SiteWorx

Cut and Fill Takeoff Software

First Takeoff Tutorial with the Practice Plan

VERTIGRAPH, INC.
Takeoff and Estimating Software

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- Please print the practice plan named 02 SW Practice Sub Grade.pdf located at C:\Program Files\Vertigraph\SiteWorx\PDF Files. In learning about the operations of SiteWorx, we recommend starting your first takeoff with this Sub Grade Only practice plan and follow the steps included herewith.

- You'll need a digitizer tablet with the digitizer driver installed to operate SiteWorx. If the driver is installed correctly you're able to move the mouse pointer on the screen using the digitizer stylus or cursor.

- Vertigraph also supplies other takeoff and estimating software including:

    1. **SiteWorx/OS** on-screen site excavation, cut and fill software
    2. **BidScreen XL** provides eTakeoffs of ePlans MS Excel
    3. **BidPoint XL**, a digitizer tablet interface for MS Excel
    4. **BidData XL** is an open, estimating database add-in for MS Excel
    5. Digitizer tablets at guaranteed best pricing.

Step 1 – Install the SiteWorx and the digitizer driver software

To operate SiteWorx you'll need to install the SiteWorx software onto your hard drive and install the software driver for your model of digitizer tablet.

The SiteWorx software found on the Vertigraph CD can also be downloaded from www.vertigraph.com or obtained by contacting Vertigraph at any of the following addresses:

Vertigraph, Inc.
Takeoff and Estimating Software
12959 Jupiter Rd, Ste 252
Dallas, TX 75238
800-989-4243 (U.S. & Canada)
214-340-9436
214-340-9437 fax
www.vertigraph.com
info@vertigraph.com

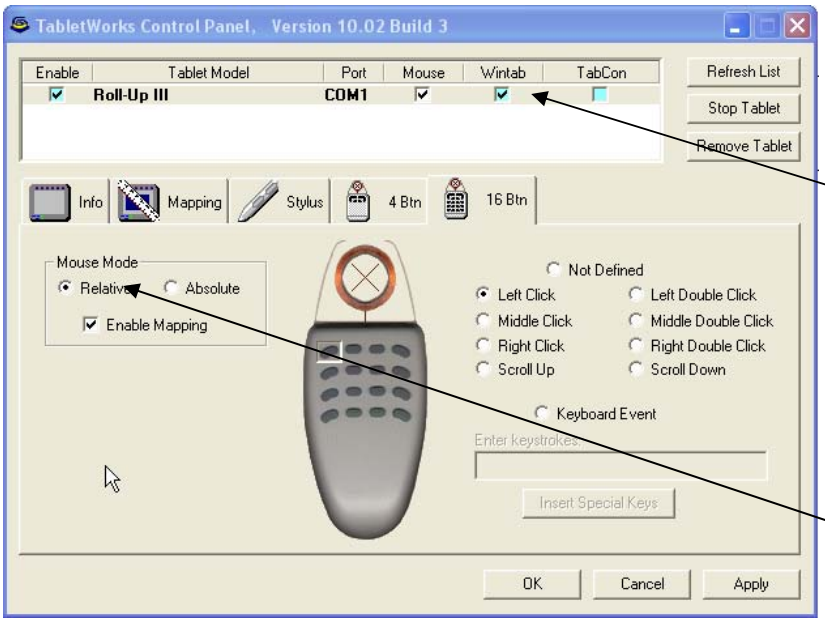
To install the SiteWorx installation file, simply double click on the SiteWorx_Setup.exe file.

Installing the digitizer's Wintab driver

Currently there are two manufacturers of large format digitizer tablets: GTCO/CalComp and the Numonics Corporation. The manufacturer of the digitizer tablet determines which digitizer tablet driver you'll install. Numonics digitizers use the Virtual Tablet Driver which ships with the Numonics digitizer on a CD. This Virtual Tablet driver can also be downloaded from www.vtablet.com. The GTCO/CalComp driver is called TabletWorks. This GTCO/CalComp TabletWorks driver may be downloaded at http://www.gtco.com/supportgtcosoftware.htm.

GTCO/CalComp TabletWorks driver

After installing the GTCO/CalComp TabletWorks driver, go to **Start** | **All Programs** | **TabletWorks** | **TabletWorks** to obtain:



Please check the **Wintab** and **Mouse** box.

Make sure the pointer is in **Relative,** not **Absolute** mode. When done with these changes, click the **Apply** and then the **OK** button at the bottom of the window.

Numonics Virtual Tablet Driver

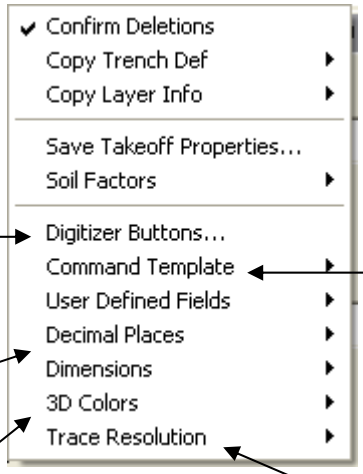
When installing the Virtual Tablet Driver with the Numonics digitizer, please review the users' guide for further instructions and/or contact Vertigraph for assistance.

Step 2 – Setup SiteWorx

After installing SiteWorx, click on the **View** menu to verify that all items are checked. Next, click on the **Options** menu. The **Options** menu appears below.

SiteWorx will not operate with the digitizer tablet until the buttons are setup.

Recommended button assignments for the 16 button cursor are included with the user guide. We suggest you print the **SW 16 Button Setup w_Tabletworks_GTCO.pdf** file if using a GTCO tablet or the **SW 16 Button Setup w_VirtualTablet_Numonics.pdf** file if using a Numonics digitizer. These files are found at **C:\Program Files\Vertigraph\SiteWorx\PDF Files**.



You're able to operate the SiteWorx commands from the template taped onto the digitizer. The template is shipped with the software or you may print the file named **SiteWorx Digitizer Template.pdf** located at **C:\Program Files\Vertigraph\SiteWorx\PDF Files**.

After taping the template to the bottom corner of the digitizer, click on **Command Template** under the **Options** menu to configure the template to the digitizer tablet.

Decimal settings may be changed at any time.

We recommend a bright red color for maximum elevation, white for middle elevation and a bright blue color for minimum elevations. High contrast colors are best.

We recommend 20 points per inch (ppi) for trace resolution.

After setting up the buttons, digitizer Wintab driver and configuring SiteWorx under the options menu you're now ready to begin your first takeoff with the 02 Sub Grade Only Practice Plan included herewith (or available for printing from the **C:\Program Files\Vertigraph\SiteWorx\PDF Files** folder) …

Step 3 - Start your First Takeoff with the Sub Grade Only Practice Plan

Two practice plans are included with the SiteWorx Package. These practice plans are also saved as PDF files at the **C:\Program Files\Vertigraph\SiteWorx\PDF Files** folder. The file names of these practice plans are **02 SW Practice Sub Grade.pdf** and **SW Practice Top of Curb.pdf**.

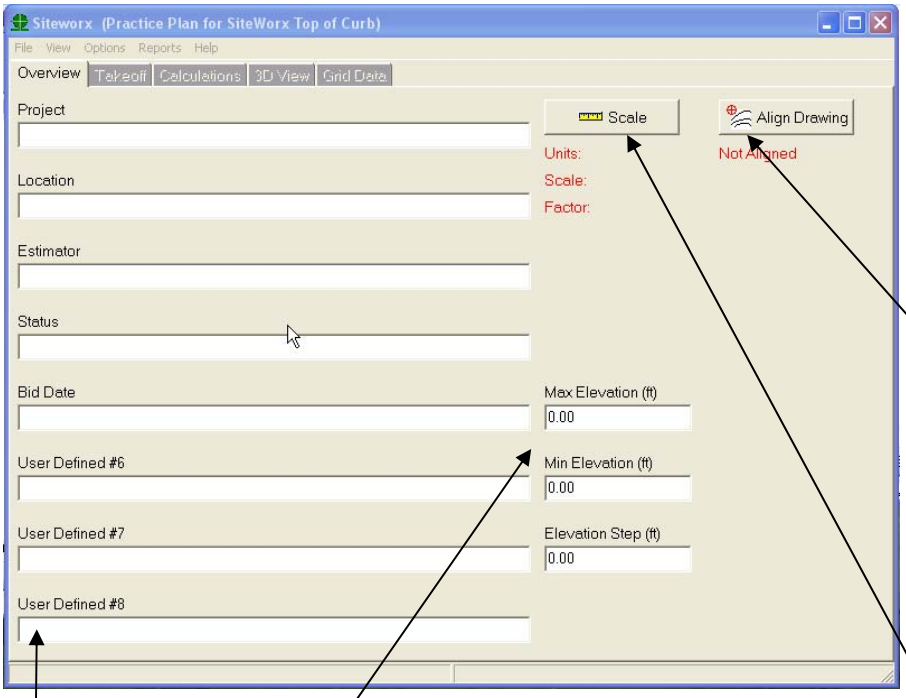
The Top of Curb practice plan is the same as the Sub Grade practice plan except that the elevations of the parking lot are noted along the top of the curb rather than inside the proposed parking lot. As a result, the parking lot is taken off a little differently between these two plans.

Please start your first takeoff with the **02 SW Practice Sub Grade.pdf** plan. As a result, tape this **02 SW Practice Sub Grade.pdf** plan to the center of the digitizer tablet.

How it Works

SiteWorx calculates the cut and fill volumes from the existing and proposed elevation points and/or contour lines digitized. As a result, every project must have a least one contour line or point elevation digitized for the existing and proposed site. SiteWorx then connects the points found in the contour lines and spot elevations to the next closest point found in a different contour line or point elevation. The points are connected to each other with a constant grade between any two points. The existing site is independent of the proposed site. As a result, separate calculations occur for the existing and proposed sites. Next, the areas, if digitized, are dropped on top of the existing and/or proposed sites as a plane. The results for the existing and proposed site are developed based on this information digitized. The differences between the existing and proposed sites are then calculated and reported based on the user defined resolution settings. The included sample practice plan is intended to show you how SiteWorx operates.

Step 4 - Complete the Overview tab window



Align the Drawing:

After setting the scale, mark three points or Xs on the blueprint to define a working rectangle. The three points, already noted as A, B and C on the practice plan should be less than a half inch outside the working area.

After marking the blueprint with these three alignment points, press the **Align Drawing** button. With the digitizer point button, digitize the NW point, SW point and SE points as noted as A, B and C on the practice plan.

If the drawing is moved on the digitizer tablet, realign the drawing by digitizing with the point button these same three points previously marked on the blueprint.

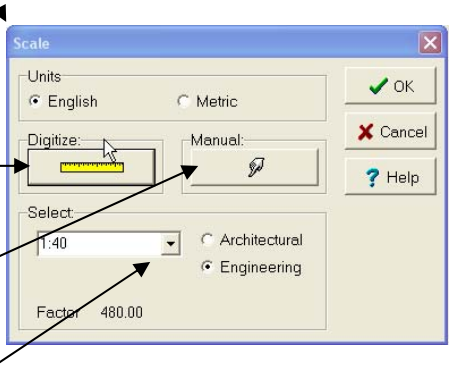
The **Max Elevation**, **Min Elevation** and **Elevation Step** fields may be changed at any time. The **Elevation Step** field is useful when entering elevations. The increase and decrease elevation buttons on the digitizer pointer will change the elevation by the step value entered here. I think you'll find that the increase and decrease elevation buttons on the 16 button cursor are often the easiest way to change elevations.

Three ways to set the scale:

1. **Digitize** the scale by clicking the yellow ruler and then using the digitizer pointer, click on the beginning and end points of a known length and enter the length.

2. Instead of digitizing the scale, manually set the scale by clicking on the **Manual** button.

3. If the drawing is a standard scale, click the down arrow and **Select** the scale from the list box. The practice plans use a 1:40 engineering scale.



IMPORTANT – Once a scale is set for the project **never** change the scale. If the scale of a drawing changes from existing to proposed for example, the scale is automatically adjusted when you re-align the drawing with the 3 points.

Setup the user defined fields by clicking on the following SiteWorx menus: **Options** | **User Defined Fields** | **Setup**.

Once established, save these default fields for all new jobs by selecting **Options** | **User Defined Fields** | **Save as Default.**

Once done at the Overview tab, save the file at the **File | Save** menu and then move to the **Takeoff tab**……

Step 5 - Digitize the Project Boundary at the Takeoff tab

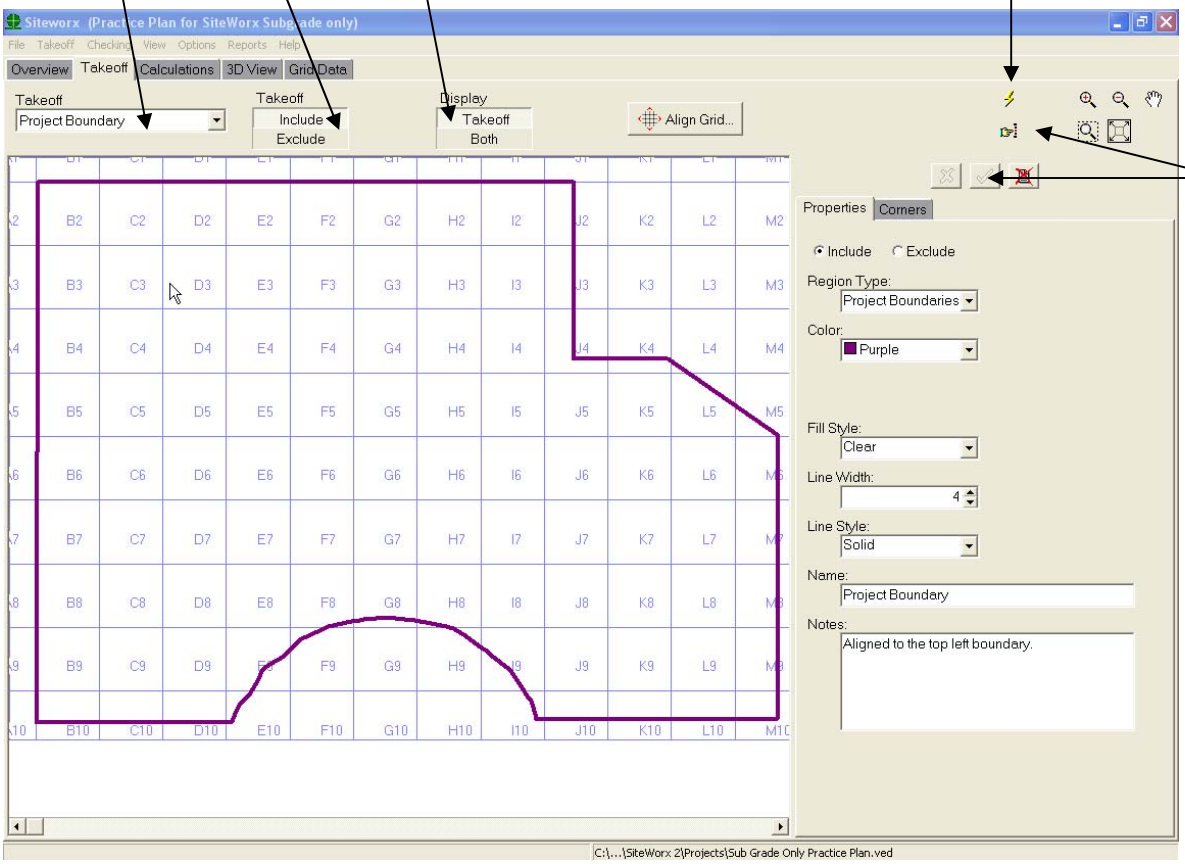
The **Takeoff** Tab is where you'll digitize the blueprint into the computer using the digitizer tablet and pointer. Commands are entered at the **top** of the window using the mouse, 16 button cursor and/or keyboard. If using the Virtual Tablet Driver, you'll be able to enter commands from the template taped to the digitizer tablet.

1. Select **Project Boundary** from the **Takeoff** list box.

2. Is the project boundary you're digitizing included or excluded from the cut and fill calculations? Select **Include** or **Exclude** here. **Note**: **Exclude** areas may be nested inside **Include** areas. If no project boundary is digitized here, the project boundary will be the Align Drawing area digitized previously at the **Overview** tab.

3. Do you want to display the Included and Excluded areas (i.e. **Both**)? Or would you rather display the **Takeoff** noted on the left? Please select either **Takeoff** or **Both**.

4. Click on the **Start Digitizing** button to begin digitizing the project boundary. Click around the project boundary clockwise or counterclockwise using the digitizer point button. When back to the first point, press the digitizer pointer's Stop Digitizing button or **F8** on the keyboard.



To change the properties of a previously digitized object, click the **Select Object** tool when the lightning bolt is not depressed, move the mouse pointer over a point within the digitized object and click the mouse to select the object. After modifying the selected item's properties on the right side of the window, click the green check mark to save the changes.

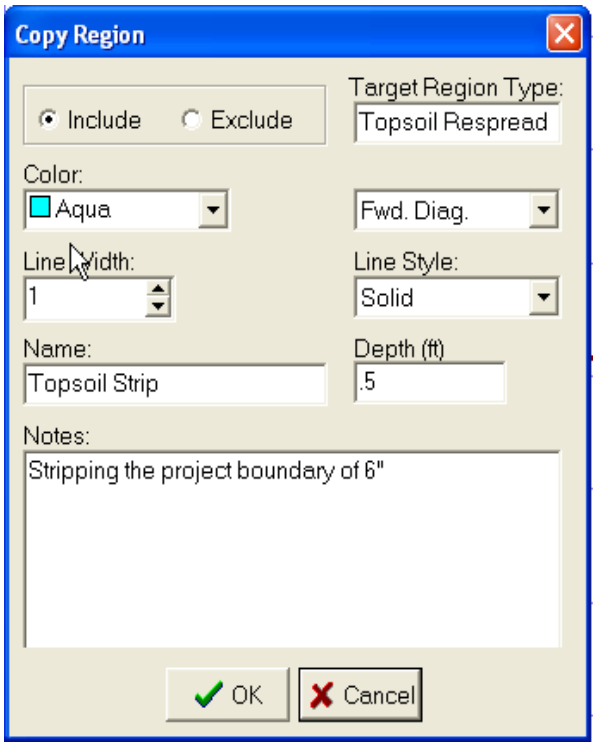
Please remember to make your selections from the top of the window before digitizing. The right side of the window discloses the properties of the last item digitized. Only modify the properties on the right side of the window after selecting a previously digitized item with the Select Object tool.

After digitizing the Project Boundary, we will next copy the project boundary as a topsoil strip area…….

Step 6 - Copy the Project Boundary as a Topsoil Strip and Topsoil Respread Area

At the **Project Boundary** Takeoff window, copy the project boundary as a topsoil strip area by clicking the right mouse button when inside the project boundary to display the following popup menu:

Select **Copy as Topsoil Strip** to display the copy region dialog box. Complete the required fields and click on the **OK** button.

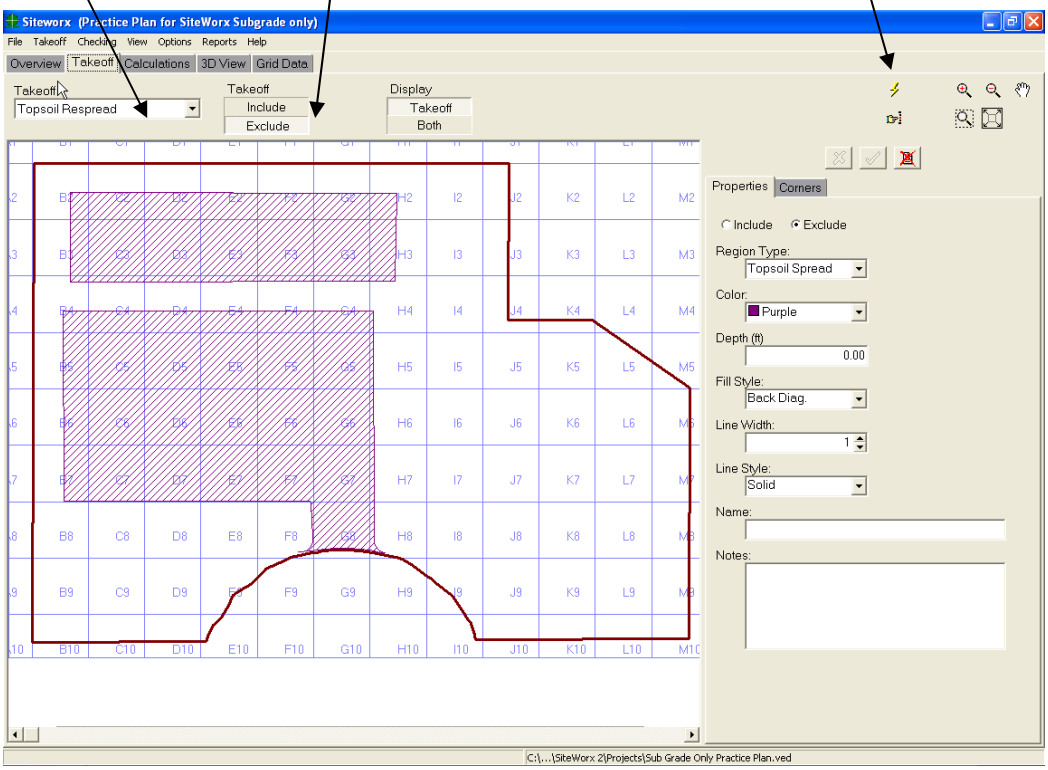


We will also copy the project boundary as a topsoil respread area by clicking the right mouse button inside the project boundary when located at the **Project Boundary** Takeoff window and selecting **Copy as Topsoil Respread**. After copying the entire project boundary as a 6" topsoil respread area, we'll exclude the slab and parking lot areas noted on the practice plan by selecting **Topsoil Respread** from the drop down Takeoff list at the top of the window. We'll then digitize the excluded topsoil respread areas (i.e. parking lot and slab) from the Topsoil Respread window.…

Step 7 - Digitize the two excluded topsoil respread areas

Select **Topsoil Respread** and **Exclude** from the top of the Takeoff window.

Then click on the Start Digitizing tool.



Using the digitizer pointer's point button, click the four corners of the concrete slab perimeter and then press the Stop Digitizing button on the digitizer pointer.

Next, click the Start Digitizing tool again and digitize around the parking lot using the digitizer point button and press the Stop Digitizing button on the pointer.

Note: The digitizer pointer must be on or close to the digitizer tablet when pressing the Stop Digitizing button. You can also stop digitizing by pressing the **F8** key on the keyboard.

When done digitizing the excluded topsoil respread areas, you'll next digitize the existing and proposed contour lines…

Step 8 - Digitize the Existing and Proposed Contour Lines

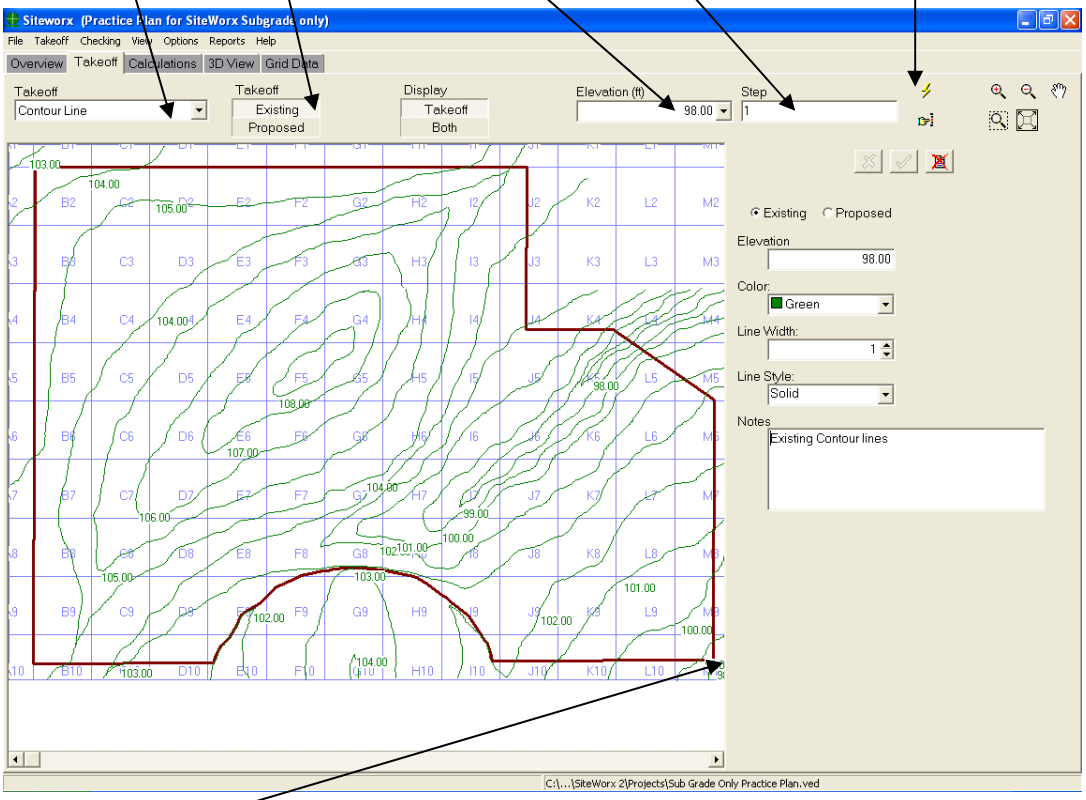
Step 1 - Select **Contour Line** as the Takeoff item.

Step 2 - Select **Existing**.

Step 3 - Enter the existing elevation to digitize (i.e. **98**).

Step 4 - Enter **1** as elevation step in the **Step** field to increase the elevations by this value when the increase or decrease elevations digitizer point button is pressed.

Step 5 - Press the Start Digitizing Tool.



First, digitize by tracing the existing 98 foot contour line in the lower right hand corner of the practice plan. Next, press the increase elevation button on the pointer (or **F11** on the keyboard) to increase the elevation from 98 to 99 and then trace the 99 foot elevation line. Continue changing the elevations using the increase elevation button and trace over the appropriate contour line while holding down the point button as you trace until you're done with the 103 existing contour elevation line. Press the decrease elevation button on the pointer (or **F12**) once to change the elevation from 103 to 102. Then trace over the 102 contour line.

Note: If you press the increase or decrease elevation button on the pointer more than once, it will change the elevation by the number of times pressed multiplied by the elevation **Step** displayed at the top of the window. Continue to change the elevations and digitize the existing contour lines by tracing while holding down the point button.

Once you're done with all of the existing contour lines, change the takeoff to **Proposed** at the top of the window and then digitize the proposed contour elevations shown on the practice plan.

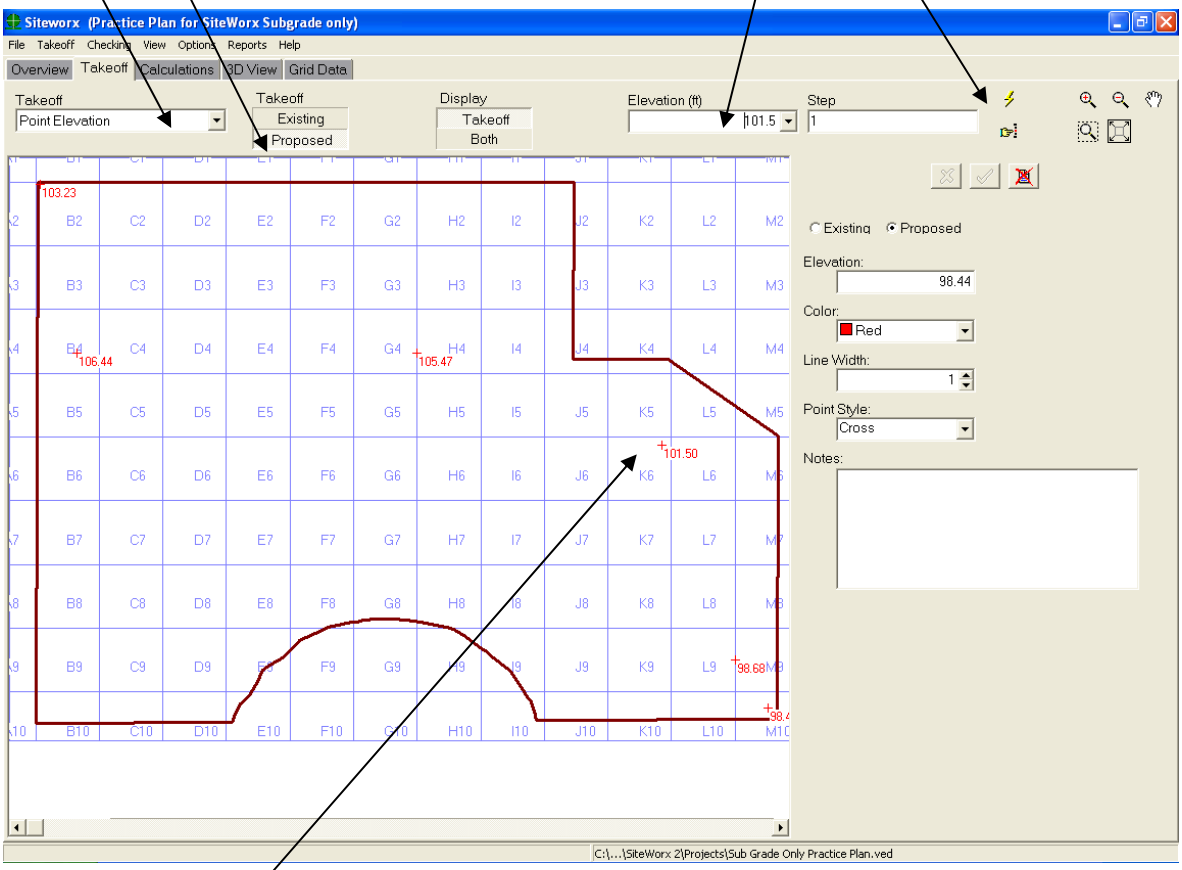
Step 9 - Digitize the Proposed Spot Elevations

Step 1 - Select **Point Elevation** from the Takeoff drop down list.

Step 2 - Select **Proposed**.

Step 3 - Enter the **101.5** elevation into the box.

Step 4 - Click the Start Digitizing Tool to begin.



Click on the **101.5** proposed elevation point, change the **Elevation** and then click on next elevation point. When you're done and seek to return to the mouse mode, click the stop digitizing button on the digitizer pointer (or **F8**).

Once you're done digitizing the point elevations, you'll next digitize the proposed areas…

Step 10 - Digitize the Proposed Concrete Slab Area

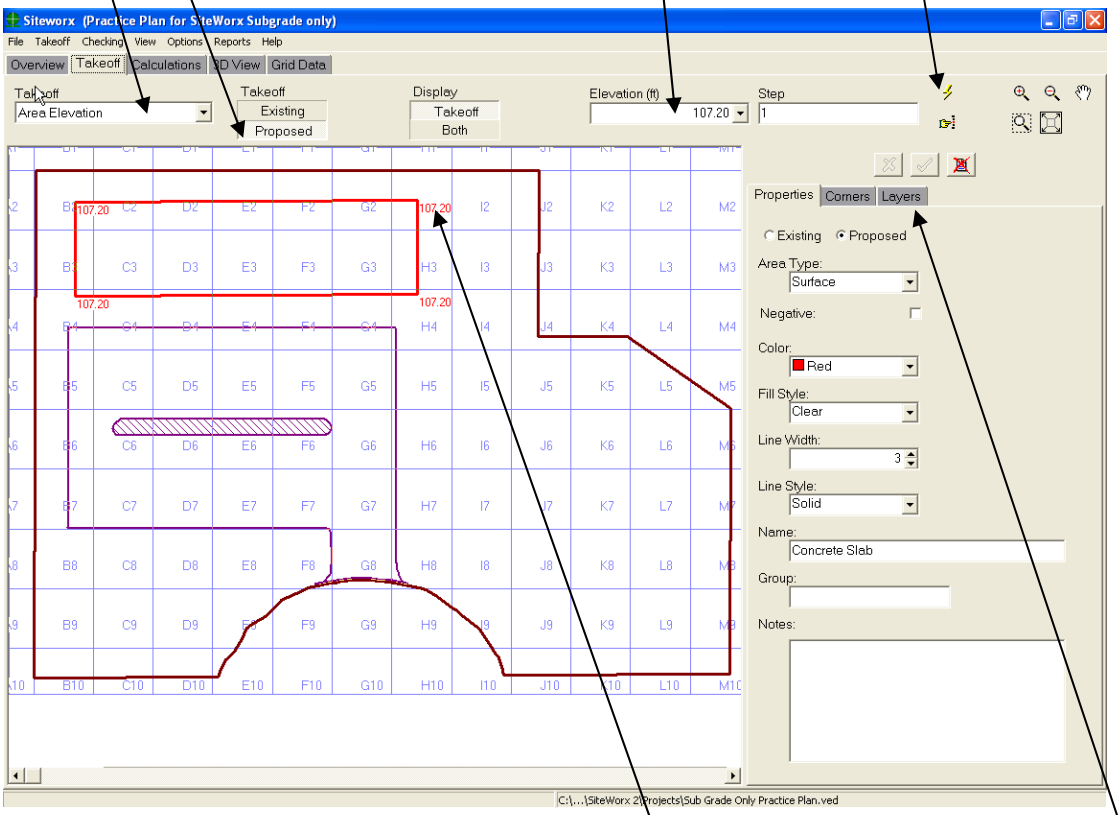
Two proposed areas are shown on the practice plan: a concrete slab and an asphalt parking lot. Additionally, two different plans are included herewith where the parking lot is taken off in two different ways: 1) Sub Grade Only Parking Lot with no curb and 2) Top of Curb Elevations Parking lot. We will start digitizing with the practice plan noted as the Sub Grade Only plan where there are no top of curb elevations on the parking lot …..

Step 1 - Select **Area Elevation**.

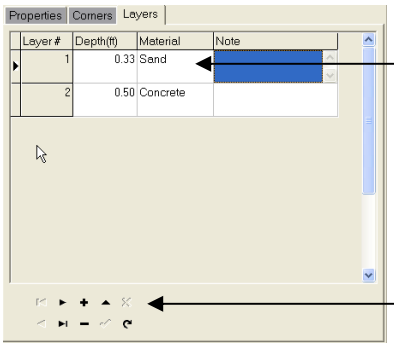
Step 2 - Select **Proposed**.

Step 3 - Enter **107.20** for the top of slab elevation.

Step 4 - Press the Start Digitizing tool.



Click on the four corners of the concrete slab and then press the Stop digitizing button on the digitizer pointer or **F8** key. Next click the **Layers** tab to add the material layers found under the concrete slab.



Material Layers with depths in feet are entered here.

Commands for the layer records are found here. When completed, post the changes by clicking on the checkmark.

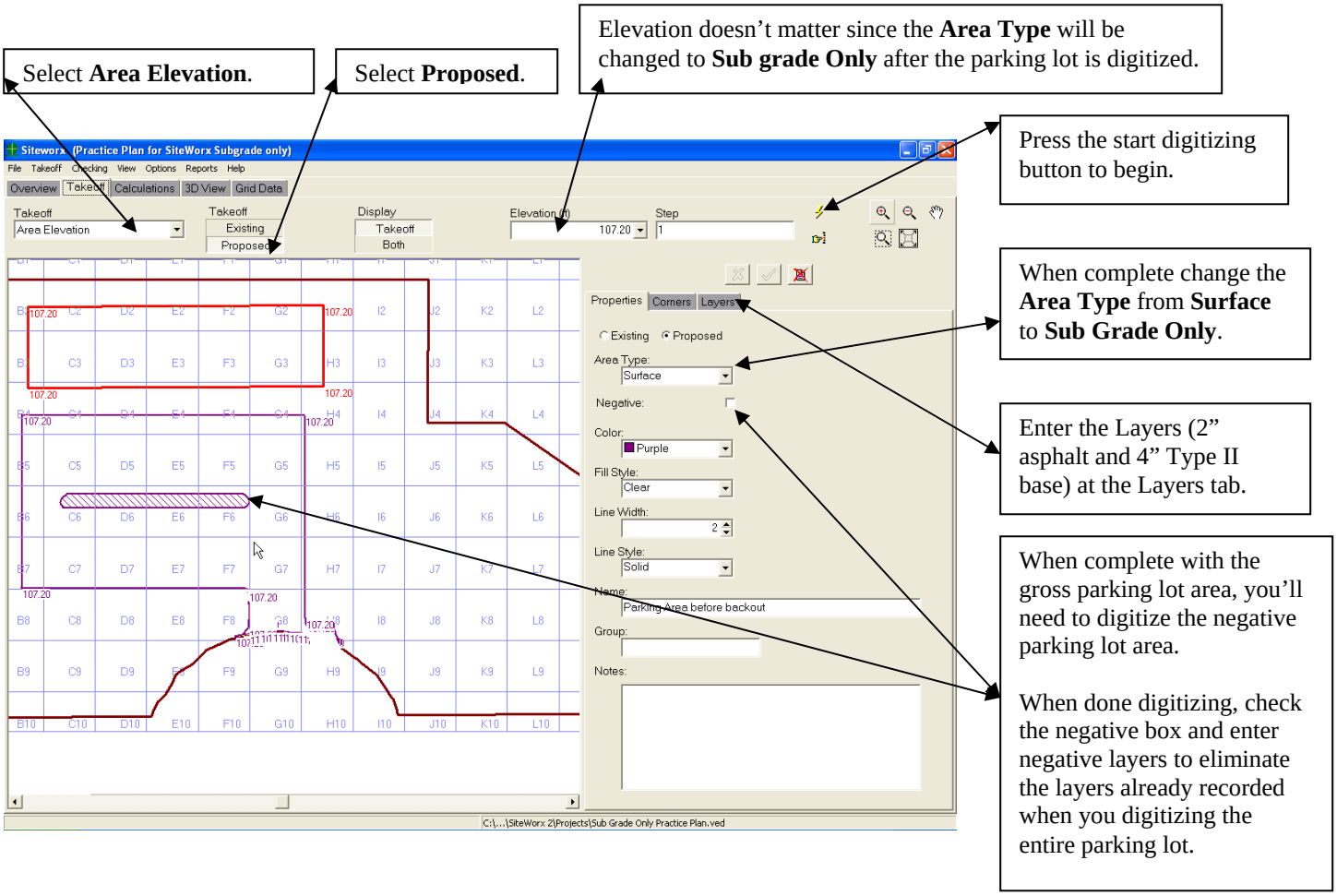
When done with the slab, we'll next takeoff the parking lot…

Step 11 - Digitize the Proposed Parking lot

Please note that two different plans are included herewith: 1) Sub Grade only plan 2) Top of Curb Elevations plan.

The proposed elevations for the Sub Grade only parking lot are the proposed contour lines and spot elevations noted inside the parking lot. As a result, after digitizing the proposed area, we'll change the **Area Type** from **Surface** to **Subgrade Only** on the right side of the window. This change to the **Subgrade Only Area Type** will reduce the proposed elevations noted inside the parking lot down by the sub grade depths entered at the Layers tab on the right side of the window.

The plan that shows the parking lot elevations at the top of curb will be digitized as a **Surface Area Type** whereby the elevations will change around the perimeter of the parking lot while digitizing. The top of curb elevations will be reduced by adding a layer for the curb height and the asphalt material to arrive at the proper proposed soil elevations. We'll start however digitizing the parking lot with the Sub Grade only plan.



The other top of curb practice plan is the same as this Sub Grade only plan except that the parking lot has elevations noted at the top of curb. If this is the case, you'll digitize the parking lot as a **Surface Area Type** and you'll change the elevations as you digitize around the parking lot perimeter.

If the elevations noted are on a 6" high curb, you'll need to record an additional sub grade layer called "Curb Height" or "Air" at the Layers tab to bring the elevations down by the curb height. Once the areas are digitized you'll be able to calculate the cut and fill volumes.

Step 12 – Calculate the Results

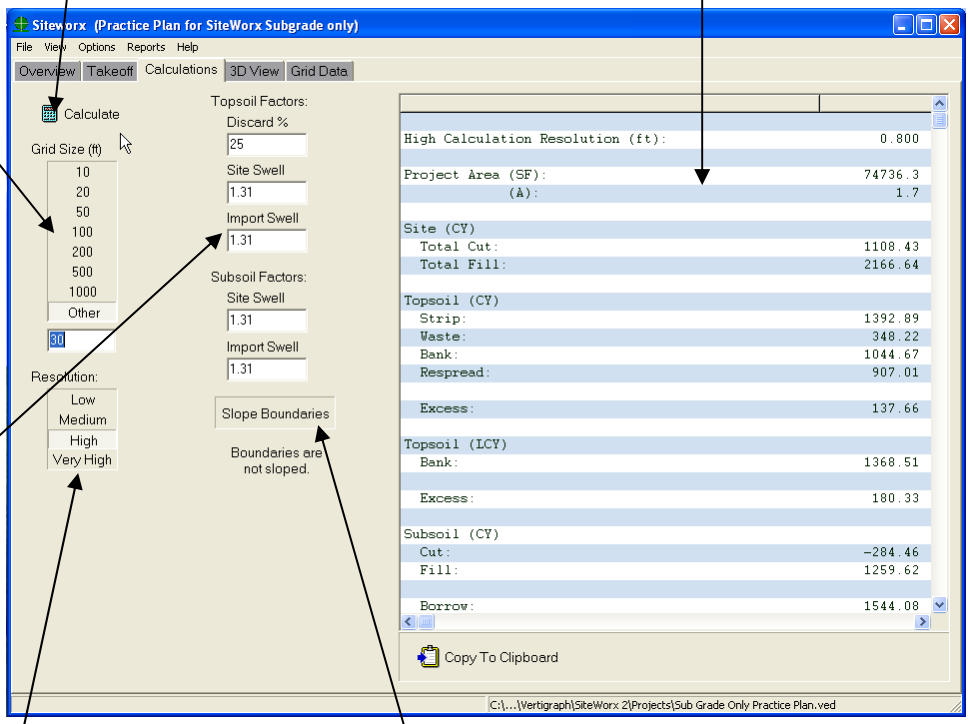
The grid size is set here and displayed at the **Takeoff** tab.

The cut and fill volumes for each grid are disclosed at the **Grid Data** tab. Grid size affects the resolution of the 3D image shown at the **3D View** tab and has an affect on the calculation resolution. The smaller the grid size, the higher the resolution displayed at the **3D View** tab.

After saving the file, click on **Calculate** to obtain results.

Calculated results are shown here. Information is broken out by topsoil and subsoil volumes.

Total Cut = Subsoil Cut + Topsoil Strip
Total Fill = Subsoil Fill + Topsoil Respread



The topsoil **Discard %** is the waste percentage. The percentage entered here disappears from the site.

The **Site Swell** and **Import Swell** factors are usually greater than 1 and less than 2. If you don't want to calculate expanded and compressed volumes, the topsoil and subsoil factors should be set to 1.

Site Swell relates to expansion and **Import Swell** is used for compression of soil volumes. The bank volumes adjusted by these swell factors show the expanded or compressed volumes and are preceded with the letter L.

The **Resolution** setting determines the spacing used when SiteWorx calculates the volumes. A higher resolution is more accurate, but takes longer to calculate. We recommend that you initially calculate with **Low** resolution, review the results and the 3D view. If the 3D view and results look reasonable, use a **High** resolution for final calculations.

The proposed elevations may be sloped to the project boundary based on the rise/run or slope percentage entered here. If no values are entered here, a slope to the project boundary will not be calculated.

After calculating the results, save the file and then review the results by clicking on the **3D View** tab……

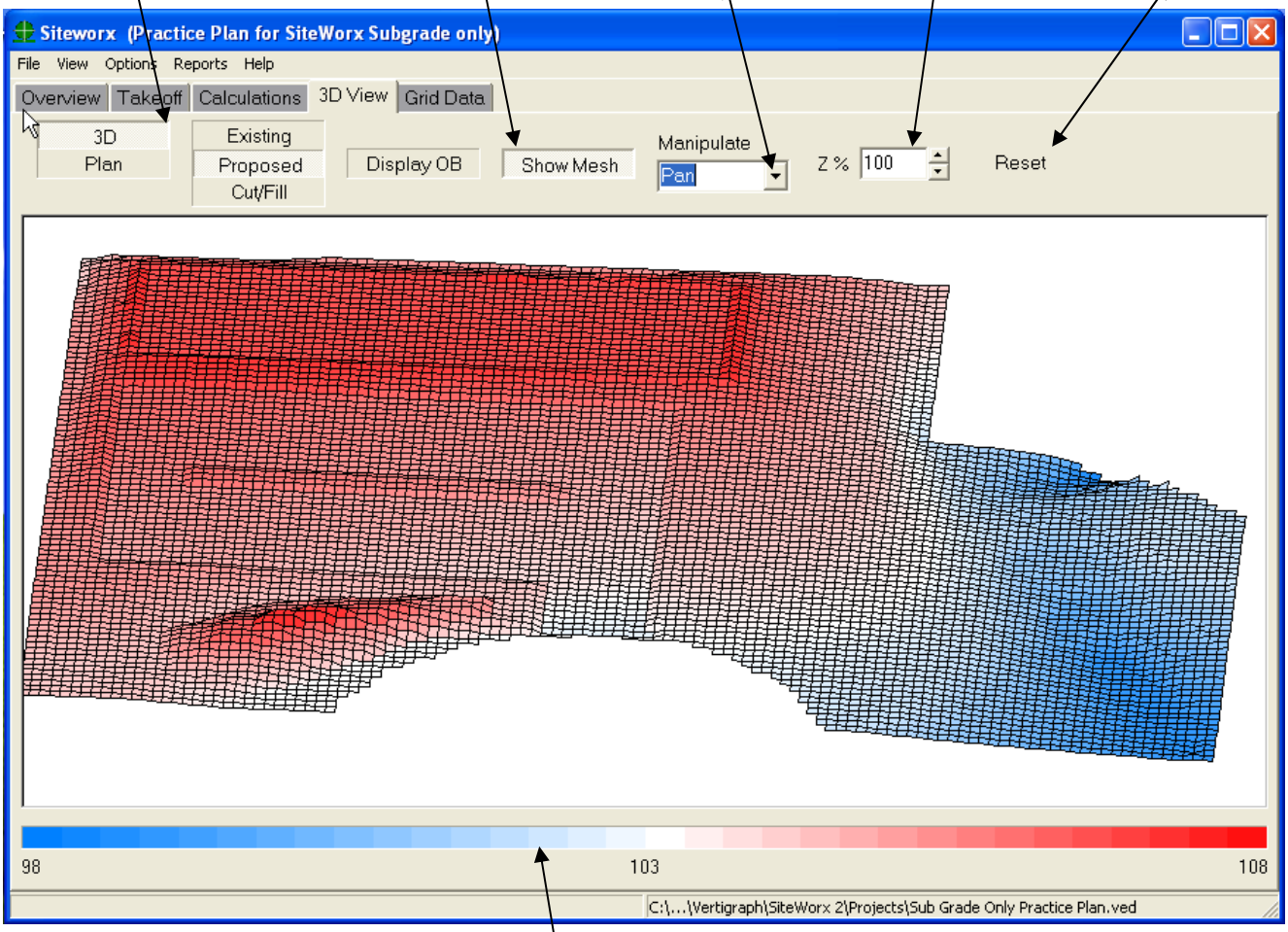
Step 13 – View the 3D Results

Make various selections from the top of the window to display the desired view.

To manipulate the image, select the **Manipulate** option from the list box here and then drag the mouse over the image.

The **Z%**, to scale, should be set to 100. To execrate the elevations, increase the **Z%** value to a value over 100.

Reset adjusts the image to the default settings and orientation.



The elevations or cut/fill depths are displayed here. To change the colors click on the **Options** | **3D Colors** menu.

Step 14 – Review the Grid Data

The actual grid location is displayed at the **Takeoff** tab.

The size of the grid is set at the **Calculations** tab.

Cut and Fill volumes consists of the topsoil volumes and the subsoil volumes.

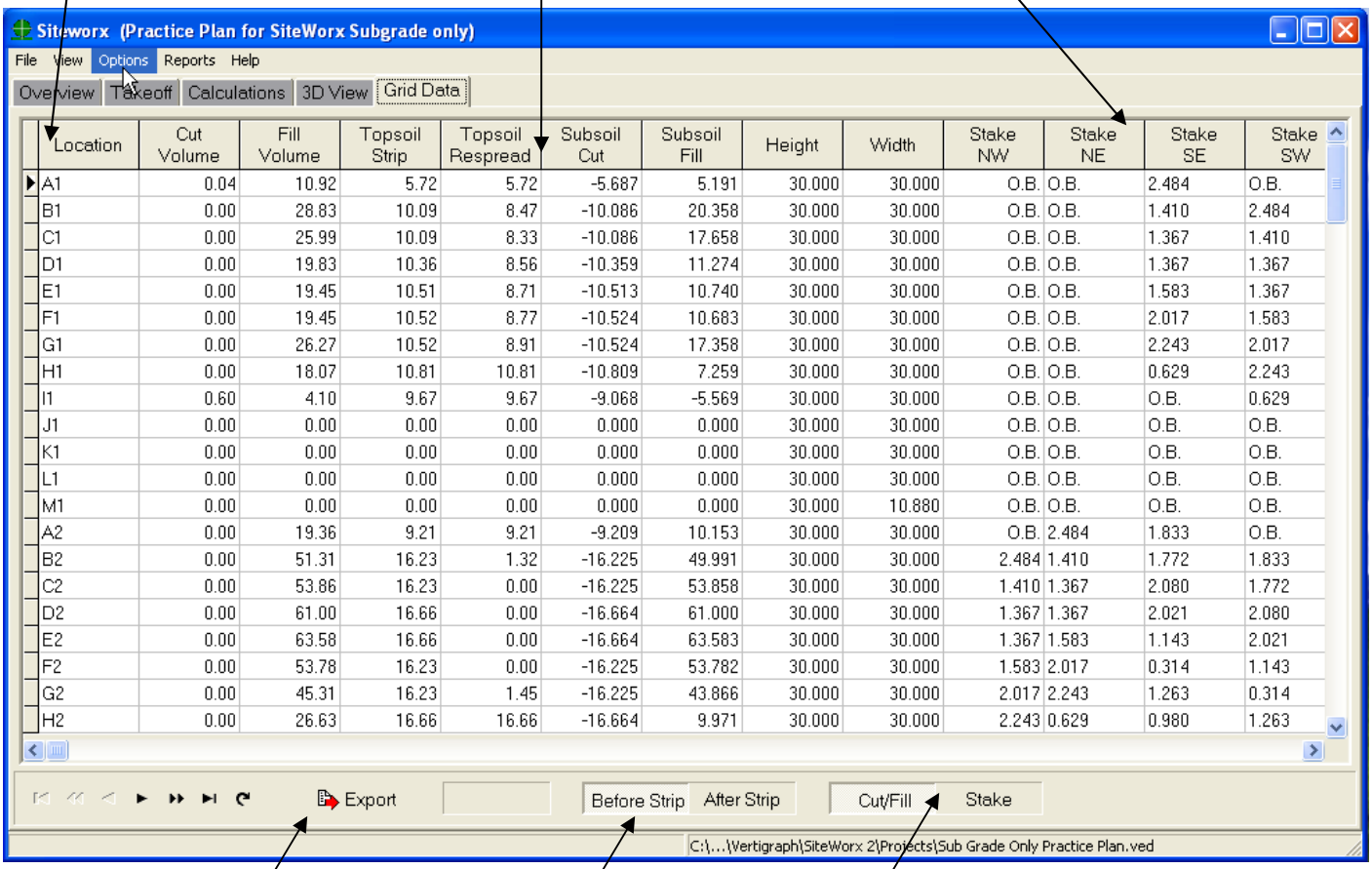
Please note:

Total Cut = Topsoil Strip + Subsoil Cut
Total Fill = Topsoil Respread + Subsoil Fill

Any negative numbers are opposites. For example, a negative cut number is a fill and a negative fill volume is actually a cut volume.

The stake heights for the four corners of the grid are shown here. Depending on the setting selected at the bottom of the window, these stake heights may be before or after the topsoil is stripped.

O.B. indicates the corner is outside the project boundary.



Location	Cut Volume	Fill Volume	Topsoil Strip	Topsoil Respread	Subsoil Cut	Subsoil Fill	Height	Width	Stake NW	Stake NE	Stake SE	Stake SW
A1	0.04	10.92	5.72	5.72	-5.687	5.191	30.000	30.000	O.B.	O.B.	2.484	O.B.
B1	0.00	28.83	10.09	8.47	-10.086	20.358	30.000	30.000	O.B.	O.B.	1.410	2.484
C1	0.00	25.99	10.09	8.33	-10.086	17.658	30.000	30.000	O.B.	O.B.	1.367	1.410
D1	0.00	19.83	10.36	8.56	-10.359	11.274	30.000	30.000	O.B.	O.B.	1.367	1.367
E1	0.00	19.45	10.51	8.71	-10.513	10.740	30.000	30.000	O.B.	O.B.	1.583	1.367
F1	0.00	19.45	10.52	8.77	-10.524	10.683	30.000	30.000	O.B.	O.B.	2.017	1.583
G1	0.00	26.27	10.52	8.91	-10.524	17.358	30.000	30.000	O.B.	O.B.	2.243	2.017
H1	0.00	18.07	10.81	10.81	-10.809	7.259	30.000	30.000	O.B.	O.B.	0.629	2.243
I1	0.60	4.10	9.67	9.67	-9.068	-5.569	30.000	30.000	O.B.	O.B.	O.B.	0.629
J1	0.00	0.00	0.00	0.00	0.000	0.000	30.000	30.000	O.B.	O.B.	O.B.	O.B.
K1	0.00	0.00	0.00	0.00	0.000	0.000	30.000	30.000	O.B.	O.B.	O.B.	O.B.
L1	0.00	0.00	0.00	0.00	0.000	0.000	30.000	30.000	O.B.	O.B.	O.B.	O.B.
M1	0.00	0.00	0.00	0.00	0.000	0.000	30.000	10.880	O.B.	O.B.	O.B.	O.B.
A2	0.00	19.36	9.21	9.21	-9.209	10.153	30.000	30.000	O.B.	2.484	1.833	O.B.
B2	0.00	51.31	16.23	1.32	-16.225	49.991	30.000	30.000	2.484	1.410	1.772	1.833
C2	0.00	53.86	16.23	0.00	-16.225	53.858	30.000	30.000	1.410	1.367	2.080	1.772
D2	0.00	61.00	16.66	0.00	-16.664	61.000	30.000	30.000	1.367	1.367	2.021	2.080
E2	0.00	63.58	16.66	0.00	-16.664	63.583	30.000	30.000	1.367	1.583	1.143	2.021
F2	0.00	53.78	16.23	0.00	-16.225	53.782	30.000	30.000	1.583	2.017	0.314	1.143
G2	0.00	45.31	16.23	1.45	-16.225	43.866	30.000	30.000	2.017	2.243	1.263	0.314
H2	0.00	26.63	16.66	16.66	-16.664	9.971	30.000	30.000	2.243	0.629	0.980	1.263

Export this data into other file types by clicking the **Export** button.

The Stake heights may be shown before topsoil strip or after the topsoil is stripped

Two different reports are available, **Cut/Fill** and **Stake**.

The **Stake** report provides the coordinates of the northwest corner of each grid. For this point, the existing elevation, proposed elevation and the depth of the cut and/or fill is also provided. To align the grids with a certain coordinate, click on the **Align Grid** button at the top of the **Takeoff** tab window when **Project Boundary** is selected. This Stake data may be exported to a number of different file formats for further import into total stations and other surveying instruments.

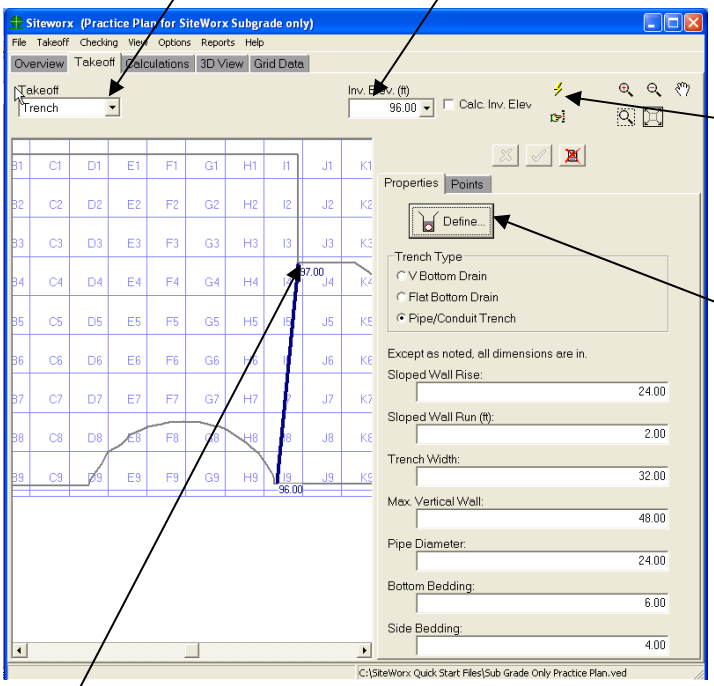
Step 15 – Takeoff Trench Volumes and Materials

SiteWorx version 2 and later allows you to takeoff trenches by digitizing the beginning and end of the trench with the invert elevations. Please note that the cut and fill volumes of any trenches are not included in any of the site excavation cut and fill reports. The trench calculations are assumed to be performed after the proposed site is calculated. The volumes and pipe material are displayed separately for any trenches taken off by selecting the **Reports | Trench** reports.

To takeoff a trench, click on the **Takeoff** tab and select **Trench**.

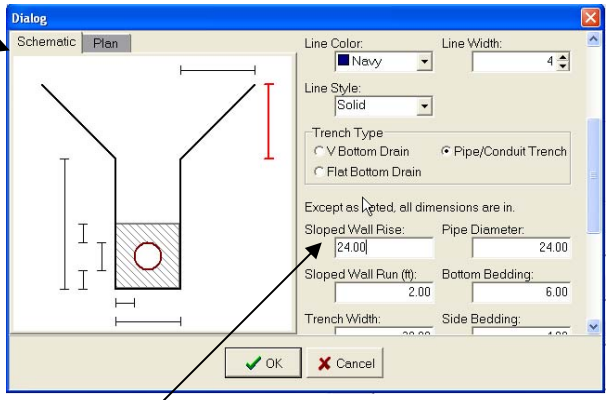
Enter the invert elevation for the beginning of the trench.

Once any two points are digitized with invert elevations, additional elevations along the trench line may be calculated if the **Calc. Inv. Elev.** is checked.



Click the start digitizing button and digitize the end of the trench.

If no trench information is carried forward as defined under the **Options** menu, the trench dialog window is presented for completion.



After digitizing the beginning of the trench with the invert elevation and entering the trench details change the invert elevation for the end of the trench and digitize the end point. When done with the trench line, press the stop digitizing button on the pointer or **F8**.

Complete the information on the right side of the trench dialog to define the trench.

A red line will be displayed at the **Schematic** tab to indicate the selected measurement field on the right side of the window. Once you're done on the right side, click the **Plan** tab to view the cross-section of the trench based on the dimensions entered.

The trench details may be edited at any time by selecting the trench with the Select Object tool and clicking on the **Define** button.

When done with the trenches, move to the Calculations tab and press the Calculate button prior to printing the reports.

Step 16 – Print the Reports and Summary

In summary the process works as follows:

- Complete the **Overview** Tab
- Click on the **Takeoff** tab and digitize all relevant items.
- Click on the **Calculations** tab and set the grid size and initially calculate using the faster **Low** resolution.
- Review the calculated results, **3D View** and **Grid Data**.
- If changes need to be made based on the initial review, select the object at the **Takeoff** tab and edit the information. To scroll through the various items digitized, click on **Checking | Examine** menu command at the **Takeoff** tab to select the numbered item.
- Once the data appears reasonable, recalculate the project with **High** or **Very High** resolution.
- Finally, print the reports found under the **Reports** menu.

Congratulations, you're now ready for a real project.

Please feel free to contact us at any time.

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