SW-DTM

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Softwel (P) Ltd.
GPO Box 1062, Kathmandu, Nepal
Phone: 977-01-4473923/4476182
Email: Softwel@welcon.wlink.com.np
http://www.welink.com.np/Softwel

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Preface

Overview of SW_DTM

SW_DTM is a complete package solution for Digital Terrain Modeling that is efficient, powerful, accurate and easy to learn. The Program has interactive module with easy to use menu system for the plotting of survey points, triangulation and plotting of contours at any contour interval as specified by the user along with the contour annotation. The Program can extract data and draw profile / cross-section for any number of alignments and can be plotted in AutoCAD in any scale along with the data extraction.

This Program has been tested and used by WELINK Consultants in a large number of projects and now, many domestic and international consultants including NEDECO / DHV are using it.

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About the Manual

The user manual contains the following chapters to guide SW_DTM software:

Chapter 1- Introduction SW_DTM

- Provides assistance for the commencement of software.
- History of the establishment of the **SW_DTM.**
- Contains the brief description of the different projects that utilize this software.

Chapter 2 – SW_DTM

- Highlights the contents of **SW_DTM.**
- Analyses the Data Files.
- Demonstrate the format of the **SW_DTM.**
- Summarize of input and output sheets
- Instruction for running of the **SW_DTM** program.
- Tips for loading the commands.

Chapter 3 - Commands

- Describes all the functions of the commands of the software.

Chapter 4 – Procedure

- Describes the steps of the SW_DTM for execution.
- Shows how to Import Points, Triangulation and Contouring along with Profile and Cross-Sections.

SW-DTM

Convections used in this Guide

The following convections are commonly used throughout the manual. Occasionally, when a menu item is referenced, its path will be written as:

> **Menu Name > Submenu > Sub-Submenu,** which follows the order of selection that the user must take.

- Menu Name refers to the parent name for a pull-down menu.

- Submenu refers to an item in the contents of the pull-down menu.

- Sub-Submenu refers to an item in the contents of a menu, stemming from a Submenu

For example: - **X-Section > Profile…** refers to the **X-Section > Profile….**option, located in the **X-Section** pull-down menu.

CHAPTER-I

INTRODUCTION

SW-DTM

INTRODUCTION

SW_DTM: Digital Terrain Modeling / Contouring

SW_DTM is a Digital Terrain Modeling and Contouring software package. **SW_DTM** has been developed by SOFTWEL (P) Ltd. and it runs in Windows platform. The main executive module is programmed in Visual Basic for Applications. This encompasses many different areas of expertise, which provide a means of storing, processing, analyzing, retrieving and using data. It includes an immense amount of capabilities to work with different types of data at the same time. The program import points of DATA file from Excel to AutoCAD in true co-ordinates and elevation.

It is convenience to generate or erase any number of points in AutoCAD. The points, so imported is associated with an attributed block showing point number, remarks and elevation. The program interprets these points and then triangulates these points with the **Delaunay Triangulation method**. The triangles, so formed can also be drawn and modified in AutoCAD. Operating the various features mentioned in the program provides the excellent Triangulation and Representation of Contour.

Main theme for the formation of this software is not only to analyze the contour but also to lay contours. The software can draw contour in AutoCAD at any user specified contour interval with proper contour annotation.

The program can draw Profile / Cross Sections in AutoCAD at any scale as specified by the user for any number of Alignments and generates data for the Profile and Cross-Sections. The output to DTM is obtained in the form of an AUTOCAD map. This delivers the data user a much friendlier presentation of data providing a much more powerful tool for decision making. The work achieved in **SW_DTM** can be obtained in printable form. The data extracted for profile and cross-section by **SW_DTM** is ready to use by another software; **SW_ROADS** if incase.

The software has been implemented successfully in a number of projects undertaken by **WELINK Consultants (P) Ltd**. Many domestic consultants like **Soil Test, RNDP** as well as few international consultants including **DHV/NEDECO** are working with this software.

Specifications

- A Complete Worksheet for the calculation of co-ordinates from the field Survey Data
- Interactive module for plotting of survey points, triangulation and plotting contour at any contour interval in AutoCAD
- Features like addition of Feature lines and deletion of triangles
- Features like contour annotation, writing spot height and changing attribute size as specified by the user
- Features like extracting data and plotting profile / cross-section for any number of Alignment.

Minimum System Requirements

- Computer with Pentium III processor or higher and at least 128 MB RAM (512 MB recommended)
- Excel 7.0 or advance
- AutoCAD 2000 or higher versions
- Windows XP

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INSTALLATION AND SOFTWARE INITIALIZATION

INSTALLATION:

SW_DTM is provided in a CD and the program should be installed from the CD. Simple instructions should be followed to install the program.

a) The CD-ROM contains the Directory **SW_DTM**
b) Open this directory and run the **Setup Icon** (by double clicking)
c) Select directory of installation as "**C:\SOFTWEL\SW_DTM**" and follow the instructions from screen for proper installation.
d) The program will automatically generate a shortcut in "Program" menu as ***SOFTWEL PROGRAMS > SW_DTM***

Upon installation, the program makes following files to its default directory **C:\Program Files \SW_DTM.**

1.   **SW_DTM .exe**: *Main executive module for Digital Terrain Modeling*
2.   **Triang1.exe**: *Main executive module for Triangulation*
3.   **Dtm_Sample.xls**: *Sample Excel Data file calculation of Co-ordinates*
4.   **Contour.exe:** *Application file for extracting sections from contour.*
5.   **Profile.exe:** *Application file for profile drawing in AutoCAD.*
6.   **Sample.dwg:** *Sample drawing file*

*All these files are supplied as "**Read only**" so that the format is protected. All these files except for the Excel File should always be in the same directory.*

Notes:

The **SW_DTM** program is protected through hardware key lock. The hardware key is provided with the program CD which is needed for both the installation and operation processes. The serial number provided with the software CD is required to continue with the installation.

By double clicking the setup icon, the program will launch the setup process. Follow the simple steps of General software setup. Provide the Serial number provided with the CD and click Install. Note that the hardware key must be connected throughout.

CHAPTER-II

SW_DTM

Input Data

Data File

The spreadsheet **Dtm_Sample.xls** has been developed for the calculation of co-ordinates for the Tachometry Survey Data. The spreadsheet **Dtm_Sample.xls** contains five Sheets. These sheets are linked with each other and most of the Cells in these Sheets contain formulae so,
- *Do not ever move the cells.*
- *Do not overwrite the formula containing cells.*

A. Softwel

This sheet is the introductory sheet containing the information about the Softwel (P) Ltd., and the sheet name.
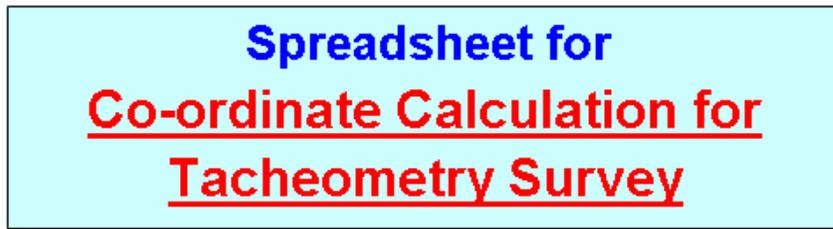
Fig: 2.1

B. Station Data

In this Sheet, the data used in all the stations are entered. The data (**Station Name**, **X-Coordinate**, **Y-Coordinate** and the **Z-Coordinate**) entered in this sheet are used to calculate the co-ordinates of all the other points taken from these stations, hence care should be taken to enter the data in these cells as all the points are plotted in respect to these data.

TRAVERSE DATA

Note: Edit these data with actual data and MODIFY the range of name "STA_DATA".

DO NOT MOVE ANY CELL

Station	X	Y	RL
BL-1	2000.000	2000.000	500.000
BL-2	2104.710	1965.322	500.245
BL-3	2043.820	1864.832	499.671
TP-1	2137.125	2065.936	499.943
TP-2	2013.296	1743.204	499.651

Table no. 2.1

C. Tache-Degree Format

This Sheet calculates the co-ordinates if the data is in degree format. All the surveyed data is entered in the Data Entry table and the formula in the Calculation part and the Final Data will be copied till the last row of the data entry. This generates the required data in the Final result.

TACHEOMETRIC POINTS ENTRY
SYSTEM : DEGREE WITH STAFF READING

PROJECT : Design of Jhang River Bridge

Data Entry

Ins Station	Back Station	Height of Instrument	Target Point No	Horzontal Angle				Vertical Angle				Slope Dist.(m)	Target ht. (m)	Remark
				D	M	S	DD	D	M	S	DD			
BL-1	North	1.468	North	0	00	00	0.0000							
			BL-3	162	04	20	162.0722	90	15	40	90.2611	142.40	1.20	
			BL-2	108	10	00	108.1667	89	56	20	89.9389	110.20	1.40	
			1	275	26	20	275.4389	90	10	40	90.1778	104.00	1.20	
			2	277	54	40	277.9111	90	13	20	90.2222	101.00	1.20	
			3	270	42	20	270.7056	90	09	00	90.1500	77.80	1.20	
			4	276	42	40	276.7111	90	01	40	90.0278	75.20	1.20	

Table no. 2.2

D. Final data

The sheet of Final data can be removed and added according to the user requirement. Components of final data can be altered according to the user and depends on the instrument used in the survey.

Calculation

Ins Station	Back Station	ST. Co-ordinates		R.ST. Co-ordinates		dX	dY	Bearing of RS	Actual Bearing	Horz. Diatance	Vertical Difference	Height of Instrument	RL of Station
		X	Y	X	Y								
BL-1	North	2000.000	2000.000					0.0000	275.4389	103.9995	-0.3227	1.468	500.000
BL-1	North	2000.000	2000.000					0.0000	277.9111	100.9992	-0.3917	1.468	500.000
BL-1	North	2000.000	2000.000					0.0000	270.7056	77.7997	-0.2037	1.468	500.000
BL-1	North	2000.000	2000.000					0.0000	276.7111	75.2000	-0.0365	1.468	500.000
BL-1	North	2000.000	2000.000					0.0000	267.2333	79.0000	-0.0306	1.468	500.000

Table no. 2.3

Final Data for Point Plotting

	Data for Processing			
Point No.	X	Y	Z	Remarks
1	1896.469	2009.857	499.945	
2	1899.962	2013.901	499.876	
3	1922.206	2000.958	500.064	
4	1925.315	2008.788	500.232	
5	1921.092	1996.187	500.237	

Table no. 2.4

E. Join Points:

To provide details on the map according to the user requirement **'Join points'** sheet can be utilized. It is prohibited to insert rows above the title row of the tables given and columns in front of the remarks column of the **'Points collection'** table.

		Note :-	0 for 2d polyline											
			1 for 3d polyline											
Points Number to be joined					Points Number to be joined				Points Collection					
Layer Name	From	To	Type		Layer Name	From	Type		S.n	X	Y	Z		Remarks
GW	10	30	0		GW	10	0		1	655093	3075802	779.913		
	50	70	0			50			2	655194.1	3075837	778.725		
REL	250	300	1			100			3	654973.9	3075641	797.928		
	350	360	1			105			4	654959.6	3075616	800.862		
RER	370	410	1			107			5	654959.7	3075616	800.885		RW:J0
						103			6	655188	3075834	778.867		j1
						102			7	655190.8	3075842	778.94		j1

Table no. 2.5

Outputs

Outputs of the DTM are listed as:

➢ DTM software analyses the data obtained from the field and plots the survey points in the AutoCAD.

➢ A Complete Worksheet for the calculation of co-ordinates from the survey data.

➢ It allows the user for triangulation and creates the boundary for triangulation according to the requirement of user.

➢ This software plots contours at any interval and provides contour annotation.

➢ Features can be inserted and added in AutoCAD directly. Features can be drawn by analyzing the data from the excel sheets too.

➢ Spot height, grid and attribute size manipulation can be obtained easily.

➢ It can extract data and plot profile and cross-section for any no of alignment.

➢ It provides accurate result that makes easier to work for the surveyors and engineers.

INSTRUCTIONS

Running the Program

- Open **Dtm_*Sample.xls*** file and Save the file with "**SAVE AS**" to some appropriate file name in your working directory for the new design works. It is better to save the file as you open it.
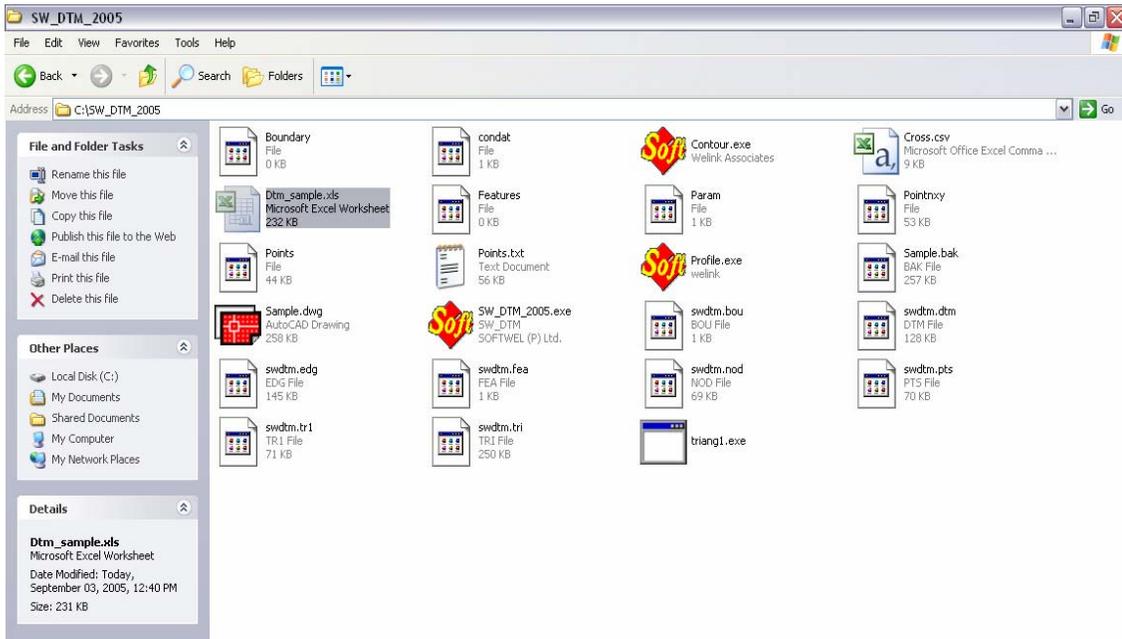
Fig: 2.2

- Start to input data for the new survey works in the excel sheet as provided, or put points collections into it from other data files.
- Start "**AutoCAD**" or leave the program to open it.
- The program, for Digital Terrain Modeling or Contouring **SW_DTM** has interactive module for easiness to use menu system.

This checks whether AutoCAD exists or not, in case it does not exists then it opens **AutoCAD** .The outlook of the **SW_DTM** as below.
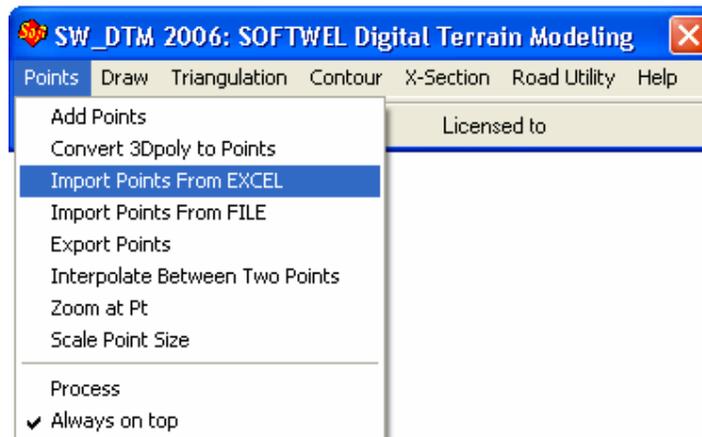
Fig: 2.3

CHAPTER-III

COMMANDS

COMMANDS OF SW_DTM

❖ POINTS

It is the first command prompt of **SW_DTM**. It allows the user to perform various configurations which are listed below:
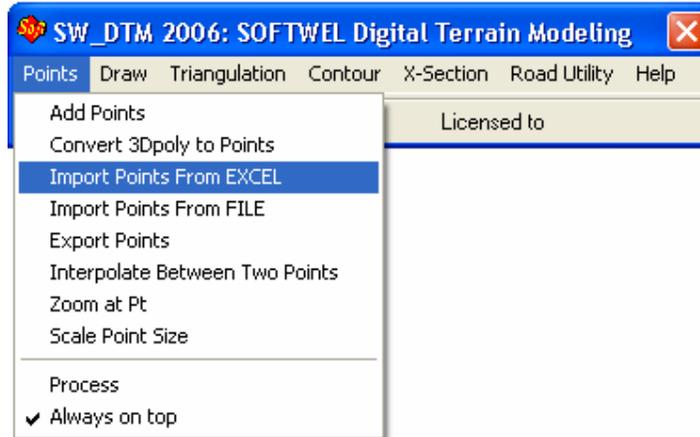
Fig: 3.1

A. Add Points

It allows adding points with point no., block size, location of point and elevation of the point.

B. Import Points from EXCEL or FILE

It helps to import points from the excel sheet, '.txt','.pnr','csv','pts' files to AutoCAD.

C. Export Points

Points can be exported from AutoCAD to desired location in '.txt','.pnr','csv','pts' files format.

D. Zoom at point

It helps to zoom the specified point.

E. Scale Point Size

This commands provides scaling option to the all the points in the drawing.

F. Process Points
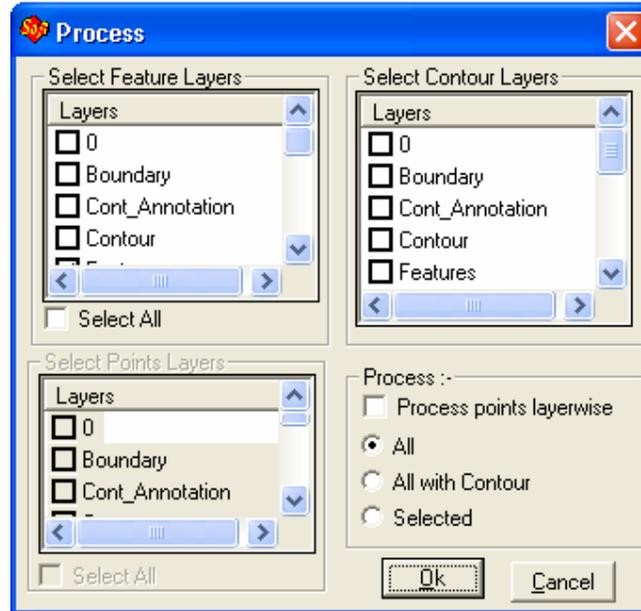
Fig: 3.2

This command processes either All or selected points on the selected layer and selected features lines and selected contour lines as feature lines.

This command processes all the imported points. Processing of points should be done every time before commencing another command if any changes like adding or removing points, feature lines, boundary lines etc., is made. It also checks all the feature lines and boundary lines if any.

❖ DRAW

Draw command allows the user to add features, draw features and insert block. This should be followed after the Process all the points.
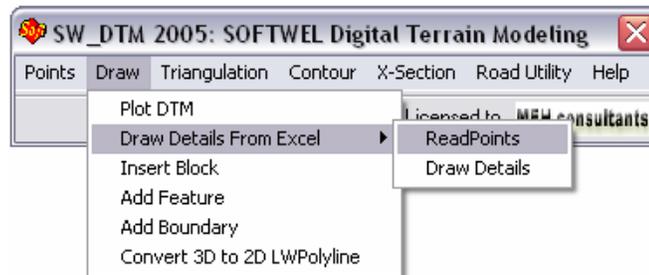
Fig: 3.3

A. Draw Details from Excel

Features command allows the user to draw details as listed points in the excel sheet. It includes read   points and draw Details.

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B. Insert Block

Insert block is used when the user has to define the details like tree, pole, stations, B.M etc.

C. Add Features:

Add Features allows the user to define the triangle edge, which may be a riverbank, a kholsi or a road boundary, so that contour goes as expected around such details.

D. Add Boundary

User can create boundary line for triangulation of points plotted according to the user's requirement.

E. Convert 3D to 2D LWPolyline

It converts 3D LWPolyline to 2D LWPolyline in AutoCAD.

❖ <u>**TRIANGULATION**</u>

Triangulation commands verify the points for triangulation and triangles are drawn through the points. "**Process all points**" should be done prior to initiate triangulation. The various commands of the triangulation under triangulation menu are as shown below:
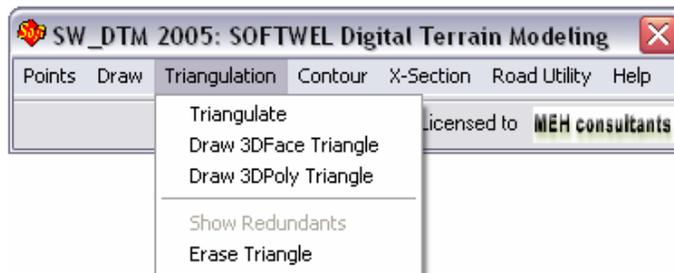
Fig: 3.4

A. Triangulate

This command allows the user to triangulate. It is performed by executing the various commands. It removes the duplicate points, allows triangulating roughly and adjusts boundary.

B. Draw 3DFace Triangle

This command allows the user to draw triangles in AutoCAD after triangulation on the imported points.

C. Delete 3DPoly Triangle

This command helps to remove triangles formed by undesired way.

D. Show Redundant

This command activates **"Redundant"** dialog box when there is the intersection between the feature lines and redundant points during triangulation process. It will allow user to select the point and zoom at that point.

Fig: 3.5

E. Erase Triangle

This commands erase the entire triangles at one time form by the triangulation.

❖ **CONTOUR**

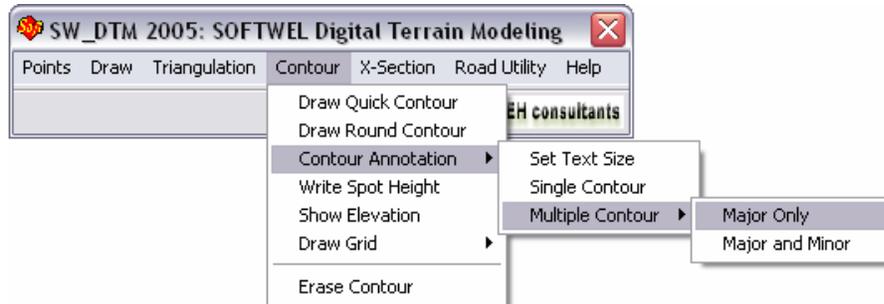Contour commands plot the contour at specified interval. It also allows the user to provide the annotation, grid and elevation.

Fig: 3.6

A. Draw Quick Contour

This command allows the user to draw contour at specified interval.

B. Draw Round Contour

This command allows the user to draw round contour which is smoother than quick contour.

C. Contour Annotation

This is the command for contour annotation. This command allows providing text size, Single Contour and Multiple Contours. Multiple Contours further allow Major only and Major and Minor.

D. Write Spot Height

This command allows the user to provide spot height for known points.

E. Show Elevation

This command helps to obtain the elevation of specified interval.

F. Draw Grid
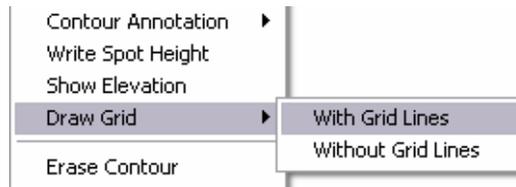
Fig: 3.7

This command allows the user to provide grid with x and y co-ordinates. It further allows With Grid Lines and Without Grid Lines.

G. Erase Contour

This command erases all the contours.

❖ **X-SECTION**

This command allows the user to select alignment and to obtain profile and cross-section.
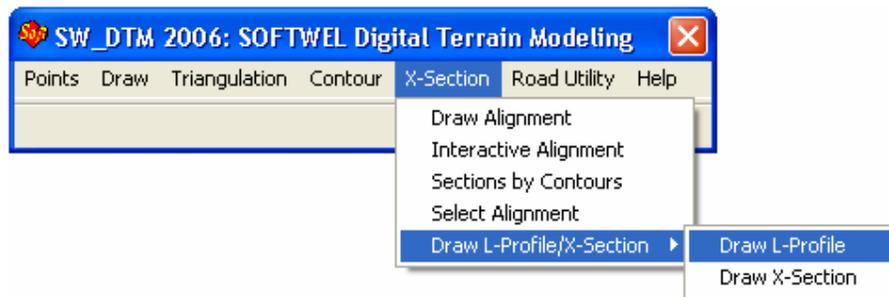
Fig: 3.8

A. Draw Alignment

This command allows user to draw alignments as required.

B. Sections by Contours

Sections by contours can be used when contour map with LWPolyline, Polyline is provided without point collection. Data can be extracted from the contour map.

C. Select Alignment

The Select Alignment command allows the user to select the alignment according to the L-profile and X-section.

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D. Draw L-Profile/X-Section

This command allows the user to draw L-profile and X-section. Further, it includes Draw L-Profile and Draw X-Section.

F. Profile from File

On using this command, Profile can be drawn from the external data file which may be in 'txt','prn','csv'   file format.

G. X-Section from File
On using this command, X-Section can be drawn from the external data file which may be in 'txt','prn','csv' file format.

❖ <u>ROAD UTILITY</u>

Fig: 3.9

A. Details for Sw_Roads

It generates detail file for Sw_Roads .

B. Make DTM for Sw_Roads

This command generates DTM file for Sw_Road .

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CHAPTER-IV

PROCEDURE

PROCEDURE

❖ Points

At beginning, as it is mentioned in the instructions, AutoCAD and excel sheets are to be launched. The data obtained from the field is manipulated and calculated for X-co-ordinate, Y-co-ordinate, Reduced level and Remarks. To commence the DTM, data of the field should be imported from the excel sheets by highlighting it as shown in the *Fig: 4.1*.or external file which may be either 'txt','pnr','csv', or 'pts' file format

1	655093	3075802	779.913	
2	655194.1	3075837	778.725	
3	654973.9	3075641	797.928	
4	654959.6	3075616	800.862	
5	654959.7	3075616	800.885	RW:J0
6	655188	3075834	778.867	j1

Fig: 4.1

Run program SW_DTM.exe.
Start >Programs >Softwel >SW_DTM.exe

Import Points

Click **Points >Import Points >From Excel** *as shown below*.
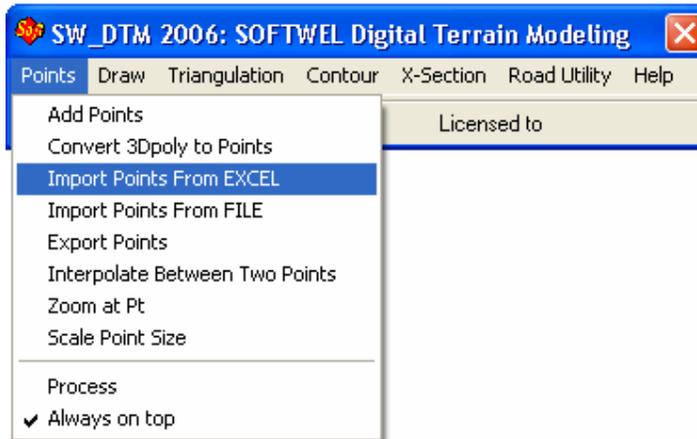
Fig: 4.2

After clicking Import points another menu of SW_DTM: Import Points appears.
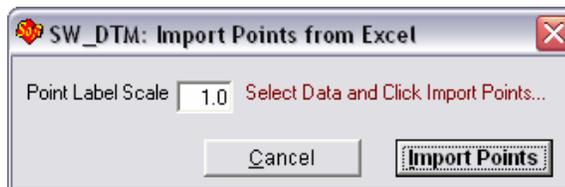
Fig: 4.3

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Point Label Scale means Text size of X, Y, Z and Remarks to represent on the AutoCAD Drawing. Provide Point Label Scale according to the requirement. Default mode of Point Label Scale is 1.

Then click **Import Points** to import points from excel sheet. The Program reads point data from the selected Data Range from the Excel sheet and plots them in **AutoCAD** with point and attributed block with attributed text for **Point No**., **Remarks** and **Elevation**.

The imported points are plotted in the AutoCAD as shown below:
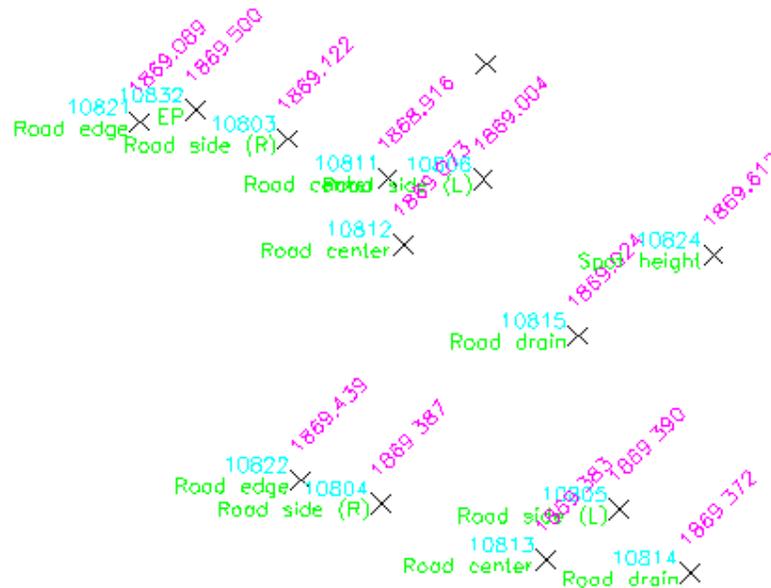
Fig: 4.4

Process Points

After importing the points, Process all the imported points or Selected Points should as required by the user**,** but features are not processed by this command.

The program processes all the points present in the **AutoCAD** drawing through the command **Points >Process** and shows the total number of point present at the Command Prompt .

Scale Point Size

The command **Scale Point Size** provides the scale on the whole drawing according to the scale given by the user. For this click **Points >Scale Point Size** then another screen appears where scale is to be provided.
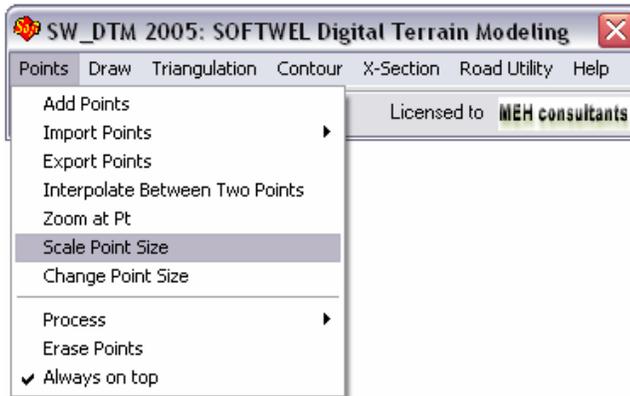
Fig: 4.6

Fig: 4.7

After providing **Scale Factor** for the point block in drawing, the scaling result is reflected in size of attributed point blocks.

<u>Zoom at Point</u>

Incase Zoom at specified point is to be done then **Zoom at Point** command is executed from the menu *Points >Zoom at Point .* After clicking on Zoom at point, it asks for the point that is required to zoom.
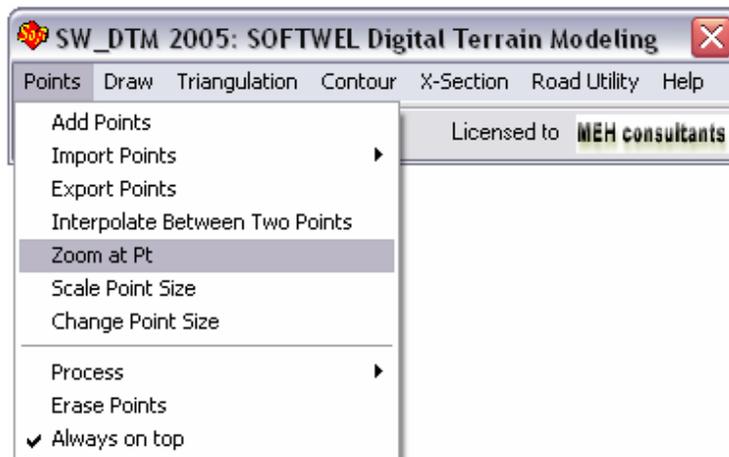
Fig: 4.8
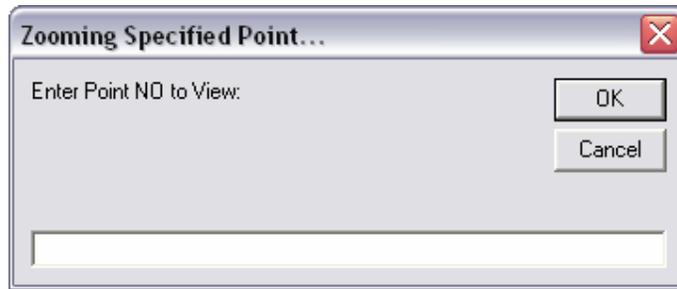
Fig: 4.9

Enter the point no required to zoom. The specified point can be seen clearly with reduced level as well as remarks.

❖ <u>**Triangulation**</u>

Triangulation is the process when used without qualification, denotes a system of surveying   in which the sides of the various triangles are computed. For performing Triangulation, Click at *Triangulation >Triangulate*
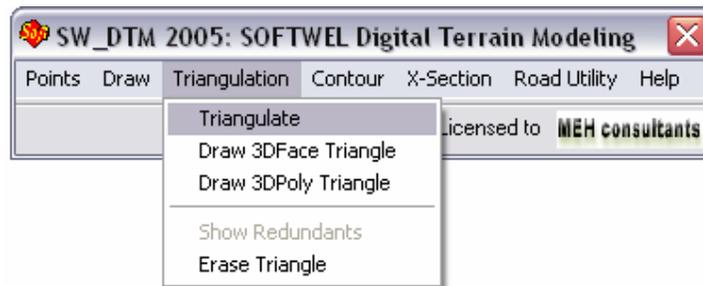
Fig: 4.10

When triangulate is clicked, another screen called **SW_DTM** Triangulate can be viewed.
Remove Duplicates command removes the duplicate points of X, Y, Z co-ordinates. It also removes the duplicate features lines. After performing remove duplicate, the files nominated below are formed; data files are **Swdtm.pts, Swdtm.bou, and Swdtm.fea**

Fig: 4.11

After clicking Remove Duplicates, Raw Triangulation gets activated. Raw triangulation manages the points to draw internal network of triangles roughly.Triang1.exe is used for the work. If incase, triangle exe does not run then while adjusting boundary it shows the error.

Fig: 4.12

After clicking Raw Triangulation, Boundary Adjustments gets activated which adjusts boundary for the triangles.
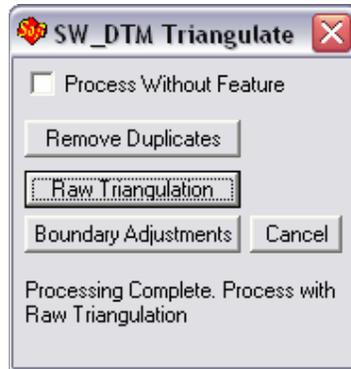
Fig: 4.13

Sometimes, Raw Triangulation button becomes unable to run Triang1.exe that is necessary for complete triangulation. In such cases, Error message given below will be displayed:

"Either Triangulation was not complete"
"or There are many Feature Lines that could not be handled. Check it. "
"or Try Triangulating once more by running the Triang1. exe externally"

The remedy for such problem is to run triang1.exe from Start menu by following step as below.
 Start > Run >triang1.exe.

After completion of **SW_DTM** triangulate, command **"Draw 3DFace Triangle" or "Draw 3DPoly Traingle"** is executed to get a view of triangle network formed. Click the *Triangulation >Draw 3DFace Triangle*

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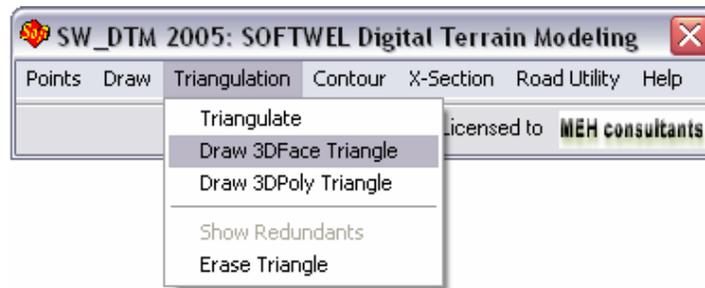
Fig: 4.14

Important Note:

Process All Points command should be executed whenever changes like, addition or removal of points, feature lines, a boundary line takes place.

In AutoCAD drawing, triangles are drawn as shown in *Fig: 4.15*
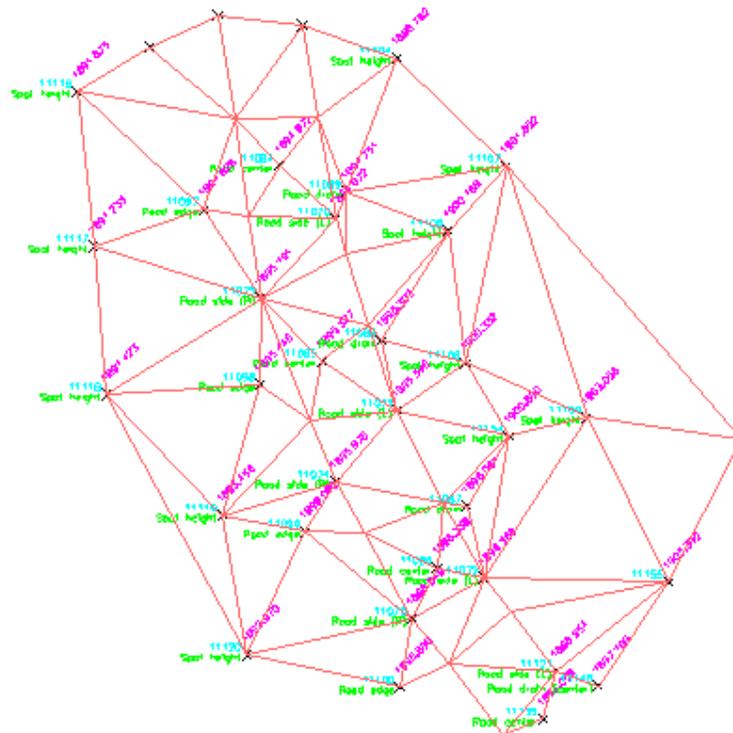
Fig: 4.15

Triangles are drawn interpolating all the possible points. In case, we need to remove some of the triangles formed, we can do it by Delete triangle command that allows user to define boundary lines. Click *Triangulation >Erase Triangle*
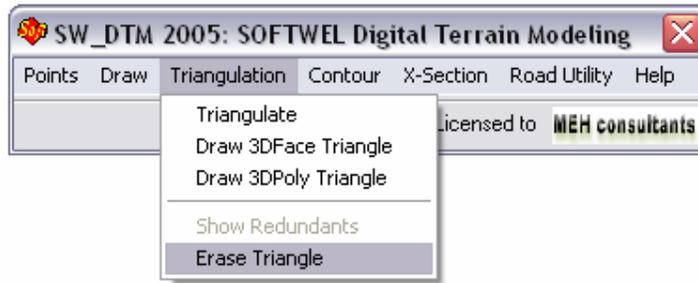
Fig: 4.16

It is usually good to define boundary lines on the periphery of the surveyed area. This boundary acts as the cutoff line for the triangulation. So this provides the user with the facility to break the triangulation networks so that the contour is created as in desired way. Process all points after creating boundary and use triangulate command for triangulation.

Triangles are drawn interpolating the points inside the boundary as shown in *Fig: 4.16*
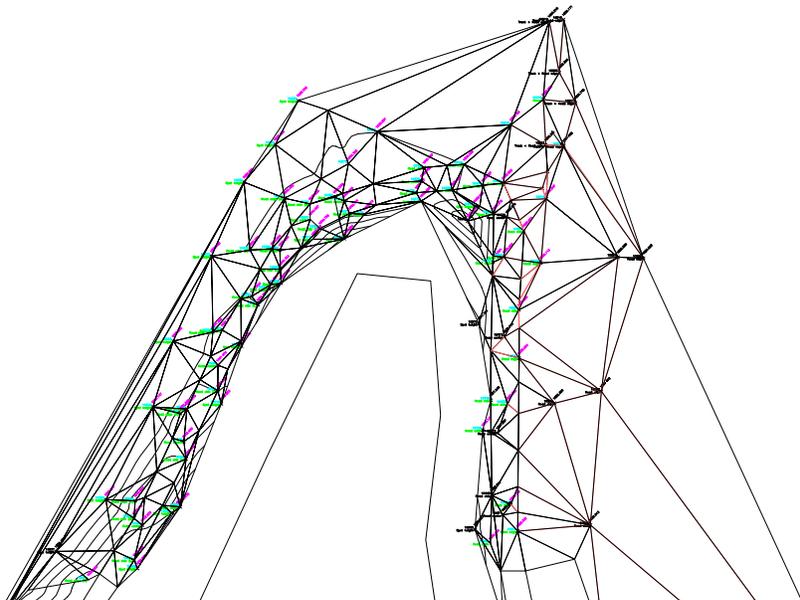
Fig: 4.17

SW-DTM

❖ **Contour Generation**

Contour generation can be done by contour command of **SW_DTM** menu.

Draw Quick Contour/Draw Round Contour

Contours can be draw by two methods either by clicking **Draw Quick Contour or Draw Round Contour**.
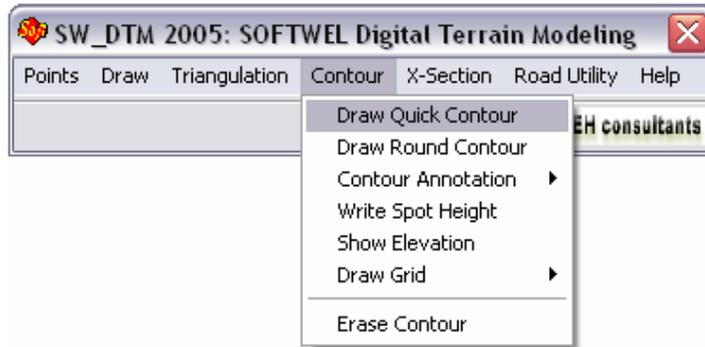
Fig: 4.18

Contours can be drawn by executing draw quick contour and draw round contour.
Contour to plot with the quick contour command is executed as shown below:
Click the **Contour >Draw Quick Contour** then another screen will appear.

Contour Interval, Major Contour and Minimum Distance should be given according to the requirement. Input the Contour Interval and then Click **"Draw".** This generates Contour at the specified Contour interval.
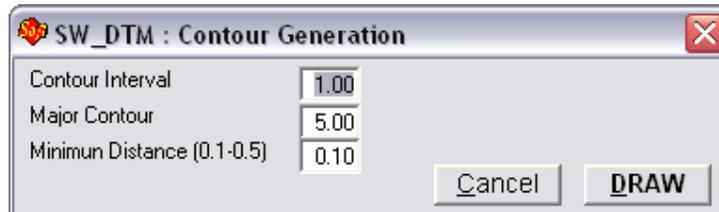
Fig: 4.19

Contour Interval can be given for Hill region 1 to 5, Terai 0.2 to 0.5 and Normal 1.
Minimum Distance can be given from 0.1 to 0.15(i.e. vertex distance.)
Figure below shows the Quick Contour
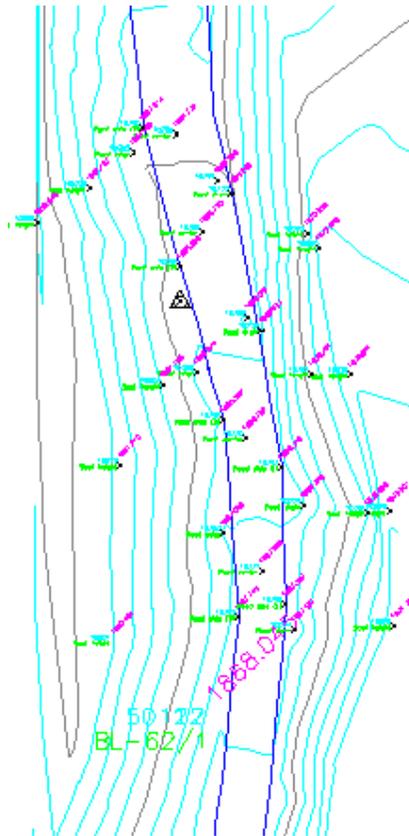
Fig: 4.20

To view the Round Contour Draw Round Contour should be executed as shown in Fig.32
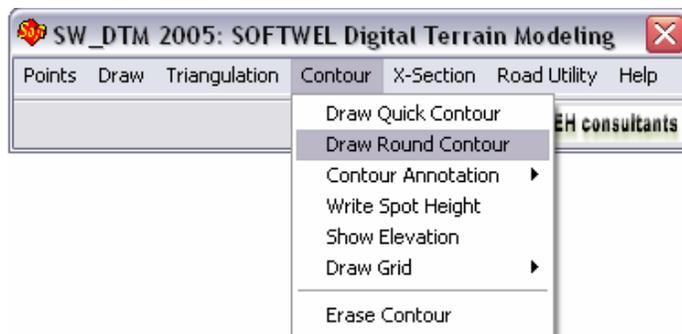
Fig: 4.21

Contour Annotation

Contour annotation allows the user to set text size, annotation for single and multiple contour. Contour can be label properly with appropriate text size.
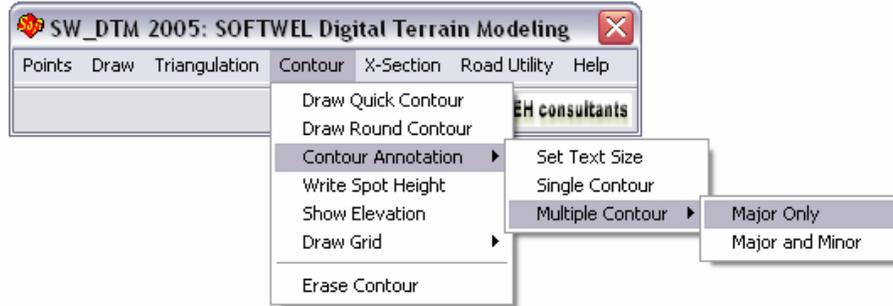
Fig: 4.22

Setting Text Size for Single Contour Annotation:

Contour >Contour Annotation >Set Text Size
Text size is given for the contour annotation. The text size is used only by single contour annotation.

Single Contour Annotation:

Contour >Contour Annotation >Single Contour
If you forgot to set the text size by set text size command, the program allows to set size at first attempt of single contour annotation. Click the Contour line, for which label is to be given, at two points across the Contour, so that the contour label text is at right orientation.

Multiple Contour Annotation:

Contour >Contour Annotation >Multiple Contour >Major Only
Contour >Contour Annotation >Multiple Contour >Major and Minor

This allows writing label for multiple contours. It has two options either **"Major only"** or **"Major and Minor".** This command asks to click two points, so that the all the contour lines to be labeled are crossed by the line joining the two points. If **"Major only"** command is chosen then it will be labeled only the major contour and if **"Major and Minor"** command is chosen, all contour lines will be labeled. As the clicking order of the points decides the text orientation, clicking points should be in proper direction.
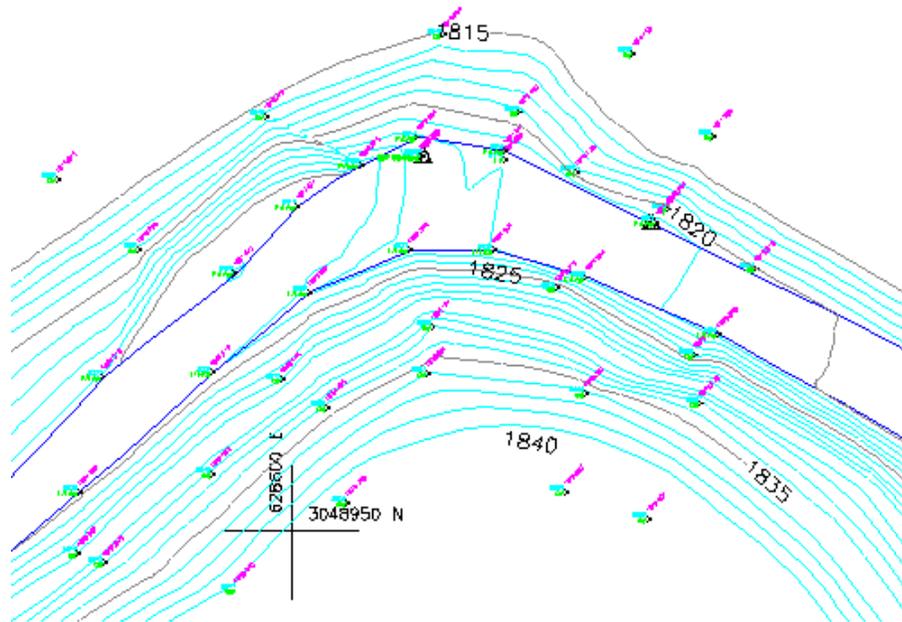
Fig: 4.23

Inspecting Elevation of any LWPOLYLINE entity

DRAW GRID

Contour >Draw Grid >With Grid Lines
Contour >Draw Grid >Without Grid Lines

This command ask user to give interval for grid, text size, lower and upper corner of the area whose grid co-ordinate is to be shown. It has two options. The former option will let user to draw the grid with lines joining the grids and the latter will let user to draw grids without lines.
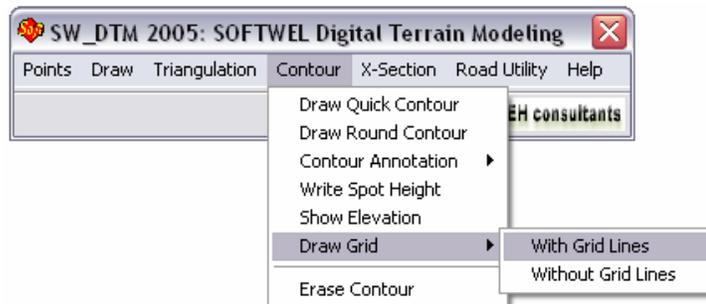
Contour Drawing without grid lines is shown below.

Fig: 4.24

SW-DTM

```
Command: grid_cor
Enter Grid Interval :100
Enter Text Size :2
First Point (Bottom Left Corner):
Second Point (Top Right Corner):
```

Fig: 4.25
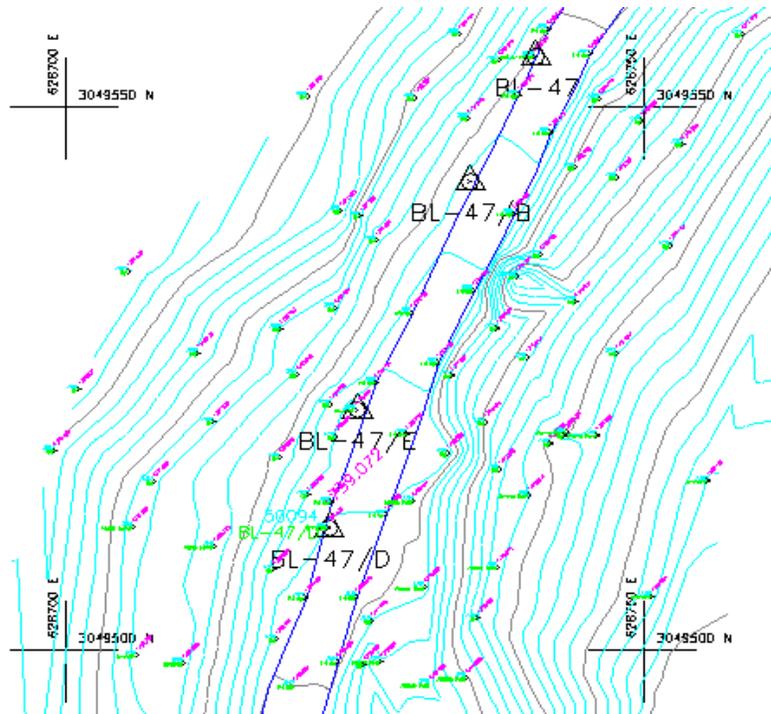
Fig: 4.26

❖ <u>**Drawing Detailing Features**</u>

<u>Draw >Features</u>
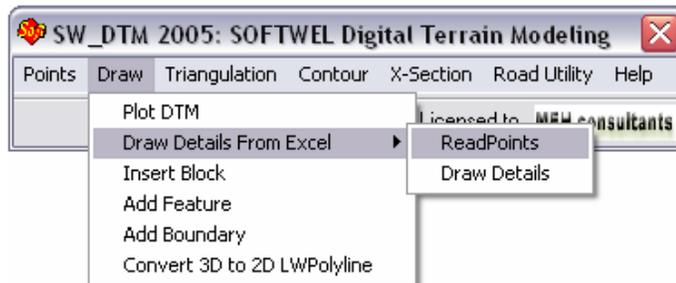
Fig: 4.27

Read Points

<div align="center">

Points Collection

S.n	X	Y	Z	Remarks
1	655093.035	3075801.930	779.913	
2	655194.127	3075837.170	778.725	
3	654973.934	3075640.680	797.928	
4	654959.645	3075615.800	800.862	
5	654959.665	3075615.790	800.885	RW:J0
6	655188.019	3075834.330	778.867	j1

</div>

Table no. 4.1

Fill the points collection table with co-ordinate data of the all the points that are drawn in AutoCAD. Click **Draw >Features >Read Points** to give the information of all the points in Points collection table.

Draw Details:

Make correct grouping of the detailing features with the points sequences. For grouping of the points two tables shown can be used. Use table of Table no.8 if the detail points are in similar range and if detail points sequence is in random order then use table of Table no.9.

Points Number to be joined

Layer Name	From	To	Type
GW	10	30	0
	50	70	0
REL	250	300	1
	350	360	1
RER	370	410	1

Points Number to be joined

Layer Name	From	Type
GW	10	0
	50	
	100	
	105	
	107	
	103	

Table no. 4.2   *Table no. 4.3*

The attributes of the tables:
1. Layer Name: - This is the name for the layer in the AutoCAD, in which the line joining the point sequence will be drawn.
2. From/To: - Give the serial number of the detail points to be joined.
3. Type: - This should be numeric value either 0 or 1. This gives the type of polyline joining the detail points.
   - Use 0 for LightWeightPolyline
   - Use 1 for 3D polyline.

   So use it properly.

   Select the correct group from table (one table at time) as shown above and click
   Draw >Features >Draw Details.

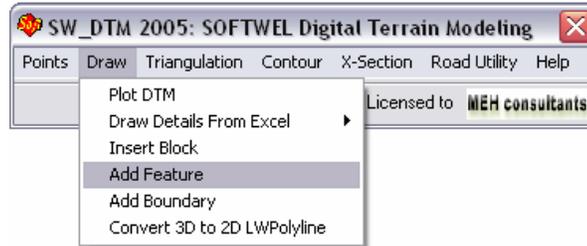# SW-DTM

Add Features:

Draw >Add Feature

Fig: 4.28

This command allows user to add feature lines that guides the triangulation network resulting the guided contour. The feature line should be drawn such that first and last points of the line must be in known node i.e. the first and last point should have some elevation. But the points in between may be in 0 Elevation which will get its Elevation from interpolation after the processing command
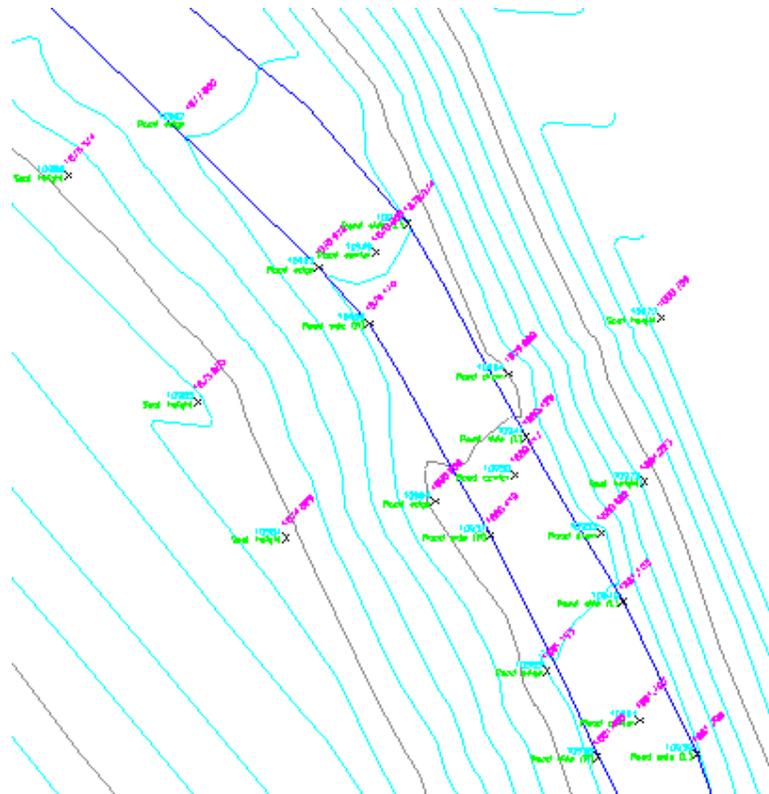
Fig of added features:

Fig: 4.29

SW-DTM

Insert Block:

Draw >Insert Block

The command Insert Block is used to add the symbol for details like stations, Bench Marks, trees, poles e.t.c. For this Insertion, Block Make command is executed in the AutoCAD prompt for the symbol with the correct attributes so that the remarks of the point selected can take place the attribute value for the block. After making Block, Range is selected in the excel sheet and this command is executed.
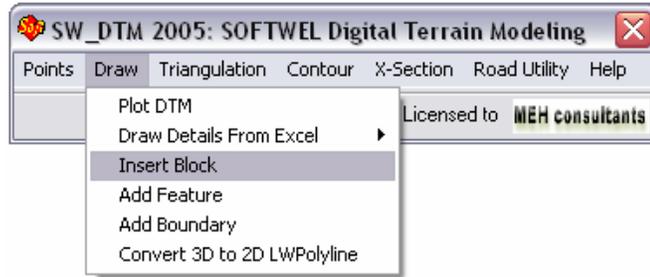
Fig: 4.30

Give the block name and click OK.
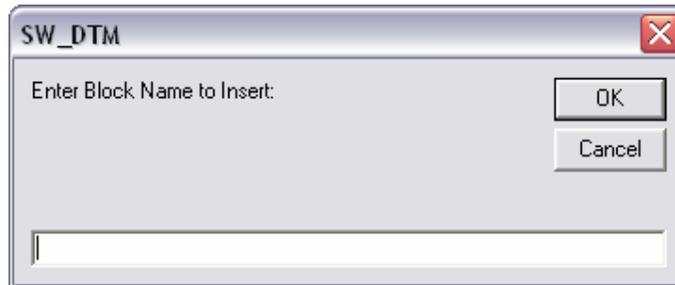
Fig: 4.31

After providing the Block Name, the block is inserted to the all points selected in the excel sheet. Insertion of block is shown below:
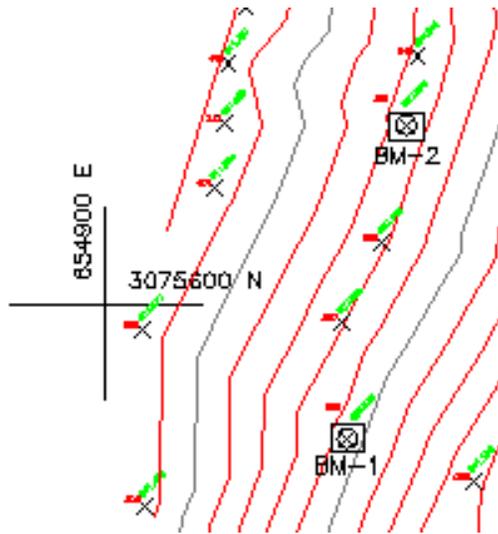
Fig: 4.32

❖ **Drawing Alignment**

Draw Alignment:

SW_DTM allows user to draw any number of alignments. **X-Section >Draw Alignment**
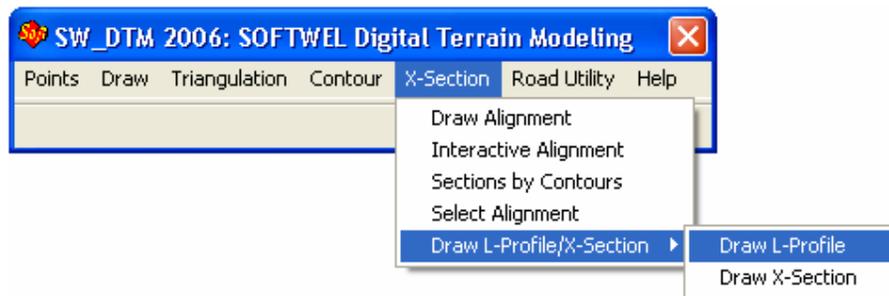
Fig: 4.33

On clicking this command, the cursor on AutoCAD screen will change into cross-hair and will let user to fix the alignment.

Drawing Profile/ Cross Section

This program can also cut profile and cross-section for any number of alignments in the Drawing.

Section by Contours:

SW-DTM

Section by Contour is utilized when point information required by **SW_DTM** program is not obtained but drawing contains contour. (e.g. old contour from another program)
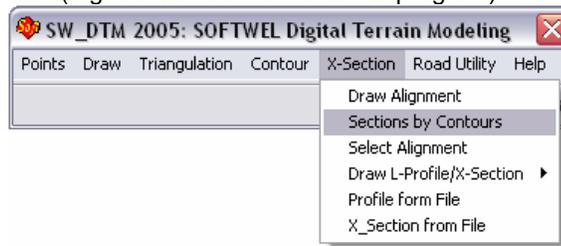
Fig: 4.34

"Draw Alignment" is to be clicked to draw the alignment line in the contour plan in AutoCAD.

Now click **Sections by Contours** of **X-Section** command.

The Screen appears which shows **"Profile-Cross from Contours"**. It lists all the layers of current AutoCAD drawing, which contains contour lines in separate layer. The screen of Profile-Cross From Contours is shown and tick only the layers that contains the contour lines.
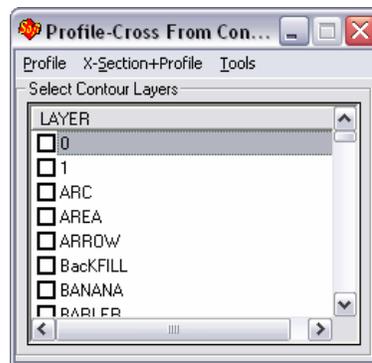
Fig: 4.35

In dialogue box of Profile-Cross From Contours the various commands like Profile, X-Section+Profile and Tools can be used to obtain X-Section and Profile drawing and data as required.

The process of using commands are similar to the procedure defined on the topics Profile and X - Section + Profile which are shown in next pages. Figures shown below define how to use the command Profile and X – Section + Profile.

29

Fig: 4.38
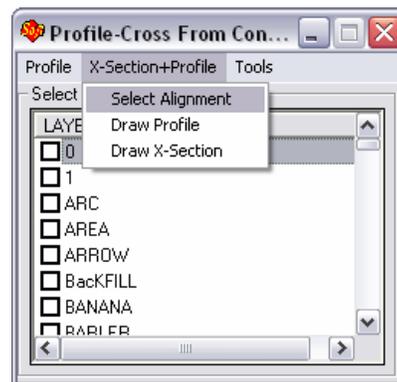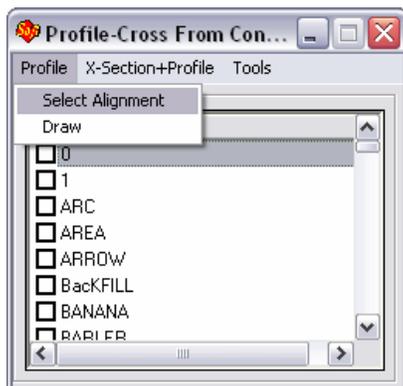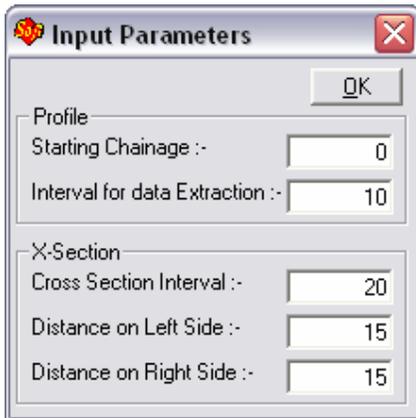
The command **Tools** allows the user to provide the Starting chainage and Interval for data extraction in the case of Profile. Cross-Section Interval and Distance on left and right Sides for the X-Section. The fig for the execution of tool command is shown below:

Click **"Ok"** after setting required values.

Select the proper Contour layers from the list and click on "Select Alignment" which will ask user to select the alignment in AutoCAD. The text will be displaying in the AutoCAD command line as in figure.

Fig: 4.39

Select the alignment in the drawing near to the start of it and then it will ask to pick a point near to the end of the alignment as in figure.
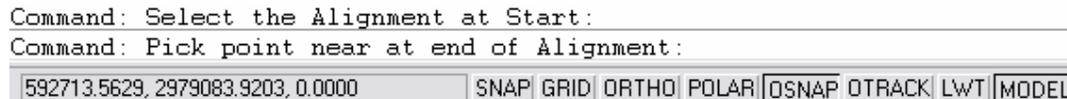
Fig: 4.40

This will pop up a **"Save As"** dialog box asking for the location and filename to save the alignment data. Type the filename and select the location for it and click on **Save.**
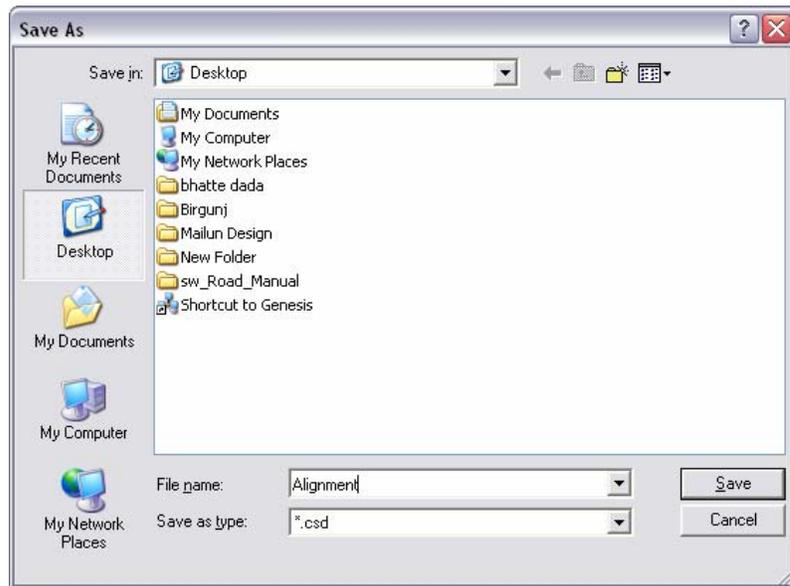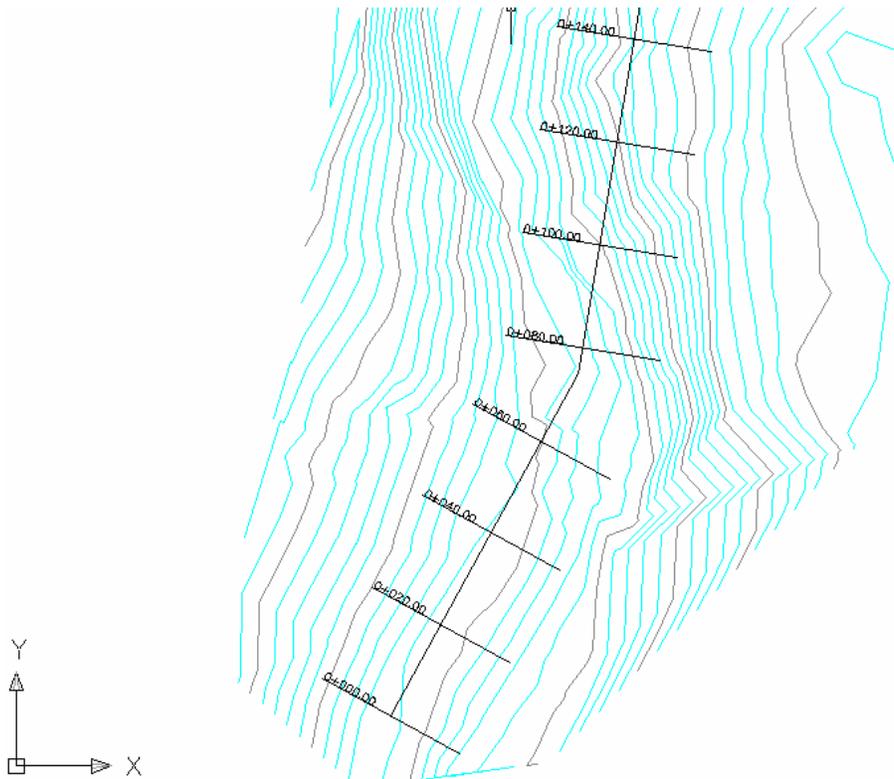
SW-DTM

Fig: 4.41

Fig: 4.42

To draw the generated profile, select **"X-Section + Profile >Draw Profile"** which will pop up with **"Open"** dialogue box asking to select the proper alignment file that has previously saved.
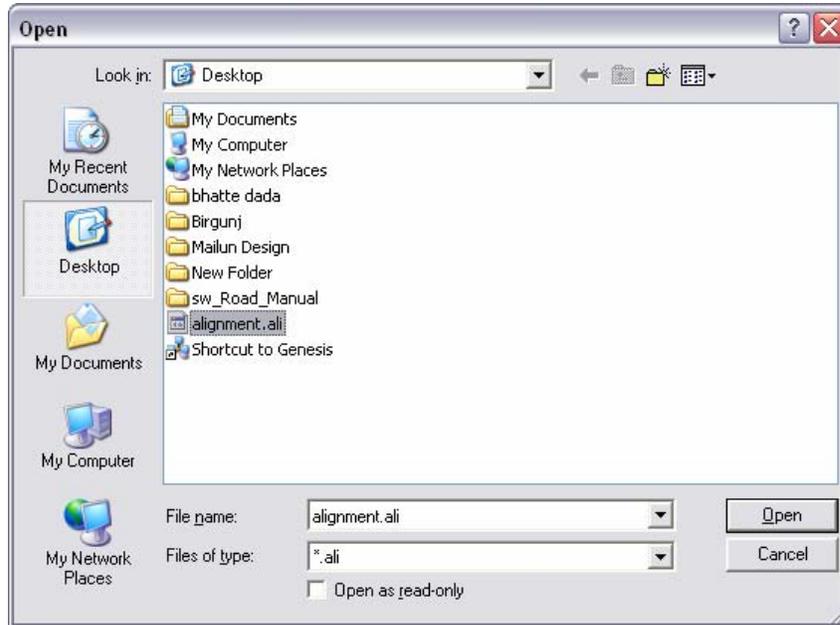

Fig: 4.43

Select the correct alignment file with extension *-ali.prn and click Open button of the Open Dialogue box.
Then another form for drawing profile appears as shown in Fig: 60
Give appropriate Horizontal Scale and Vertical Scale. Then click **Execute** to draw profile. Then the Pick Point button becomes enabled (which was previously inactive). Click **Pick Point** and then the program prompts for the picking a point in AutoCAD as start point for the drawing.

<u>Profile:</u>
X-section >Select Alignment
First draw required alignment line in AutoCAD by **Line** or **Polyline** command or **X-Section >Draw Alignment**.
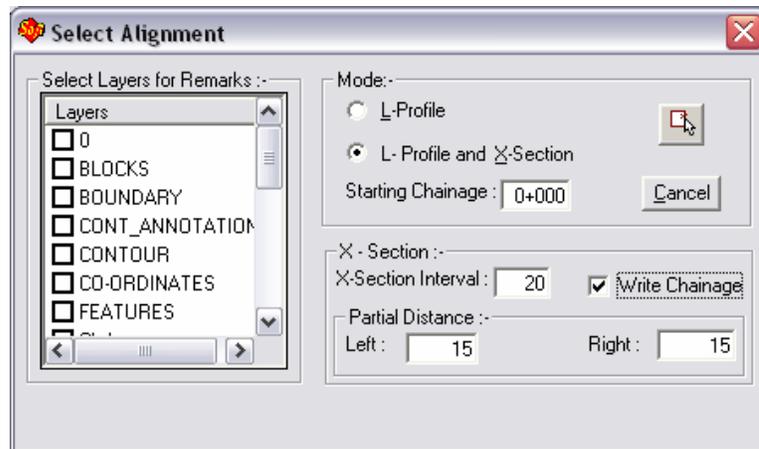

Fig: 4.45

This form will allow user to select required layers for remarks, mode for generating data either for Profile only or Profile and cross-section. Give the value for starting chainage, value for x-section interval, select either to write chainage on plan or not, define the value for the partial distance at right and left from the center line for the cross-section.

Selecting **"L-Profile"** option will generate data for profile section only and the option **"L-Profile and X-Section"** will generate data for profile and cross section both.

Click on [icon] which will prompt for saving the alignment by displaying the save dialogue box as shown below in fig. 55. Type for the file name and click on **"Save"** button. Then it will change the cursor on AutoCAD to small square letting user to select the alignment on the screen which must be **"LWPolyline"**. Now the generation of Profile and cross section starts.
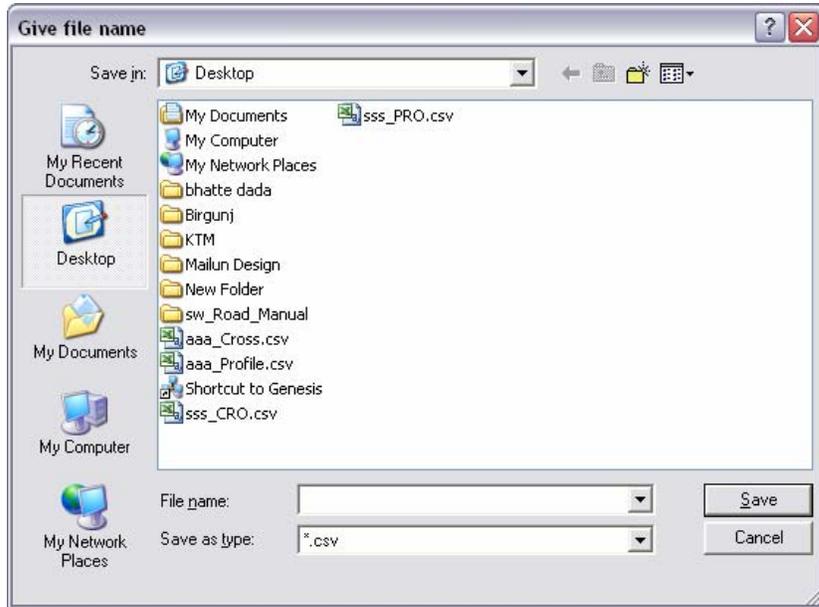

Fig: 4.46

Draw Profile:

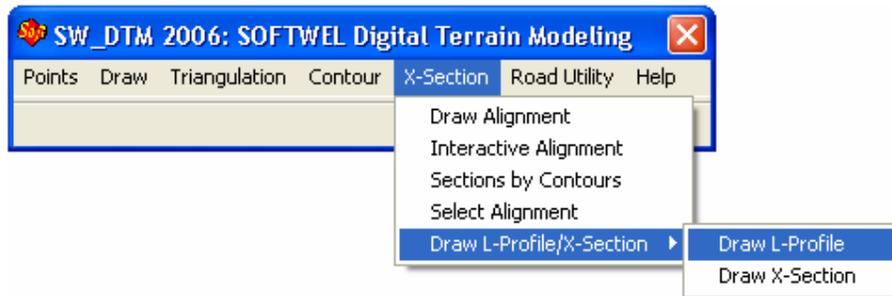 Click Draw *X-Section > Draw L-Profile/X-Section >Draw L-Profile*

Fig: 4.47

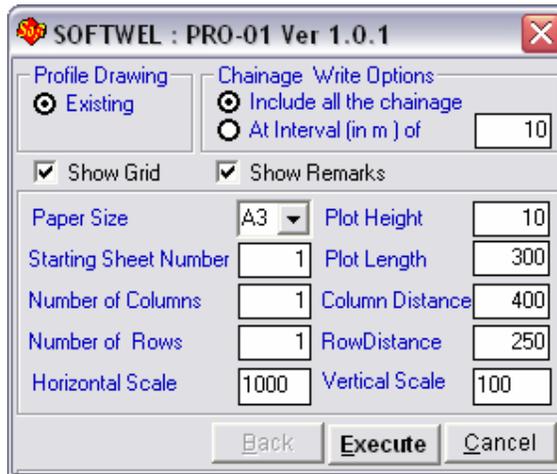Then open dialogue box appears to choose the options and settings to draw the profile drawing.

Fig: 4.48

Choose the option either **"Include all the chainage"** or **"At Interval (m) of"**.
"Show Grid" will let user to show the grid on profile drawing.
"Show Remarks" will allow user to show remarks on profile drawing.
Select the paper size as required by the user. It may be **A1, A2, A3** and if all profile is needed to be drawn then select **"All".** Give the sheet number with which user want to start. Type the number of columns and number of rows for the drawing layout. Set the horizontal and vertical scale.
"Plot Height" will allow user to keep the difference in reduce level while drawing which will create a breaking for the profile drawings. The height difference is in meter.
"Plot Length" will break the sheet and start the new sheet as the value mentioned for it. The plot length is in meter.
"Column Distance" is the distance between two sheets column wise.
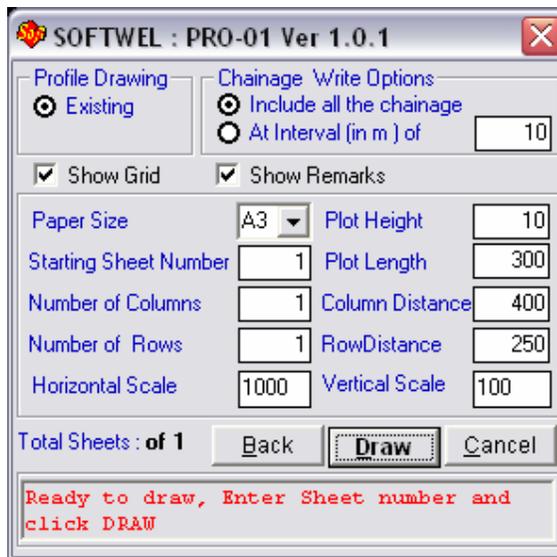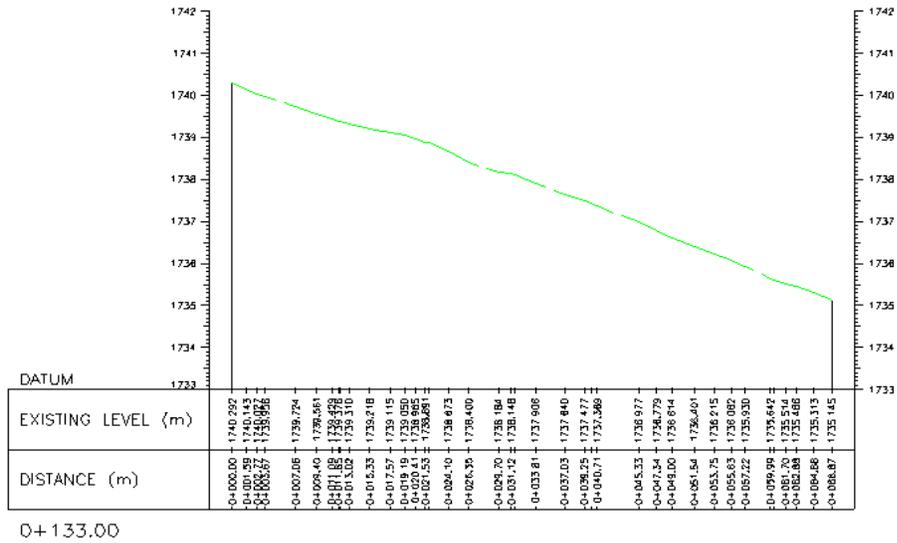**"Row Distance"** is the distance between two sheets row wise.

Fig: 4.49

After setting all required values for all options, click on **"Execute"** button which will then convert into **"Draw"** button. Now click on this button which will ask user to pick a point on AutoCAD to draw the profile drawings.

```
Alignment 'C:\Program Files\SW_Roads\RNDP_03-12-2\LL11-ali.prn' is ready for
Drawing Section...
Command: Click a Point as the Origin...
```
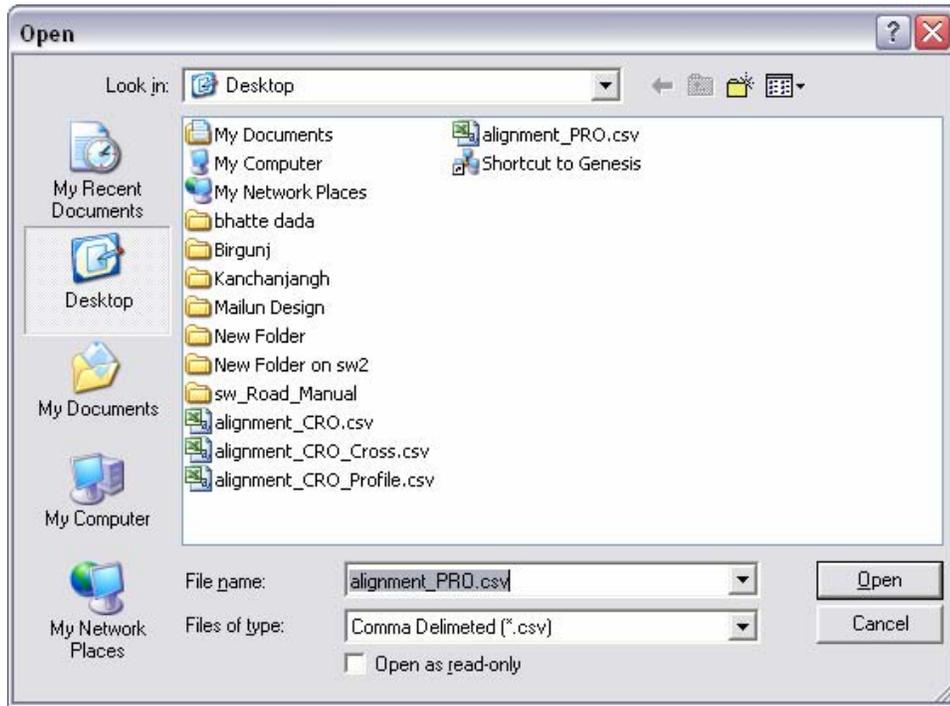
Fig: 4.50

Fig: 4.51

Draw Profile from External File:

SW_DTM has the provision to draw the profile drawing from external data file with an extension either "txt", "prn", or "csv".

Click X-Section >Profile from File

Fig: 4.52

An **Open** dialog box will appears as follows:

![SW-DTM logo]

Fig: 4.53

Select the appropriate file for profile and click **Open.**
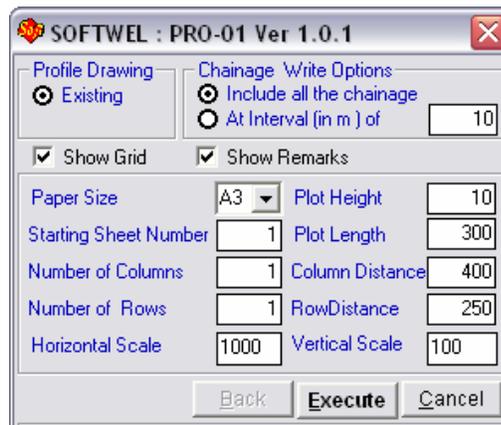

Fig: 4.54

A dialog box for profile drawing will appear and repeat the same process as earlier.

Cross-Section:

The program also provides the drawing of cross-section for the selected alignment from the previously generated data.

SW-DTM

Draw Cross-section:

The command for the execution is shown below:
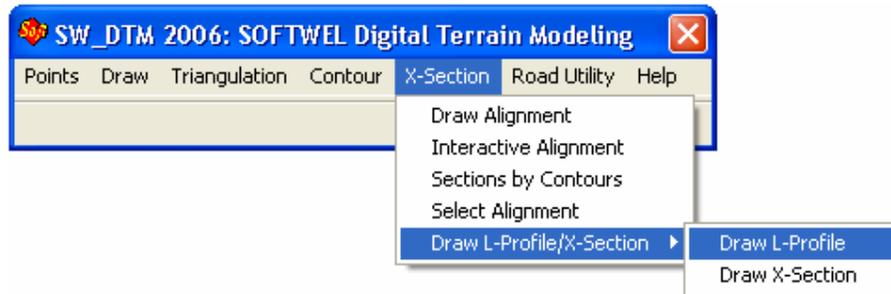**X-Section >Draw L-Profile/X >Draw X-Section**

Fig: 4.55

A dialogue box titled Drawing Cross-section appears.

As the program supply options for the Horizontal Scale & Vertical Scale and other options for the proper sheet planning of Cross Sections, Input the scale and the other appropriate data as required, Then Click "**Execute",** the Program reads the Data and then "**Pick Point**." activates.
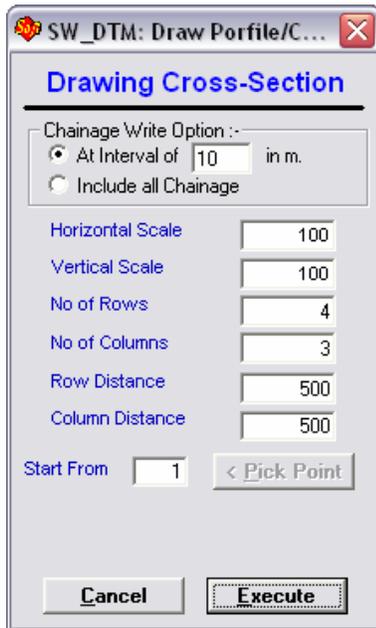

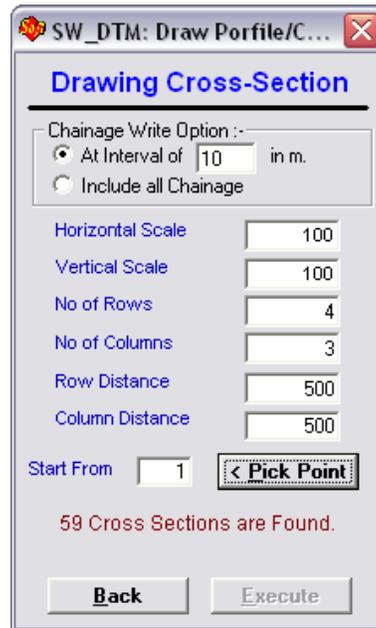*Fig: 4.56*   *Fig: 4.57*

Pick a Point as the reference point for the drawing. Then the program reads the Cross-Section and also data file for profile and cross-section are created at the time of execution.
The file can be opened directly from MS-Excel. Generation of the drawing in this way can be obtained in different scale as desired. Figure below shows sample Cross-Section of the selected alignment.
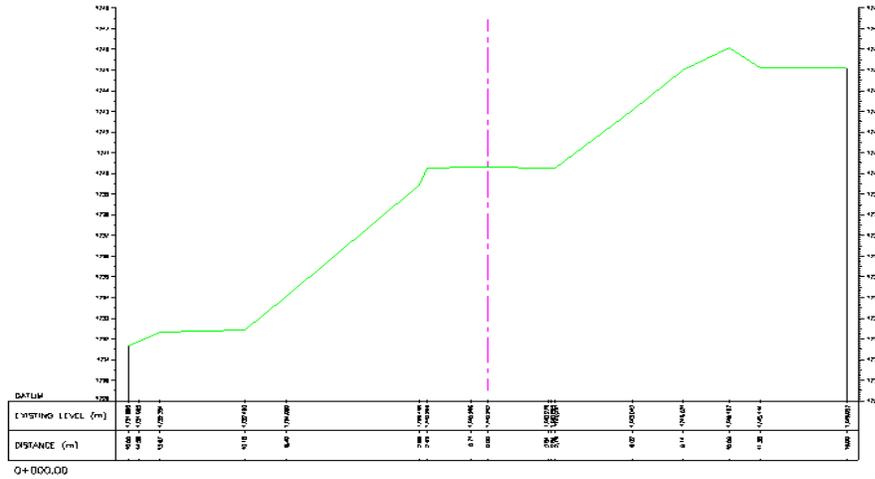
Fig: 4.58

<u>**Draw Cross-Section from External File:**</u>

User can draw cross-section drawings from external data file which may be "txt","cas","prn" extensions.
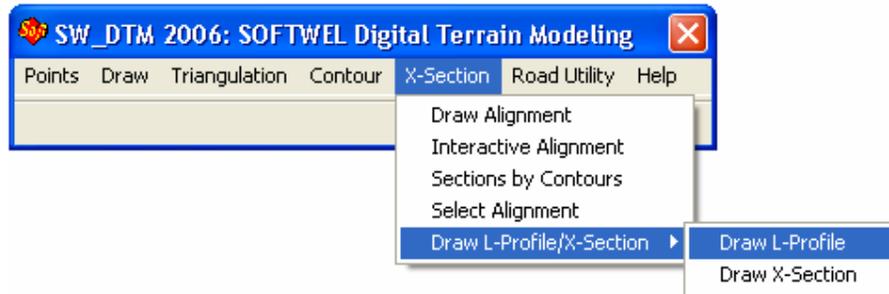
Click X-Section >X-Section from File

Fig: 4.59

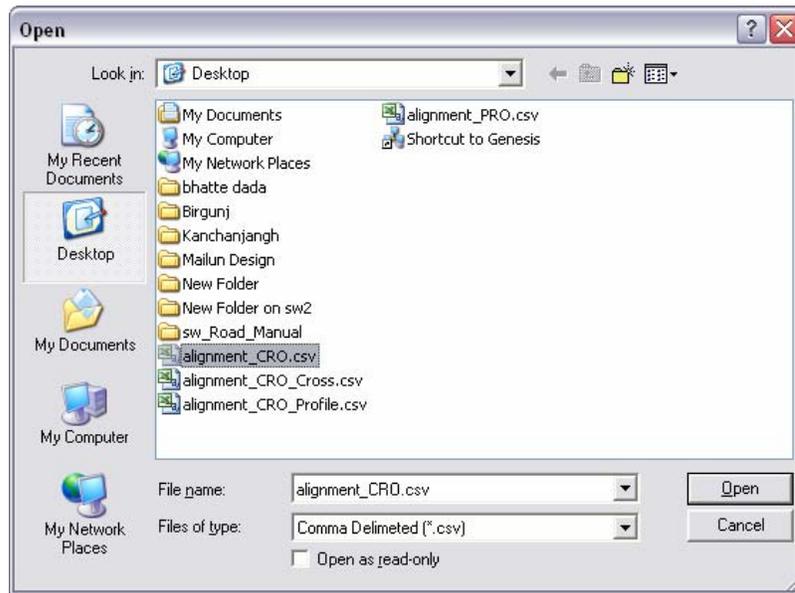An **"Open"** dialog box will appear:

Fig: 4.60

Select the cross-section file to be drawn and click **"Open".**

Fig: 4.61

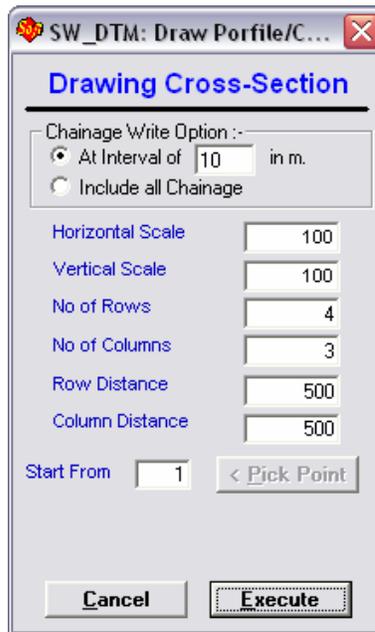A **"Drawing Cross-Section"** dialog box will appear and repeat the same process as earlier.