



CAD: Lining Up CAD Data in ArcGIS

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Second Edition**

There are different methods to resolve alignment issues:

- 1] Georeference CAD files in ArcMap. (Excellent instructions for this process are found in the Help documentation.)**
- 2] Apply Move and Scale options in the original CAD program.**
- 3] Create a custom projection file to align CAD data in ArcMap.**

CAD data might not align because the data was created with....

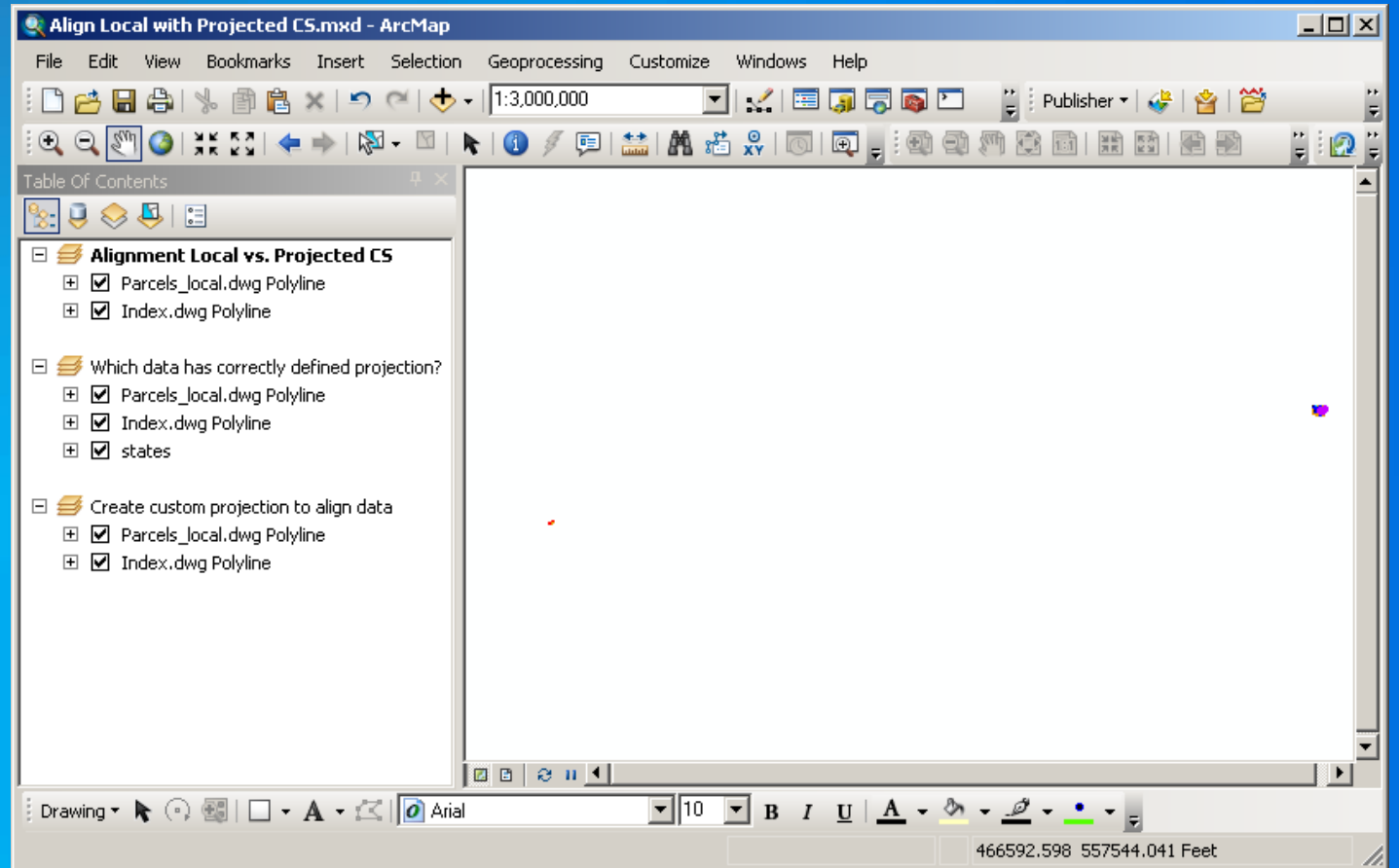
- A local coordinate system
- Unusual units of measure
 - Inches
 - Centimeters
 - Miles
 - Kilometers
- Use of ground coordinates instead of grid

Demonstrate 3 techniques to modify PRJ and align CAD data:

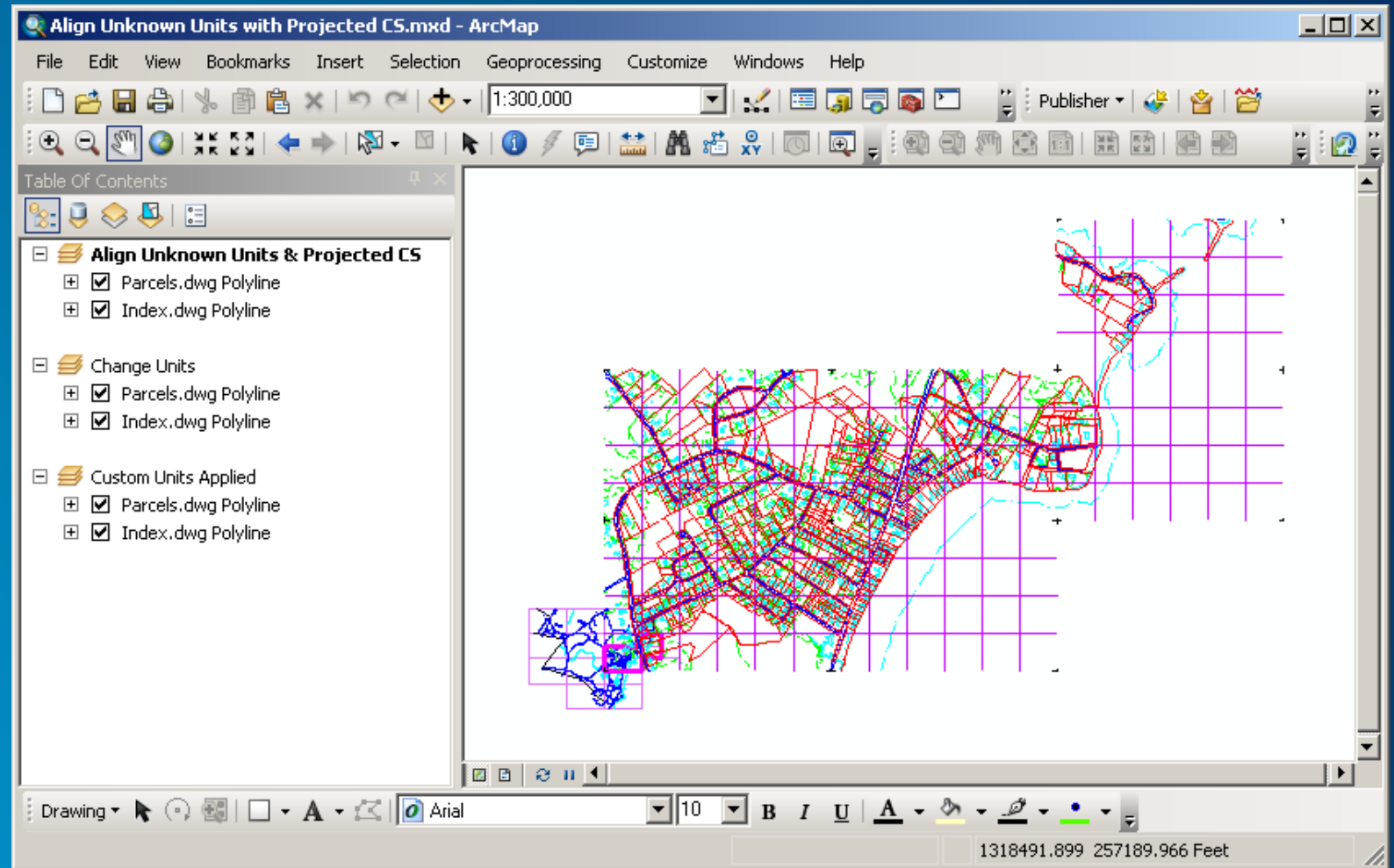
- Align CAD data that is offset from the proper location
- Identify and apply non-standard units to the projection file
- Apply a scale factor within the PRJ file to adjust for data drawn with ground coordinates

BECAUSE OF THE DISTORTION INHERENT IN THE MERCATOR PROJECTION, WHICH WAS CALCULATED FOR NAVIGATION IN THE 16TH CENTURY, WE STRONGLY ADVISE USING ANOTHER MORE SUITABLE PROJECTION FOR THE FOLLOWING OPERATIONS.

Does this look familiar? This is an example of how CAD data created in local coordinates will display in relation to data in a projected coordinate system.

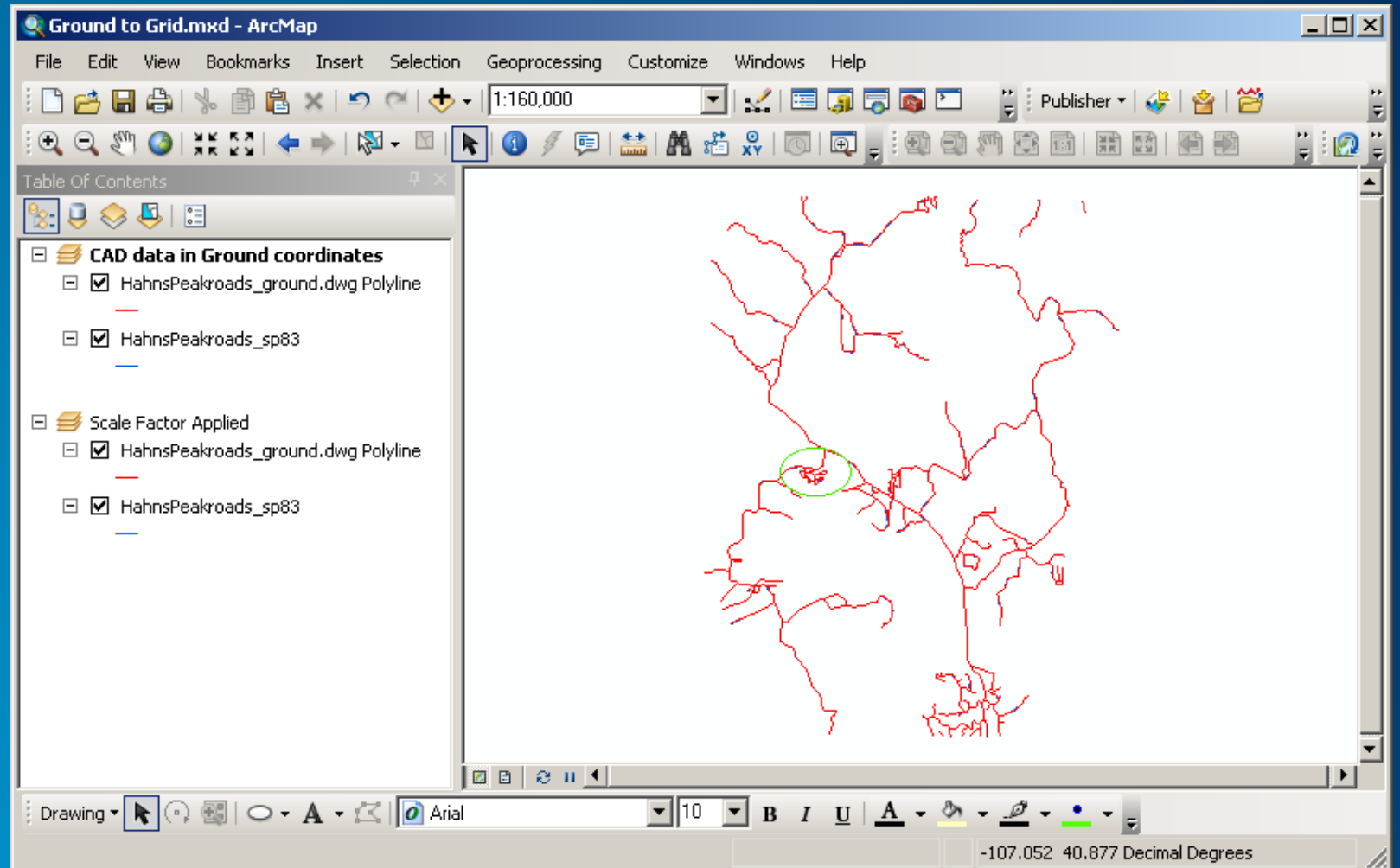


How about this?
This CAD data was
created with units
of inches instead
of feet.

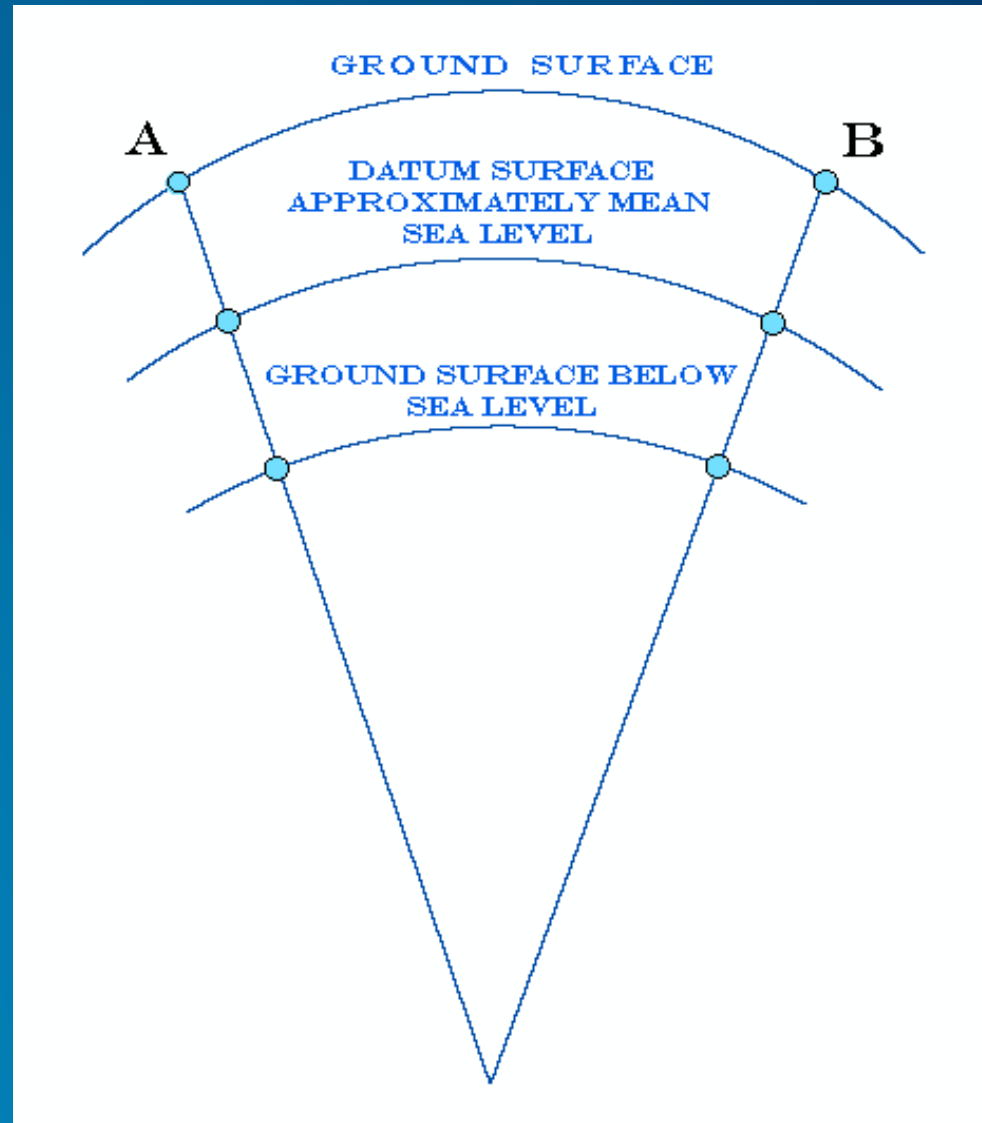


Data provided courtesy of the Rockingham County, New Hampshire
Planning Department

Maybe you have seen this...
This may be a scaling issue due to the difference between ground and grid coordinates.



What is ground to
grid conversion?



Where is the Scale Factor parameter inserted into the PRJ file?

```
PROJCS["HahnsPeak_ground",GEOGCS["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Lambert_Conformal_Conic"],PARAMETER["False_Easting",3000124.500316083],PARAMETER["False_Northing",999844.25],PARAMETER["Central_Meridian",-105.5],PARAMETER["Standard_Parallel_1",39.71666666666667],PARAMETER["Standard_Parallel_2",40.78333333333333],PARAMETER["Scale_Factor",1.0003],PARAMETER["Latitude_Of_Origin",39.33333333333334],UNIT["Foot_US",0.3048006096012192]]
```

The parameter must be entered between the 2nd Standard Parallel and Latitude of Origin parameters when applying to the Lambert Conformal Conic projection.

How may the Scale Factor affect the False Easting & False Northing?

```
NAD 1983 StatePlane Colorado North FIPS 0501 (US Feet).prj - Notepad
File Edit Format View Help
PROJCS["NAD_1983_StatePlane_Colorado_North_FIPS_0501_Feet",GEOGCS
["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID
["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT
["Degree",0.0174532925199433]],PROJECTION["Lambert_Conformal_Conic"],PARAMETER
["False_Easting",3000000.000316083] PARAMETER
["False_Northing",999999.999996],PARAMETER["Central_Meridian",-105.5],PARAMETER
["Standard_Parallel_1",39.71666666666667],PARAMETER
["Standard_Parallel_2",40.78333333333333],PARAMETER
["Latitude_of_Origin",39.33333333333334],UNIT
["Foot_US",0.3048006096012192],AUTHORITY["EPSG",2231]]
```

```
HahnsPeak_ground.prj - Notepad
File Edit Format View Help
PROJCS["HahnsPeak_ground",GEOGCS["GCS_North_American_1983",DATUM
["D_North_American_1983",SPHEROID
["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT
["Degree",0.0174532925199433]],PROJECTION
["Lambert_Conformal_Conic"],PARAMETER
["False_Easting",3000124.500316083],PARAMETER
["False_Northing",999844.25],PARAMETER["Central_Meridian",-
105.5],PARAMETER
["Standard_Parallel_1",39.71666666666667],PARAMETER
["Standard_Parallel_2",40.78333333333333],PARAMETER
["Scale_Factor",1.0003],PARAMETER
["Latitude_of_Origin",39.33333333333334],UNIT
```

Three different methods for modifying the PRJ:

- **Modify False Easting and False Northing parameters to align data created in a local coordinate system**
- **Identify unusual units of measure and modify the PRJ, to apply those units to the data**
- **Apply a scale factor to the PRJ to adjust for data in ground coordinates**

What to request from the CAD operator:

From AutoCAD:

- Create all data elements in Model Space.
- Add layout elements in Layout (Paper) Space, not in Model Space.
- Do not add Viewports to Model Space.
- Explode the blocks.
- Save the file in Model Space.

From Microstation:

- When using Microstation v8, the DGN file must be compressed in Microstation or the data will not draw or convert in ArcGIS Desktop.
- The seed file used as a template to create the new DGN file must not contain features.

From both CAD programs:

- Use underscores instead of spaces in the file name.
- Remove any rotation that has been applied to the file before saving in the CAD program.
- What units were used to create the data, and what scale factor was applied, if any.
- Detach references from the file in the CAD program. These will not draw or convert in ArcGIS, and will distort the spatial extent of the data.

Additional Resources:

Esri Support Center Knowledge Base Articles:

- **“Identify the spatial reference, projection, or coordinate system of data”**
<http://support.esri.com/en/knowledgebase/techarticles/detail/29129>
- **“Identify an unknown projected coordinate system using ArcMap”**
<http://support.esri.com/en/knowledgebase/techarticles/detail/24893>
- **“Create a custom projection file in ArcMap to align CAD data”**
<http://support.esri.com/en/knowledgebase/techarticles/detail/42485>
- **“Select a suitable map projection or coordinate system”**
<http://support.esri.com/en/knowledgebase/techarticles/detail/24646>
- **“Lining Up Data in ArcGIS: a guide to map projections, second edition”** from Esri Press
<http://esripress.esri.com/display/index.cfm?fuseaction=display&websiteID=231&moduleID=0:>

Questions?





Understanding our world.