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## Chapter 20: Quantities

### Overview

Quantities are calculated by many different methods. The type of quantity, its unit of measurement, and how it is shown in the plans will dictate the method used to calculate it. Since this is a CADD manual, this chapter will go through the procedures used to calculate quantities using plan and cross section drawings. A detailed description of each item to be calculated, the means of calculation, and the accuracy needed is reserved for another publication.



These methods will only work if you use D&C Manager to draw or set the symbology of the elements you need to quantify.

This chapter is broken into two sections. Calculations in plan view and calculations in cross sections. D & C Manager will be used to calculate items in the plan drawing and XS Reports will be used to calculate items in the cross section drawing.

### Quantities in Plan Drawings

Three different types of quantities can be calculated in the plan drawing: each, linear, and area. All of these will be calculated using the computation tool in Design & Computation manager. Most of the items that need to be calculated are set up in CFLHD's Design & Computation Manager database. So, if you followed these standards while drawing each element, quantity calculations will be easy. See the chapter on D&C Manager for more information on drawing elements.

The D&C manager can be selected by picking Plan View Quantities in the Project Manager Workflow Dialog Box, or by selecting Design and Computation Manager from the GEOPAK Road Tools Dialog Box.

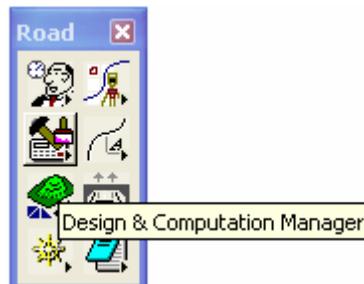


Figure 20-1: Accessing D&C Manager from the Road Tools Dialog Box

If you select the D&C Manager from the Project Manager Workflow Dialog, GEOPAK will automatically set Design & Computation Manager in Compute mode. If you select Design & Computation Manager from



the GEOPAK Main menu, you will need to shift it to Computation mode by selecting the Compute button in the menu bar.

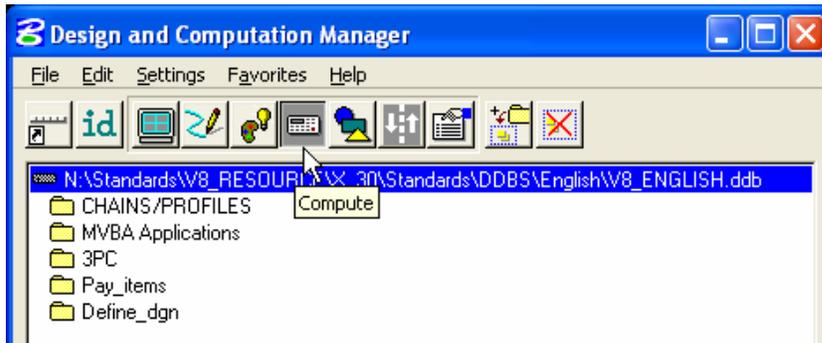


Figure 20-2: Compute Icon

This will pop up the following two dialog boxes.

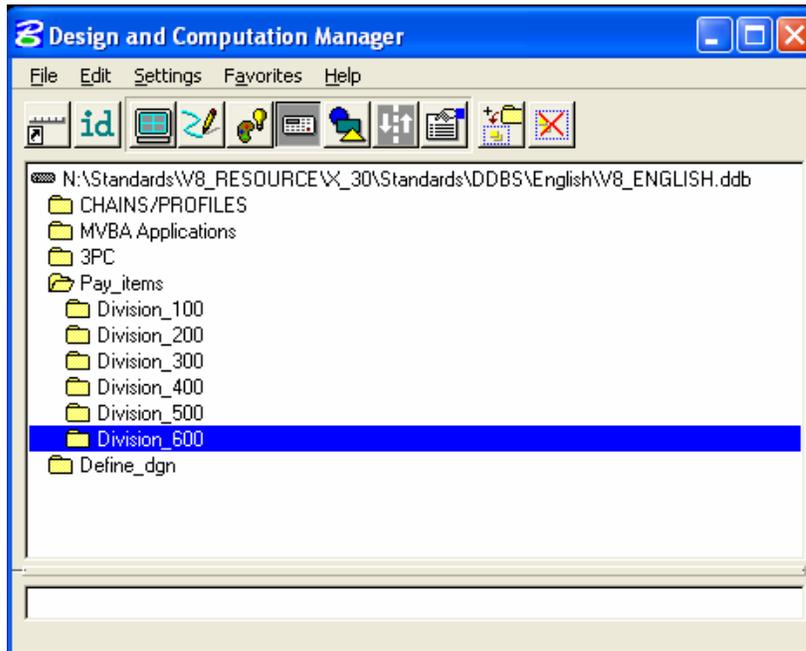


Figure 20-3: Select Item for Computation

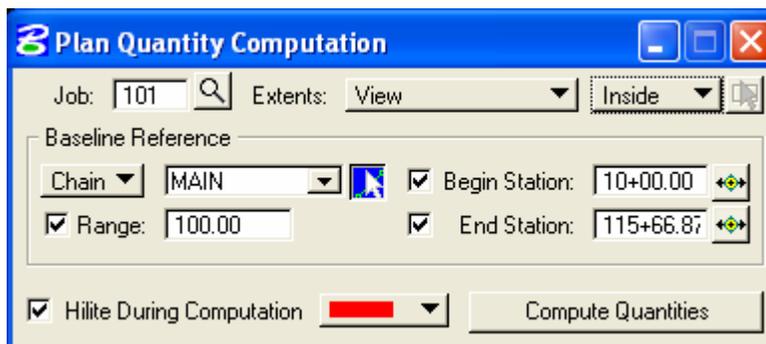


Figure 20-4: Compute Dialog



The first dialog box will allow you to select the items to be calculated. The second dialog box sets up the parameters for calculating and reporting the quantities. The following workflows will explain the processes for calculating quantities in each of the three types: each, linear, and area.

Examples of quantities to be calculated in units of “each” are end sections, terminal sections, lights, survey monuments, etc. The following workflow will guide you through the calculation process.

## Workflow 1: Calculating “By Each” Quantities

1. *Select the item or items that you want calculated using the D & C Manager item list. Double-clicking on the item to be calculated will populate collection box at the bottom.*

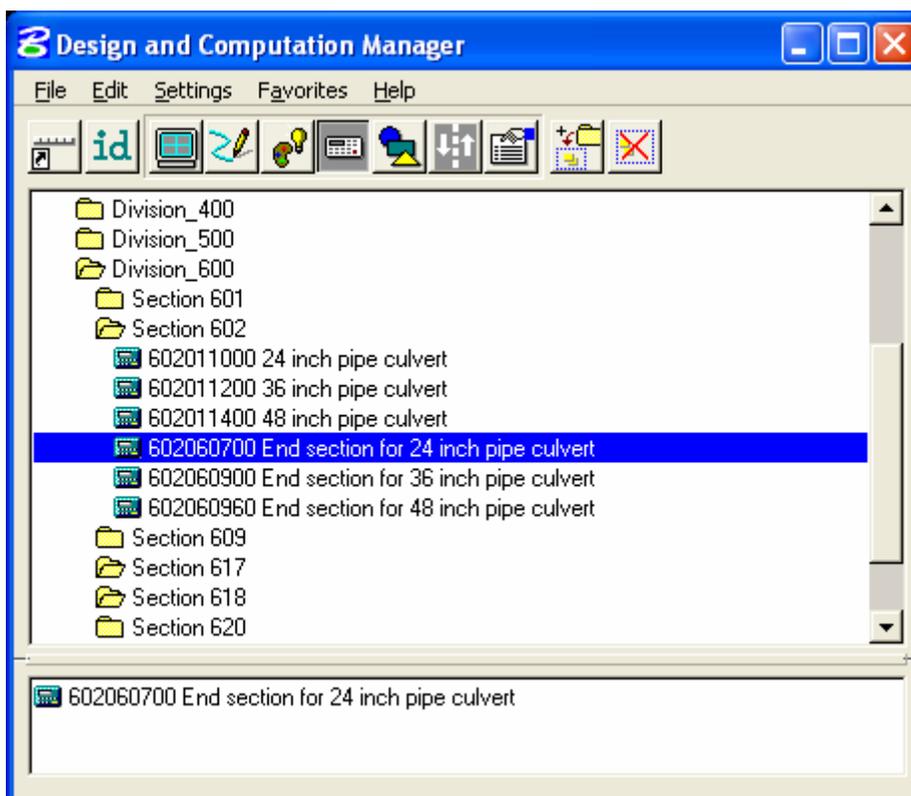


Figure 20-5: Item Selection

2. *Make sure the Job Number and Chain Name are correct. Set the Extents to View, Fence, or Active Design File. Select Compute Quantities.*

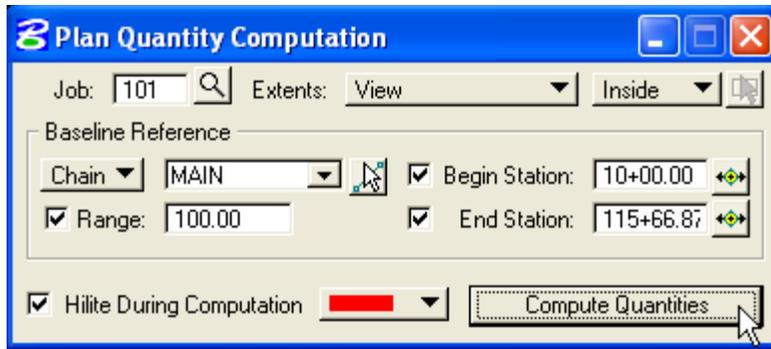


Figure 20-6: Compute Dialog

3. This will bring up the following dialog box:

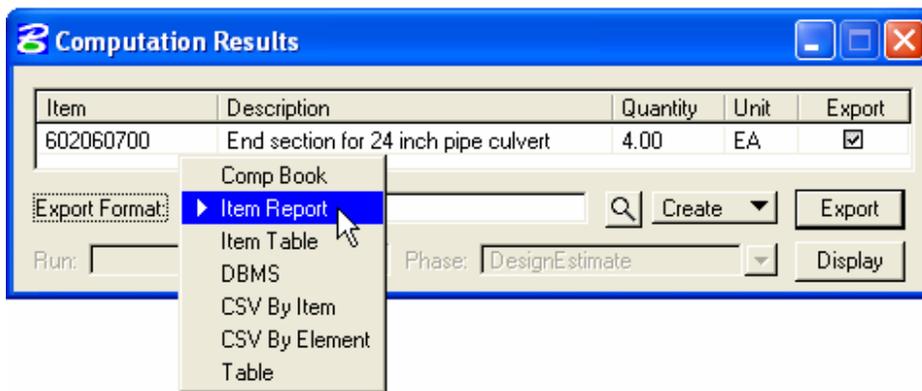


Figure 20-7: Computation Results Dialog

4. To get an itemized calculation (Station and Offset to each item), change the Export Format from Item Report to Comp Book, then give it an output file name to look like the following:

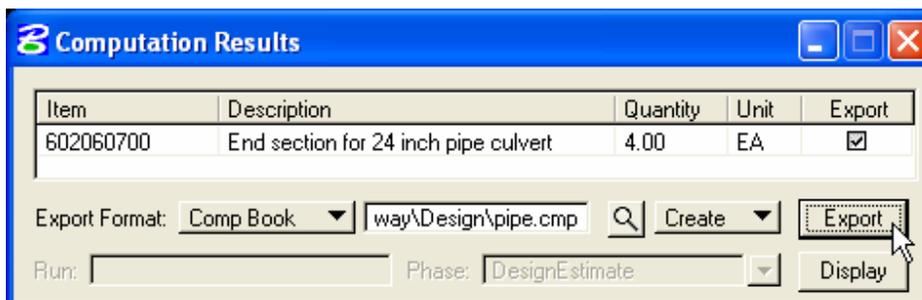


Figure 20-8: Computation Results Dialog for Comp Book

5. Select Export.



6. The following report will be created:

Date: 4/25/2006 10:46:15 AM Page No. 1

Pay Item No. 602060700 Unit:EA File Name: c:\Your\_Project\Roadway\Design\pipe.cmp

Pay Item Name: End section for 24 inch pipe culvert

Baseline	Station	Offset	Northing	Easting	Quantity
MAIN	20+01.42	-23.97	523103.2502	1832584.5340	1.00
MAIN	19+98.80	12.83	523124.3845	1832573.1610	1.00
MAIN	17+17.89	25.53	523283.6007	1832794.6399	1.00
MAIN	17+12.85	-23.11	523250.4473	1832831.9375	1.00
Totals	Unit:EA				4.00

Figure 20-9: Output

Examples of linear quantity calculations are fence, curb, guardrail, etc. The following Workflow will guide you through the calculation process.

## Workflow 2: Calculating “Linear” Quantities

1. Select item or items that you want calculated using the D & C Manager item list.

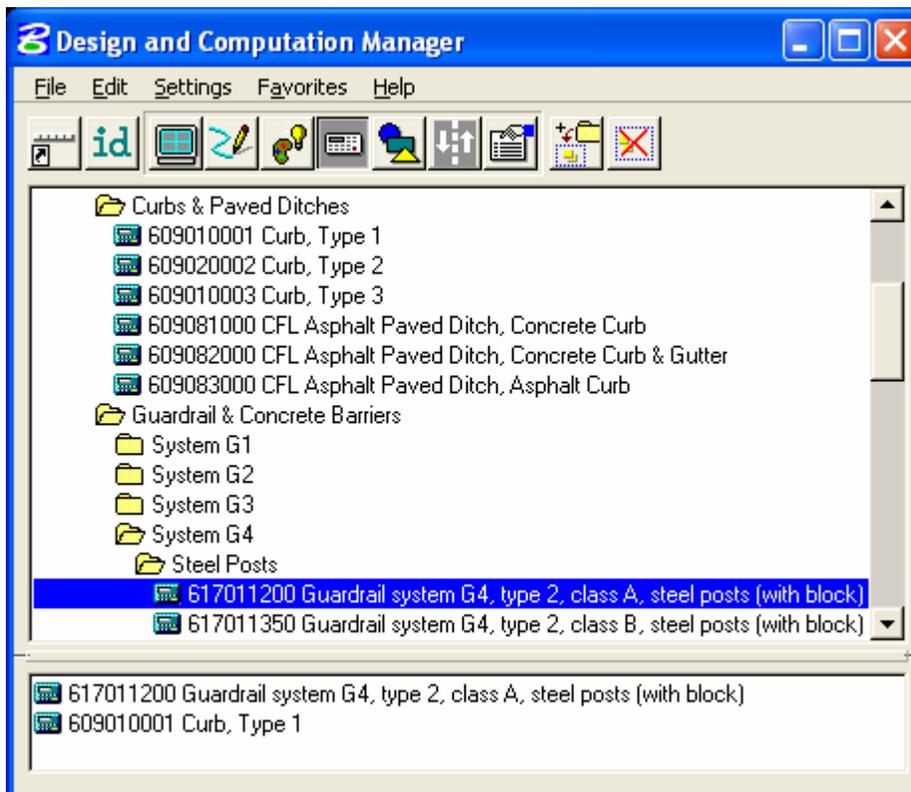


Figure 20-10: Multiple Item Selection



2. Make sure the Job Number and Chain Name are correct. Set the Extents to View, Fence, or Active Design File. Select Compute Quantities.

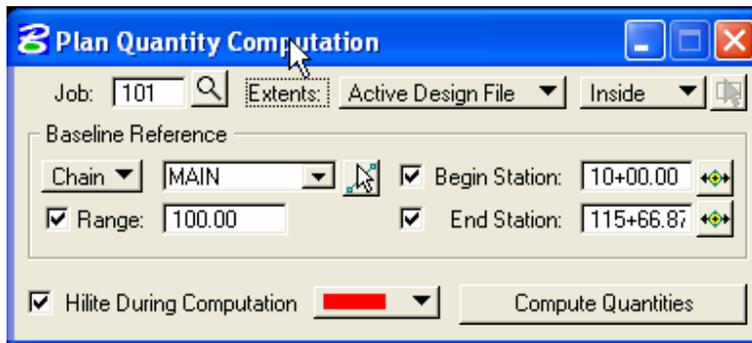


Figure 20-11: Compute Dialog

3. This will bring up the following dialog box:

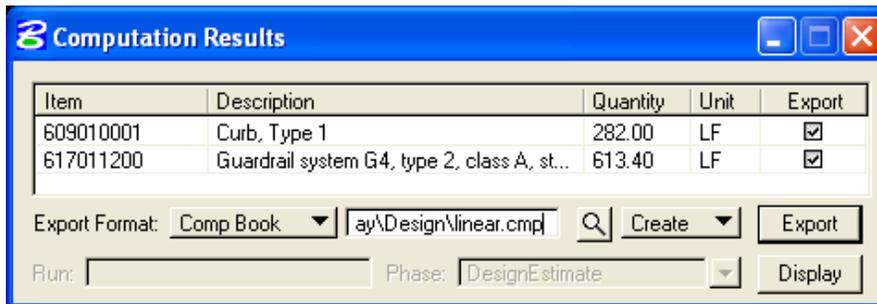


Figure 20-12: Computation Results

4. Set Export Format to Comp Book and add a file name. Select Export to get the following output file:

LINEAR MEASUREMENT COMPUTATION													
Date: 4/25/2006 10:55:22 AM													
Page No. 1													
Pay Item No. 609010001 Unit:LF File Name: c:\Your_Project\Roadway\Design\linear.cmp													
Pay Item Name: Curb, Type 1													
	[B E G I N]		[E N D]		[O R I G I N & L]		[F I N & L]		Over/Under	Run	Remarks		
Baseline	Station	Offset	Station	Offset	Gross Length	Deduct	Net Length	Gross Length	Deduct	Net Length			
MAIN	12+37.72	12.00	13+72.65	16.11	136.00	0.00	136.00						
MAIN	12+64.32	-27.27	14+12.16	-20.89	146.00	0.00	146.00						
Totals	Unit:LF				282.00	0.00	282.00						
Date: 4/25/2006 10:55:22 AM													
Page No. 2													
Pay Item No. 617011200 Unit:LF File Name: c:\Your_Project\Roadway\Design\linear.cmp													
Pay Item Name: Guardrail system G4, type 2, class A, steel posts (with block)													
	[B E G I N]		[E N D]		[O R I G I N & L]		[F I N & L]		Over/Under	Run	Remarks		
Baseline	Station	Offset	Station	Offset	Gross Length	Deduct	Net Length	Gross Length	Deduct	Net Length			
MAIN	17+83.87	-21.33	20+74.13	-8.37	301.15	0.00	301.15						
MAIN	18+83.63	18.96	22+09.21	27.46	312.25	0.00	312.25						
Page Totals	Unit:LF				613.40	0.00	613.40						
Totals	Unit:LF				613.40	0.00	613.40						

Figure 20-13: Output



Notices, in the example above, multiple quantities were calculated at once. You can add the items that you need calculated in the collection box by double clicking on it. If you want to remove an item from the collection box, simply double click on it in the box.

Examples of “area” quantities that are calculated in the plan view are roadway obliteration, sidewalk and concrete pavement. Since GEOPAK uses shapes to calculate areas, area quantities are not quite as simple as the “By Each” and “Linear” quantities, but once you get used to it, it is a time saver. The following Workflow will guide you through the process.

### Workflow 3: Calculating “Area” Quantities

1. *Highlight the item you want to calculate, and then select the Shape button on the menu bar.*

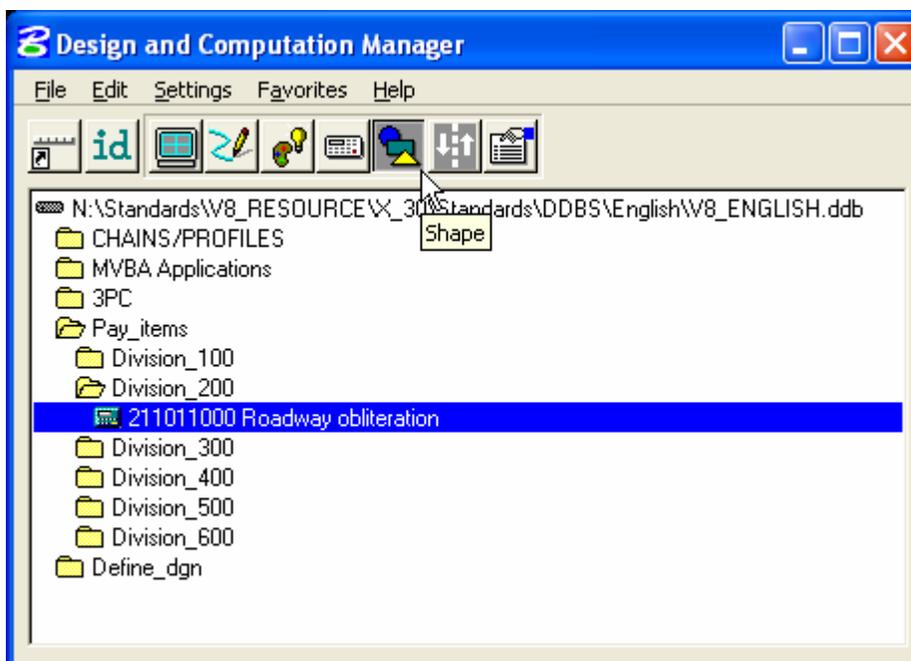


Figure 20-14: Place Shape Icon

2. *The following dialog box will come up.*

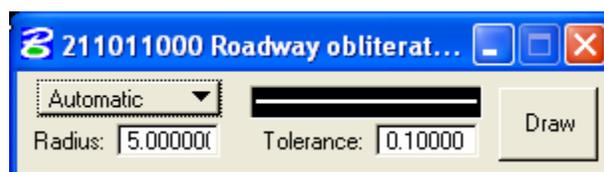


Figure 20-15: Place Shape Dialog



*The correct level symbology will be automatically input. The Automatic button has three choices: Semi-auto, Automatic, and Exclusive. Semi-auto will allow you to pick the items you want to create the shape with, Automatic will create a shape around a point that you pick inside your area, and exclusive will create a shape where you want to exclude an area such as a planter in the sidewalk.*

3. *The two methods that you can use are Automatic and Exclusive. Exclusive is used when there is a deduction from the area, for example a planter in the middle of a sidewalk. Automatic is used when there is no need for deduction. The easiest method is Automatic; the tolerance and radius values can be adjusted if automatic is not working. Pick Draw and pick a data point in the middle of the area that you want the shape in. GEOPAK will draw the shape. When you pick draw with Exclusive, GEOPAK will prompt you to pick a data point inside the outside shape. Once you pick that data point, GEOPAK will highlight the outer shape and then prompt you to pick inside the inner shape to deduct. Once that data point is selected, GEOPAK will draw the shape with the hole in it.*
4. *Once the shape has been created, go back to Plan Quantity Computation dialog box. Double click to select the item you want calculated.*

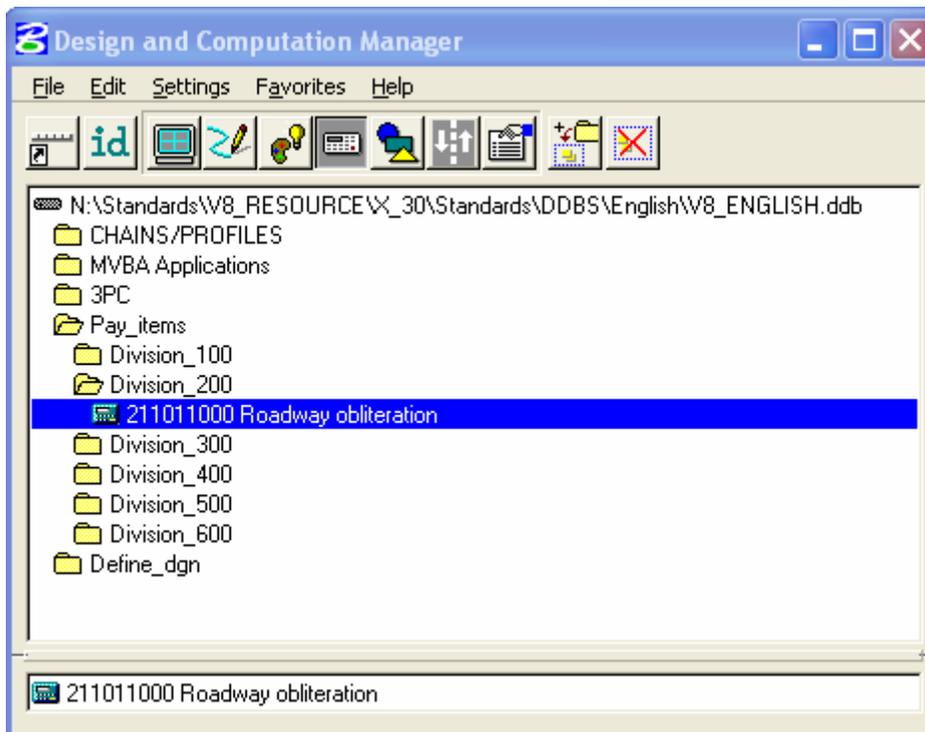


Figure 20-16: Item Selection



5. *Select Compute Quantities.*

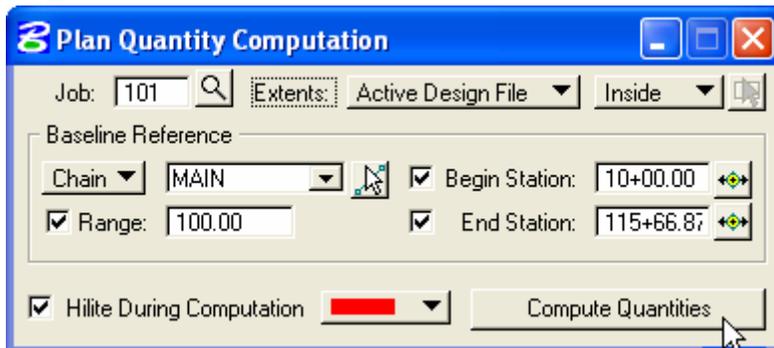


Figure 20-17: Compute Dialog

6. *The following dialog box will appear.*

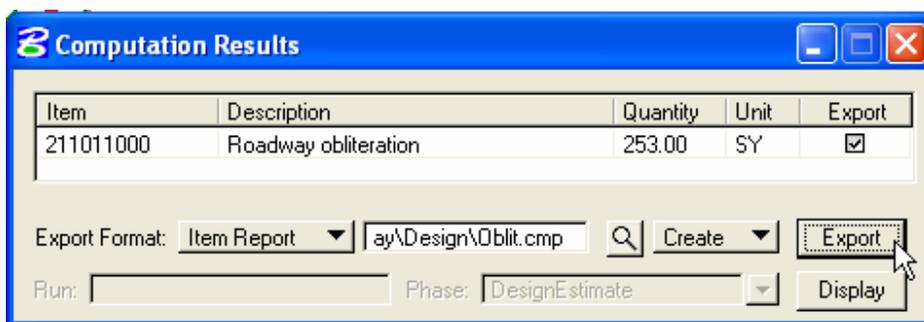


Figure 20-18: Computation Results

7. *Change the Output to Item Report and select Export. The following report will be produced.*

Item No.	Description	Unit	Quantity
211011000	Roadway obliteration	SY	253.000

Figure 20-19: Output

Geopak can also calculate volumes and weights of items such as pavement and base course. Quantities for pavement and base course have edge tapers, so these quantities are more accurately calculated using a spreadsheet or using the earthwork run.

### Quantities in Cross Sections

Besides computing earthwork, surfacing, pavement removal, and topsoil from cross sections, cross sections can be used to calculate seeding



and clearing quantities. This chapter will provide workflows that show you how to calculate the clearing and seeding quantities.

## Workflow 4: Calculating “Clearing” Quantities

1. *Open your cross section file and access the XS Reports dialog box. This can be done by selecting the Reports & XS Quantities button in the bottom right hand corner of Project Manager Workflow Dialog Box, or by pressing Applications>GEOPAK ROAD>Cross Sections>Report.*

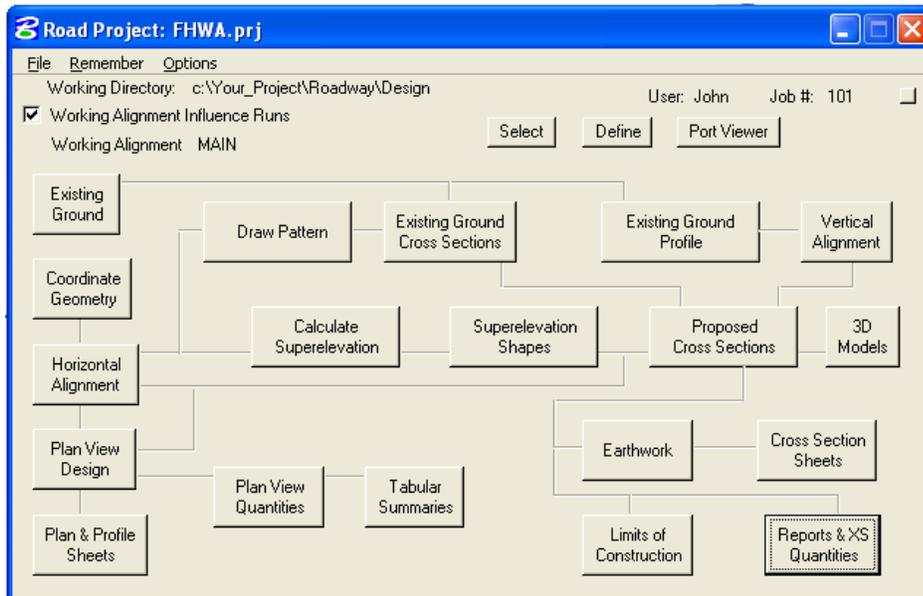


Figure 20-20: Accessing Reports & XS Quantities

*Or by pressing the XS Reports button from the Road Tools Dialog Box.*

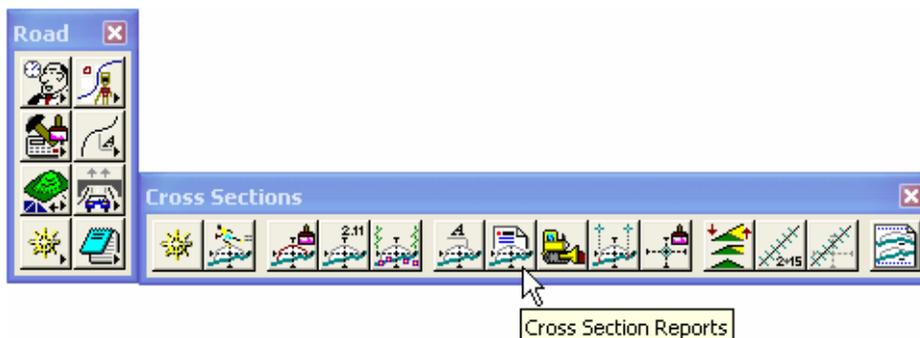


Figure 20-21: Accessing Cross Section Reports Icon



2. This will bring up the following dialog box.

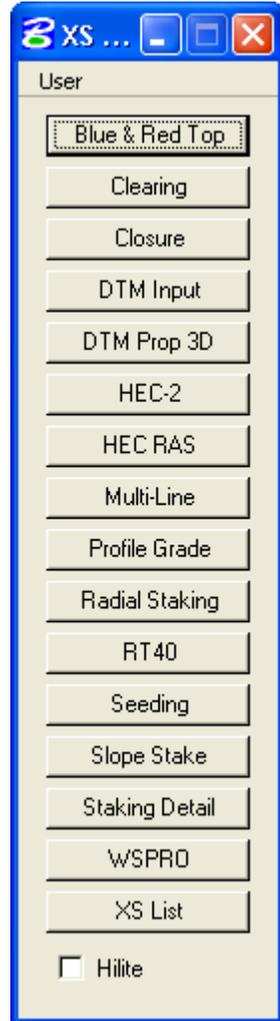


Figure 20-22: Reports Dialog Box

Select User>Preferences to bring up the following dialog box.

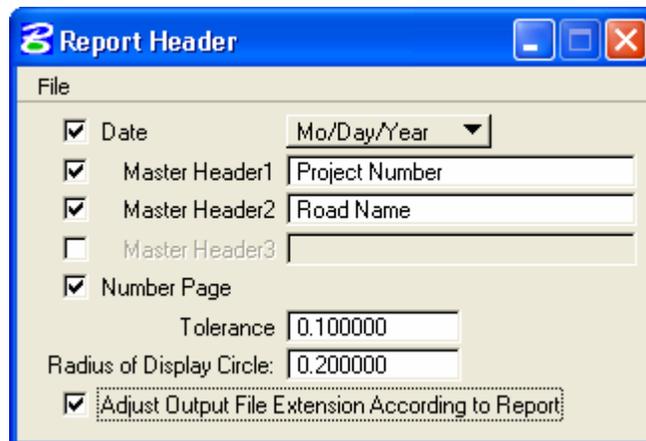


Figure 20-23: Report Settings



3. *This information will be put at the top of the quantity report. Include the Project Number in the Master Header 1 space, and the Road Name in the Master Header 2 space.*
4. *Press the Clearing button in the XS Report dialog box.*



Figure 20-24: Clearing Button

5. *This will bring up the following Clearing Report Dialog box.*

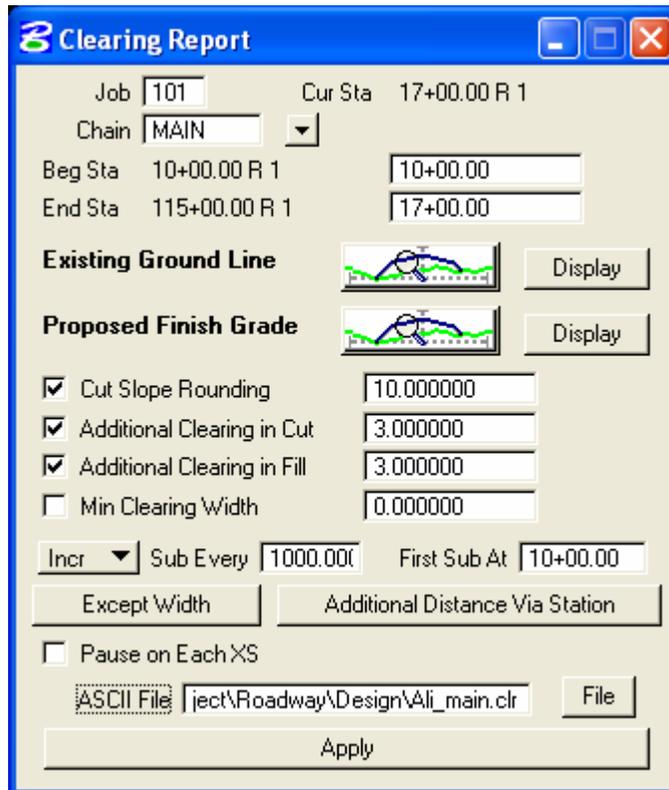


Figure 20-25: Clearing Report Dialog

6. *Make sure you check the Beg Station and End Station to ensure that they are the stations you want. For multiple station ranges, the report may need to be run multiple times. The symbology for the Existing Ground should be set as shown below.*

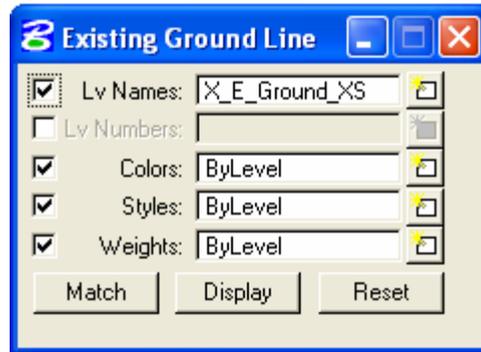


Figure 20-26: Existing Ground Symbology

The symbology for the Proposed Ground should allow GEOPAK to trace completely across from the left catch point, over the top of pavement to the right catch point. To view the selected symbology, pick the symbology button  next to either Existing Ground Line or Proposed Finished Grade. Cut slope rounding, Additional Clearing in Cut, and Additional Clearing in Fill should match what is shown in the typical sections. Each project may have different values. However, typical values are 3.0 m or 10 ft. for Cut Slope Rounding and the Additional Clearing in Cut and Fill should be set at 1.0 m or 3 ft. The increment is set at 500 m or 1000 ft.

7. The Exception Width can be used to subtract out the existing pavement width. CFLHD typically does not subtract the existing pavement out, but this can be used if needed. Press the Except Width button to get the following dialog box. Fill in the beginning station, ending station, and width, then pick the add button as shown.

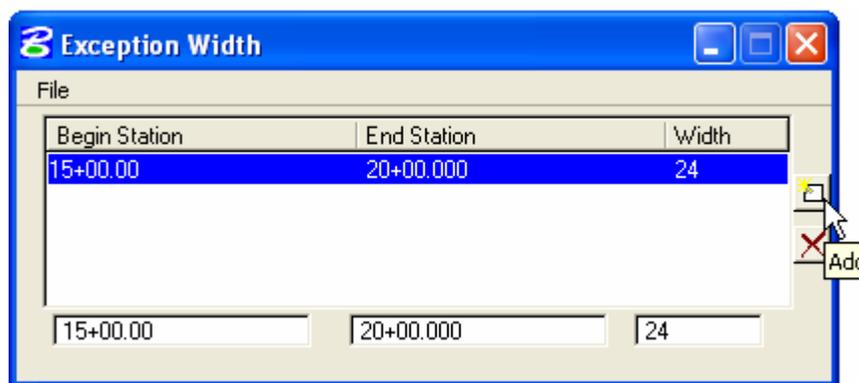


Figure 20-27: Exception Width

8. Close the Exception Width dialog box. Type in the output filename for your Clearing Report, and then select Apply in the Clearing Report Dialog Box. The following output file is produced.



04/25/2006

Project Number  
Road Name  
CLEARING REPORT

Page# 1

```

CUT SLOPE ROUNDING           =      10.0000 Ft
ADDITIONAL CLEARING IN CUT    =       3.0000 Ft
ADDITIONAL CLEARING IN FILL   =       3.0000 Ft
MINIMUM CLEARING WIDTH       =       0.0000 Ft
SUBTOTALS EVERY 1000.0000 Ft. BEGINNING AT STATION 10+00.00 METHOD INCR
ADDITIONAL EXCEPT WIDTH VIA STATION RANGE
15+00.00 TO 20+00.000 = 24.000 Ft
.....
ADDITIONAL CLEARING LEFT SIDE = 0.00 Ft
ADDITIONAL CLEARING RIGHT SIDE = 0.00 Ft
.....
STATION      CLEARING  DISTANCE  EXCEPTION  AREA  SUBTOTAL  AREAS
              LT      RT          WIDTH      SF      SF      ACRES

11+00.00 R 1  29.14   27.33      0.00      5673      0
12+00.00 R 1  29.20   27.79      0.00      5825      5673  0.1302 (ACCUM SF 5673.0000 )
13+00.00 R 1  31.43   28.07      0.00      5845      5825  0.1337 (ACCUM SF 11498.0000 )
14+00.00 R 1  29.89   27.48      0.00      5845      5845  0.1342 (ACCUM SF 17343.0000 )
15+00.00 R 1  29.13   28.11      24.00      3331      3331  0.0765 (ACCUM SF 20674.0000 )
16+00.00 R 1  32.35   27.83      24.00      3472      3472  0.0797 (ACCUM SF 24146.0000 )
17+00.00 R 1  26.50   28.59      24.00      3364      3364  0.0772 (ACCUM SF 27510.0000 )
DEDUCTED ACRES = 0.1377
TOTAL SF = 27510.0000
TOTAL ACRES = 0.6315

```

Figure 20-28: Clearing Report Output

## Workflow 5: Calculating "Seeding" Quantities

1. Follow steps 1 through 3 in workflow 4.
2. Press the Seeding button on the XS Report dialog box.



Figure 20-29: Seeding Button



- This will bring up the following Seeding Report Dialog box. The elements are the same as the Clearing Report with some additional needed information. The Candidate Seeding Element section needs the symbology of the slopes that will be seeded (typically the cut, fill, and ditch foreslope). These are the slopes that will be seeded. The Max Allowable Slope can vary on each project. This slope will be determined during the project, but for preliminary quantity calculations, you should use 1V:2H as the Max Allowable Slope.

Figure 20-30: Seeding Report Dialog

- Pick the Additional Distance button to bring up the following dialog box.

Figure 20-31: Additional Distance



5. Fill in the appropriate values. They should be the same as the Cut Slope Rounding and Additional clearing in fill values used in the Clearing Report. Select OK.
6. Type in the output filename for your Seeding Report and then select Apply in the Seeding Report Dialog Box. GEOPAK will produce the following file.

04/25/2006 Project Number \_\_\_\_\_  
Road Name \_\_\_\_\_  
SEEDING REPORT Page# 1

```

NUMBER OF LEFT CUT SLOPES TO BE BYPASSED = 0
NUMBER OF LEFT FILL SLOPES TO BE BYPASSED = 0
NUMBER OF RIGHT CUT SLOPES TO BE BYPASSED = 0
NUMBER OF RIGHT FILL SLOPES TO BE BYPASSED = 0
ROUNDING DISTANCE FROM CUT SLOPE STAKE = 10.00 Ft
MAXIMUM ALLOWABLE SLOPE FOR SEEDING/SODDING 1.0000 / 2.0000 Rise over Run
ADDITIONAL SEEDING LEFT SIDE = 0.00 Ft
ADDITIONAL SEEDING RIGHT SIDE = 0.00 Ft
ADDITIONAL SEEDING IN CUT = 3.00 Ft
ADDITIONAL SEEDING IN FILL = 3.00 Ft
SUBTOTALS EVERY 1000.0000 Ft BEGINNING AT STATION 10+00.00 METHOD INCR
SCALING FACTOR = 1.00000 WITH LABEL [ SF ]
  
```

STATION	SLOPE DISTANCE		AVERAGE SLOPE DIST		A R E A		SF BOTH	SUBTOTAL LT	A R E A		SF BOTH
	LT	RT	LT	RT	LT	RT			RT		
11+00.00 R 1	20.51	16.90						0			0
	( 37.41)		26.83	22.42	2683	2242	4925				
12+00.00 R 1	33.14	27.94									
	( 61.08)		33.09	22.71	3309	2271	5580				
13+00.00 R 1	33.04	17.48									
	( 50.52)		33.03	22.90	3303	2290	5593				
14+00.00 R 1	33.02	28.32									
	( 61.34)		31.25	30.40	3125	3040	6165				
15+00.00 R 1	29.48	32.48									
	( 61.96)		31.29	29.35	3129	2935	6064				
16+00.00 R 1	33.10	26.22									
	( 59.32)		33.14	28.03	3314	2803	6117				
17+00.00 R 1	33.19	29.84						18863	15581		34445
	( 63.03)										
TOTAL	LEFT	RIGHT			BOTH						
SF=	18863.0000	15581.0000			34445.0000						
ACRES=	0.4330	0.3577			0.7907						

Figure 20-32: Seeding Report Output

**Related links:** Using Knucklehead's Guide for GEOPAK Road 2004 Edition.

[Clearing Notes](#)

[Seeding Notes](#)