Takeoff and DWF/Scanned Images
March 21, 2008

Application

Carlson Takeoff works best with digital files of the existing and final designs, ideally in the form of one or more DWG files which can be inserted into one drawing for analysis of earthwork and quantities. At the other extreme, there is the case where you obtain only "paper plans" and must digitize both the existing and final designs, typically using a GTCO digitizer where use of the Carlson puck is recommended. In the middle are the situations where one surface can be obtained in the form of a DWG or digital file, and the other surface exists in the form of a scanned image or picture. This is the topic of this white paper.

Specific Example: Final Design as DWG, Original Contours as DWF file

Engineers may in some cases be unwilling to share the entire project design in the form of a DWG file. They may instead provide the existing contours or final design as a DWG and the other surface as an image in some form. In such a case, you can place the image on top of the DWG and move, scale and rotate the image to fit, and then trace the surface information using a mouse rather than a digitizer. This is the process discussed below.

Consider the following example where the construction company obtains the final design as shown here:
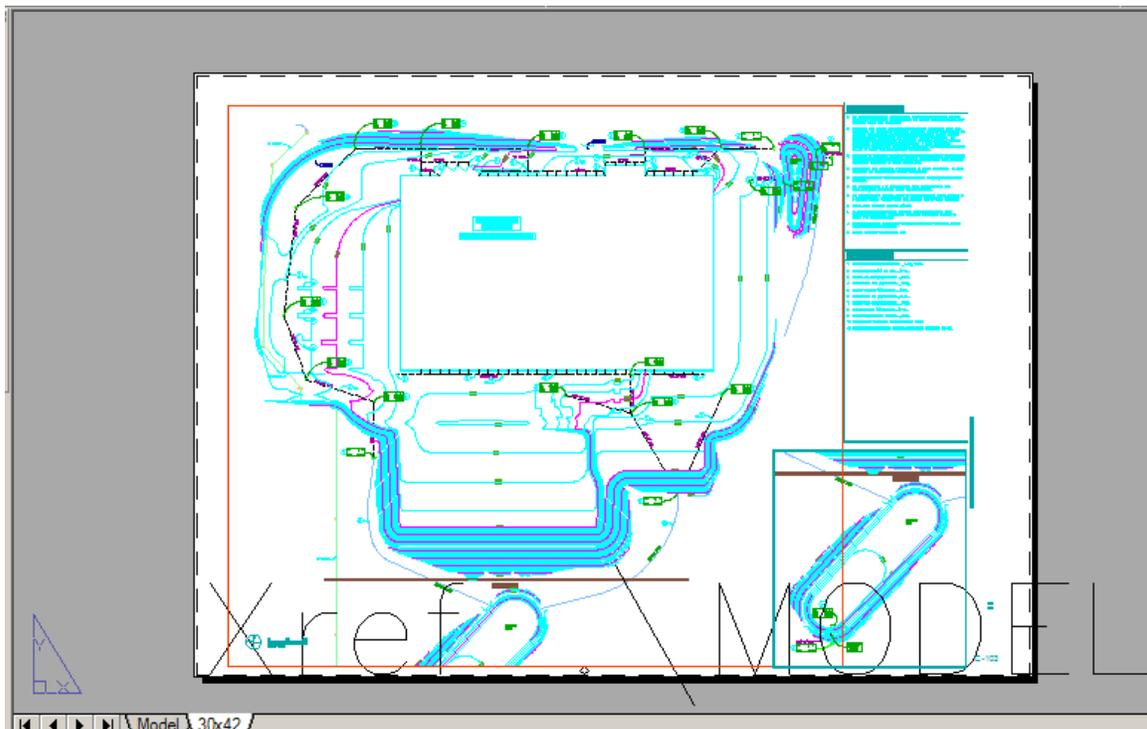
As an aside, any drawing such as that shown above, which comes in framed in what is called "paper space", should be converted to "model space" by clicking the Model tab at the bottom of the screen (to the left of the 30x42 paper space tab). It should also be pointed out that in certain early versions of Carlson Takeoff R2, it may be necessary to erase what is in paper space (type E for erase, then "All" for all objects), to avoid interference of paper space with the functions of the 3D Drive Simulation, which sometimes flickers based on the content of paper space. This characteristic was eliminated in later versions of Takeoff R2 and subsequent releases.

The model space plan view is shown below. Note that it contains only final design contours and no existing contours.
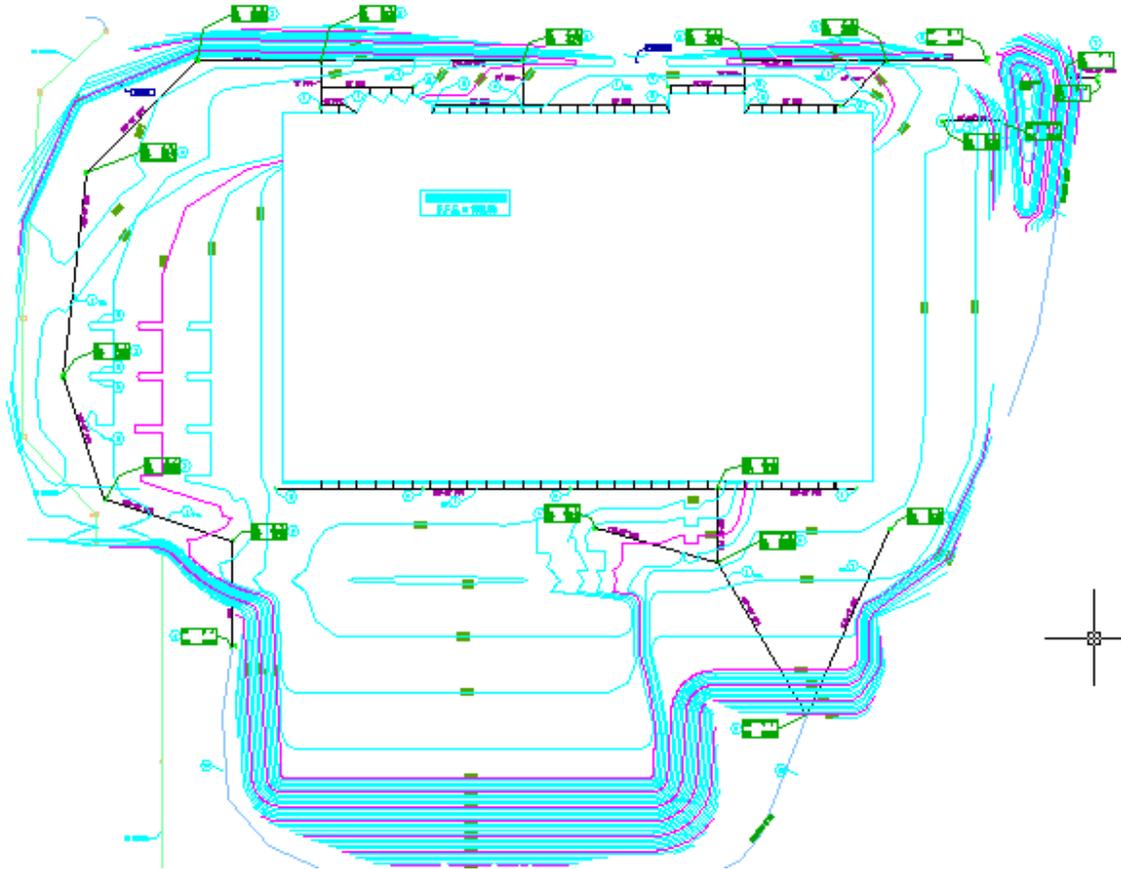
In this example, the existing contours were provided only in the form of a DWF file. A DWF file is made from a DWG file and is viewable within Windows simply by selecting the file within Windows Explorer. Note that Windows Explorer brings in the file in "stages" and after a few seconds, the entire DWF file appears.
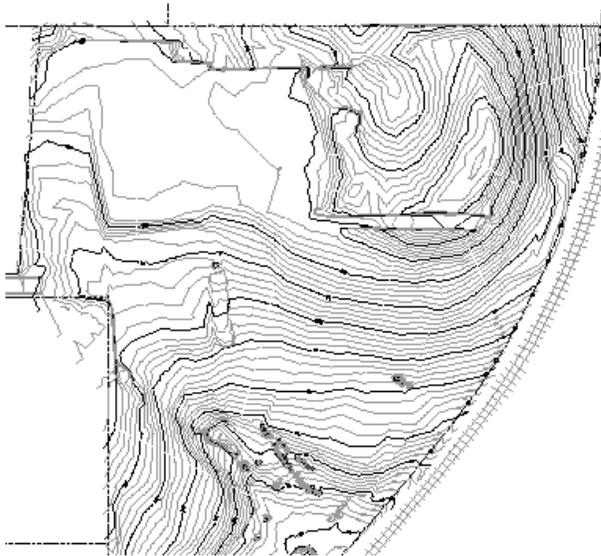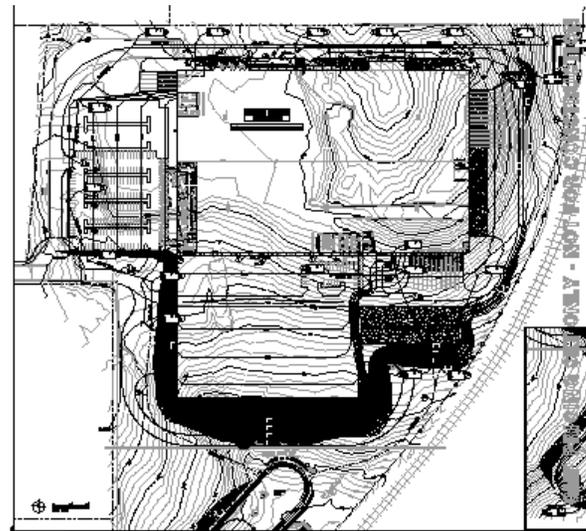
| After 3 seconds | After 6 seconds |

The goal is to capture the DWF as a standard image that you can trace with the mouse. Since the complete drawing at the right is very cluttered, you can capture the existing contours only by pressing the Prnt Scrn button as soon as they appear, then saving the image (at left) in Paint as a bitmap or "bmp" file.

ImageAttach

To bring in the image, you can type the command "ImageAttach" or you can use the pulldown menus and select Draw pulldown, then the command Image and within that choose "Raster Image". Then you right click within the dialog that appears and select the appropriate bitmap or other image file. The need to right click is a bit cryptic, so you may prefer to simply type ImageAttach and directly select the image as prompted.

The command will lead to the screen dialog shown here:
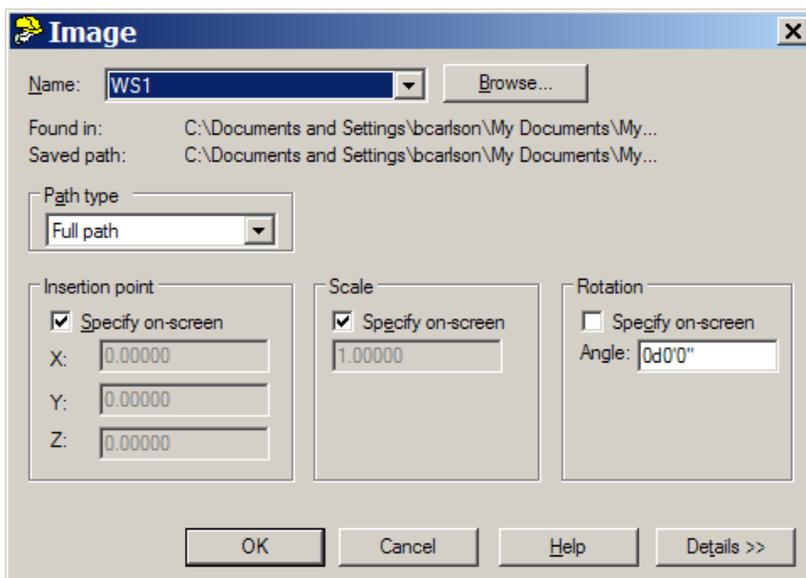
Click OK and pick a point, for example, to the right of the actual drawing. When the program prompts for scale, you can experiment with scale factors that make the image appear approximately the same size as the actual DWG drawing (in this case, a scale of 2500 resulted in the size shown).
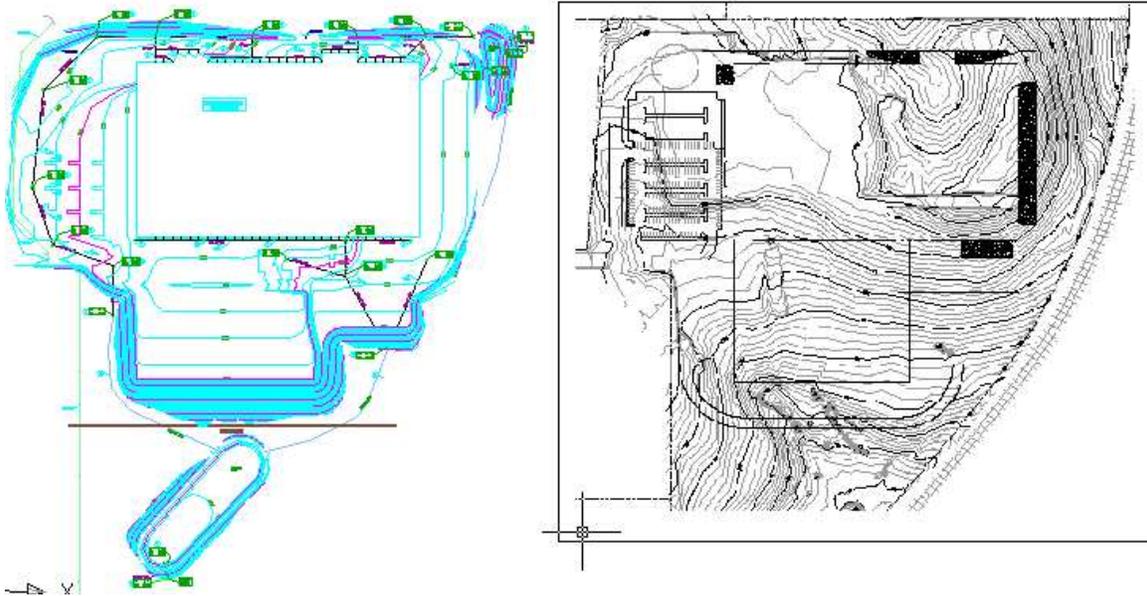
Move, Rotate and Scale, plus "Display Order"

The next step is to move the image so that a point on the image is placed on top of the corresponding point on the drawing at left. For this, you must find a point in common. To do the move, simply enter "M" for move at the command line or pick move under the Edit pulldown menu. The program will ask you to select objects, and for that you need to pick on the outer border near where the cursor shows above, which selects the entire image.

After the move, you may find that the image masks and hides the drawing underneath. If that is the case, the next step is to use the command "Display Order" under the View pulldown and select the border of the image and send it to the "Back" as shown below:

Enter object ordering option [Above objects/Under objects/Front/Back] <Back>:

Now that the image and and drawing can be seen simultaneously, the next step is to rotate the drawing into place. The standard Rotate command under the Edit pulldown will accomplish this. Find two lines in common and rotate the image to match the design drawing. Finally, you may need to further scale the image. This is the standard "Scale" command which can be typed or found under the Edit pulldown menu. Find a line in common and scale the image to fit the true dimension of the drawing.

Digitizing the Existing Contours by Tracing by Mouse

For speed and practical application, it may be sufficient to trace only the 5-foot contours even when 1-foot contours are provided. However, it is a good idea to supplement the 5-foot contours with high-point and low-point 1-foot contours and let the program interpolate the existing grade from that data set. When a series of 5-foot or 1-foot contours are to be digitized, it is easier to use the "Contour Polyline" command under the Digitize pulldown menu, because it has the built-in option to specify the interval and auto-increment the interval, as shown below:
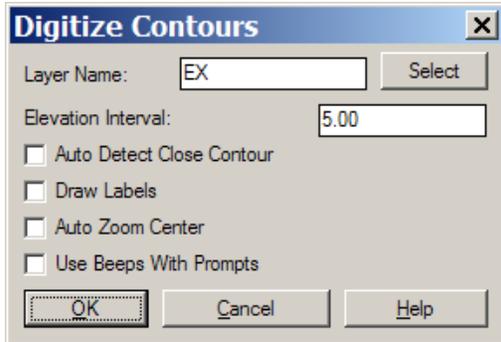
This command is set up to work with a digitizing tablet. If you want to do "heads up" digitizing with the mouse, as we do in this case, then you need to allow for mouse usage by selecting Settings pulldown menu, option "Configure", then General Settings, then select Use Mouse in the dialog below:
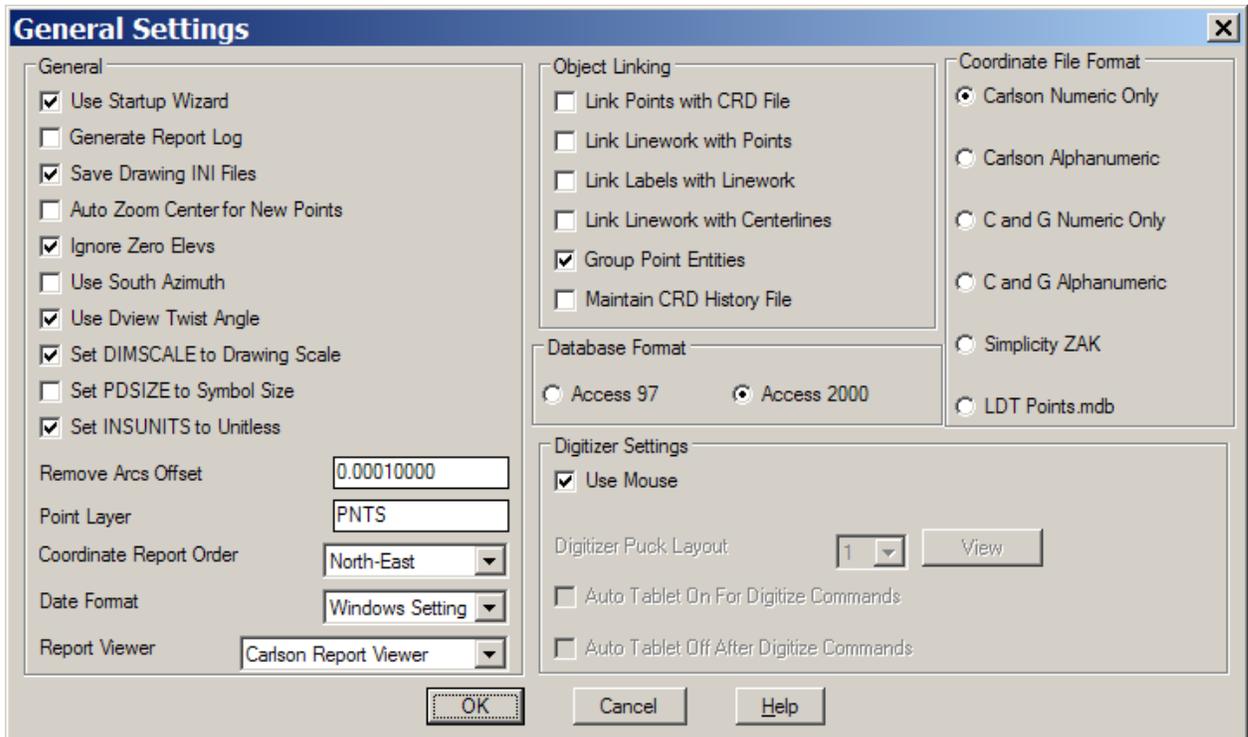
Then under the Digitize pulldown, click on Existing surface (to tell the program to apply the contours to the existing surface within "Define Layer Target/Material/Subgrade" under the Takeoff pulldown (the command "where the action is", the command that identifies which layers are existing and which are design). Then all the contours that are digitized will go to the EX layer (as defined in the above dialog) and the EX layer will automatically be located under the Existing surface column, as shown below:
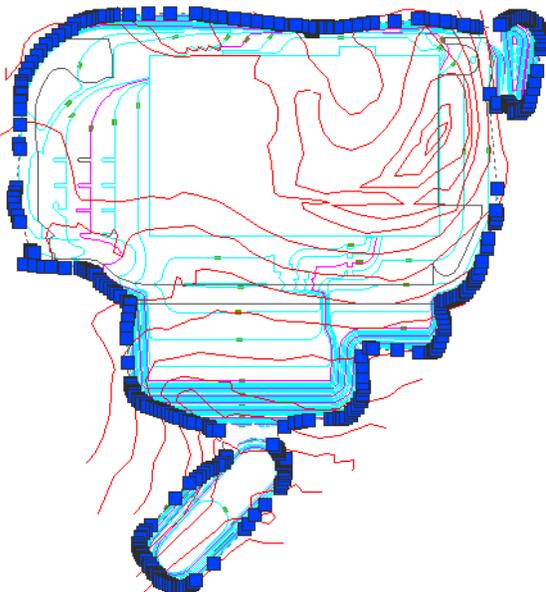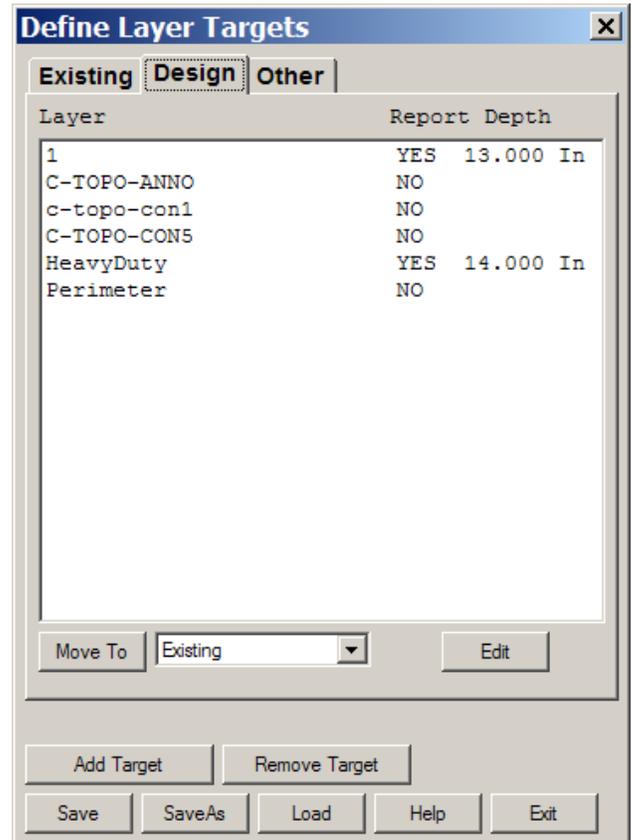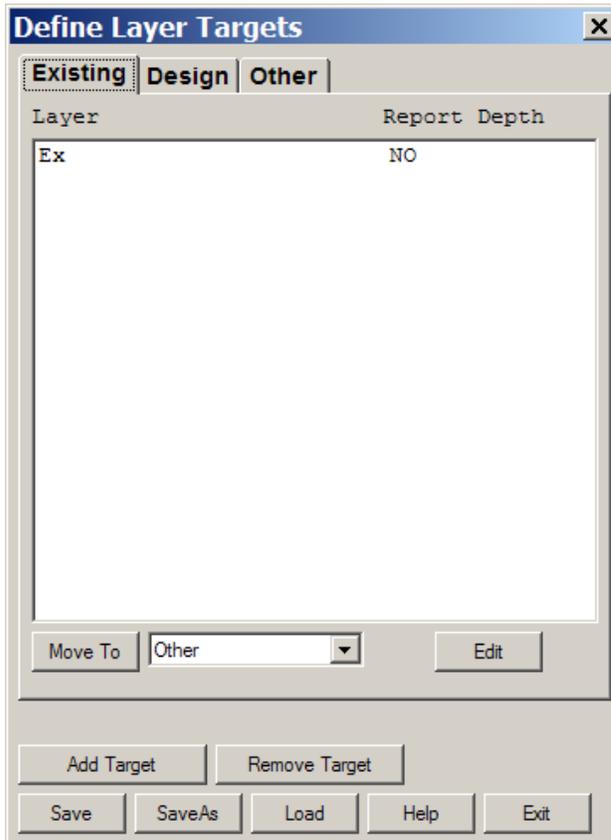
Existing contours are shown in red. The perimeter shown with the "grips" (which appear when you click on the perimeter and disappear by clicking Esc) was created by using the command Shrinkwrap by Gap, with only the final contours shown. The ends of the final contours define the perimeter, and shrinkwrap will auto-draw the perimeter around all the contour ends. That perimeter is used for the Boundary polyline of the earthwork. With the above layers defining existing and final surfaces, and with the perimeter shown, earthwork and material quantities are computed.