XS Reports & Limits of Construction

16.1 XS Reports

Objectives	Create various cross section reports: - for plan use (design elements and quantities) - as input for other programs and/or applications of GEOPAK - for construction layouts. Create and draw construction limits in the plan view file.	
Project Manager	Reports and XS Quantities Limits of Construction	
Tools	Cross Sections	
Menu Bar Application	GEOPAK Road > Cross Sections > Cross Section Reports GEOPAK Road > Cross Sections > Construction Limits	

The GEOPAK Cross Section Report Utility can extract up to sixteen different reports from original and design cross-sections. For each report generated, the user must set the parameters of the existing and/or design cross sections. GEOPAK also provides an option to make custom headers for each of the reports via the **User** pull down menu.

16.1.1 Custom Header



From the XS Report dialog box, select **User > Preferences.** A Report Header dialog box will appear with all options ghosted out. To activate the individual fields simply toggle on the box next to the desired field. Once you have completed the dialog box, the information will be saved as an .hdr file. This allows for the creation of a separate header for each type of report. The tolerance field determines the maximum gap allowed between cross section elements.

SXS Report
User
Blue & Red Top
Clearing
Closure
DTM Input
DTM Prop 3D
HEC-2
HEC RAS
Multi-Line
Profile Grade
Radial Staking
RT40
Seeding
Slope Stake
Staking Detail
WSPRO
XS List
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😤 Report Header	×
File	
🗖 Date	Mo/Day/Year
Master Header1	
Master Header2	
Master Header3	
🔽 Number Page	
Tolerance	0.010000
Radius of Display Circle:	4.000000
🔲 Adjust Output File E	xtension According to Report

16.1.2 Blue and Red Top

Based on the dialog box settings, GEOPAK determines the offset and elevation of a slope and its breakpoints. Blue refers to the top of pavement and Red is the top of subgrade. The user must determine this by indicating text and level, color, weight and style for each surface.

16.1.3 Clearing

The **Clearing Report** is useful for obtaining clearing and grubbing quantities. For each station, GEOPAK will list the clearing distance on each side of the chain and the width of any exception. You can obtain the results in the appropriate units. Toggle boxes for Cut Slope Rounding, Additional Clearing in Cut and Fill, and Minimum Clearing Width are provided for increased control over the output.

GEOPAK can also generate quantity sub-totals based on the value specified in Sub Every.

To use the **Except Width** option, you must have an existing ASCII file that includes the Beginning and Ending Station and Exception Width.

Once everything is set, you can output the information to an ASCII file

16.1.4 Closure

The **Closure Report** provides information on the intersection point between the user defined proposed finish grade and existing ground. In addition to the ASCII report, the designer may instruct GEOPAK to close any gap either by drawing a vertical line between the endpoint of the proposed finish element and the existing ground or extending the slope of the last proposed element to intersect existing ground. The procedure will not extend existing ground. The **Closure Report** can be accessed within any MicroStation cross section file by selecting Closure from the main XS Reports dialog box.

16.1.5 DTM Input

This process generates XYZ coordinates from cross section elements and places this information into an ASCII file for use by the DTM portion of GEOPAK. To use this dialog box simply enter the .gpk job number, chain name and station range. GEOPAK will read the cross section elements based on level, weight, color and style.

16.1.6 DTM Proposed 3D

This report is similar to DTM Input except that you can set both original and proposed cross sections at the same time. This report also differs in that it makes break lines across the cross sections.

16.1.7 HEC - 2

This process reads cross section elements and formats the information in an ASCII text file suitable for use in the HEC-2 hydraulic program.

16.1.8 HEC RAS

This process reads cross section elements and formats the information in an ASCII text file suitable for use in the HEC RAS hydraulic program.

16.1.9 Multi-Line

This report is useful in creating cross-sections for staged construction. Begin by entering the job number, chain name and station limits. Primary cross section element parameters must be completed before secondary element parameters. This is important due to the order in which GEOPAK reads the information. Once all the parameters have been entered, the new cross sections may be drawn to the design file or you may choose the display only option. An ASCII text file will be generated.

16.1.10 Profile Grade

The **Profile Grade Report** is one of the most versatile reports available. It prints existing ground and design grade elevations and low point elevations for each cross section. Additionally, this report has the ability to search either for the low points or any text string that you specify and create horizontal and vertical alignments and store them directly into the .gpk. Horizontal alignments created from this report will have no curves.

16.1.11 Radial Staking

The **Radial Staking Report** is a specialized report created for the U.S. Federal Highway Administration (FHWA).

16.1.12 RT 40

The **RT 40 Report** produces RDS based RT40 data. To use this dialog box simply fill in the job chain name, stationing range and the parameters of the cross section elements you wish to use.

16.1.13 Seeding

Other than the usual entries, the user must enter the parameters of the elements to be seeded.

This dialog box includes slope and subtotal options as well as a way to limit the number of segments read (**By-Pass Segments**). The user may also establish additional seeding specifications (**Additional Distance**).

Once all of the settings are complete, the report will produce seed or sod quantities written to an ASCII output file for use in plan quantities.

16.1.14 Slope Stake

The **Slope Stake Report** is a special format report developed for the FHWA. This report generates offsets, elevations and superelevation information for each cross section. To generate this report fill in the usual cross section parameters plus Subgrade and Hub Staking information. When complete, push Apply and the report is written into an ASCII file.

16.1.15 Staking Detail

The **Staking Detail Report** determines the tie down point between the proposed finished grade and the existing ground. GEOPAK will list the right and left offset, elevation, and slope of the finish grade and superelevation rate for each cross section. To create this report, fill in the project information and desired cross section elements' parameters. Once complete, you have the choice between two formats, a FHWA ASCII report or a Montana DOT report (includes ditch elevations).

16.1.16 WSPRO

This report takes the cross section elements and turns them into an ASCII file for use as input in the WSPRO hydraulic analysis program.

16.1.17 XS List

This report creates a listing of elevations and offsets for each cross section element according to user defined parameters. You have the option of creating either an original cross section list or a design cross section list. These reports are very similar to RDS cross section lists.

16.2 Limits of Construction

Project Manager	Limits of Construction. Note a run must be created.	
Tools	Cross Sections	
Menu Bar Application	GEOPAK Road > Cross Sections > Cross Section Reports GEOPAK Road > Cross Sections > Construction Limits	

When the **Limits of Construction** dialog box in invoked, the Limits of Construction dialog box opens.

The user must specify the Job number, the chain name, and the file containing the plan view information. The **Existing Ground** and the **Proposed Finish Grade** sections should be filled by the run if Project Manager is utilized.

The **Parameters** button opens the dialog box below. The symbology for the cut, fill, and transition construction limits can be set in this dialog box.

2 Plot Parameters for Construction Limits	ĸ
_ Cut	
Level 22 Weight <u>5</u>	
Color 2 Style	
Fill	
Level 22 Weight <u>5</u>	
Color 3 📕 Style ———	
Transition	
Level 22 Weight5	
Color 4 Style	
Place Construction Limit Offset From CL	
Parameters	
OK Cancel	

<mark>8</mark> Limit of Consti	uction X
Job 101	Cur Sta 200+00.00 R 1
End Sta 200+00	0.00 R 1 220+00.00 R 1
Plan Dgn C:\da	ta\geo\vdot\road1\d17682des. Files
Existing Grour	nd Line
Level 1	Color 0
Weight 1	Style 0
Proposed Fini	sh Grade
Level 2-4	Color 0-253
Weight 0-15	Style 0-7
Parameters	s Radius of Display 5.000000
Tie Down Option	All Tie Downs
	Apply

The **Place Construction Limit** toggle allows the user to place various text strings along the construction limits. Selecting the Parameters button, and making the desired changes in the dialog box shown on the next page will set the symbology for these text strings.

Place Construction Limit

 Offset From CL
Elevation
Depth From CL
Prefix/Suffix

The **Radius of Display** field is the size of the display circle when GEOPAK is scanning the crosssections.

The last option in the main **Limits of Construction** dialog box is the **Tie Down Option**. There are two **Tie Down Options**. If the **All Tie Down** option is set, all tie downs within a section are plotted. (I.e. wide medians, outer roadways, ramps, etc. may have tie downs in between the limits of the main roadway, and the outer roadway or ramp.) If the **Outer Tie Down** option is selected, then only the outmost tie downs are plotted.

<mark>8</mark> Plot Parameters for	Labels X
Cut Prefix	
Level 53 V Color 5 -	Veight 0 Font 1 5000 Decimal 0
T Orientation Re	Introduct Introduct Iative 0.0000000 LT Offset 10.000000
	Left Left
ОК	Cancel

Once the **Apply** button is clicked, the limits of construction and the optional text are drawn into the plan view file at the specified symbology.

😤 XS Report

Blue & Red Top

Clearing Closure

DTM Input

DTM Prop 3D

HEC-2 HEC RAS Multi-Line Profile Grade Radial Staking RT40 Seeding Slope Stake Slope Stake Staking Detail WSPR0 XS List

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User

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LAB 16: Cross Section Reports, Driveway Profiles, and Limits of Construction

16.1 Cross Section Reports

- Step 1. Execute C:\data\geo\VDOT\road1\LAB16.EXE.
- Step 2. Open c:\data\geo\vdot\road1\d17682xsmainline.dgn.
- Step 3. Access Project Manager.
- Step 4. Select Reports and XS Quantities.
- **Step 5.** From the XS Reports dialog box, select the **User > Preferences** dialog box.

Report Header		X 😤 XS Report 🔹
Date	Mo/Day/Year	Preferences
Master Header1		Clearing
Master Header3		Closure
🔽 Number Page		DTM Input
Tolerance Badius of Display Circle:	0.010000	DTM Prop 3D
Adjust Output File Extension According to Report		HEC-2
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Set the tolerance to .01.

Dismiss the Report Header dialog box.

Step 6. From the XS Reports dialog box, select the Profile Grade report.

We are going to use this report to create a Chain and Profile along our left edge of shoulder. We'll use this information later to help in the creation of our driveway profiles.

GEOPAK[®]

Step 7. Fill out the **Profile Grade** dialog box as shown and click **Apply**. To add the Text Search information to the collection box, push the **ADD** button. (Store Text: **EOSLOUT**)

Profile G	irade Report
ile	
Job 🛛	101 Cur Sta 200+00.00 R 1
Chain 🖡	MAINLINE Profile mainline
Beg Sta	200+00.00 R 1 200+00.00 R 1
End Sta	220+00.00 R 1 220+00.00 R 1
Existing	Ground Line
Leve	Color 1
Weigh	5 Style 2
Propose	d Finish Grade
Leve	2-13 Color 0-255
Weigh	0-15 Style 0-7 Select
Text Text	Chain Profile Preference
Store Add	eosi eosi i ext Alig Text: eoslout Sta Text Alignment e Prof eosi I Store Chain feosi Delete Modify
Beginnin	g Point Number D5000
ASCII F	le eosi101.ivd File

- **Step 8.** After processing is complete, dismiss the dialog box.
- Step 9. Access COGO.
- **Step 10.** Access COGO Navigator using the icon



or use the **Tools > Navigator** pulldown.

Step 11. Use the **Chain** option to see a list of the stored chains. Notice **EOSL** has been stored.





Step 12. Use the **Profile** option to see a list of the stored profiles. Notice **EOSL** has been stored

- Step 13. Exit COGO.
- Step 14. From the XS Reports dialog box, select the DTM Input report.

We'll use this report to create a proposed model (dtm) from our cross sections. We'll also use this information later in the creation of our driveway profiles.

Step 15. Fill out the DTM Input dialog box as shown and click Apply.

Creating DTM Input Fil	e		×
Job 101 C Chain MAINLINE	ùurSta]	200+00.00 R	1
Beg Sta 212+55.93 R 1		200+00.00 R	1
End Sta 213+68.55 R 1		220+00.00 R	1
⊤XS Elements		3 	
Level 2-4	Color	0-255	Select
Weight 0-15	Style	0-7	
Pause on Each XS			
ASCII File proposed.dat	t		File
	Apply		



Note: The levels for XS Elements should only refer to 2-4. These are the levels that make up the top of Finish Grade.

Note that in Step 15 we only created a .dat file. This is an ascii file that is used to create the DTM. We'll create the dtm in the next section.

Step 16. After processing is complete, dismiss the DTM Input dialog box.

Step 17. Also dismiss the XS Reports dialog box.

16.2 Driveway Profiles

Step 1. Before beginning the process to create the driveway profiles, we'll need to create the proposed DTM.

Select the **Existing Ground** button from the **Road Project: 17682.prj** workflow dialog box.

- Step 2. Select the previously created run 'ground1' and press OK.
- Step 3. Select the Build Triangles icon from the DTM Tool Palette.



Step 4. Fill out the Build Triangles dialog box as shown and click Process.

😤 GEOPAK - Build Triangles	×
Data File : proposed.dat	Files
TIN File : proposed.tin	Files
Dissolve Option : Side	
Side Length : 30.000000	
Process	

- **Step 5.** Dismiss the **Build Triangles** dialog box. When prompted to save settings, push **Yes**. Dismiss the **DTM Tool Palette**.
- Step 6. Open the Microstation design file c:\data\geo\vdot\road1\d17682work.dgn.

Note that pattern lines have been placed at the driveway locations. These pattern lines have the following symbology: LV=51, CO=2, WT=2.

- Step 7. Open the Microstation design file c:\data\geo\vdot\road1\d17682driveways.dgn.
- Step 8. Select the Existing Ground Cross Sections button from the Road Project: 17682.prj workflow dialog box.

Create a new run 'driveway' and click OK.

Cross Sections	S Draw Cross Sections
Job Number: 101 🔽 Chain: MAINLINE 🔽 Draw	Job Number: 101 🔽 Chain: MAINLINE 🔽 Draw
XS Cells Surfaces	XS Cells Surfaces
┌ Pattern	Type Name Display Settings Method
By DGN File 🔻	TIN survey.tin L:1 C:1 W:5 S:2 Triangles 🔁
Design File: d17682work.dgn	TIN proposed.tin L:1 C:4 W:3 S:0 Triangles
☑ Level: 51 Select ☑ Line	×
☑ Weight: 2 Select ☐ Line String	
Color: 2 Match Reset	Details
Style: 0 Select Display	TIN File: proposed.tin 🕞
	Method: Irlangles V Iype: Line V
Scale Spacing	Display Settings Filter Tolerances
Horizontal: 10.00000 Horizontal: 1000.000	By Level Symbology ▼ Lv 1 Horizontal: 0.3000
Vertical: 10.00000 Vertical: 500.0000	Feature: 🔽 🛃 Variance: 0.1000
Number of XS by Column: 20	Taut Calling

Step 9. Fill out the dialog boxes as shown and click Draw.

Proposed Surface Symbology (lv = 1, co=4, wt=3, lc=0)

Existing Surface Symbology (lv=1, co=1, wt=5, lc=2)

Step 10. Dismiss the Draw Cross Sections dialog box and Save Settings.

Review the ground lines drawn. Notice that the proposed ground line may not terminate precisely on the existing ground. This is because elevations are being interpolated between proposed cross sections.

You can tie this down manually or you can use the XS Reports > Closure Report.

Step 11. Select the Proposed Cross Sections button from the Road Project: 17682.prj workflow dialog box.

Create a new run 'driveway' and click OK.

Step 12. Fill out the XS DGN File category as shown:



Step 13. Fill out the **Pattern** category as shown:

S Proposed Cross Sections - driveway	
<u>Files</u>	
XS DGN File Image: Constraint of the second second second shapes Existing Ground By DGN File Existing Ground By DGN File Chain MAINLINE Shapes Chain Define DGN Variables File Define Variables DGN File Plot Parameters Image: Colors Veight Select Weight Select Image: Colors Image: Colors	I 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
Match Display Reset	<u>OK</u> Cancel

Step 14. Fill out the Existing Ground category as shown:

Proposed Cross Sections - Driveway	×
Files XS DGN File Pattern Existing Ground Shapes Shape Clusters Define DGN Variables Plot Parameters Veight Select Types Match Display	Files 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

×

Step 15. Fill out the **Shapes** category as shown:

iles	
XS DGN File Pattern Existing Ground Shapes Shape Clusters Define DGN Variables Define Variables Plot Parameters	Use Working Alignment Definitio

Step 16. Under the **Shape Clusters** category, add the Mainline chain and profile to the list box as was done in previous exercises.

Typical Thick
Thick
Coloot
<u>s</u> elect
Down
An

Step 17. Press the Typical button to access the Typical Section Generator.

Select the Typical ENTR and press Apply.



NOTE: Press the **Description** button and review the documentation.

Step 18. Your dialog box should fill out automatically and look like the following:

20 DOM ET	Chain	Tie/PGL	Profile	
KS DGN File	MAINLINE	0.000000	MAINLINE	Typical
Existing Ground				Thick
Shapes	11			THICK
Shape Clusters				
Define DGN Variables	Chain MAI		0.0000 Des 140	
Define Variables				AINLI <u>S</u> elect
Plot Parameters	✓ Add	Modify	Delete Up	Down
Side Slope Condition				
Side Siope Condition				
LT				
RT				
	14 - 15	1.00		
Define M	1odify	Delete	Up	Down
Denne				
Denne				
Criteria File				
Criteria File				
Criteria File	ance.x.			
Criteria File	ance.x.			

Step 19. Select the Define Variables category. Modify the following variables as shown:

Name of Working File	d17682work.dgn
Name of Cross-Section File	d17682driveways.dgn
Lt Ent Take-Off Align Name	EOSL

Step 20. Select the **Plot Parameters** category and fill out as shown. Don't forget to set the Line Text level to 63 as in previous exercises.

KS DGN File Pattern Existing Ground Shapes Shape Clusters Define Uasters Define Variables Pot Parameters	XS Lines Level 2 Weigl Color 0 Sty Text V Line Text Station Text Baseline Name Text	Define Define
Plot Pavement Thickness Fill Gaps Between Clu Transition Definition Intersect between Clu	I.O Isters ALL Isters	
 Process Clusters as In Remove Skewed Effective 	ndicated ect	

- **Step 21.** Process the cross sections. When complete, Exit the run but don't forget to **Save Settings**.
- Step 22. Review the Driveway Profiles using XS Navigator.

16.3 Plan View Limits of Construction

- **Step 1.** Open the Microstation design file c:\data\geo\vdot\road1\d17682xsmainline.dgn.
- Step 2. From the Road workflow dialog box, select Limits of Construction. Create a run called Mainline.
- Step 3. Populate the Limits of Construction dialog box as shown:

8 Limit of Construction	×
Job 101 C Chain MAINLINE Beg Sta 200+00.00 R 1 End Sta 220+00.00 R 1	ur Sta 200+00.00 R 1 Tolerance 7.750000 200+00.00 R 1 220+00.00 R 1
Plan Dgn d17682des.dgn	Files
F Existing Ground Line -	
Level 1	Color 1
Weight 5	Style 2
┌ Proposed Finish Grade	
Level 2-13 Weight 0-15	Color 0-255 Style 0-7
Parameters	Radius of Display 5.000000
Tie Down Option All Tie	Downs
	Apply

Step 4. Click the Parameters button to open the Plot Parameters dialog box. Populate as shown:

Plot Parameters	for Construction Limits
Cut —	
Level 22	Weight 5
Color 2	Style
Fill ———	
Level 22	Weight 5
Color 3	Style
Transition —	
Level 22	Weight 5
Color 4	Style
Place Constructi	on Limit Offset From CL
F	Parameters
OK I	Cancel
immi	

2 Plot Parameters for Const	Plot Parameters for Construction Limits 🛛 🗙	8 Plot Parameters for Construction Limits
Cut	Cut	Cut
Level 22 Weight	Level 22 Weight 5	Level 22 Weight 5
Color 3 Style	Color 3 Style	Color 3 Style
Transition	Transition	Transition
Color 4 Style	Level 22 Weight Color 4 Style	Color 4 Style
Place Construction Limit Offset From CL	Place Construction Limit Offset From CL	Place Construction Limit
Parameters	Parameters	Parameters
OK Cancel	OK Cancel	OK Cancel

Note: Cut Line Style = 5; Fill Line Style = 3; Transition Line Style = 4

- Step 5. Click OK to close the Plot Parameters dialog box.
- Step 6. Click Apply to process the Limits of Construction.
- Step 7. Exit the Limits of Construction dialog box and Save Settings. Review the limits of construction in c:\data\geo\vdot\road1\d17682des.dgn.

Since GEOPAK does not create the Limits of Construction exactly like VDOT would like to see them, we will use a special application to update them to the correct symbology.

- Step 8. From the Road workflow dialog box, select Plan View Design.
- Step 9. From the Plan View Design tool palette, select **D&C Manager**.
- **Step 10.** Navigate to the category **Road Design > Special Applications**.
- **Step 11.** Important! Make sure that all of your Limits of Construction are shown in View 1.
- Step 12. Within this category, double-click on the item Update LOC.
- **Step 13.** At the following prompt, click **OK**.

Prompt	
All L.O.C. must be displayed in V	liew before processing!
DK	Cancel

Step 14. Enter the Job Number as shown and click **OK**.

Prompt	
Enter GEOPAK Job Number:	
101	
OK	Cancel

Step 15. Enter the baseline name as shown and click OK.

Prompt	
Enter Baseline Name:	
MAINLINE	
OK	Cancel

Step 16. Set the units to English as shown and press OK.

Prompt	
Select Units:	
English	•
OK	Cancel

Step 17. Set the scale as shown and click **OK**.

Prompt	
Select Scale:	
25	▼
OK	Cancel

Step 18. Dismiss D&C Manager and review the changes made to the Limits of Construction.

Step 19. Exit MicroStation.