

NEW GEOREFERENCING TOOLS FOR CIVIL DRAWINGS

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Introduction

New tools were created to enhance ArcMap georeferencing capabilities for civil utility plans.

Tool	Function
Locate	Zoom to an area based on Atlas page (1/2 section), parcel # or cross streets.
Rescale	Scale the scanned image to real world coordinates.
Circle	Draw a circle of user specified radius around a chosen point.
Shift	Move the plan image from one point to another.
Rotate	Rotate the image around a designated point.
Update Worldfile	Create or update the world file.

Purpose

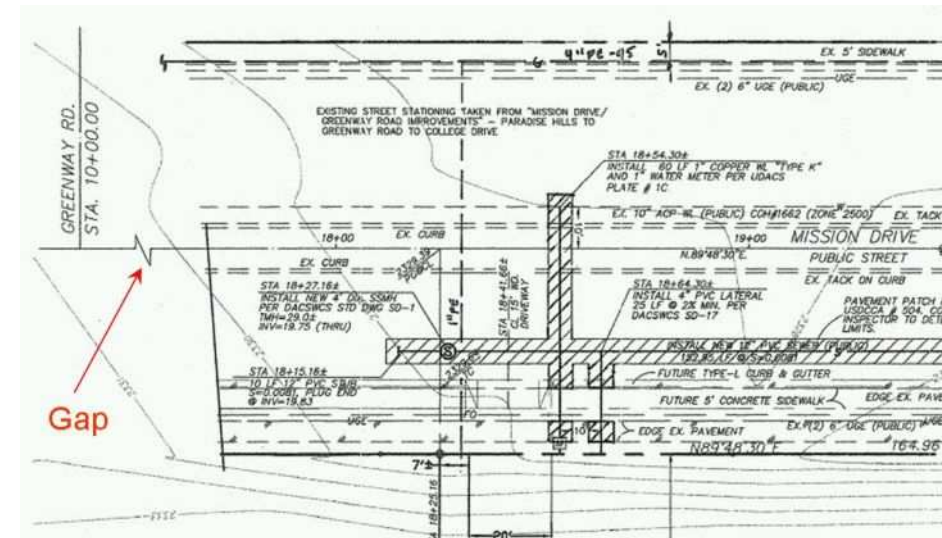
Challenge: Water and sewer infrastructure GIS data are initially created by digitizing features from scanned civil engineering drawings. Some of these drawings do not contain enough control points to be georeferenced using the standard ArcMap georeferencing tools. Many of the drawings contain ambiguous lines that may or may not match real world features.

Observations: All of the drawings have 3 independent components; a real world scale, at least one point in common with the reference data, and a rotation direction. Thus all drawings have 3 elements for georeferencing but not necessarily 3 control points.

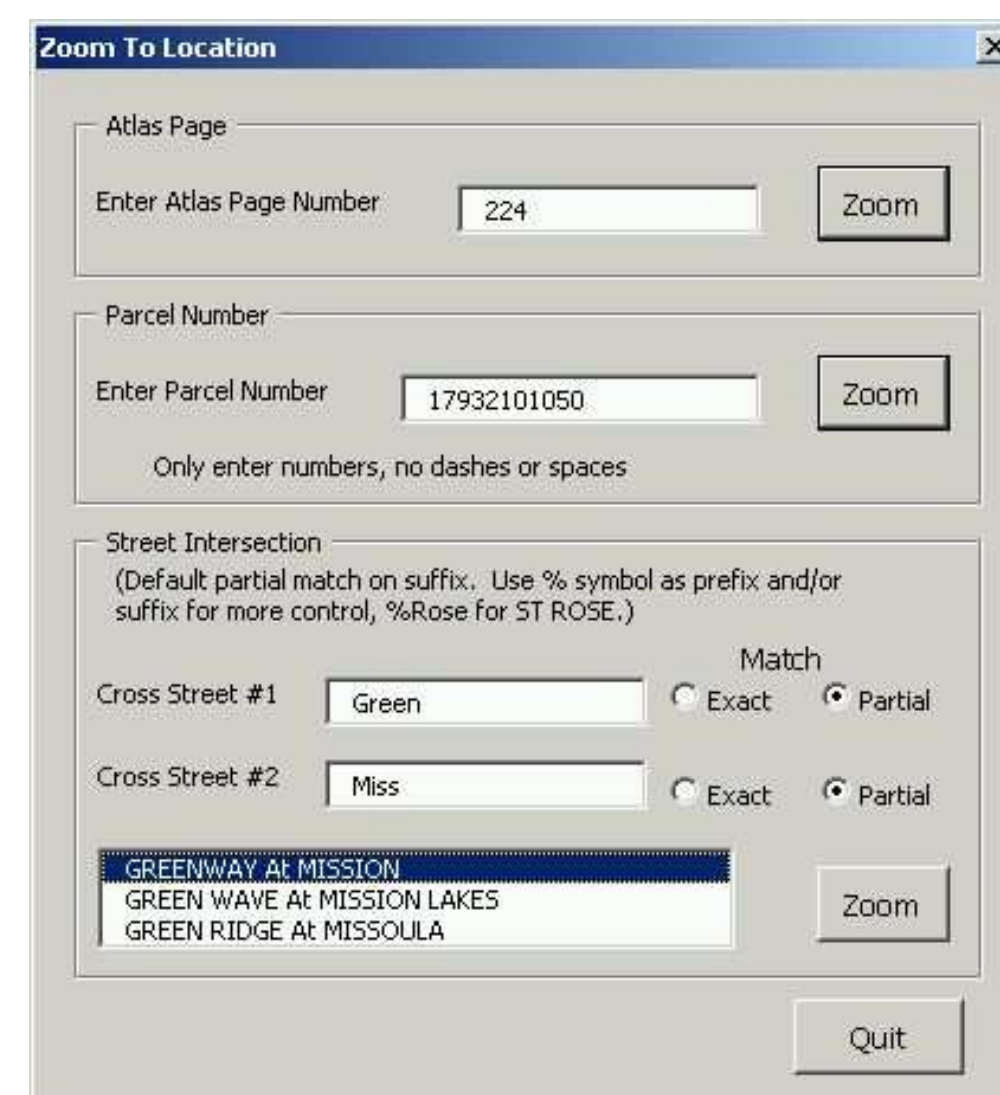
Solution: As long as an image can be rescaled, shifted and rotated into the proper position, it can be georeferenced. Tools were developed to assist in these tasks.

Example Usage

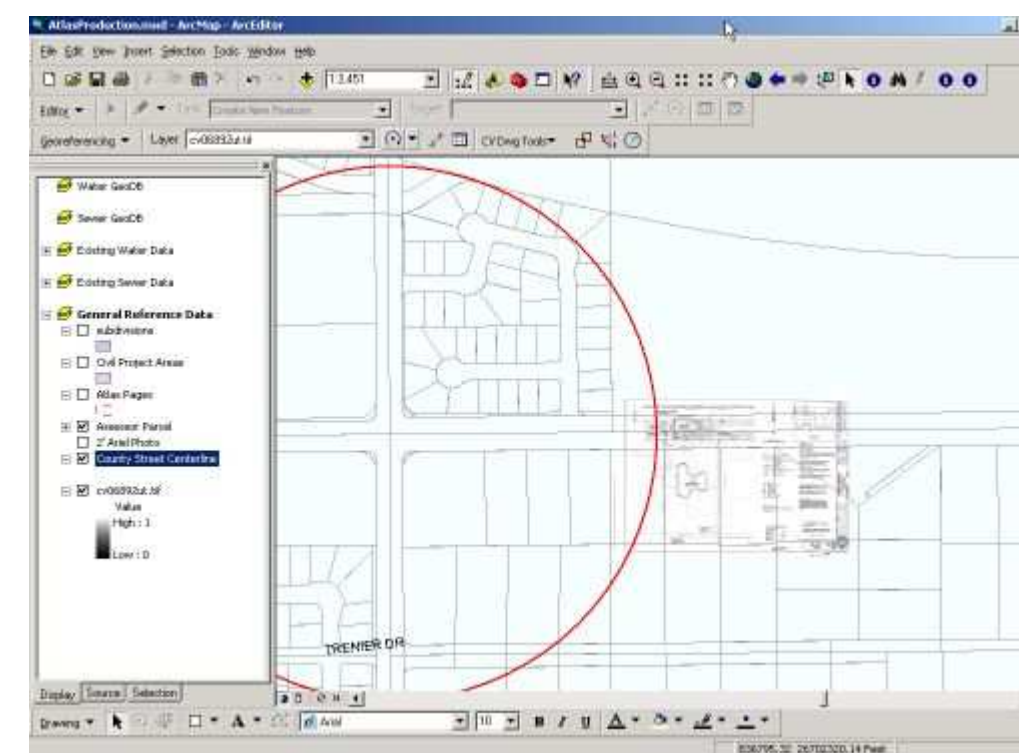
Note the lack of control points in the drawing below. This would normally be impossible to georeference with ArcMap.



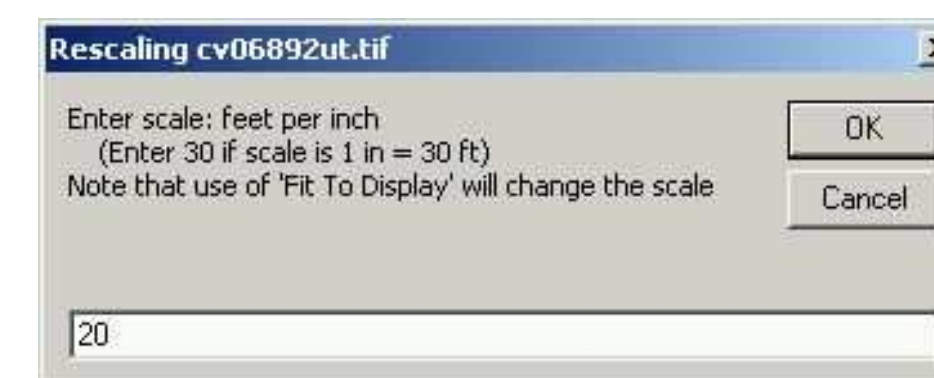
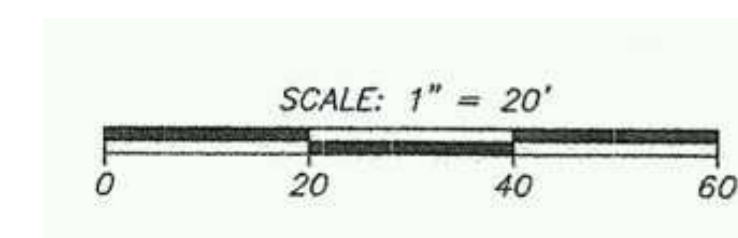
The left side of the image shows a street intersection. This is seen to be at Greenway Rd. and Mission Drive. The Locate tool can be used to quickly zoom to this area. The Atlas page or parcel number can also be used as shown below. Any of the Zoom buttons can be used to display this area.



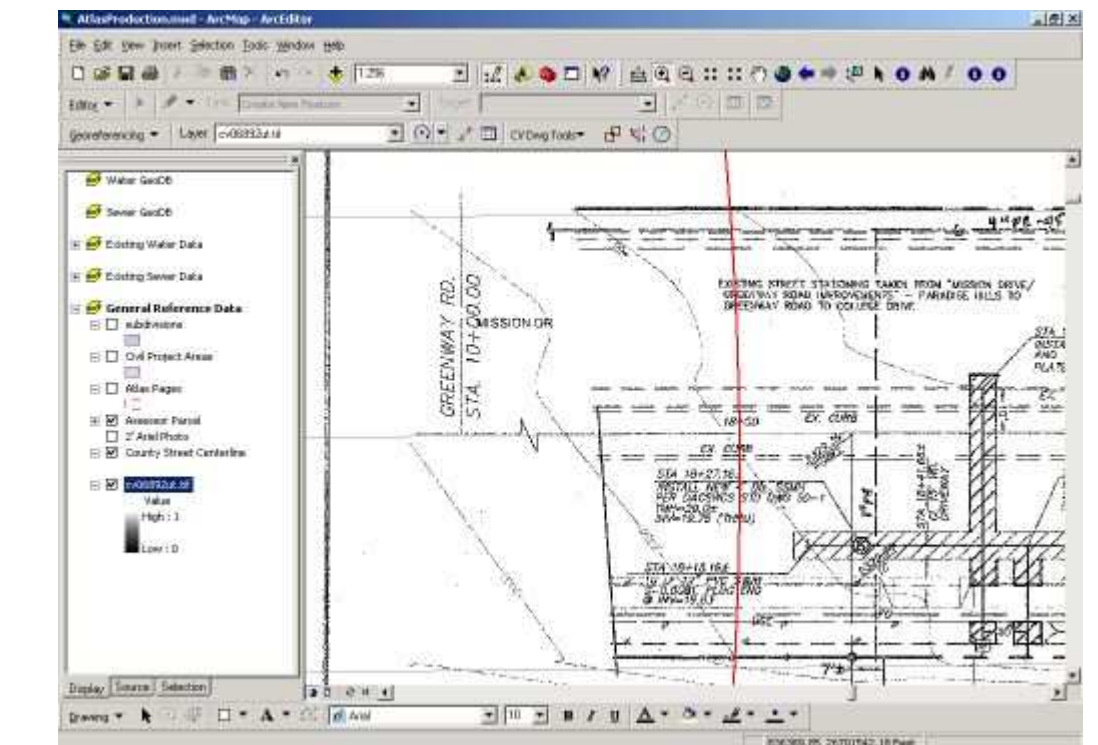
Using the Circle tool, a circle is drawn, centered at the intersection, with an 800 foot radius. The circle meets the centerline of Mission Dr. at station 18+00. A similar circle with a radius of 1000 feet should be at station 20+00.



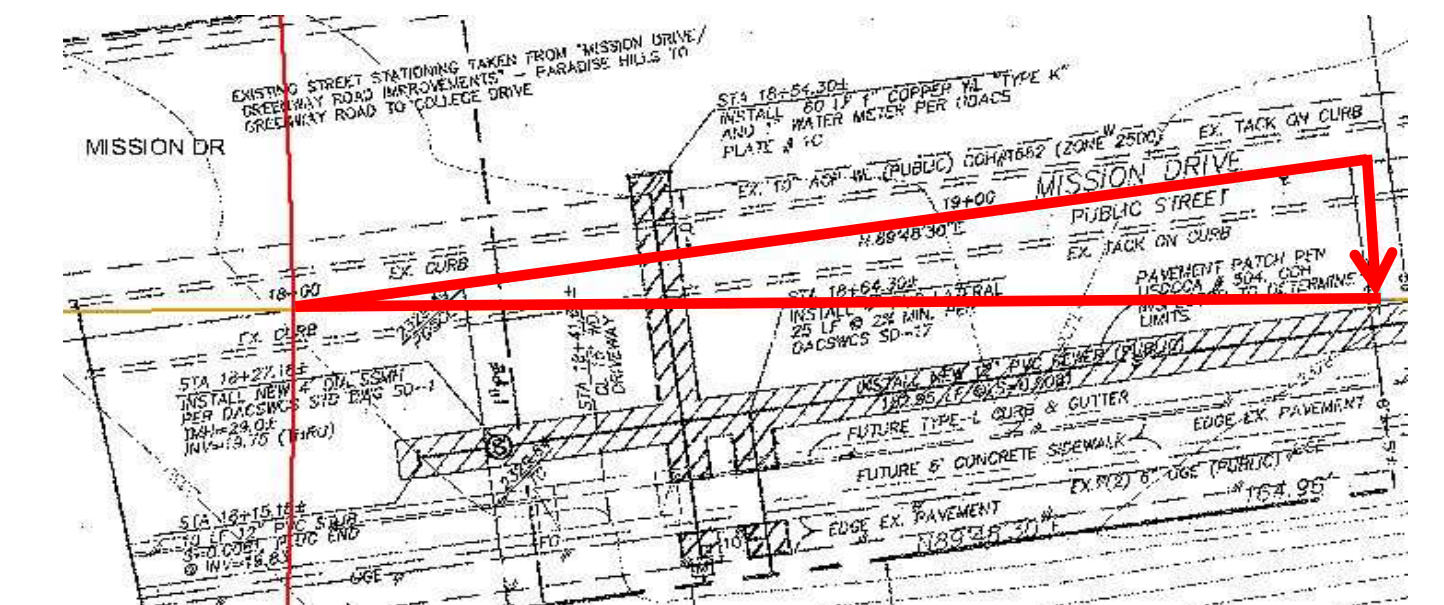
Now that the screen is at the proper location and a common point has been constructed, the image can be scaled using the Rescale tool and the drawing scale. This scales the image and centers it on the screen.



The Shift tool can be used to align the Station 18+00 tic mark on the image to the intersection of the circle and the street centerline. The mouse cursor turns into a crosshair allowing the points to be precisely selected for proper alignment.



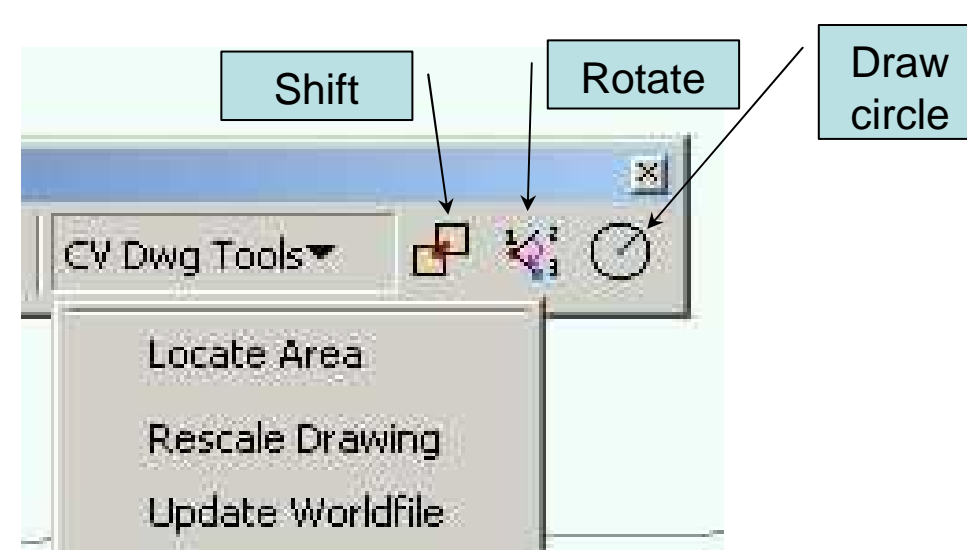
The Rotate tool can be used to rotate the image around the Station 18+00 mark to align the road centerline on the image with the road centerline on the reference data. The mouse cursor turns into a crosshair to better select the pivot point and a feedback line assists in aligning the rotation angle with the street centerlines.



On the full image it becomes apparent that there are now 4 control points, 2 on parcel corners and 2 at the station points. Use of these 4 control points results in a very small RMS error.

When the image is properly aligned, the Update Worldfile button can be used to create or update the world file. This only affects the **tfw** file and does not alter the **tif** file. This allows further changes to be made if desired.

Tools



However there is a gap between the intersection and the area of the image. The intersection is at Station 10+00 while the image starts at 18+00, an 800 foot gap.

Conclusion

Use of these tools allows an image to be easily georeferenced that would be hard or impossible using the standard ArcMap georeferencing tools. This results in a more accurate fit since the user can easily find matching points and it also increases the speed and efficiency of the process. These tools can be used in conjunction with the standard ArcMap georeferencing tools.