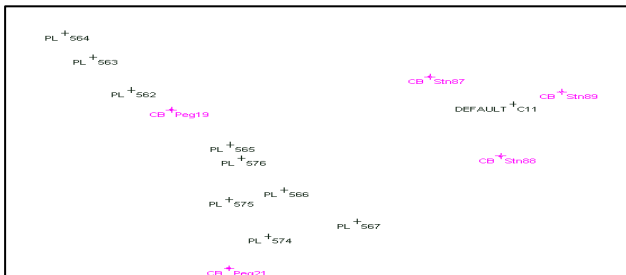


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

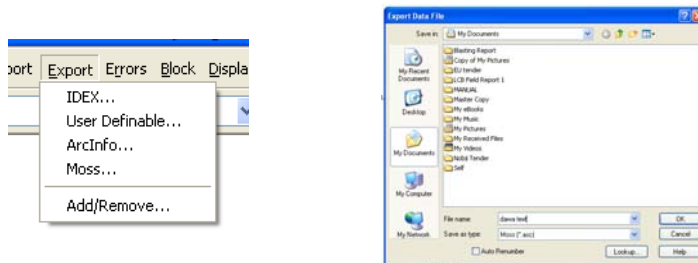
## ROAD MX

### DESIGN STEPS

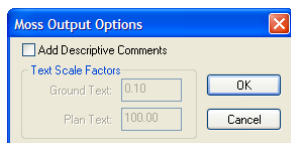
First open the Liscad Program and open your project that contains the Survey Data as below



In the LISCAD program  
Go to *Data Conversion* in the Task menu  
Then from *Export data* choose *Moss...*



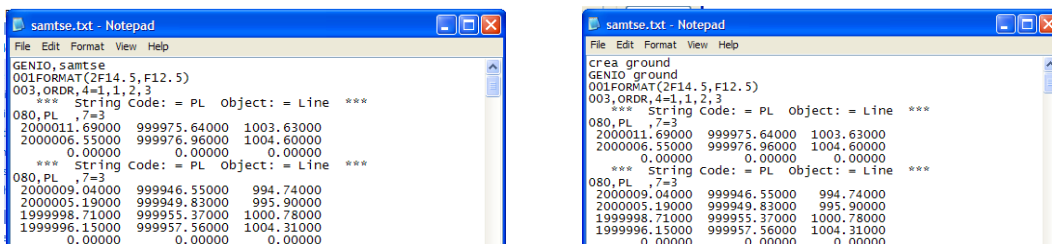
After you have given a file name press *OK* then you will be prompted with a dialog box as below, make sure you uncheck the *Add Descriptive Comments* and click *OK*



Now go into the directory you have saved the file and rename the file extension as below

Rename the (.asc) ext. to (.txt) ext. file/ press ok

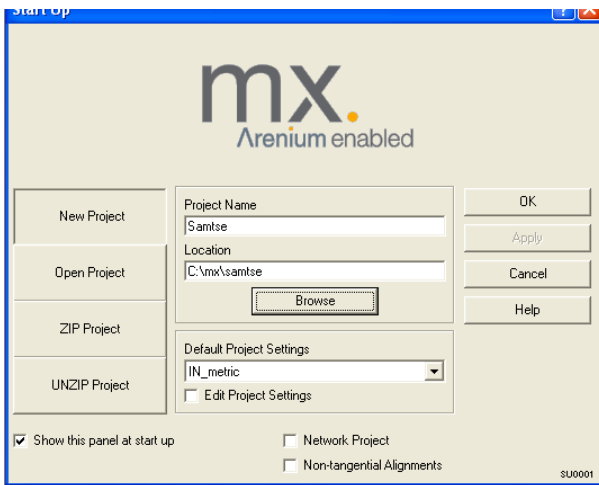
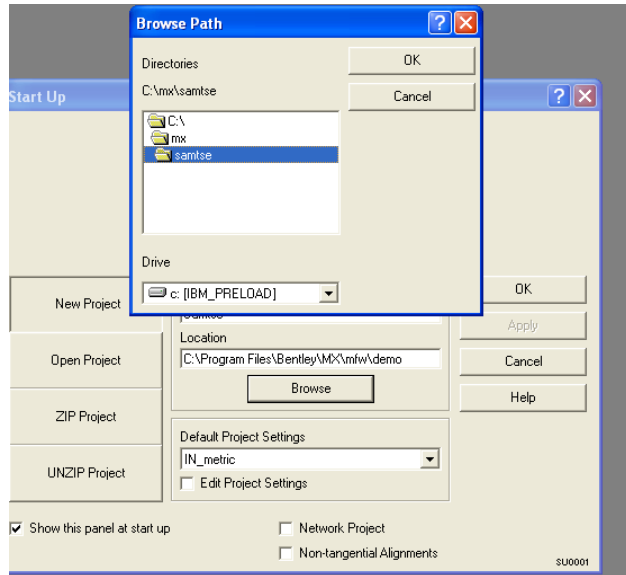
Then open the file in notepad and delete the first line e.g. GENIO,samtse in the example below and add two lines with Crea ground and GENIO ground



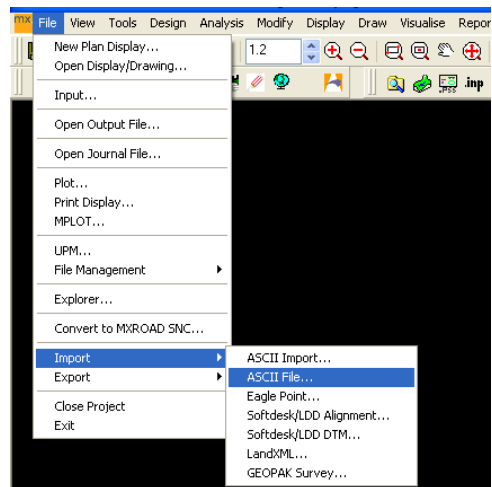
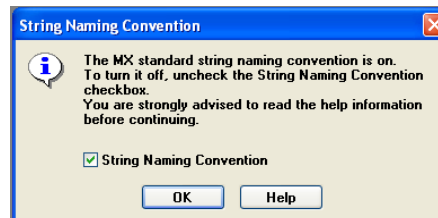
Then save the file and exit.

# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Now open the MX Road application (if a new project select **New Project** and give a name in the Project Name then select the directory where you have the data for example C:\mx\samtse and click **OK**



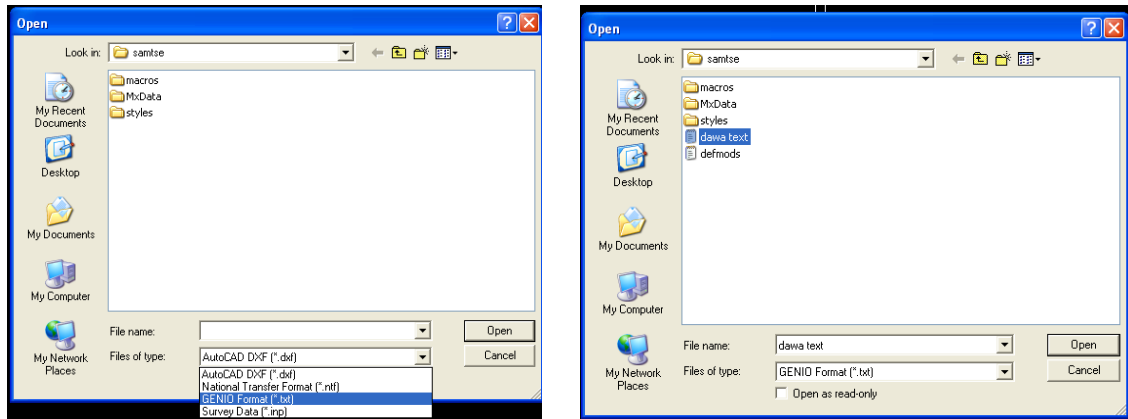
Then you should have a dialog box as below and click **OK** and another box appears



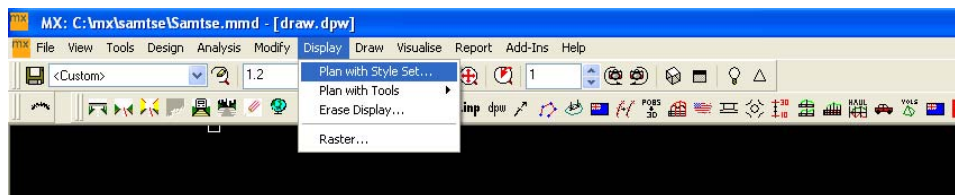
Simply Click **OK**

Now from the *File* choose *Import* and then *ASCII File...*

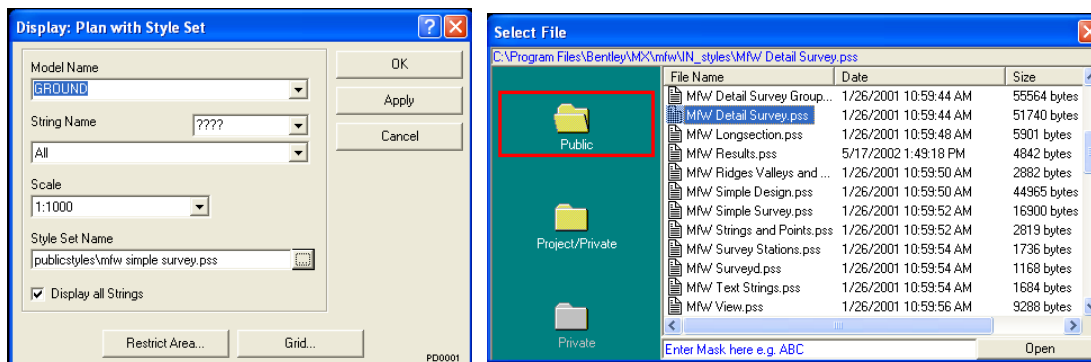
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu



From the **Files of type:** choose *GENIO Format (\*.txt)* and then select your file and press **Open**



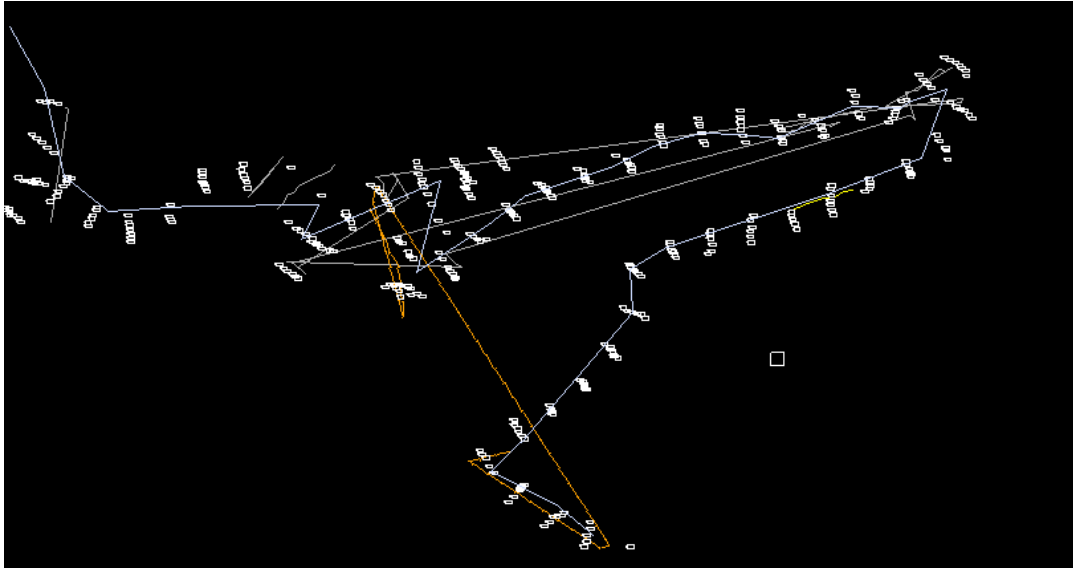
Now from the *Display* Choose *Plan with Style Set...* then



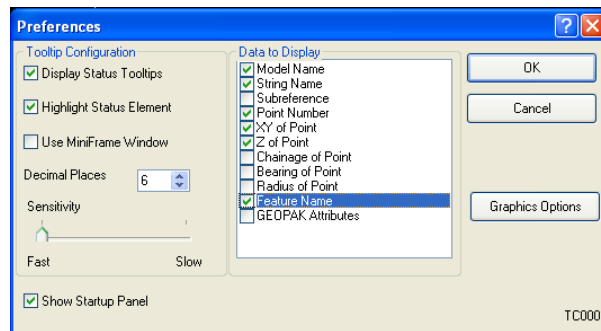
Select the Model Name by clicking the small arrow button, then rest you can leave it as default. For the Style Set Name click on the box beside it and you will be prompted with a style set file listing , select *MfW Detail Survey.pss* and click *Open*

Your survey data will be displayed on the screen as below.

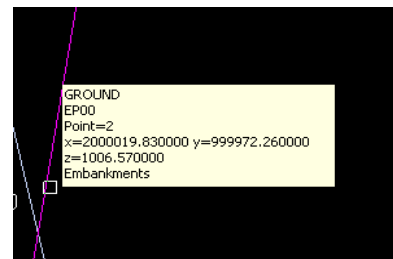
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu



Click *View* then *Preference* and a dialog box as below will appear. In this you can select all the information you want about a point/string.

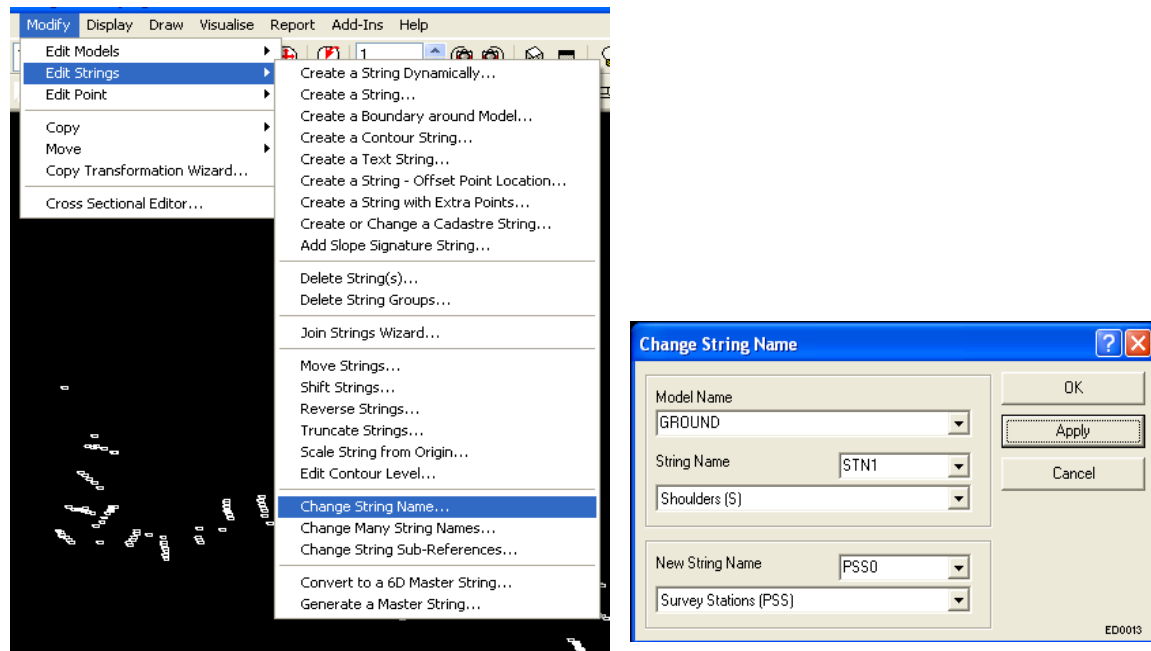


And then click *OK* now place the cursor over a line/point and the information will be displayed as below.



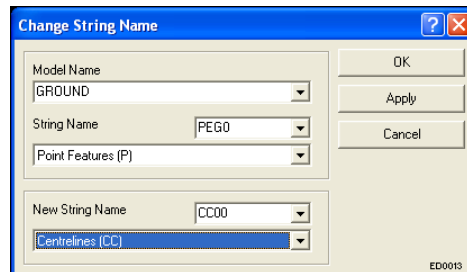
Now since our stations are appearing as line we would like to convert the line into points. So select *Modify/Edit Strings/Change String Name...*

# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

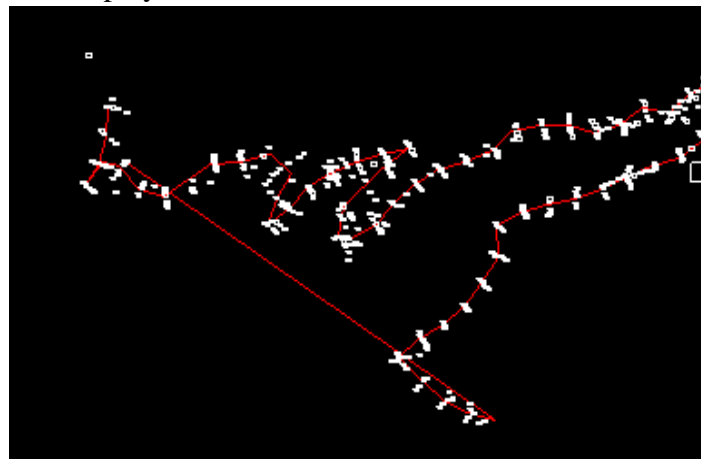


Choose the Model Name, select the string to change for String Name and choose Survey Stations (PSS) for the New String Name then press Apply. Now continue to change all the lines into Points.

The last thing change the PEG feature into CC line.



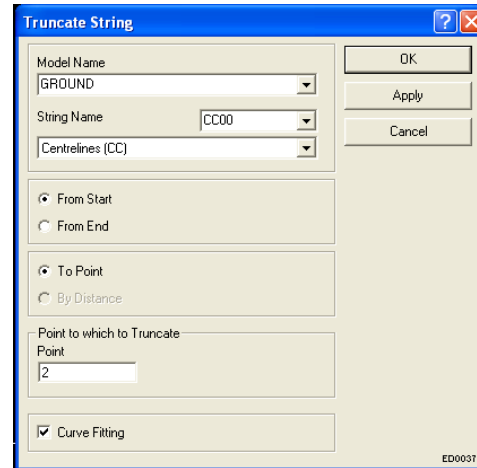
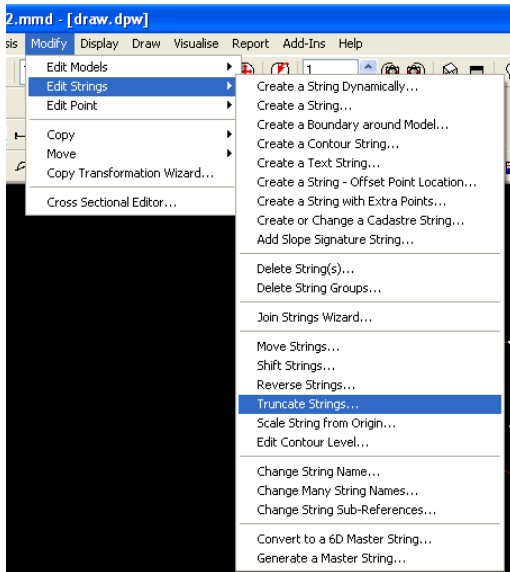
Now your display should look like the display below.



# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

## TRUNCATE LINES

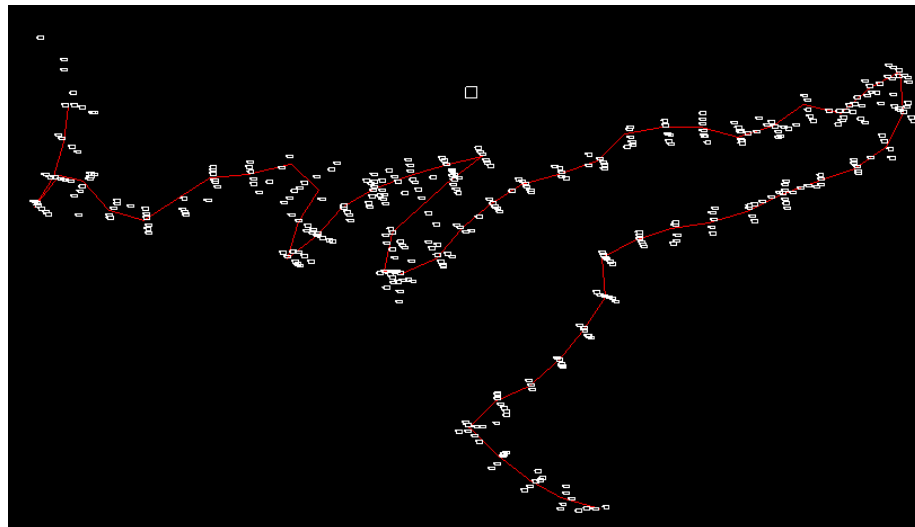
From *Modify* choose *Edit String* and then *Truncate Strings*.....



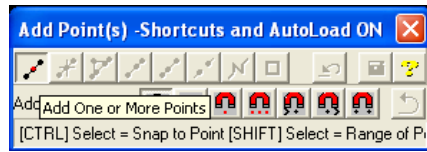
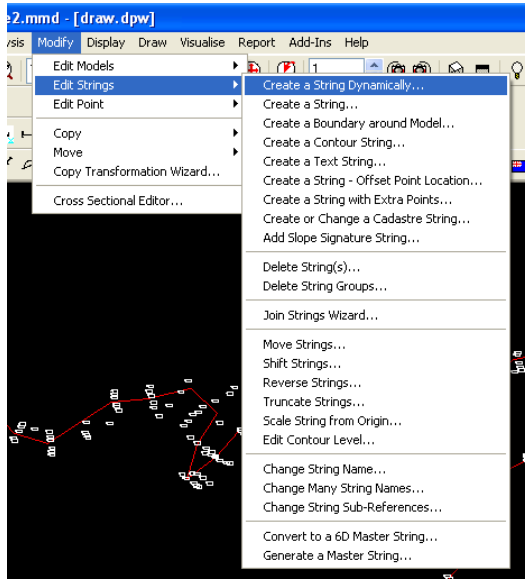
Then when the **Truncate String** Dialog box appears then select the *Model Name* and then the *String Name* to truncate. After that select *From Start/From End*. Then select the *To Point (No.)* and press *OK*

And should be left with the screen as below.

Now to add a boundary around the data.  
Goto *Modify* –  
*Edit Strings* –  
*Create a string Dynamically*.....

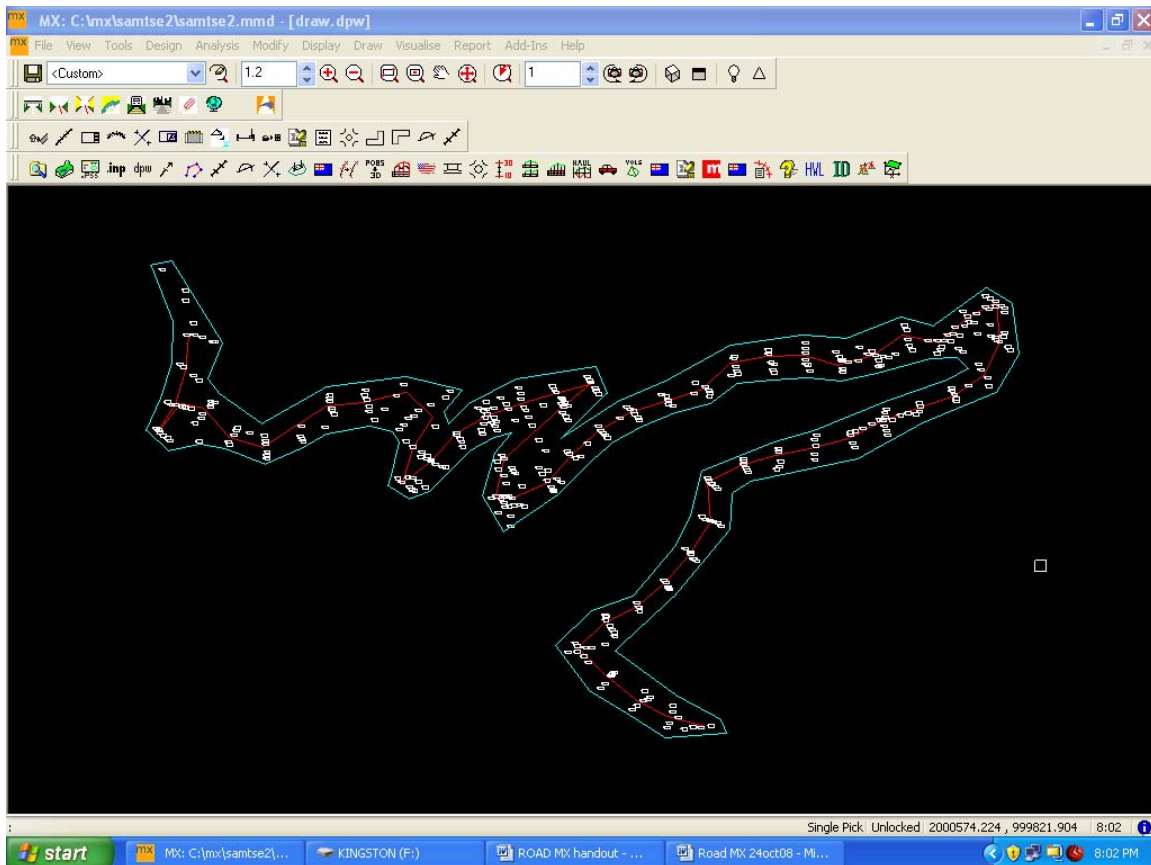


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu



From the Add Point(s) Dialog box choose *Add One or More Points* and then choose *Select in Free Space (No Snap)*  
Then click to create points around your

data.



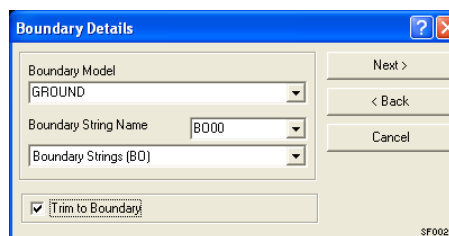
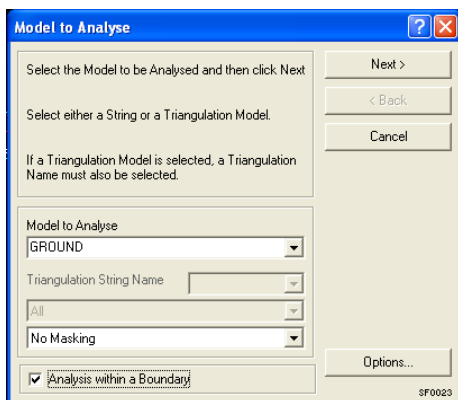
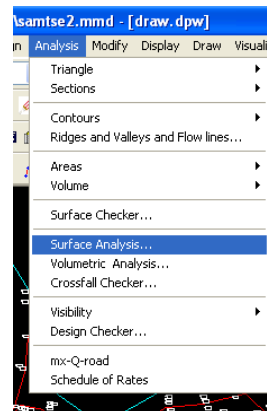
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

To Create a DTM

Choose *Analysis – Surface Analysis*.....

From Model to Analyse dialog box choose the Model to Analyse e.g. *GROUND* in our case

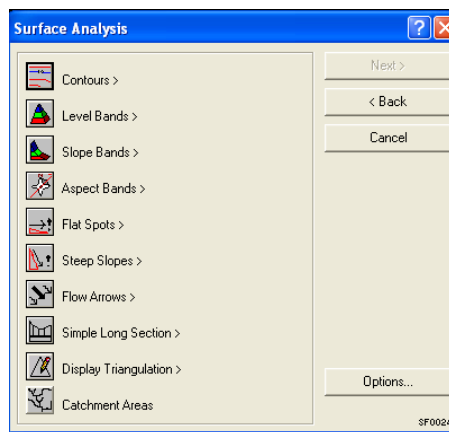
Then make sure that *Analysis within the Boundary* is ticked. And then press *Next >*



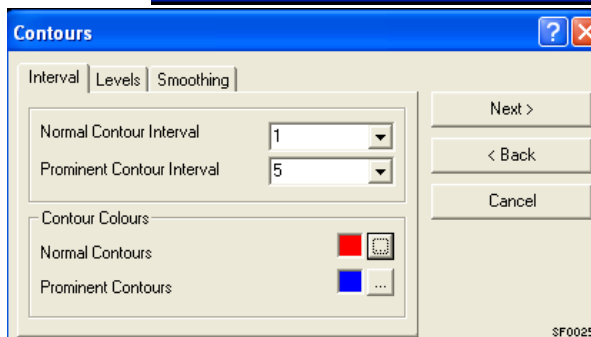
You will be prompted with another Dialog box (Boundary Details) in this select the *Boundary string Name* and tick the *Trim to Boundary*. Then click *Next >*.

Once you click Next you will be prompted with Surface Analysis Dialog Box.

Now select Contour> icon



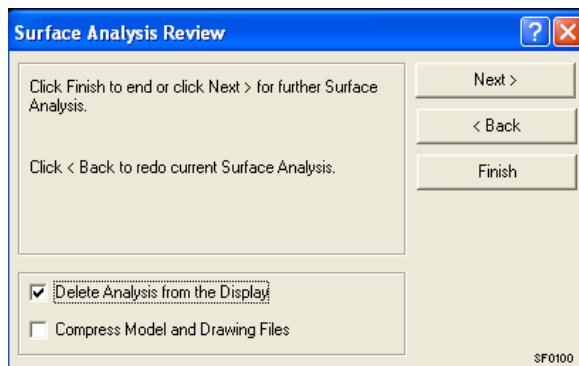
Then choose the *Normal Contour Interval* and the *Prominent Contour Interval*  
Then click *Next >*



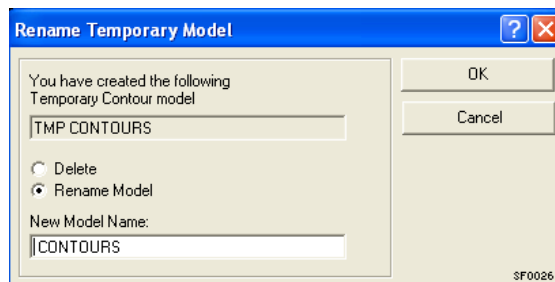


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

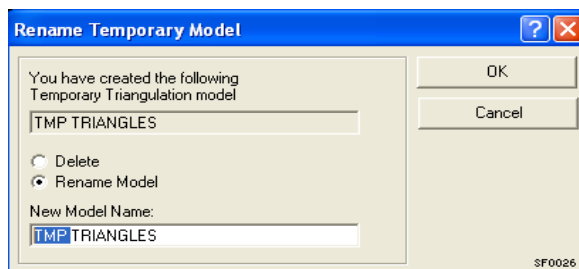
Then click *Finish*



Select Rename Model and change the **TMP CONTOURS** to **CONTOURS** and click *OK*

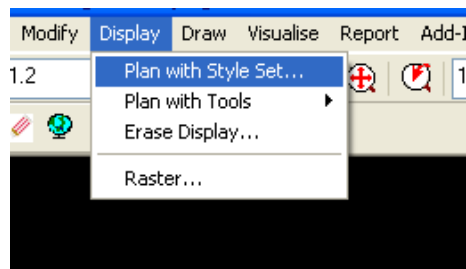


Select Rename Model and change the **TMP TRIANGLES** to **TRIANGLES** and click *OK*

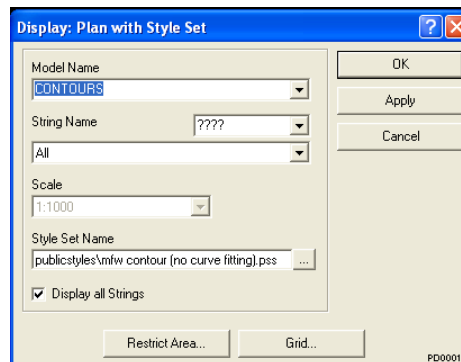


**DISPLAY CONTOUR ON SCREEN**

Click *Display / Plan with Style Set...*



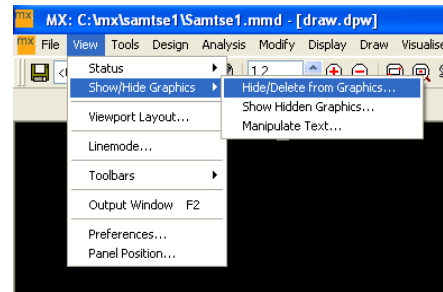
For the Model Name choose **CONTOURS** and for the Style Set Name choose *mfw contour (no curve fitting).pss*



# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

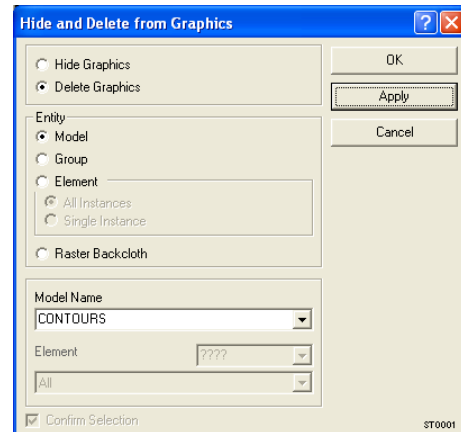
To display only the Boundary and the Center line

Choose *View / Show/Hide Graphics / Hide/Delete From Graphics....*

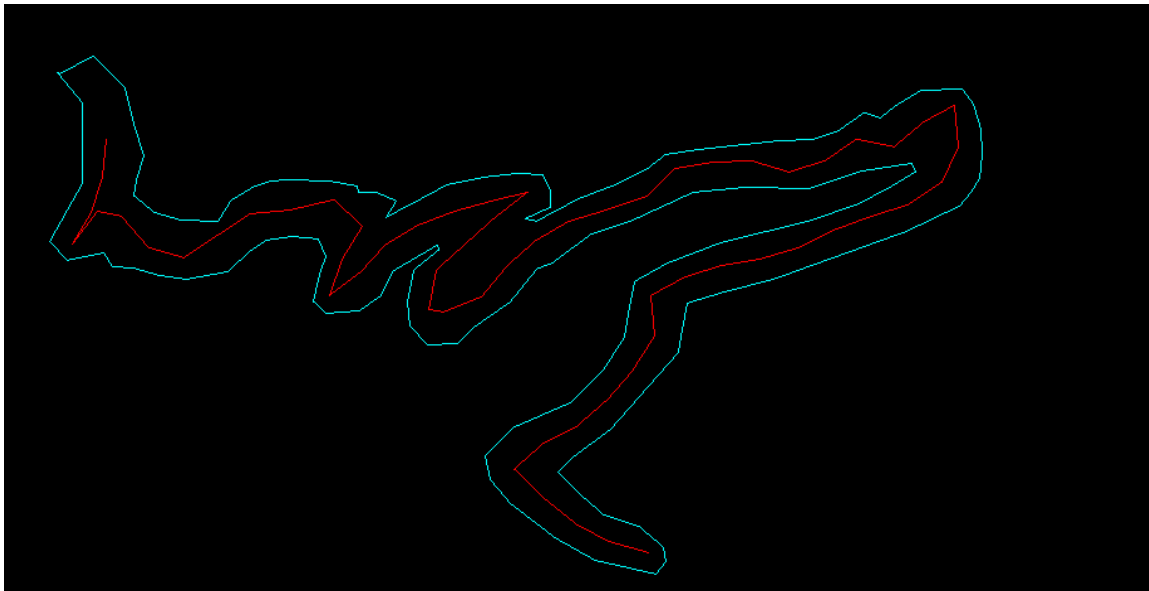


Select Delete Graphic Entity as Model and The Model Name as CONTOURS. And click Apply.

If you have any other Models Displayed then delete that too.



You should have a screen as below.

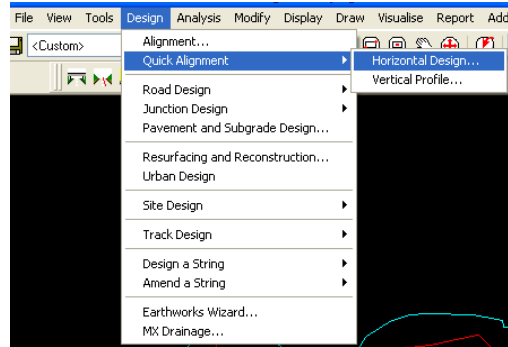


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

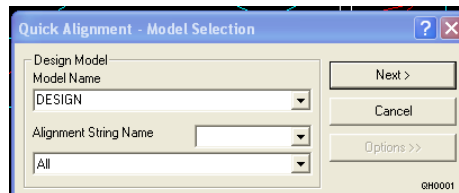
## MX Road Design Process

### The Horizontal Alignment.

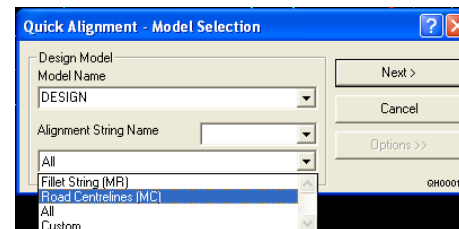
From the pull down menu choose  
*Design/Quick Alignment/ Horizontal Design...*



In the **Quick Alignment** Dialog box you will enter the **Model Name** e.g. DESIGN in this case and then click anyway on the screen and you will be prompted with a warning box as below. Just click on *Yes*



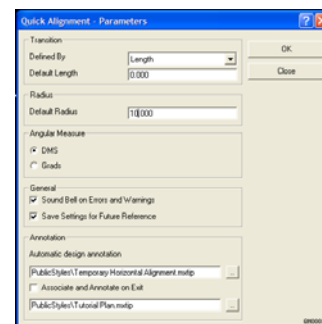
Then select Road *Centrelines* (MC) from the **Alignment String Name**



And click *Next >*

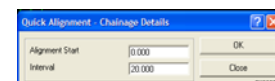
Click on the Parameter setting icon and Parameter Dialog box will be prompted.

Here you can change the parameter settings for now we will change only the Default Radius to 10. Since the minimum radius we are going to use is 10m. Rest you can leave it as default. And click *OK*



Now click on Add IPs and add IPs to form a good horizontal alignment. You should have a guide line to follow e.g. in this case we have CC. The Horizontal Alignment should be as close to the guide line and the curves should not overlap each other. The best alignment would be as follows. As close as to the guideline, no curves overlapping and a minimum no. of IPs.

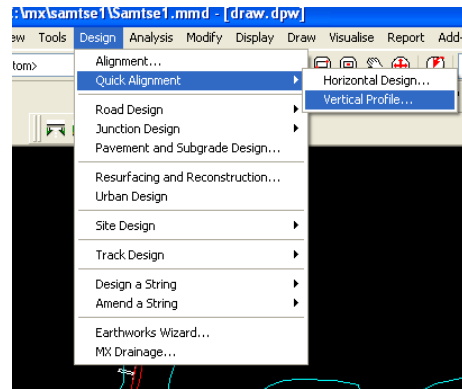
After you are satisfied with your alignment click on OK and when the box appears you have the option to provide the start chainage and the Interval. And then click *OK*



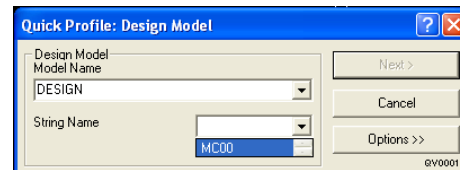
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

## The Vertical Alignment.

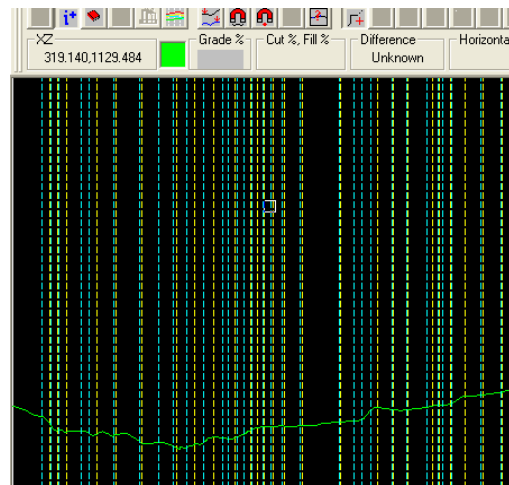
Go to *Design/Quick Alignment/Vertical profile..*



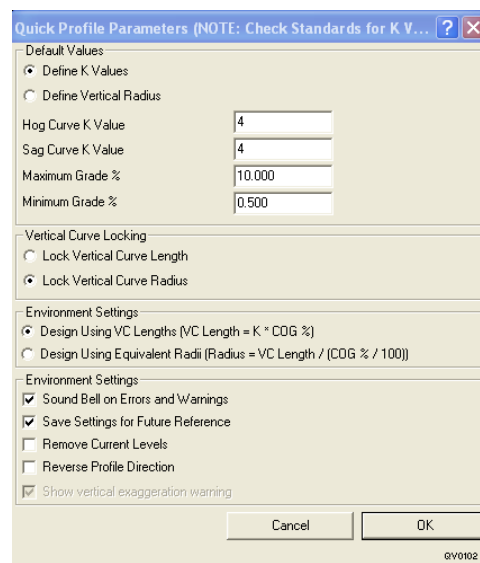
A Dialog box appears , Select Model name (as named earlier) and then select String name



The vertical alignment is displayed ( Correct IP if any break lines are observed)

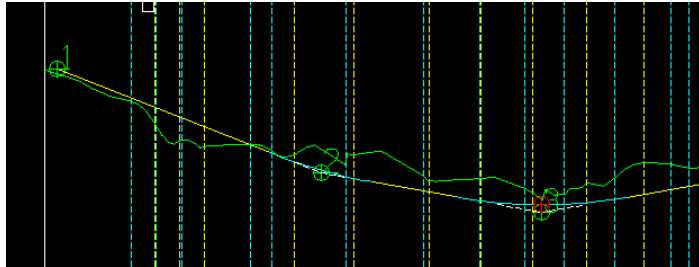


Click on the Parameter icon and set the settings, we will just change the K values, for hill road a K value of 4 is fine, so change both the K values to 4. For the Maximum Grade refer you road standard manual and check the value and provide it here. E.g. here we will provide as 10%. For minimum grade leave it as default.

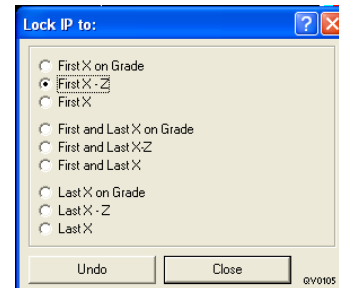


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Now add in the vertical alignment, taking into all the factors, e.g. in hill road full cut would be advisable, so your alignment should be below the profile. Again o curve length should overlap.



After you are again satisfied with the vertical alignment you should lock the first and Last IP. To do this click on *Lock Start/End IPs* to lock you will be prompted with a **Lock IP to** dialog box. Select the required option and click Close.

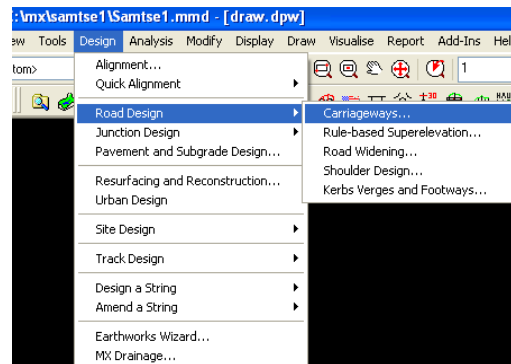


Now exit the vertical alignment option by clicking OK.

Now Hide/Delete all Model except DESIGN Model.

## Adding Carriageway

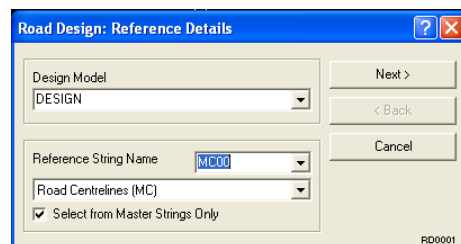
Select *Design / Road Design / Carriageway...*



Then Select the Design Model and the Reference String it should be MC\*\*

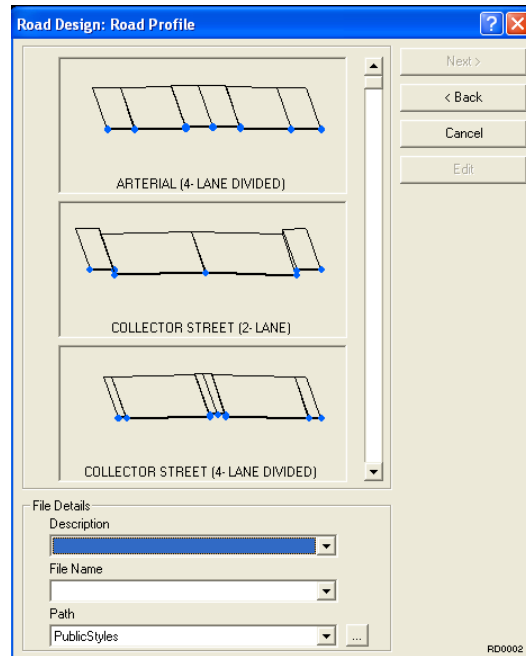
(\*\* could mean any number you have given)

Then click *Next >* if any dialog box appears just click *OK*

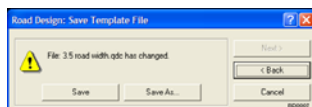
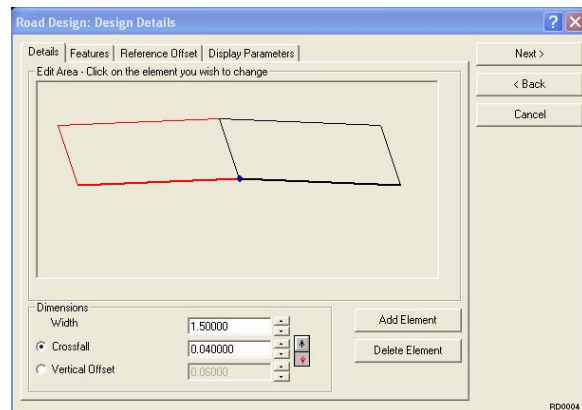


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

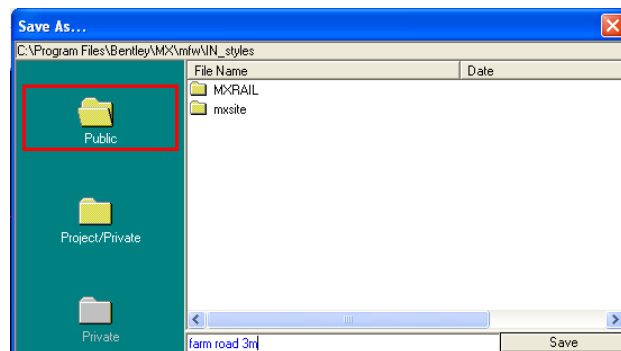
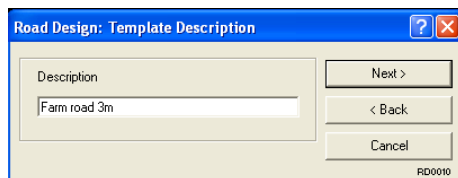
From the Road Design: Road Profile dialog box choose a template similar to the one you want and click on *Edit*.



Now edit the Width and the Crossfall for your Template. E.g. Width = 1.5 m both side to make it 3.0m and a crossfall of 0.04 meaning 4% for Earthen Road. Then click *Next >*



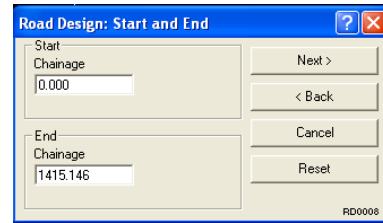
Click on *Save As...*



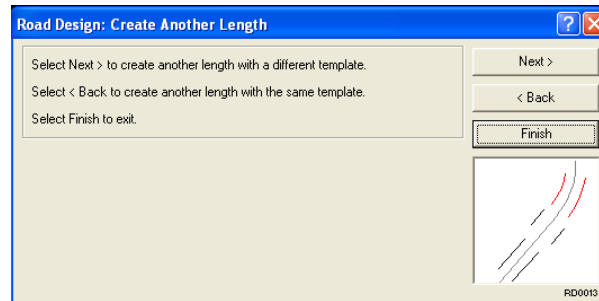
Enter the Description for the Template and click *Next >* Then Save the file with a name easy to remember in the Public Directory.

# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

You will be asked to supply the Chainage for Start and End. Give the chainages and click *Next >*



If you want to give different Carriageway the click *Next >* if not Click *Finish*

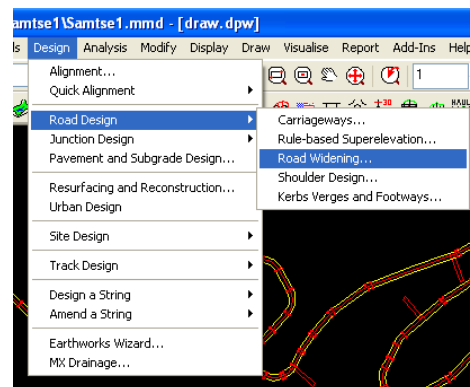


Your design will now have a Carriageway on it.



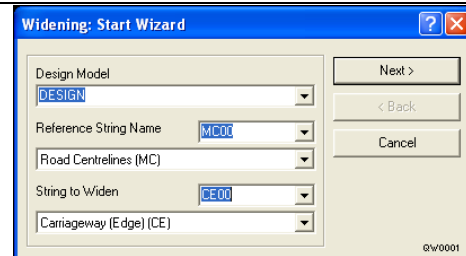
## Road Widening

Select *Design / Road Design / Road Widening....*



# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Then Select the Model which is DESIGN  
The Reference String Name (which is the Road Centrelines(MC))  
And then the String to Widen (which is Carriageway (Edge) (CE))  
Then click *Next >*



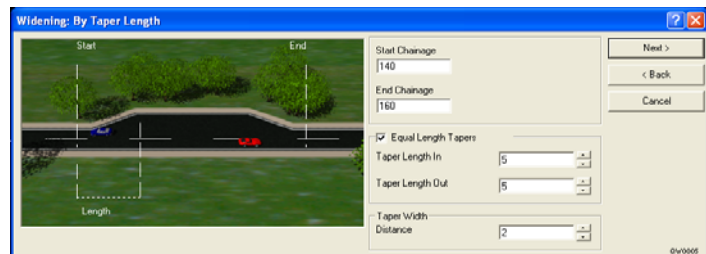
Now the Widening Details.

Check the different options and whichever you feel the best select it and click *Next >*



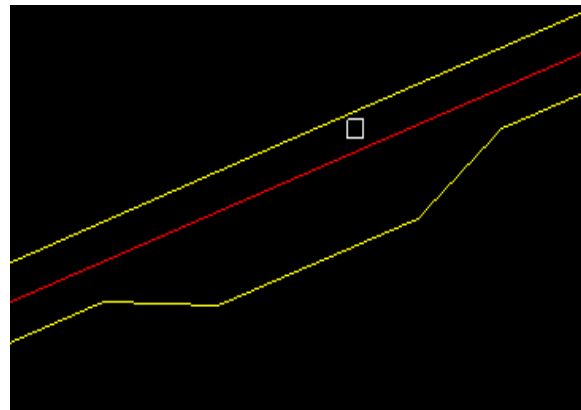
Choose the Start Chainage. The End Chainage, the Taper Length and the Distance to Widen.  
Then click *Next >*

Click *Finish*



Then your carriageway will appear as in the figure.

Provide the Passing Bays only on straight portion of the Road.

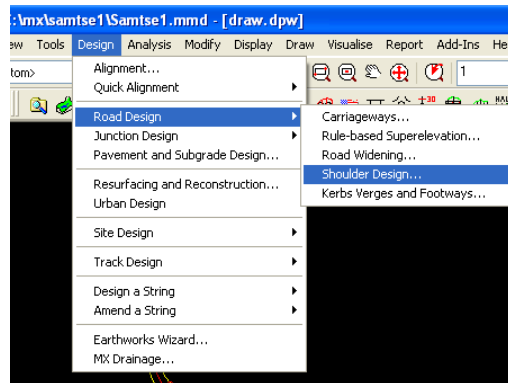




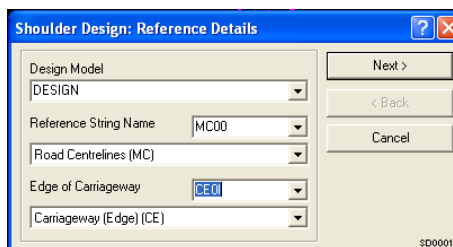
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

## For shoulder Design

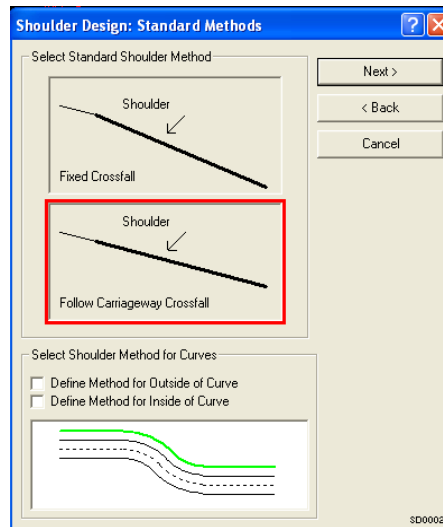
Select *Design/Road Design/Shoulder Design...*



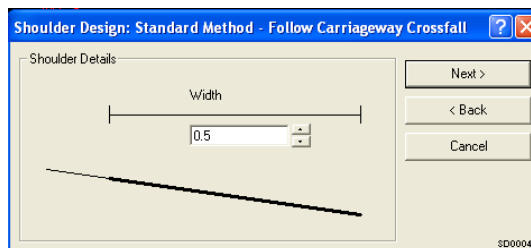
Select the Design Model, the Reference String and the Edge of the Carriageway. As in the Figure.



Choose the Method of Shoulder you want to apply. The first one is with a different crossfall from the Carriageway, these are usually provided in a metallic carriageway. The second one is having the same crossfall as that of the carriageway. This is usually provided for Earthen Roads so we will choose this and click *Next >*

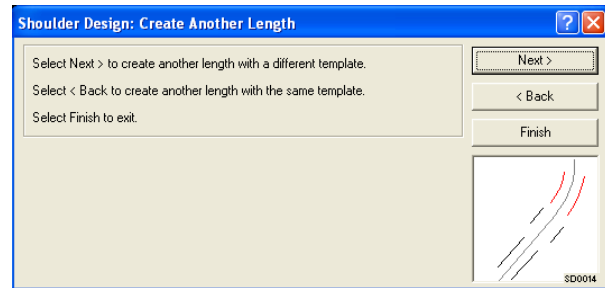


Provide the width of the Shoulder. Then Click *Next >*

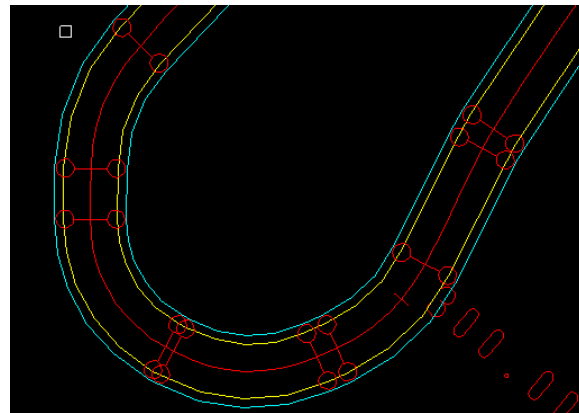


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Now to Provide for the other side of the Road Click *Next >* and repeat the same process, but this time select the other edge of the Carriageway. Once completed click *Finish*

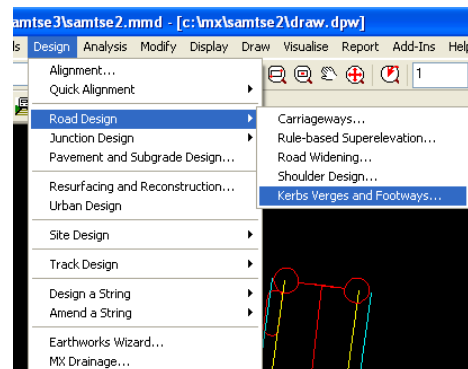


Now we will have the centerline, Carriageway and the shoulder on our design.

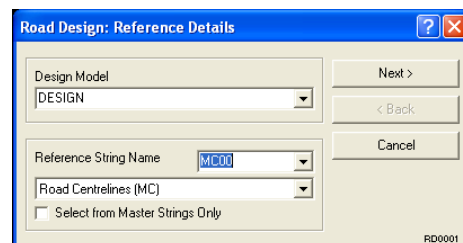


## Now Apply the drain

Select *Design/Road Deign/Kerbs Verges and Footways...*

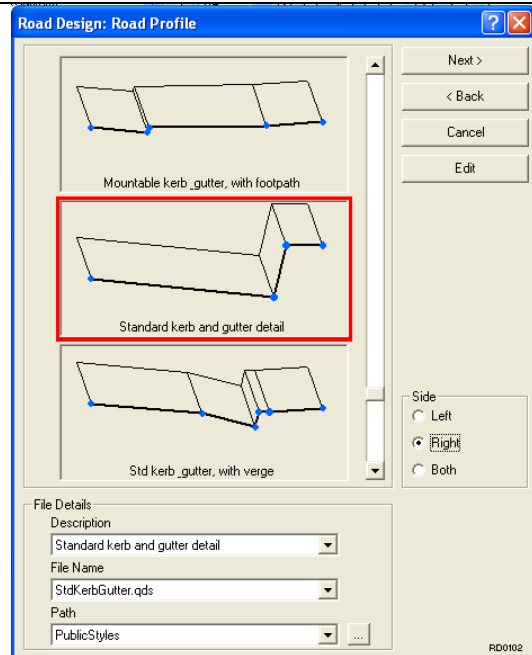


From the **Road Design: Reference Details** Dialog Box.  
Choose the Design Model *DESIGN* and the reference String Name *MC00*  
Then click *Next >*

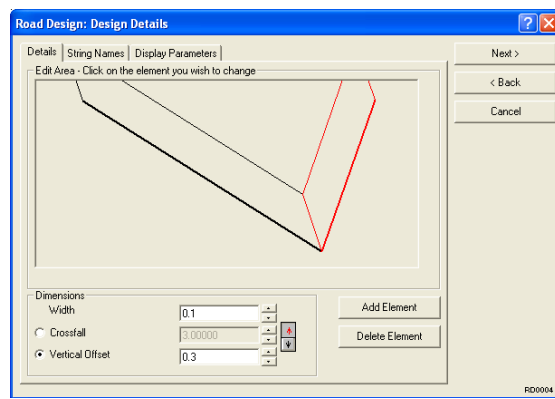
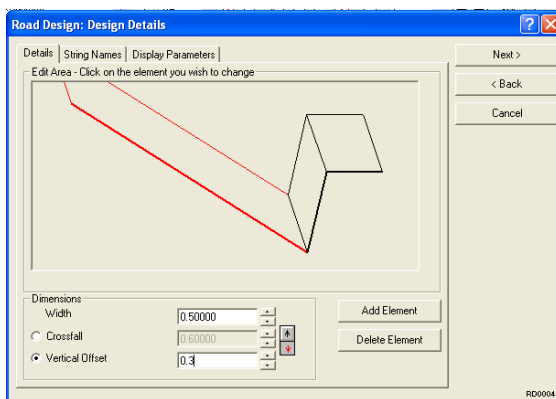
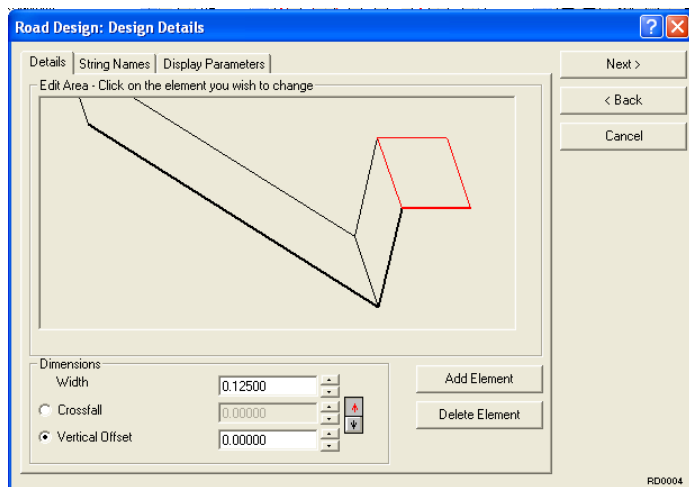


## ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Since we want to apply drain on the Hill side and it is the Right side click on the Right radio button. And then select the drain template which is very similar to the drain you want to create, which in this example is the **Standard kerb and gutter detail** and click **Edit**.

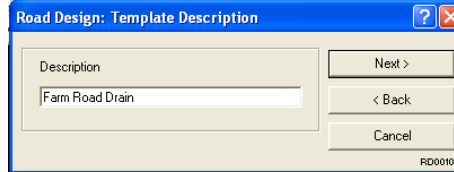
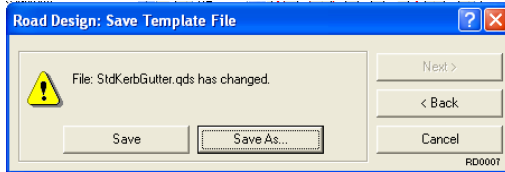


Now select the element which you do not want, and the click *Delete Element*

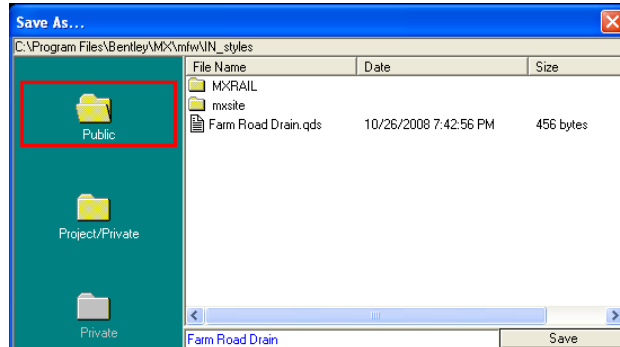


Now Edit the Width and the Vertical Offset for both the elements. Make the *width as 0.5 and 0.1* respectively and the Vertical Offset as *0.3 for both*. Then click *Next >*

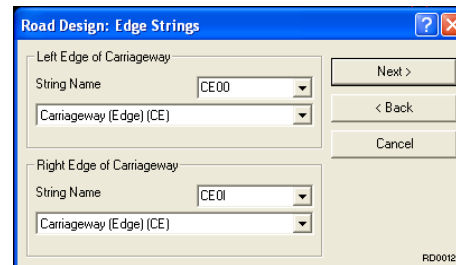
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu



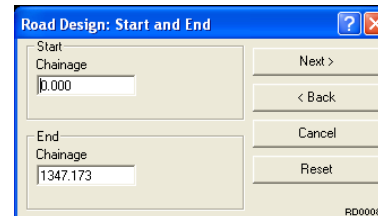
Now click *Save As...*  
For Description Enter as *Farm Road Drain*  
Then click *Next >*  
And the for the file name enter the same as the Description and then click *Save*



When the **Road Design: Edge String** dialog box  
Select the string you want to add the drain to which  
in this case will be the *Carriageway (Edge)(CE)*  
Then click the *Next >* button.

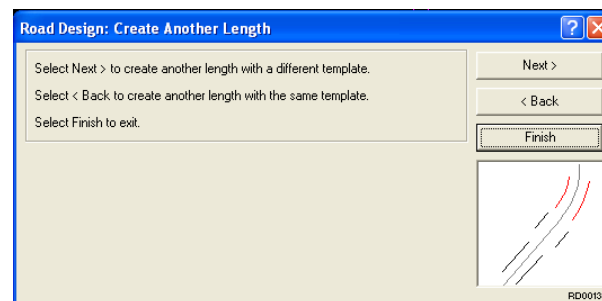


From the **Road Design: Start and End** dialog box  
Select the *start chainage and the end chainage*  
Then click the *Next >* button.



Now click on *Finish*

After applying *Finish* repeat this steps to  
apply the drain on the hill side only.

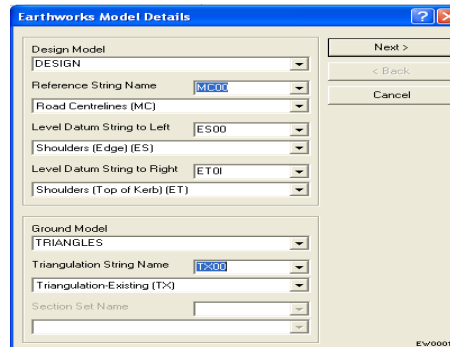


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Now to apply the Batter for our cross section we will select.  
*Design/Earthworks Wizard*

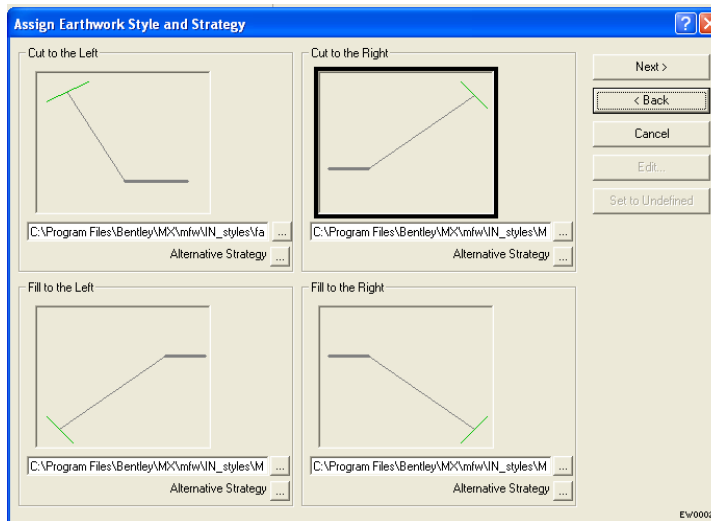


From the Earthworks Models Details  
We will select the Design Model and the Reference String Name.  
Select Level Datum String to Left, for this select the string which is the last and for the Select Level Datum String to right.

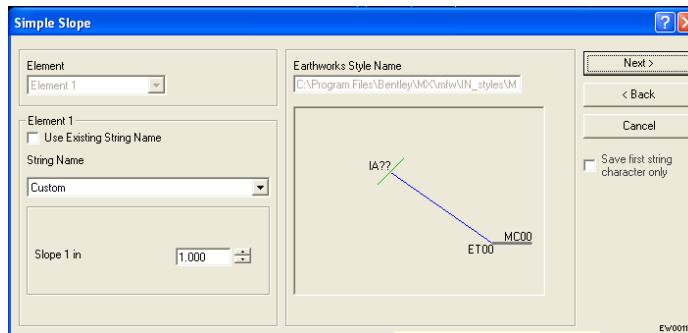


Then select the Ground Model and the Triangulation String Name *TX00*  
Then click *Next* >

Click on one of the template and click *Edit*



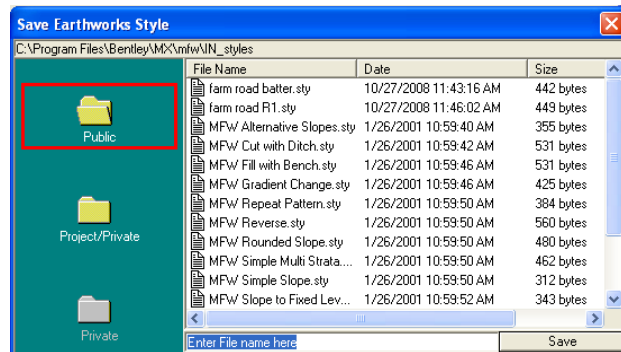
For the slope select 0.5 and then click *Next* >



# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

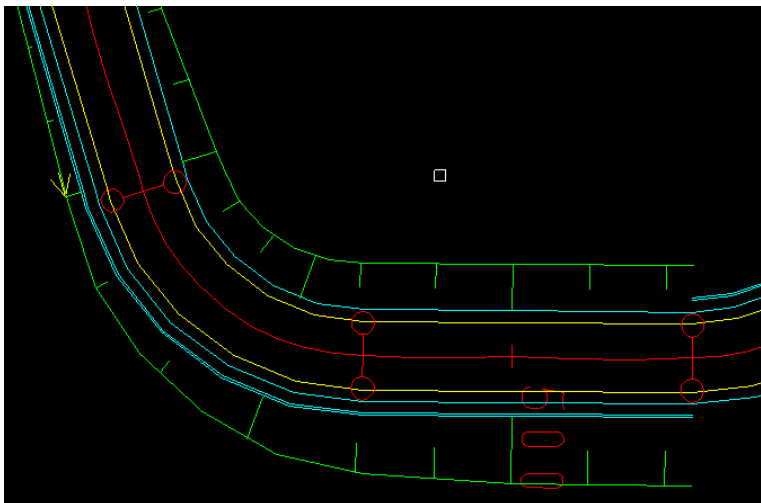
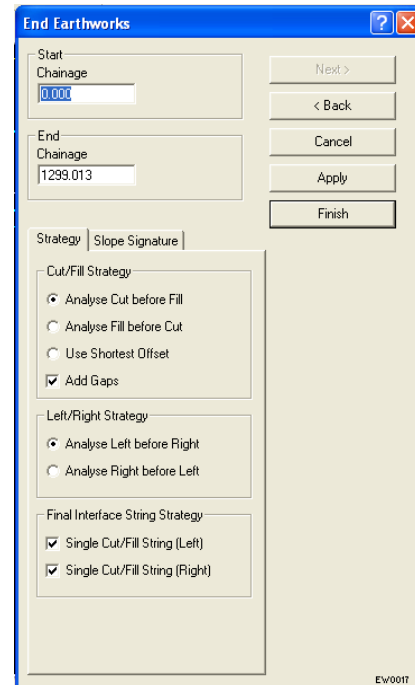
Save the file name as *Farm Road Batter* and click *Save*.

Repeat this for the Fill and give the slope as *0.3* and save the file name as *Farm Road RW*



Select the Chainage start and end. Then click *Next >*

Make sure you apply the earthwork on the alignment as part as you have applied for the drain.

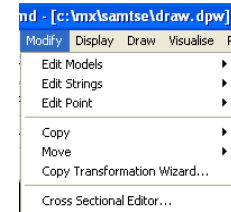


Your Display should look like this.

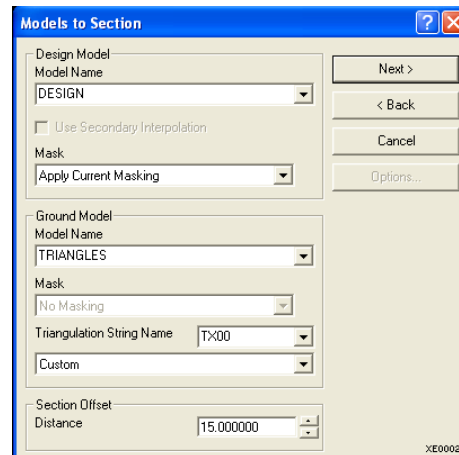
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Editing the Cross Section.

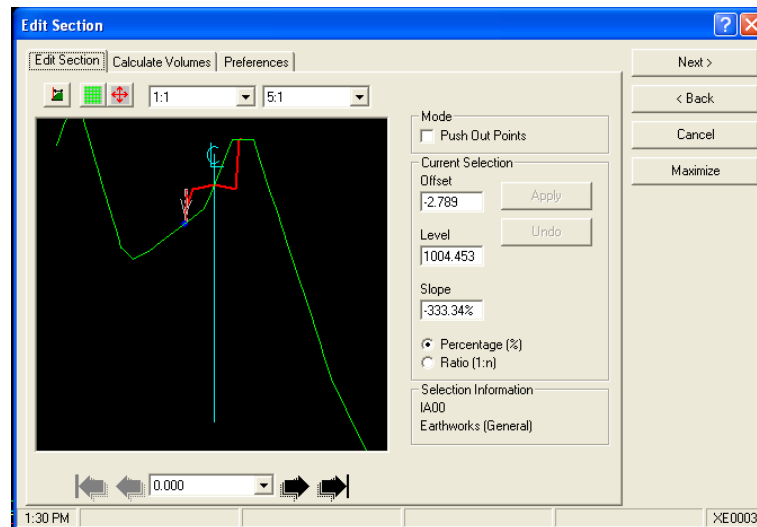
Select *Modify/Cross Sectional Editor*.....



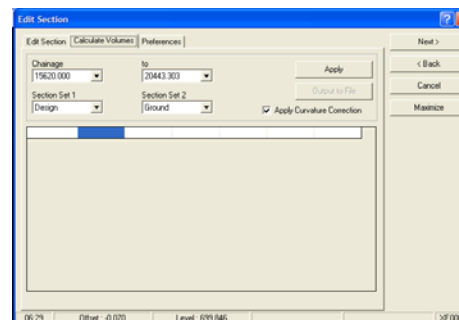
In the Models to Section dialog box  
Select the Model Name and the Triangulation  
String Name as *TX00*  
For the Section Offset Distance type *15*  
Then click *Next* >



Edit the require cross  
sections and then click on  
*Calculate Volumes*.

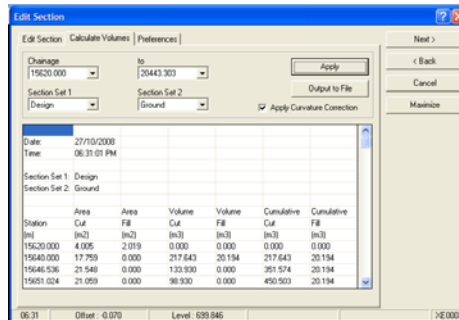


For the Section Set 1 select *Design* and then  
Section 2 select *Ground*  
And then click *Apply*

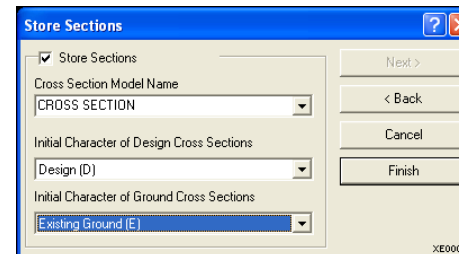


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Once Earthwork Volume is generated click on *Output to File* and save it as a *txt* file.



Then click *Next >*



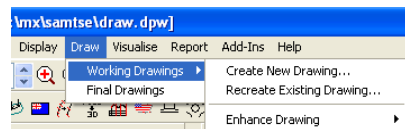
Now from the Store Sections Dialog box

Type Cross Section Model Name as CROSS SECTION and then click on the screen and click OK to create the Model.

Then for Initial Character of Design Cross Sections Select *Design (D)*

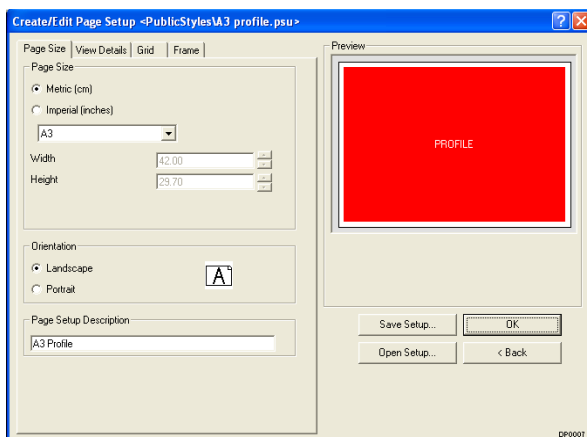
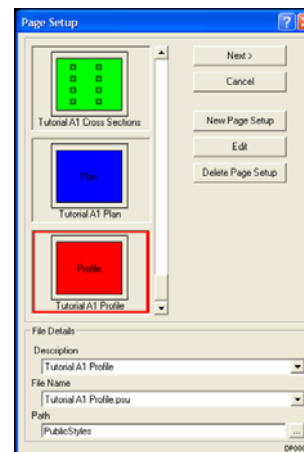
For Initial Character of Ground Cross Sections Select *Existing Ground (E)* and then click *Finish*

**Now for creating the Template for profile and cross section.**



Select *Draw/Working Drawings/Create New Drawing...*

Once in the Page Setup dialog box Select *Tutorial A1 Profile* and click *Edit*



In the Page Size tab select the Page Size as A3, leave the Orientation as Landscape

Then select the View Details Tab

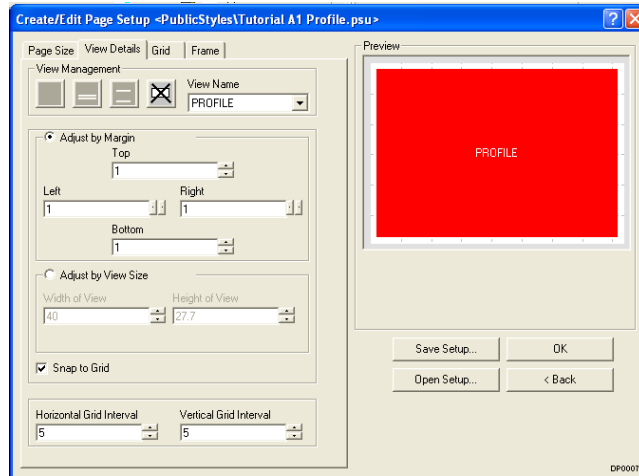


# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

In the View Details Tab

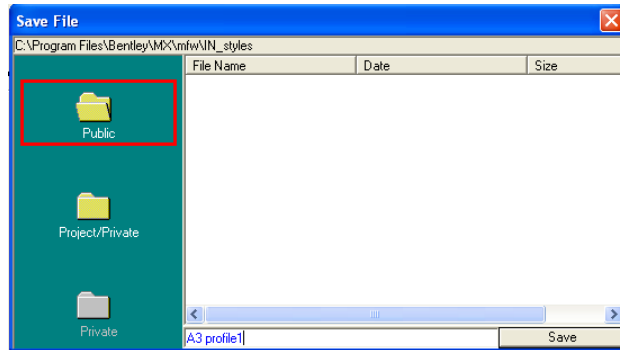
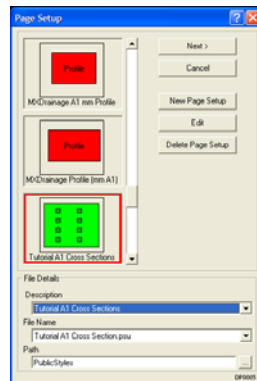
Adjust by Margin to 1 for Top,  
Bottom, Left and Right.

Then from the Frame Tab check the  
Frame Around the Margin and then  
click *Save Setup...*

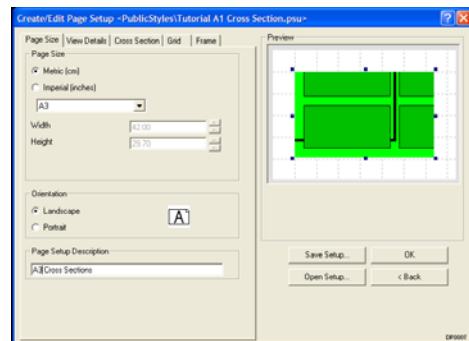


Save the setup as *A3 Profile* and click  
*Save*

Then Select  
*Tutorial A1*  
*Cross Sections*  
and Click *Edit*



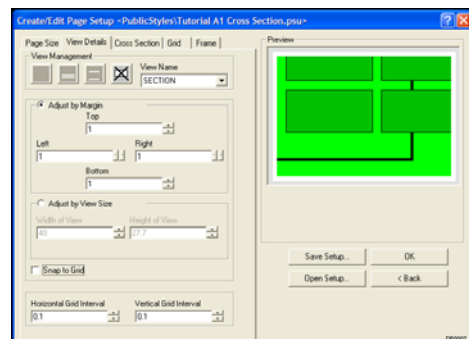
From the Create/Edit Page Setup Dialog Box and  
Page Size Tab again select *A3* and for the Page  
Setup Description Type *A3 Cross Section* and then  
click on *View Details* Tab



Now in the View Details Tab

Adjust all the Margin to 1 and uncheck the *Snap to*  
*Grid*.

Then click on the *Cross Section* Tab



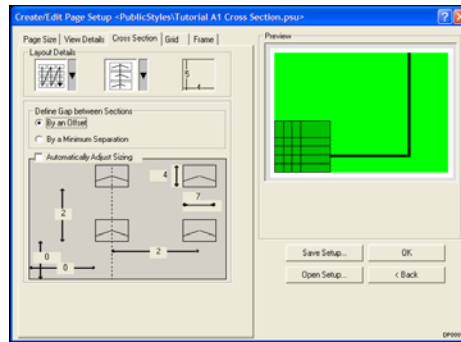
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

In the Cross Section Tab

Set all the settings as per the Figure to the right.

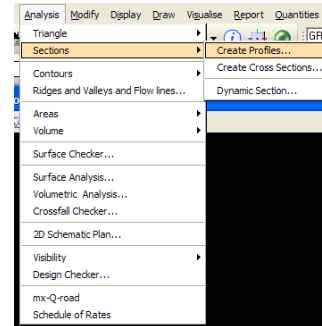
Then from the Frame Tab check the Frame Around the Margin and then click *Save Setup...*

Save the file with a file name as *A3 Cross Section*

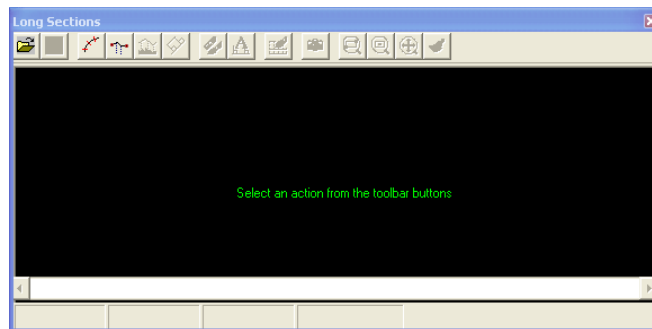
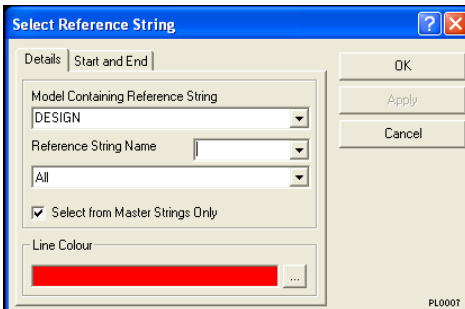


Now create the profile and Cross Section Drawing Files.

From Pull Down Menu Select *Analysis/Sections/Create Profiles....*

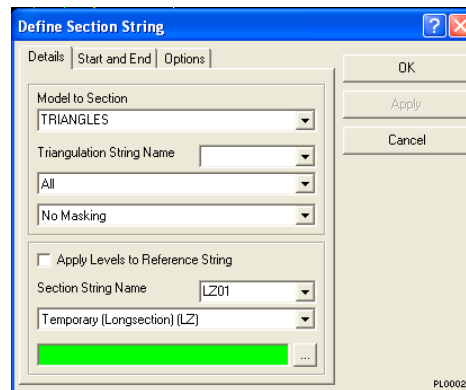


In the Long Sections Dialog box  
Select *Reference String* Icon



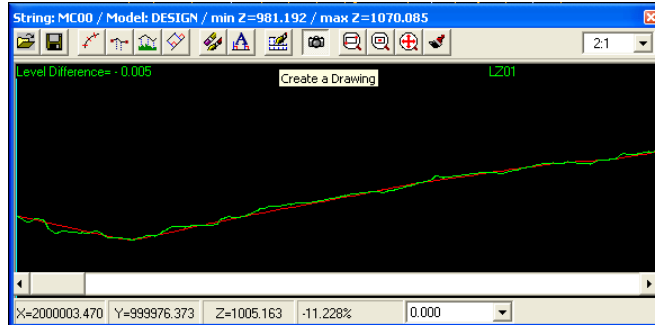
Select the Model as *DESIGN* and the reference String Name as *MC00* and then click *OK* and when back to the Long Sections Dialog box click on *Create New Section*.

Here Select the *TRIANGLES* as model and select the Triangulation String as *TX00* and then click on the *Start and End* Tab and provide the start and end chainage and click *OK*



# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

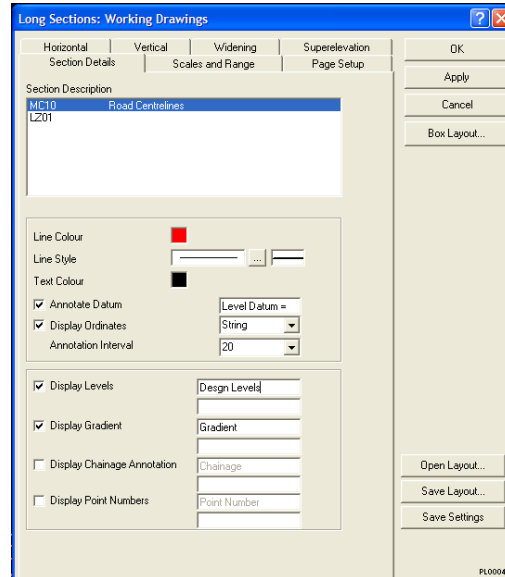
Now click on the Create a Drawing Tab.



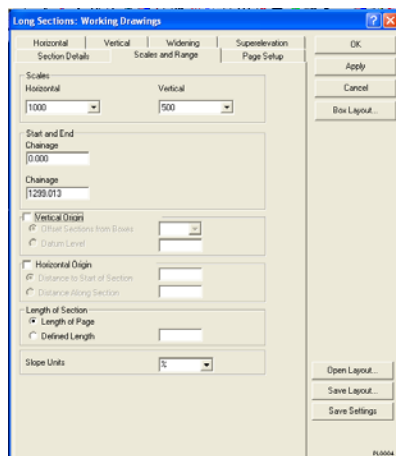
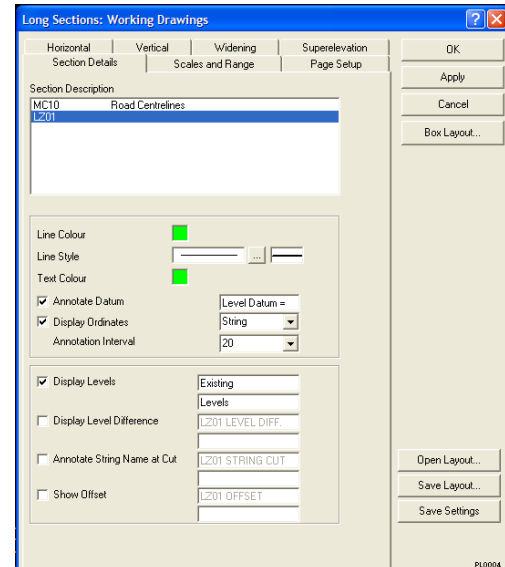
In the Section Details Tab

- For the Road Centrelines
- Have the following checked.
- Annotate Datum
- Display Ordinates
- For Annotation Interval select 20
- Display Level and Rename MC00 LEVELS to Design Levels
- Display Gradient

As per the Figure shown and then click on the next section.



Check as per Figure and change the Display Levels as Existing Levels and then click on Scale and Range Tab.



# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

In this Tab select the Scale for Horizontal as *1000* the Vertical Scale as *500* then click on *Page Setup Tab*

In this Tab select *Fixed Page* and then select the *A3 Profile* file as *Page Setup*.

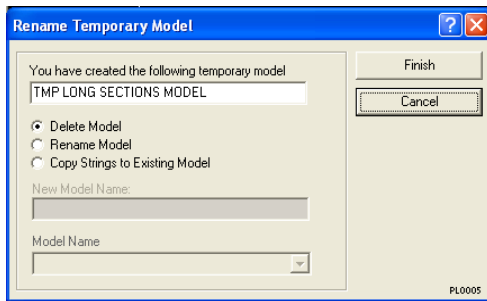
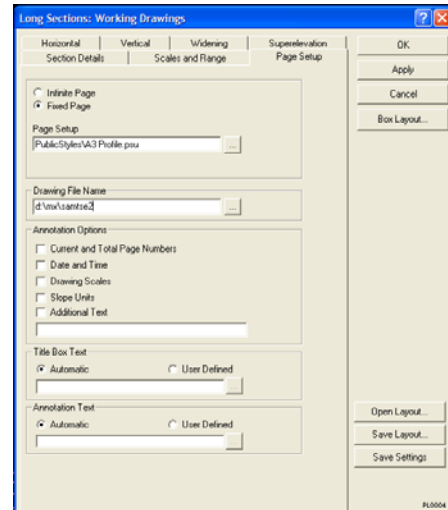
Then click *Apply*.

If you find it suiting you then click on *Save Layout..*

Save it in a Directory easy for you to use it later.

Then click *OK* button

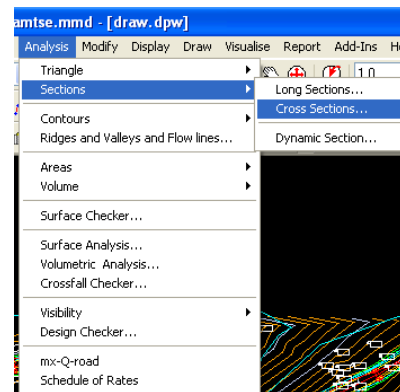
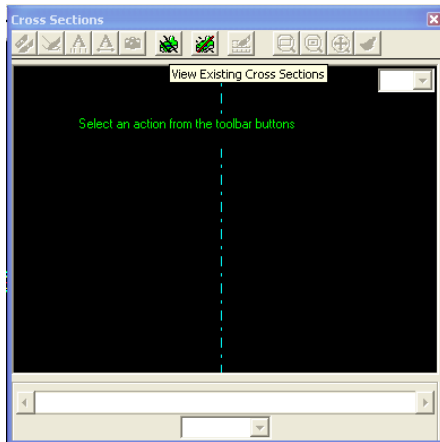
Then click *Yes* on the next Dialog Box.



Have the *Delete Model* radio button on and click *Finish*

## Create Cross Section Drawing File

Again From the Pull Down Menu Select *Analysis/Section/Cross Sections...*



In the Cross Section Dialog Box.  
*Select View Existing Cross Sections*

# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

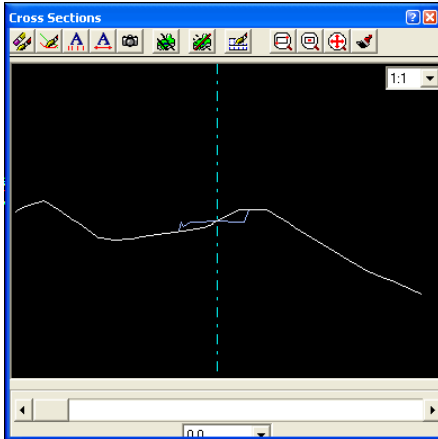
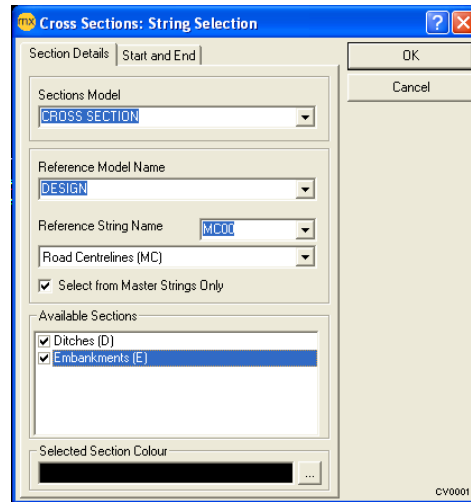
From the Cross Sections: String Selection Dialog Box for

Sections Model select *CROSS SECTION*

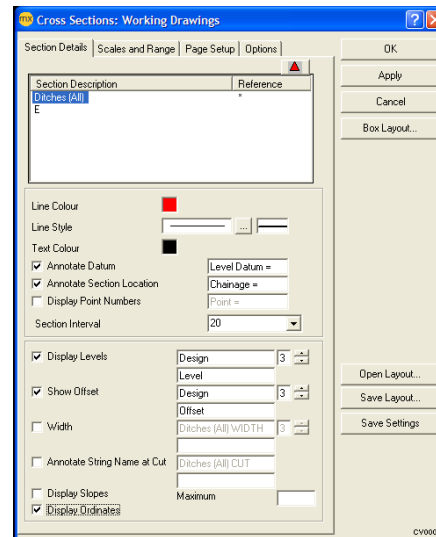
Reference Model Name select *DESIGN*

Reference String Name select *MC00*

Then check the *(D) and (E)* and click *OK*



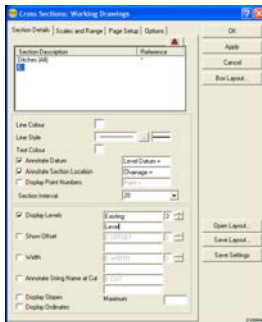
Now from the Cross Sections Dialog Box  
Click on *Create New Cross Section Drawing*



In the Cross Section: Working Drawing Dialog Box  
Under the Section Details Tab

Select and Type as per the figure shown.

Then select the *E*



Again Select and Type as per the figure shown.

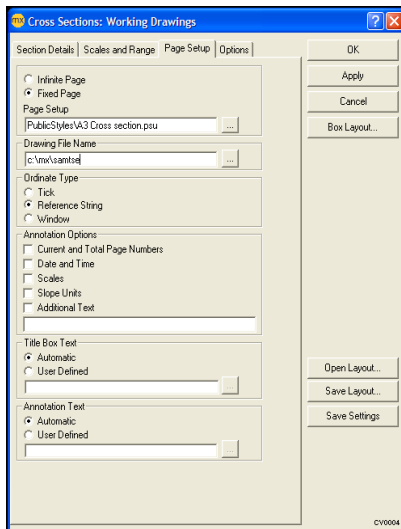
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

And select *Scales and Range* Tab

In the Scales and Range Tab

Select the Horizontal Scale as 500 and the Vertical Scale as 500

Then click on the *Page Setup* Tab



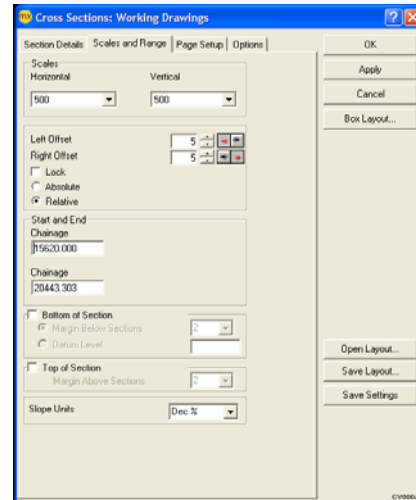
In the Page Setup Tab

Select the Fixed Page radio button.

Then click *Apply*

If you are satisfied with the setup then click on *Save Layout...* and save the layout in a directory where you can use it in future.

Then click on *OK* then click Yes on the next Dialog box.



You have completed creating the Drawing files for Profile and Cross Section. Now we will Export all Plan, Profile and Cross Section Drawing Files to AutoCAD file. In MX 2004 Edition you have the option to export to AutoCAD DXF file.

Display the Plan with Design Model and Contour Model

Then Select *File/Export/DXF/2D....* and save the file as dxf file.

Now from the Pull down Menu select

*File/Open Display/Drawings...* then select the Draw long section file.

Then Select *File/Export/DXF/2D....* and save the file as dxf file.

Again from the Pull down Menu select

*File/Open Display/Drawings...* then select the Draw cross section file.

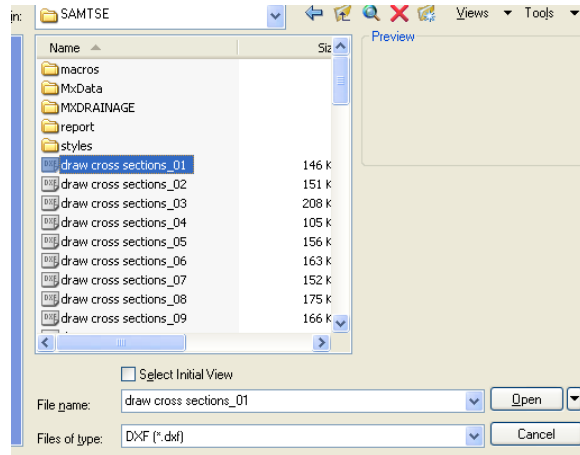
Then Select *File/Export/DXF/2D....* and save the file as dxf file.

# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

In Auto Cad

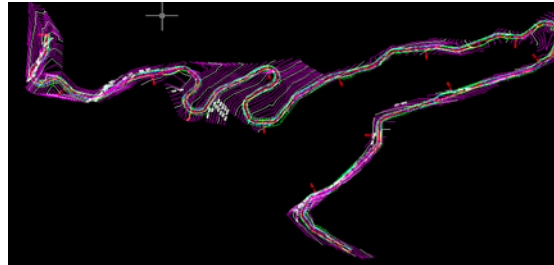
*Open the dxf file*

*Select the file name which you want to open*

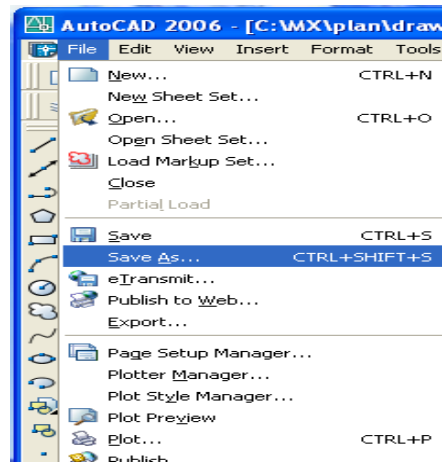


The plan which is exported dxf MX file to Auto Cad and open the the file and then edit the map as required.

- *Open Auto Cad*
- *Open dxf file, file type*
- *Then zoom all to get this map.*



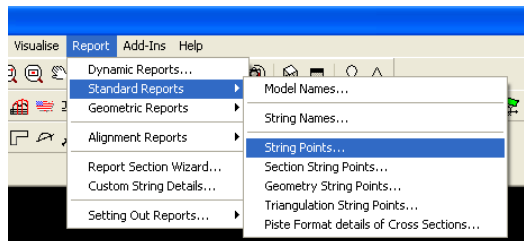
After that you can do all editing.



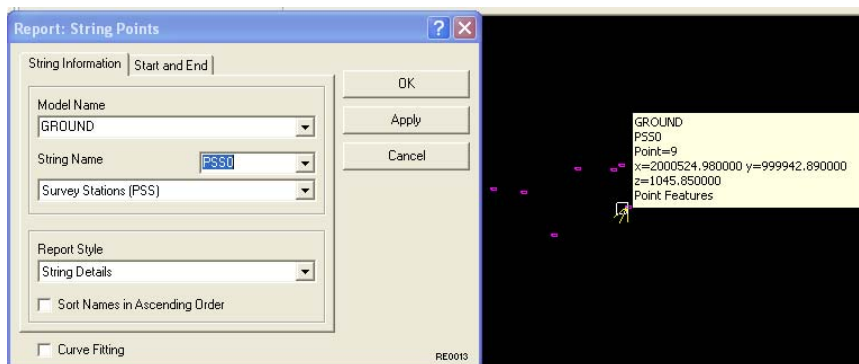
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

## Report Printing

First of all only display the Station Feature  
Then from the Pull Down Menu select  
*Report/Standard Reports/String Points....*

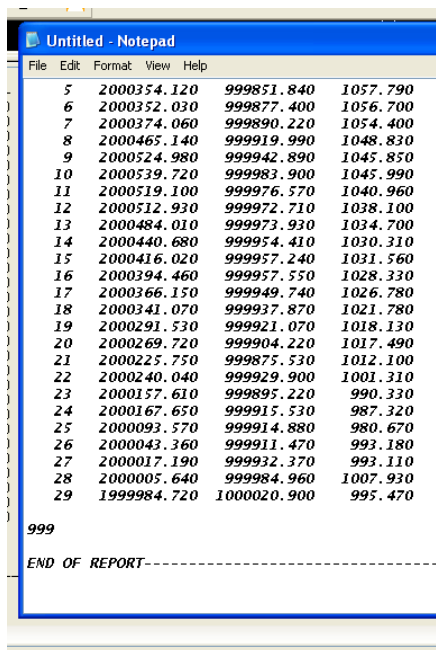
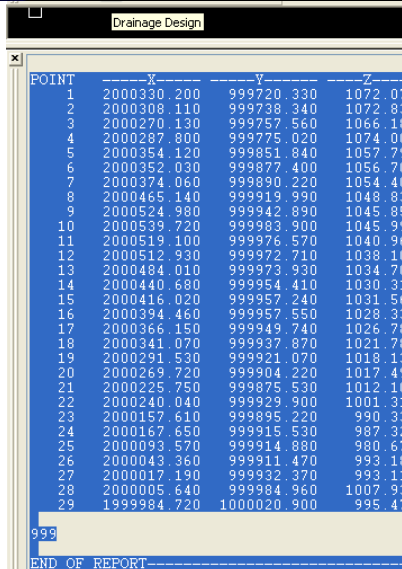


Then Select the  
Model and the  
Station String  
Name.



Click *OK*

Press F2 if your Control Window is not open.  
Select all the text and copy it.



Open Notepad and paste it there and save it as a text file in a directory of your choice.

In the same manner do for Centerline.



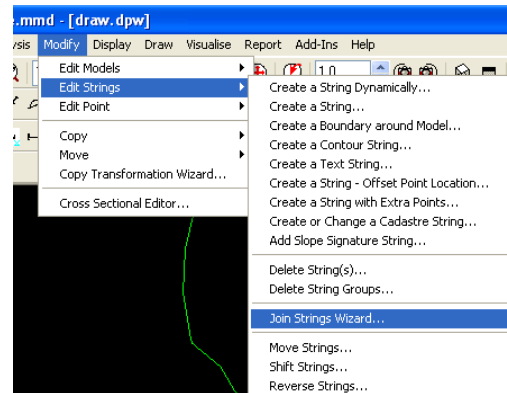
# ROAD MX Training Handouts: Department of Roads, MoWHS, Thimphu

Now for the Batter.

Since we have the Batters with different String name we will first join all the Right batters.

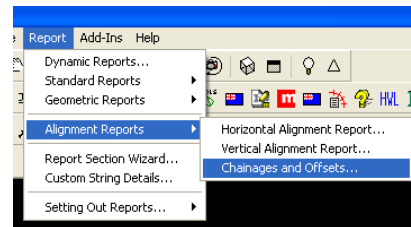
Select *Modify/Edit Strings/Join Strings Wizard*.

Select the **Model** and the **String Name** you want to join. And then one by one select all the string you want to join together and when finished, click on *Finish*.



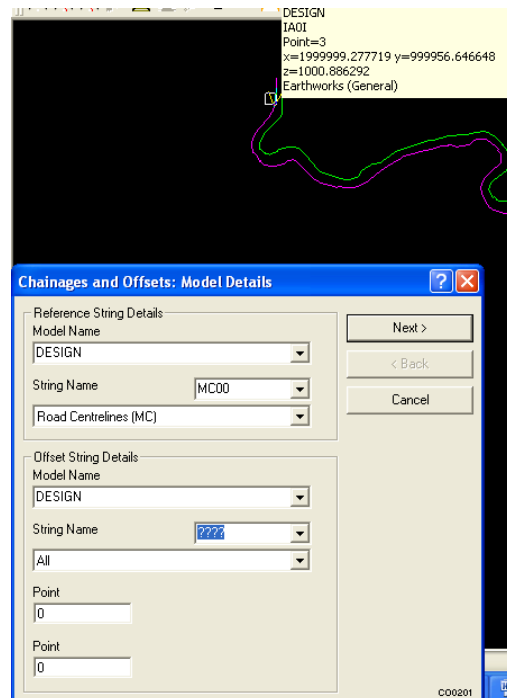
Repeat for the other Batters.

Now to Generate the Report for the Batter select *Report/Alignment Reports/Chainage and Offsets...*



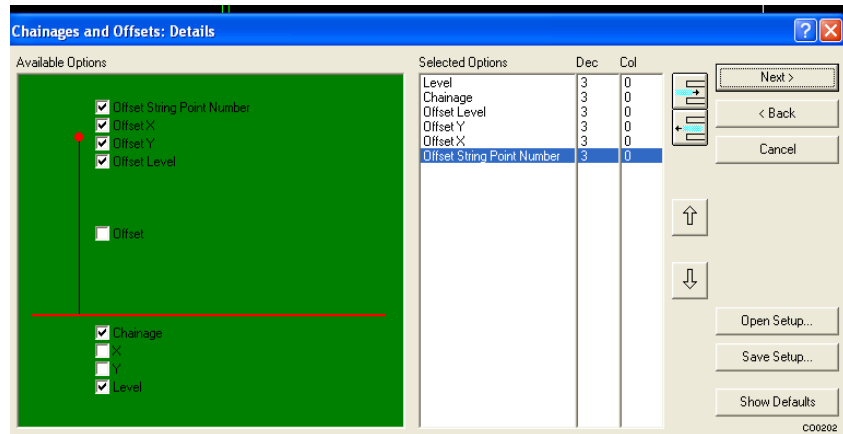
Choose the Model Name and the Reference String Name as *MC00*

For the Offset String Details again choose the Model Name and the string Name which will be the Earthwork. And click *Next >*



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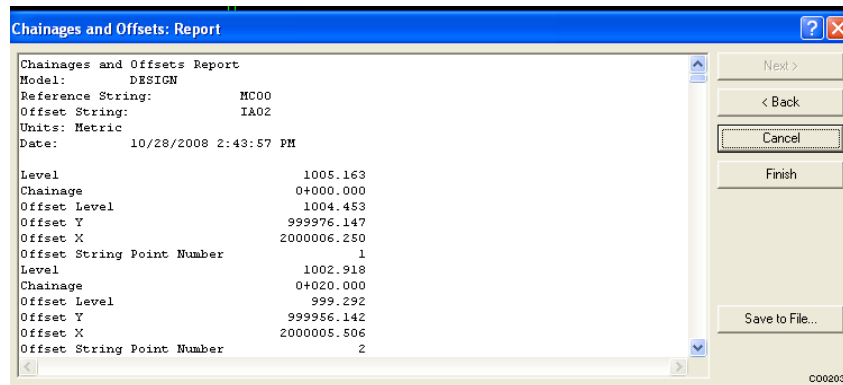
Check as per the figure and then click *Next >*



The Report will be generated then click on *Save to File...*

Save it as a txt file.

Repeat this step for the other batter and save the file.



Now you have the Drawing Files in Acad format and the reports in txt file. Print all the drawings and report file to be sent to the Surveyors for setting out in the Field.

**Tashi Delek.**

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**ROAD MX Training Handouts:**  
**Department of Roads, MoWHS, Thimphu**

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List of Participants
