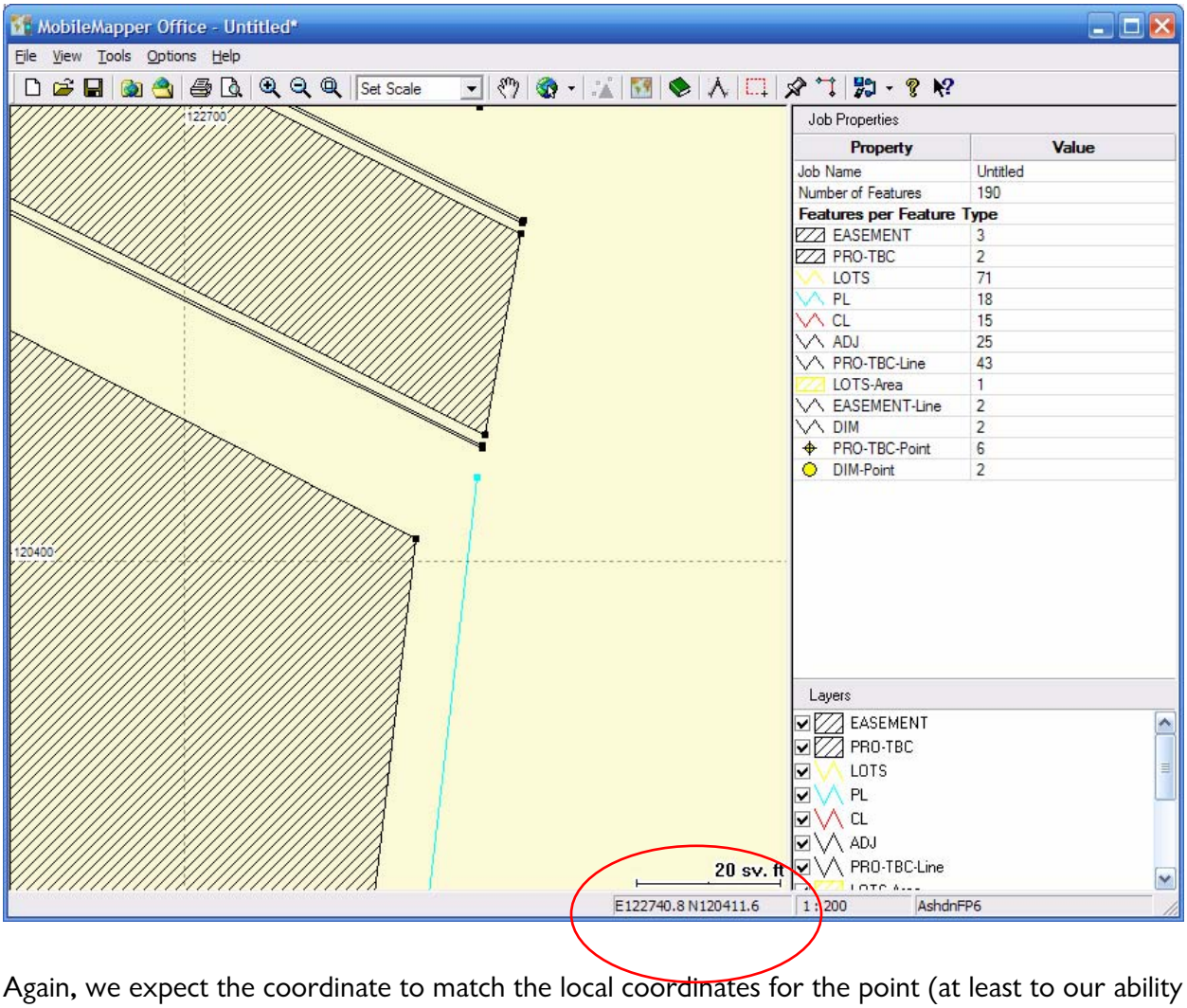


Now let's verify that the local coordinates for our control points are correct. Zoom to the south west corner and place the pointer tool over the control corner:



The displayed coordinates should match the local coordinates of the point.

Now move the drawing so that you are centered near the other control point and repeat:

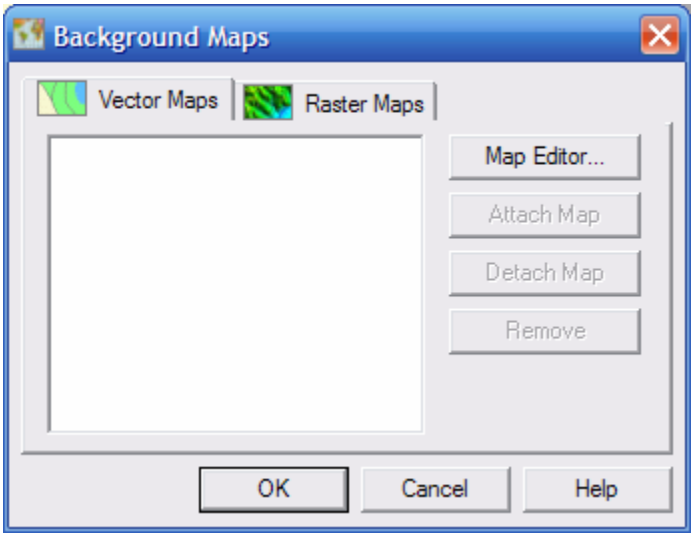


Again, we expect the coordinate to match the local coordinates for the point (at least to our ability to hold the cursor near the center of the point).

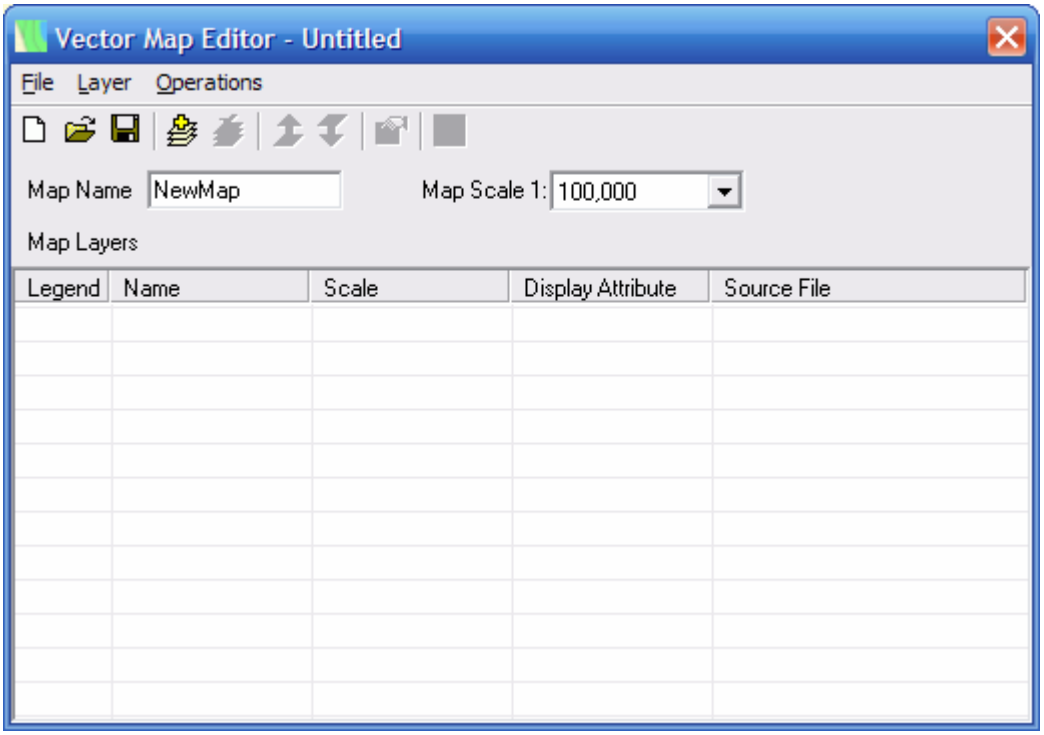
Now that we have verified that the MobileMapper Office local coordinate system matches the drawing (dxf) file, we can build a base map for the MobileMapper Pro:

Get an empty job (so we don't have two copies of the base layer) by pressing "File: New". Decline to save the current job.

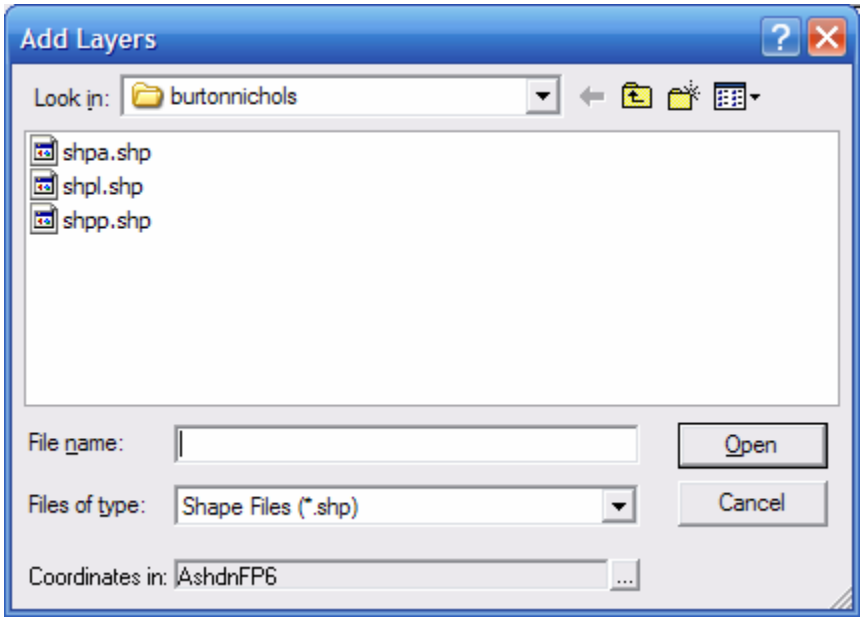
Next select the main menu option “Tools: Background Maps”:



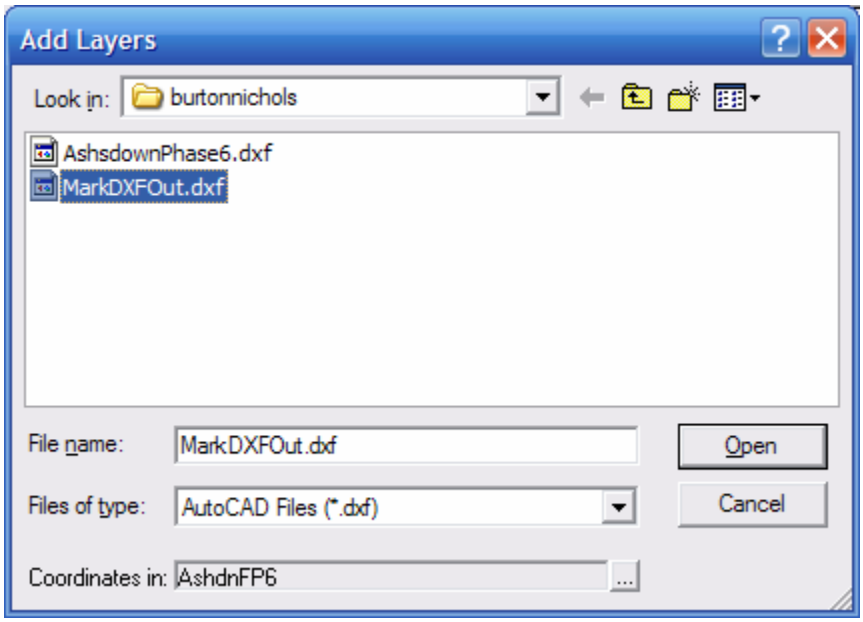
Select the “Vector Maps” tab, then press “Map Editor...”:



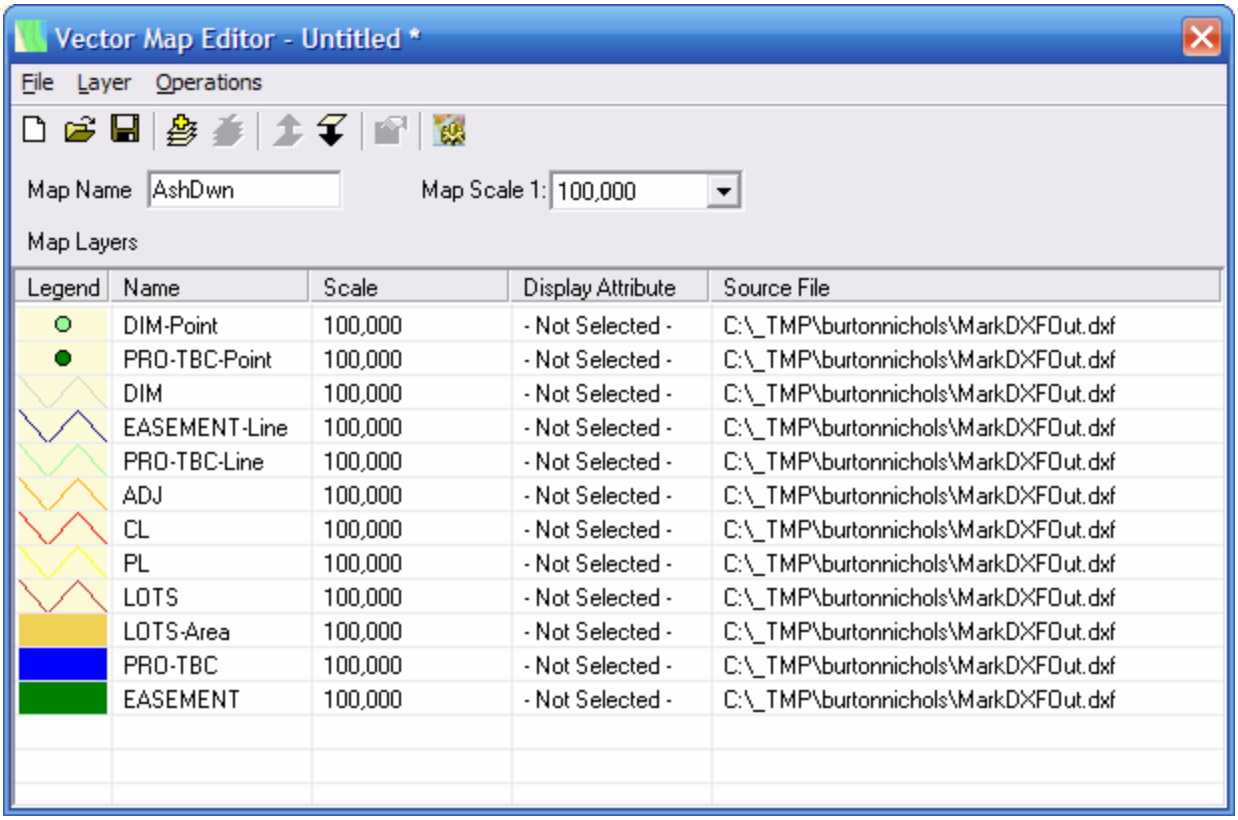
Select “Layer: Add...”:



Note that our new coordinate system ‘AshdnFP6’ is listed as ‘Coordinates in:’. Change the “Files of type” drop down to (*.dxf), then highlight the DXF you wish to import:

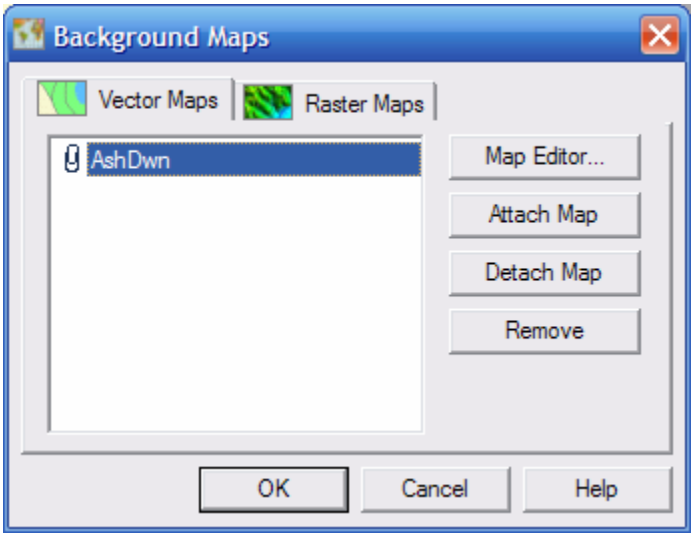


Press ‘Open’:



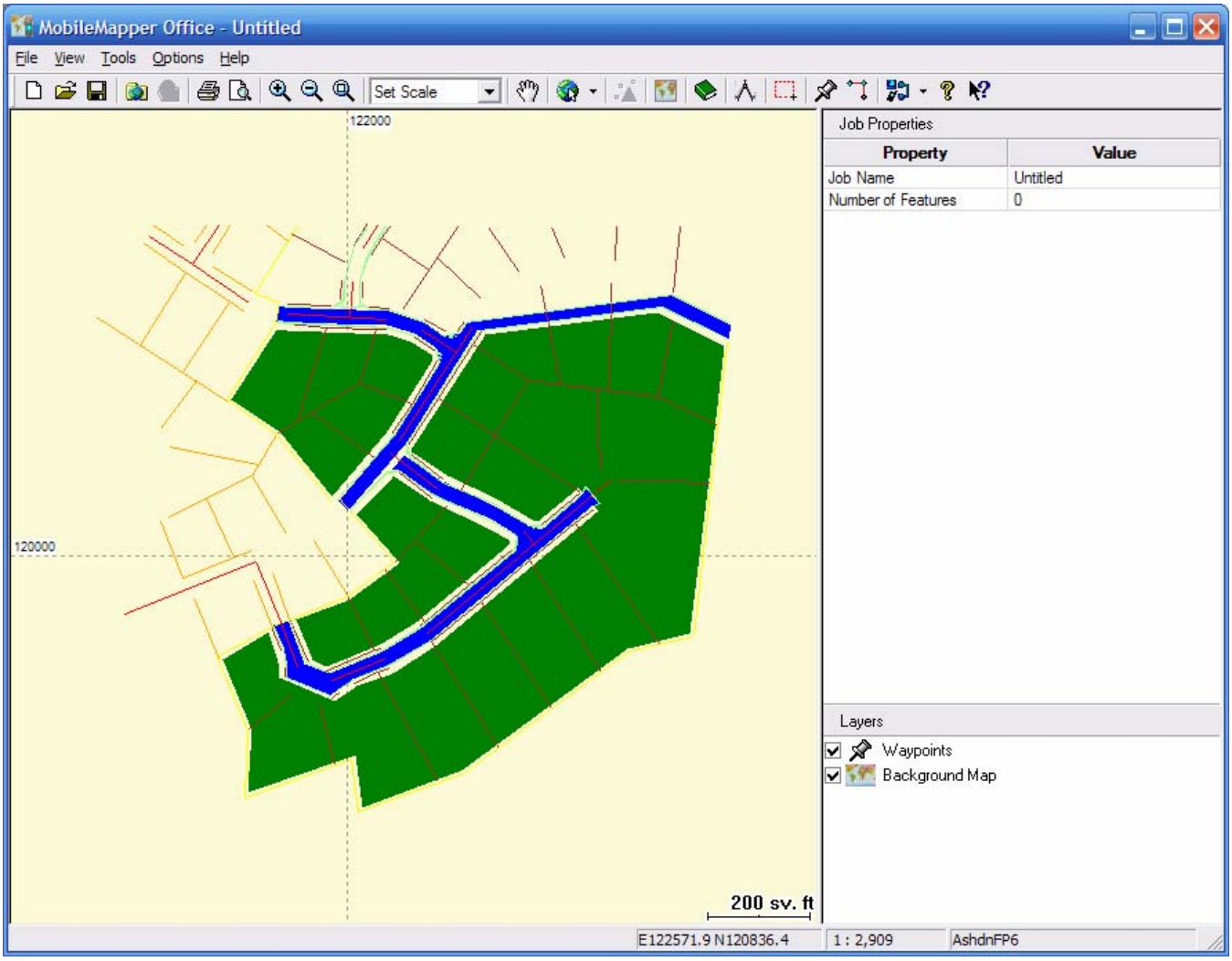
Futz around with the colors and fills and get them how you want them, then select “Operations: Create Map”. Wait a bit (about 10 seconds on my machine), then select “File: Save As” and enter a suitable name (“AshDwn” in this case).

Finally select “File: Exit” to return to the “Background Maps” dialog:



Press “OK”:

You should have a background map that shows the contents of the DXF file:



You can transfer this map into the receiver using the main menu option "File: Upload to GPS: Background Map". (You MUST have the receiver connected to the serial port at this point.)

Follow the onscreen instructions.