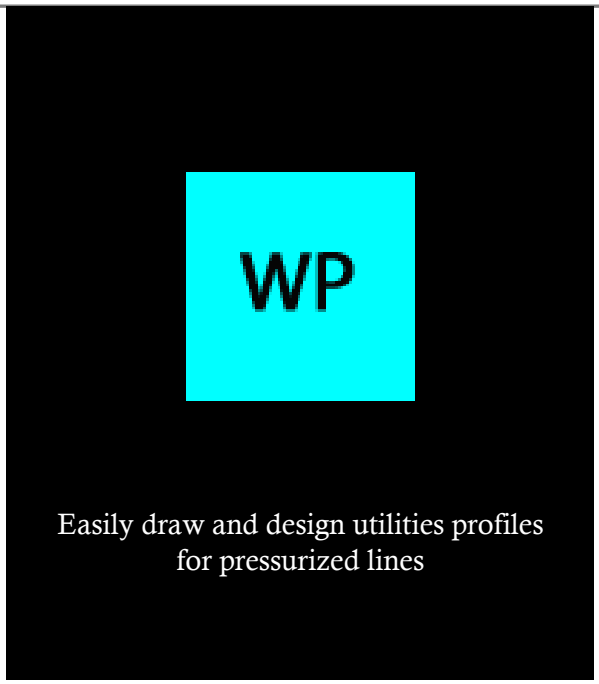


WP v1.0 User guide

Wet Utilities Profiler

Ibrahim El Shar

TABLE OF CONTENTS

1 INTRODUCTION:

The User Manual contains all essential information for the user to make full use of WP v1.0 AutoLISP routine. This manual includes a description of functions and capabilities, contingencies and alternate modes of operation, and step-by-step procedures for drawing profiles using WP.

1.1 PURPOSE AND SCOPE

This program was initially designed to draw and design profiles for the existing and relocated pressurized lines in Riyadh Metro Project. It enables the user to quickly draw and edit profiles of pressurized lines.

1.2 AUTHOR INFORMATION

This AutoLISP was programmed by Ibrahim El Shar. As a little background: Ibrahim has a civil engineering degree from the Lebanese university and a master's degree in industrial engineering and management from American University of Beirut. Ibrahim was introduced to AutoLISP while he was working at K&A and immediately so the huge potential for productivity in automation and customization that AutoLISP offers.

1.3 SUPPORT INFORMATION

Please feel free to contact me on my below email in case you need help with WP or you would like to report a bug. Bug reporting is much appreciated.

Email: ibrahim.elshar@gmail.com

Website: ibrahim-elshar.com

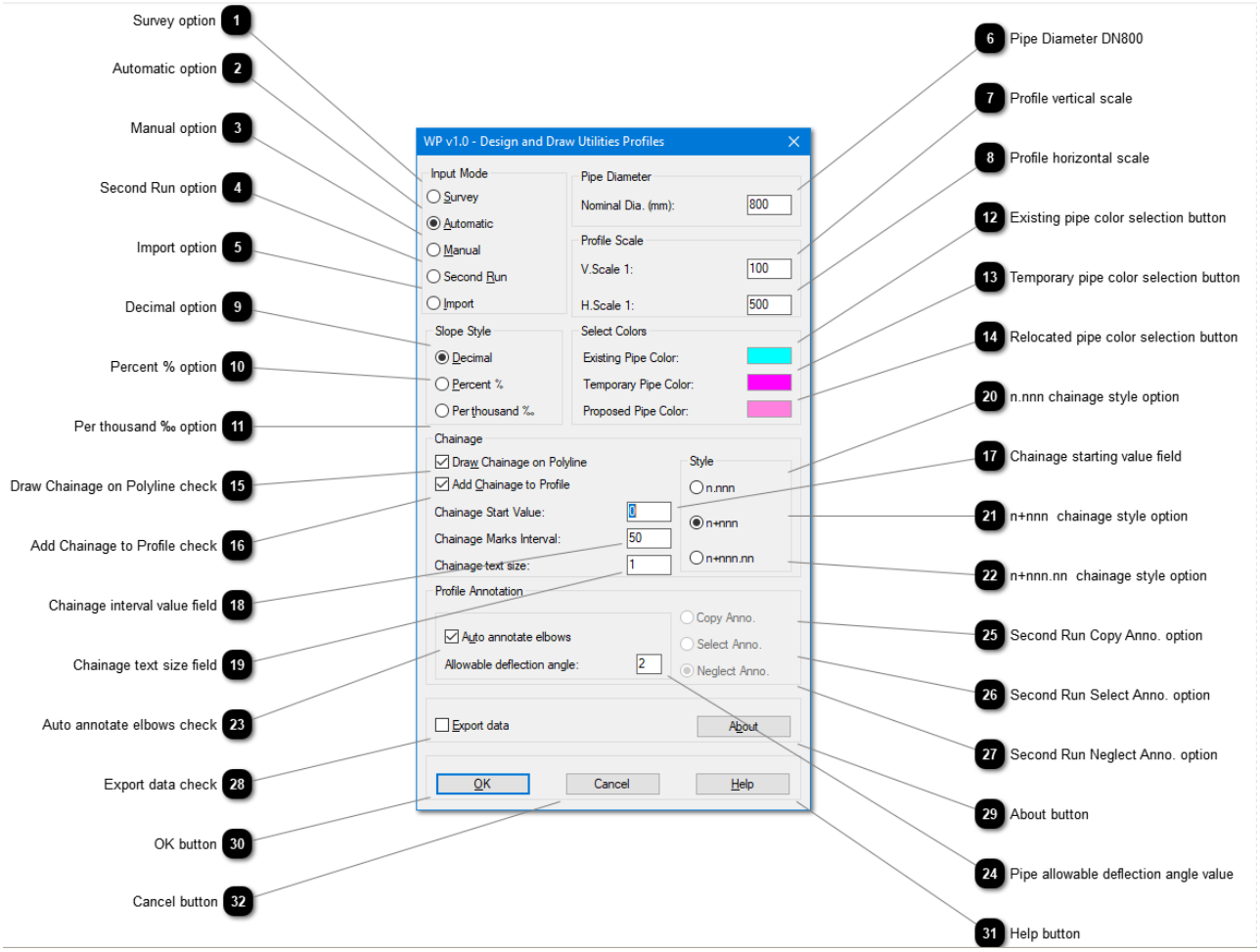
2 INSTALLATION

To start using WP v1.0 first copy WP.vlx file to the place where you store the AutoLISPs on your computer. Then in AutoCAD type appload > browse to the location where you have placed WP > select WP.vlx and load it. Also you have to place WP.chm in the AutoCAD installation directory so you will be able to load it from within the WP dialog window.

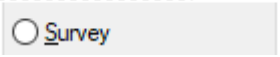
Note: Future versions of WP will have standalone installation as per Autodesk standard apps installation packages.

3 WP V1.0 - DESIGN AND DRAW UTILITIES PROFILES WINDOW

This section gives a brief description of the elements of WP v1.0 graphical user interface.



1 Survey option

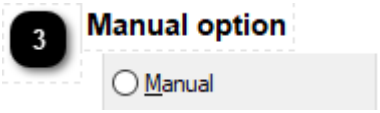


When Survey input mode is selected, WP will utilize the survey contour polylines to find the ground level at the selected pipe route polyline.
Users will have the option to specify the invert level at each point or at some of the points or only at the start and end of the selected pipe polyline. This option will be available at the invert level input of the second point of the route polyline of course only in the case where the pipe route polyline consists of more than 2 points. Hence, the user should prepare beforehand the invert levels at each point of the pipe route polyline or at least the invert levels at the start and end (tie-in points in case of relocation). Note that in the case where the user input the invert level at the first and last points only, the pipe profile will have one slope and the intermediate points invert levels will be calculated accordingly. The latter option is easier since only the first and last points inverts are required, later on the profile of the pipe can be edited using the Second Run mode.

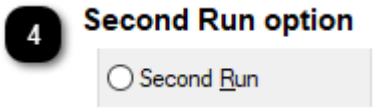
2 Automatic option

In this mode, the AutoLISP will ask the user to enter the point name (e.g. BFV, ARV, Washout, 45 H.Bend, start of relocation...etc.), the grade level, and the invert level at

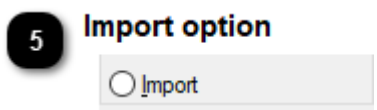
each point of the selected pipe route polyline.
Users will have the option to specify the invert level at each point or at some of the points or only at the start and end of the selected pipe polyline. This option will be available at the invert level input of the second point of the route polyline of course only in the case where the pipe route polyline consists of more than 2 points.
The user should prepare beforehand the grade and invert levels at each vertex of the pipe route polyline or the grade levels of all vertices and only the invert levels at the start and end (tie-in points in case of relocation). Note that in the case where the user input the invert level at the first and last points only, the pipe profile will have one slope and the intermediate points invert levels will be calculated accordingly. The latter option is easier since only the first and last points inverts are required, later on the profile of the pipe can be edited using the Second Run mode.



In this mode, the user has to pick points on the pipe route polyline. The program will then ask the user to enter the point name (e.g. BFV, ARV, Washout, 45 H.Bend, start of relocation...etc.), the grade level, and the invert level at each point.
The user must always enter the first and last points invert levels. Intermediate points invert levels are optional.
The user should prepare beforehand the grade and invert levels at each vertex of the pipe route polyline or the grade levels of all vertices and only the invert levels at the start and end (tie-in points in case of relocation). Note that in the case where the user input the invert level at the first and last points only, the pipe profile will have one slope and the intermediate points invert levels will be calculated accordingly. The latter option is easier since only the first and last points inverts are required, later on the profile of the pipe can be edited using the Second Run mode.



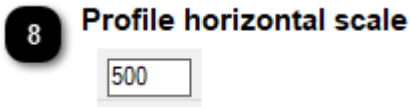
This mode is used only for editing profiles. Users can edit a profile that has been previously generated with WP or without WP on condition that the ground level and pipe invert level are illustrated on the profile by polylines having the same direction and without overlapping vertices. In this mode, users can edit the ground levels, slopes, invert levels and intermediate distances shown on the profile. Editing is done by simply editing the polylines by stretching the vertices that make up these polylines. Modifying or adding vertices on the invert level polyline will change or add text values corresponding to the new vertex. All edits should be done on the polylines prior to running Second Run function.



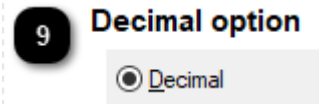
Draws a profile from the imported excel file data. In this mode, the user can design the profile in excel and then draw the corresponding profile from the ".xls" file.

The user has to enter the value of the pipe nominal diameter.

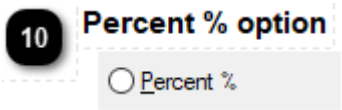
The profile vertical scale value. For e.g., to draw a profile with a vertical scale of 1:100 the user has to make sure that 100 is entered in this field.



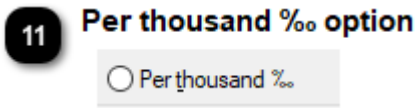
The profile Horizontal scale value. For e.g., to draw a profile with a Horizonal scale of 1:500 the user has to make sure that 500 is entered in this field.



When this option is selected the slope fields in the profile are presented as decimal numbers.

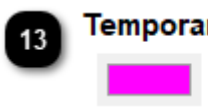


When this option is selected the slope fields in the profile are presented as percentages.



When this option is selected the slope fields in the profile are presented per thousand.

Click on this button to change the color defining the existing pipe color on the profile. This controls the output (color, text and title) of the profile.

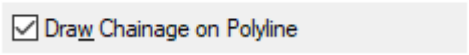


Click on this button to change the color defining the temporary pipe color on the profile. This controls the output (color, text and title) of the profile.

14 Relocated pipe color selection button

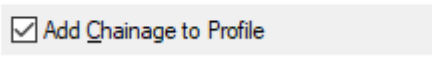
Click on this button to change the color defining the proposed pipe color on the profile. This controls the output (color, text and title) of the profile.

15 Draw Chainage on Polyline check



This option is only available in Survey and Automatic modes. If selected the program will draw the chainage on the selected polyline representing the pipe route.

16 Add Chainage to Profile check



This option is only available in Survey, Automatic and Manual modes. If selected the program will draw the chainage of the selected polyline on the profile.

17 Chainage starting value field

This field defines the chainage start value (default value 0).

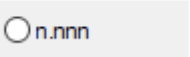
18 Chainage interval value field

This field defines the interval between chainage marks (default value 50).

19 Chainage text size field

This field controls the text size of the chainage marks (default value 2.5).

20 n.nnn chainage style option

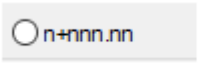


If this option is selected the chainage marks text are produced in decimal format.

21 **n+nnn chainage style option**

If this option is selected the chainage marks text are produced in n+nnn format.

22 **n+nnn.nn chainage style option**



If this option is selected the chainage marks text are produced in n+nnn.nn format.

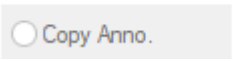
23 **Auto annotate elbows check**

This option is only available in Survey and Automatic modes. When this option is selected the program will automatically annotate the bends of the selected pipe route polyline. Accordingly, the user will not be asked to enter the name of a point which happen to be a bend on the polyline. The bends angles are 90, 45, 22.5 and 11.25. The deviation from these standard angles are controlled by the allowable deflection angle field.

24 **Pipe allowable deflection angle value**

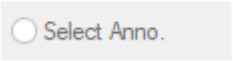
This field defines the allowable deviation of an angle to be considered one of the standard bends. The value of this field is automatically changed in line with the pipe nominal diameter. The user can still alter the default value.

25 **Second Run Copy Anno. option**



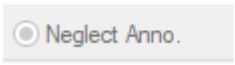
This option is only available in second run mode. If selected the program will automatically copy the crossings, annotations, lines, etc., and paste it on the new profile.

26 **Second Run Select Anno. option**



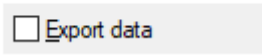
This option is only available in second run mode. If selected the program will prompt the user to select the points annotations to reproduce them on the new profile. Here, it is important to select the annotations in the correct order.

27 Second Run Neglect Anno. option



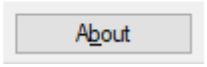
This option is only available in second run mode. If selected the annotation and crossings will not be copied on the new profile. The user can then copy the annotations and crossings manually to the new profile.

28 Export data check



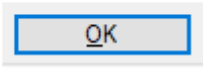
When this option is selected the data obtained from the user to draw the profile will be saved in an excel sheet. The excel sheet can be edited in excel as required. The user can then import the excel ".xls" file to draw the profile using the import mode.

29 About button



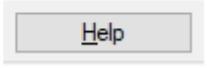
This button will show the current version and date of WP, the developer contact information and any necessary info that the developer chooses to display.

30 OK button



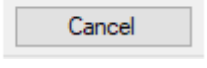
Configure WP as required in the GUI and then click "OK" button to initialize the AutoLISP routine.

31 Help button



This button will show this help document. Make sure to place WP.chm in the AutoCAD installation directory.

32 Cancel button



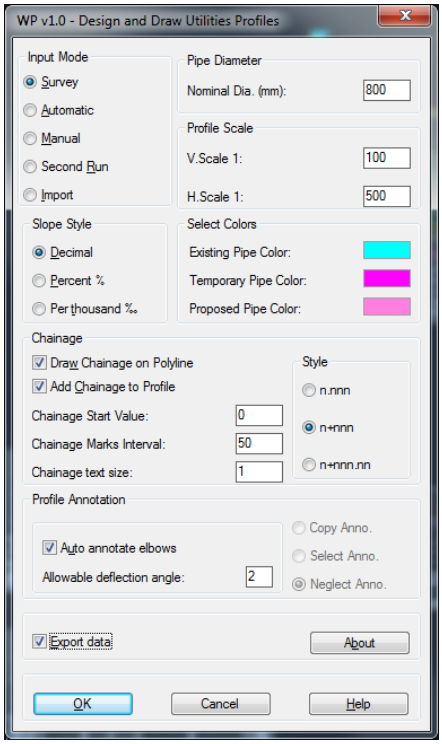
Cancel button will dismiss WP window.

4 OPERATING INSTRUCTIONS

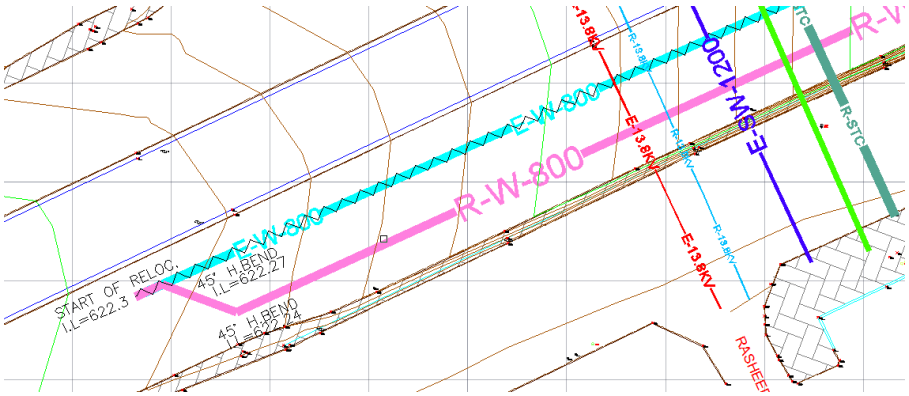
This section presents step-by-step tutorials for the 5 different input modes used in WP v1.0.

4.1 SURVEY MODE:

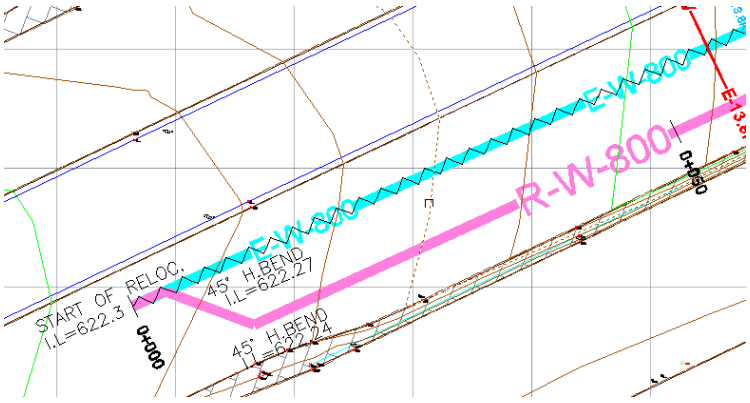
Step 1. Select Survey in Input Mode, fill in the desired options (scale, diameter, slope style, chainage, colors, etc...) then select OK.



Step 2. Select the pipe route polyline.



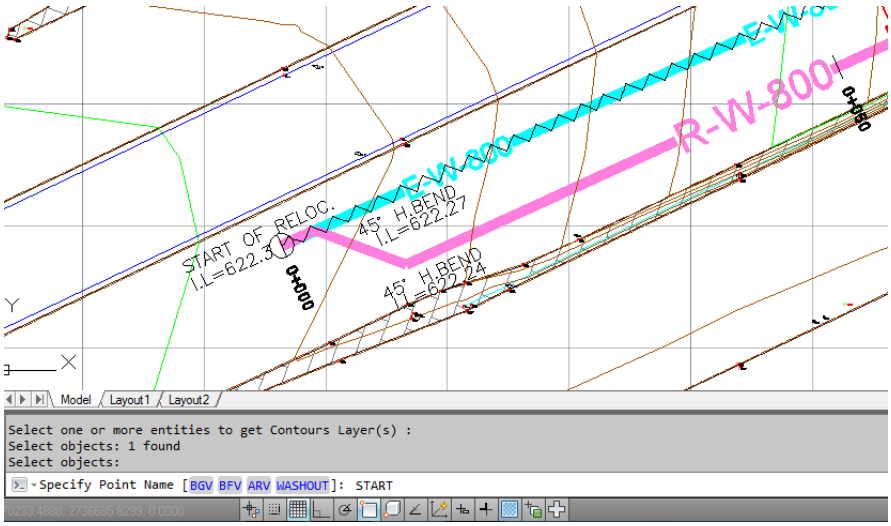
Step 3. Select one or more contour polylines. Select the minimum number of contour polylines which ensure capturing all contour layers.



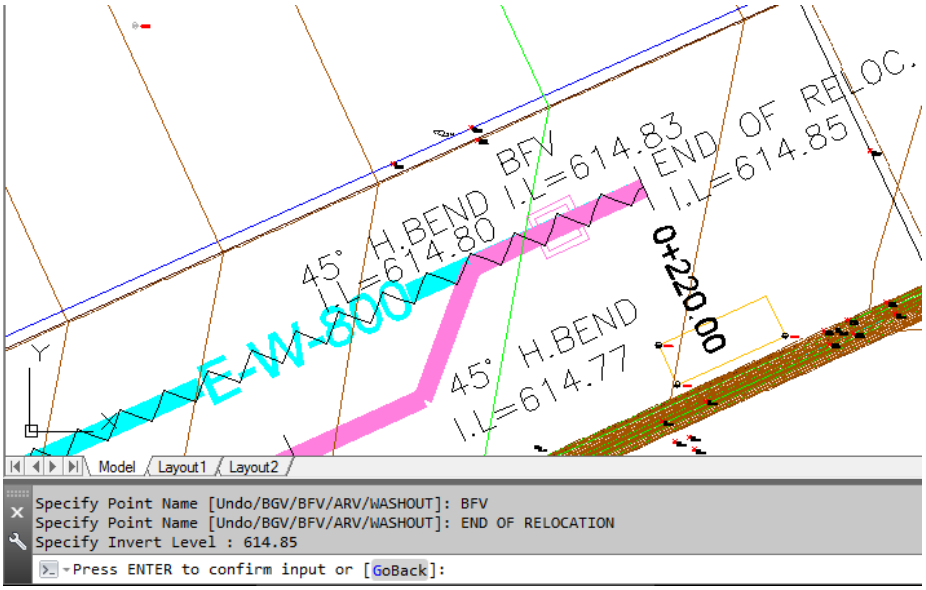
Step 4. At this point, the AutoLISP will prompt the user to specify the name and invert level of each vertex (shown inside a circle) on the pipe route polyline. The AutoLISP will go over the vertices moving in the direction of the polyline. To go over the vertices in the opposite direction, the user has to "reverse" the polyline. E.g. of user input for point name can be (start of relocation, BFV, ARV, 45° H.Bend, etc..).
For each of the first and last point the user should provide a specific invert level (Tie-ins).

At the second point, the user will have the option to either specify the invert level at this point or skip it or skip all. Skip option will allow the user to skip specifying the invert Level at the current point only. If skip all option is specified then the AutoLISP will not ask the user again for invert level until the end point of the polyline is reached.

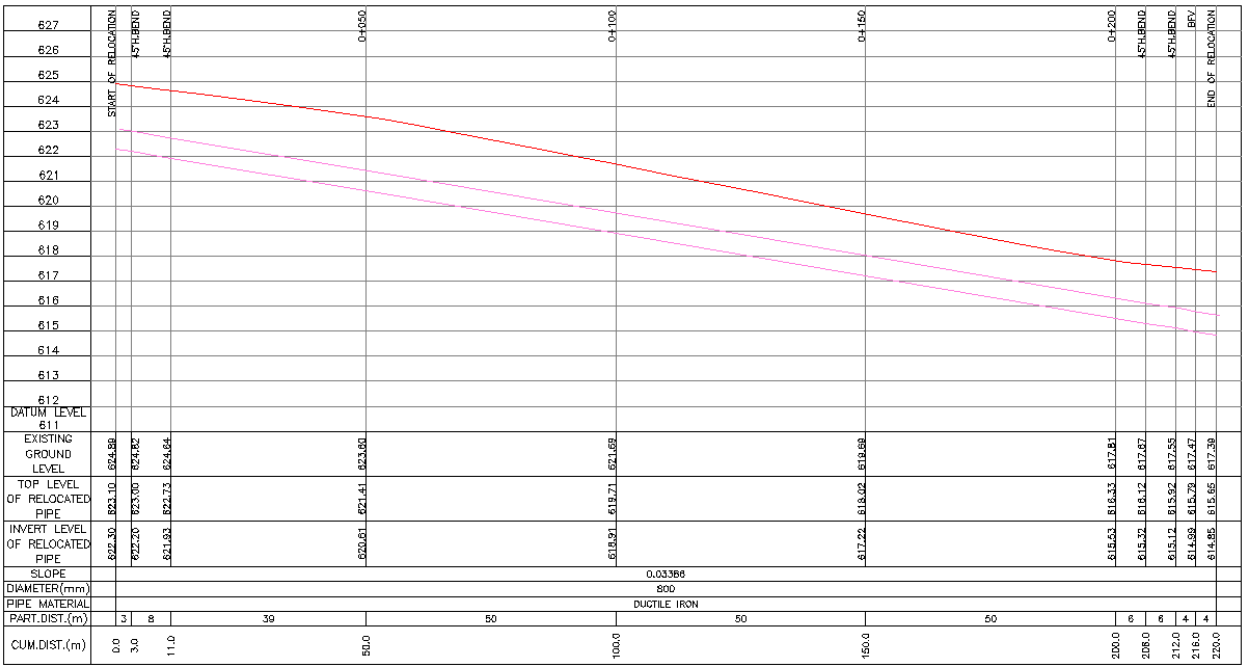
NOTE: The user can enter "u" or "U" when entering the point name to undo all changes done on the current point and go back to the previous point input.



Step 5. After specifying the input of all vertices, the AutoLISP will ask the user to press enter to proceed or G to go back and make any changes on the specified data.



Step 6. If "Export data" was checked in step 1 then the AutoLISP will ask the user to save an excel file containing the data of the profile. The AutoLISP will then generate the profile.

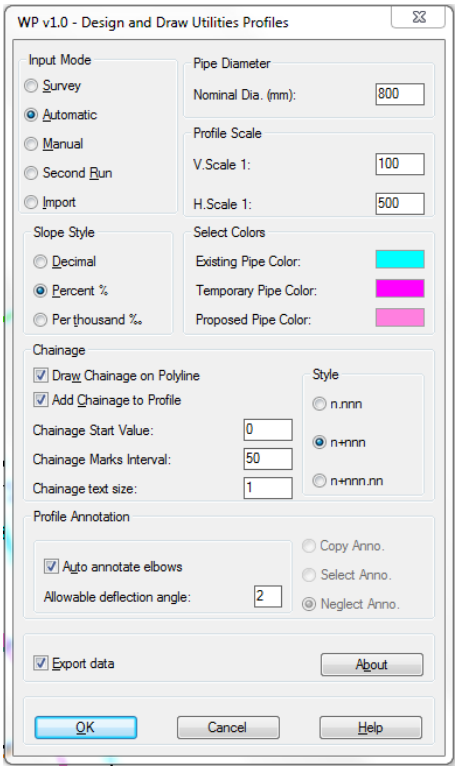


RELOCATED WATER LINE DN800

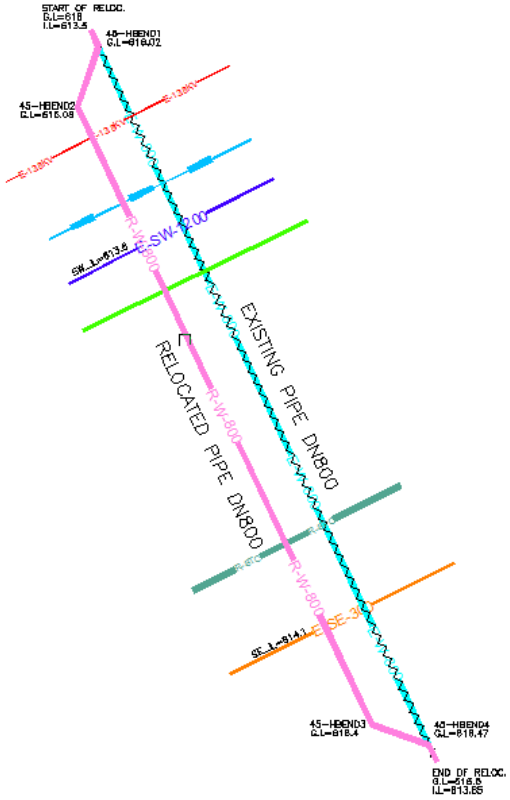
(VER. SCALE = 1/100 HOR. SCALE = 1/500)

4.2 AUTOMATIC MODE:

Step 1. Select Automatic in Input Mode, fill in the desired options (scale, diameter, slope style, chainage, colors, etc...) then select OK.



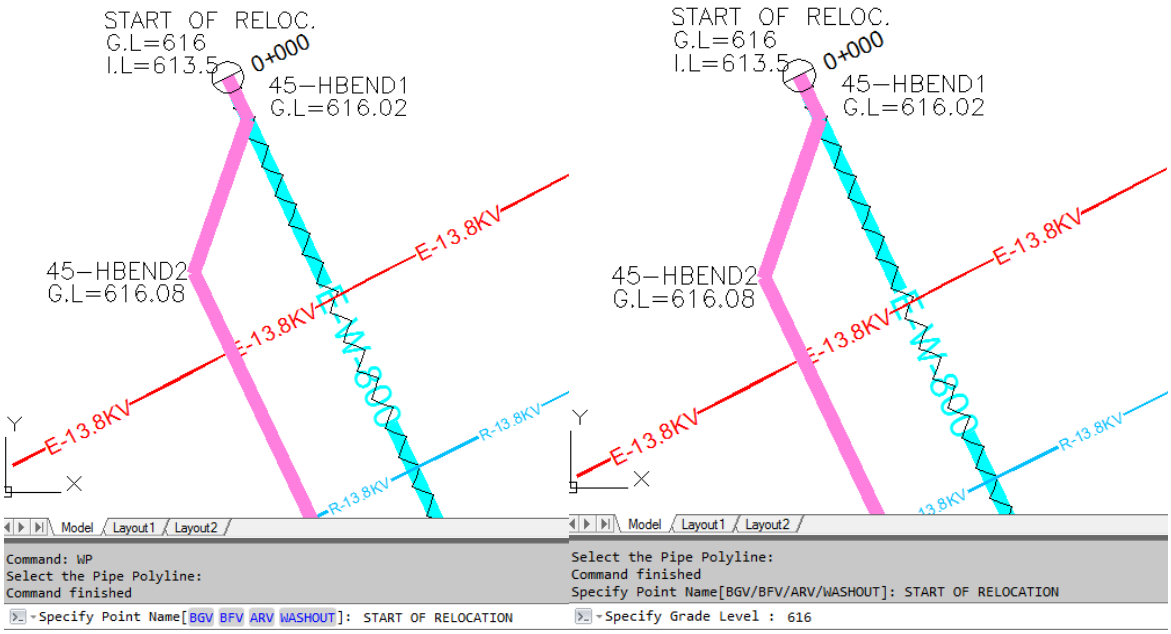
Step 2. Select the pipe route polyline

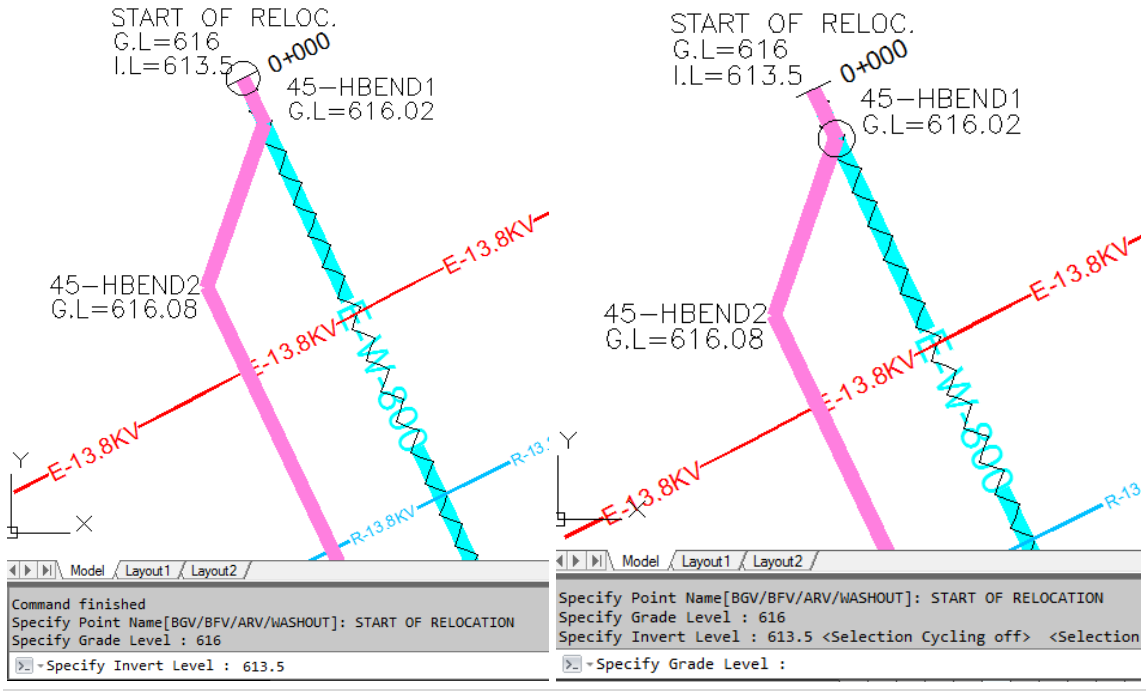


Step 3. At this point, the AutoLISP will prompt the user to specify name, ground level and invert level at each vertex (shown inside a circle) on the pipe route polyline. The AutoLISP will go over the vertices moving in the direction of the polyline. To go over the vertices in the opposite direction, the user has to "reverse" the polyline. For each of the first and last point the user should provide a specific invert level (Tie-ins).

At the second point, the user will have the option to either specify the invert level at this point or skip it or skip all. Skip option will allow the user to skip specifying the invert Level at the current point only. If skip all option is specified then the AutoLISP will not ask the user again for invert level until the end point of the polyline is reached.

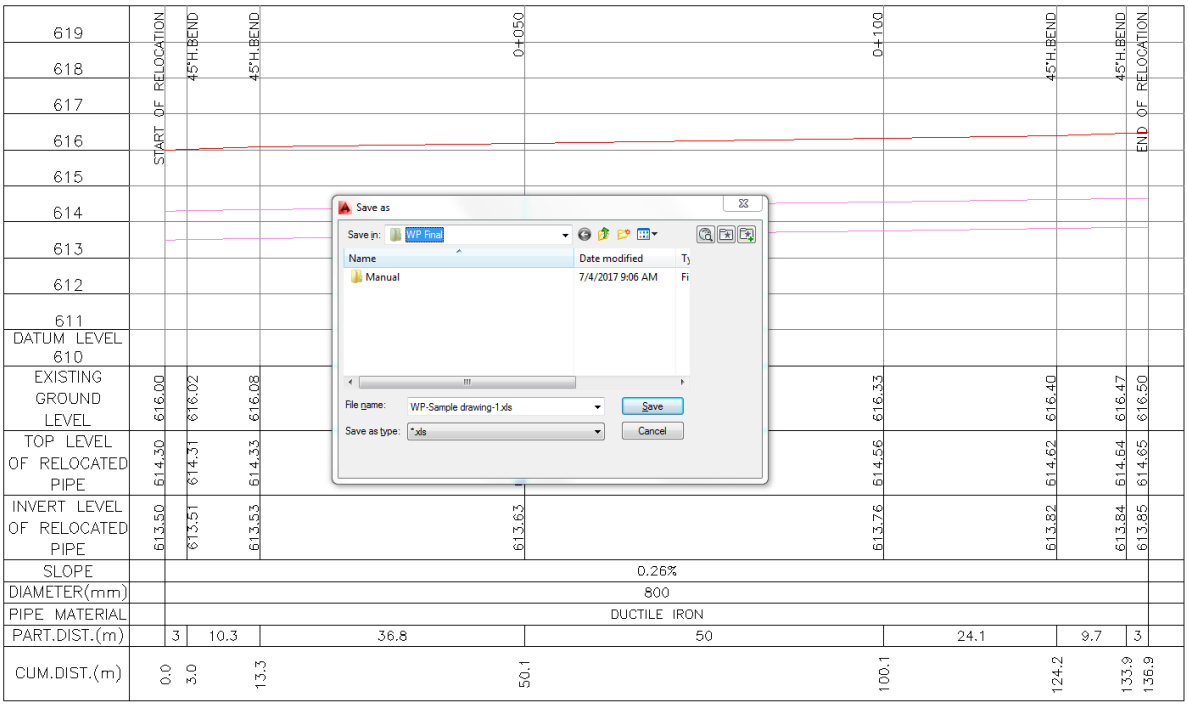
NOTE: The user can enter "u" or "U" when entering the point name to undo all changes done on the current point and go back to the previous point input.



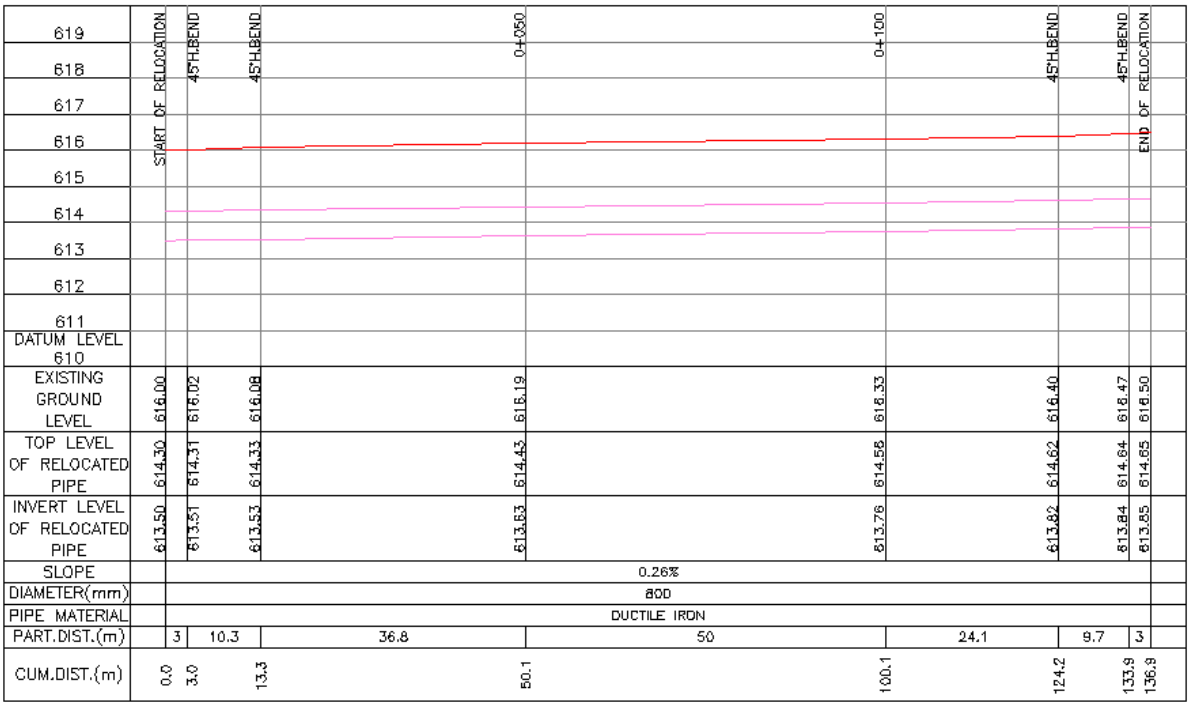


Step 4. After specifying the input of all vertices, the AutoLISP will ask the user to press enter to proceed or G to go back and make any changes on the specified data.

Step 5. If "Export data" was checked in step 1 then the AutoLISP will ask the user to save an excel file containing the data of the profile. The AutoLISP will then generate the profile.



619								
618								
617								
616	START OF RELOCATION	45°H.BEND	45°H.BEND	0+050	0+100	45°H.BEND	45°H.BEND	END OF RELOCATION
615								
614								
613								
612								
611								
DATUM LEVEL 610								
EXISTING GROUND LEVEL	616.00	616.02	616.08		616.33	616.40	616.47	616.50
TOP LEVEL OF RELOCATED PIPE	614.30	614.31	614.33		614.56	614.62	614.64	614.65
INVERT LEVEL OF RELOCATED PIPE	613.50	613.51	613.53	613.63	613.76	613.82	613.84	613.85
SLOPE	0.26%							
DIAMETER(mm)	800							
PIPE MATERIAL	DUCTILE IRON							
PART.DIST.(m)	3	10.3	36.8	50	24.1	9.7	3	
CUM.DIST.(m)	0.0	3.0	13.3	50.1	100.1	124.2	133.9	136.9



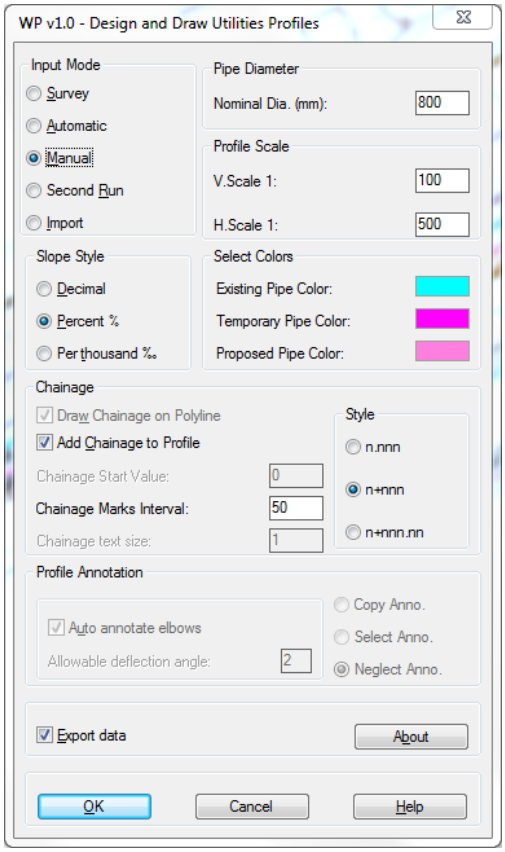
619								
618								
617								
616	START OF RELOCATION	45°H.BEND	45°H.BEND	0+050	0+100	45°H.BEND	45°H.BEND	END OF RELOCATION
615								
614								
613								
612								
611								
DATUM LEVEL 610								
EXISTING GROUND LEVEL	616.00	616.02	616.08	616.19	616.33	616.40	616.47	616.50
TOP LEVEL OF RELOCATED PIPE	614.30	614.31	614.33	614.43	614.56	614.62	614.64	614.65
INVERT LEVEL OF RELOCATED PIPE	613.50	613.51	613.53	613.63	613.76	613.82	613.84	613.85
SLOPE	0.26%							
DIAMETER(mm)	800							
PIPE MATERIAL	DUCTILE IRON							
PART.DIST.(m)	3	10.3	36.8	50	24.1	9.7	3	
CUM.DIST.(m)	0.0	3.0	13.3	50.1	100.1	124.2	133.9	136.9

RELOCATED WATER LINE DN800

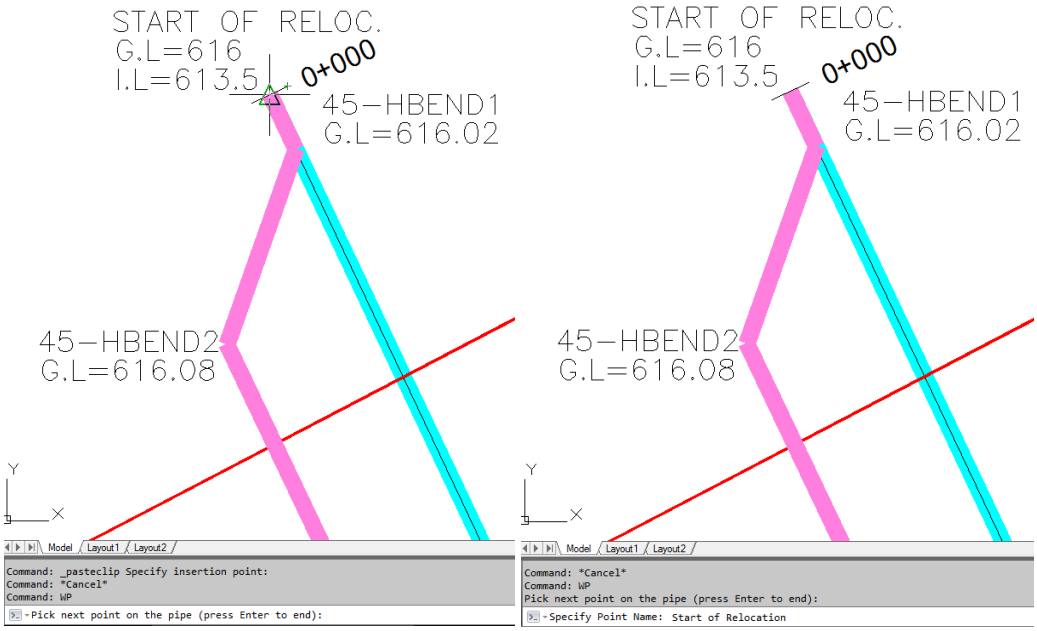
(VER. SCALE = 1/100 HOR. SCALE = 1/500)

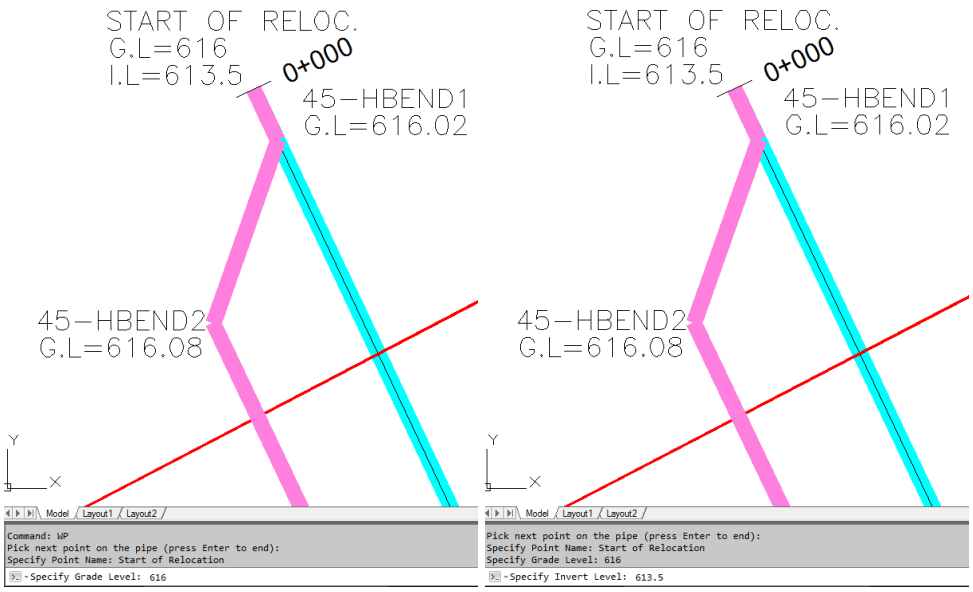
4.3 MANUAL MODE:

Step 1. Select Manual in Input Mode, fill in the desired options (scale, diameter, slope style, chainage, colors, etc...) then select OK.



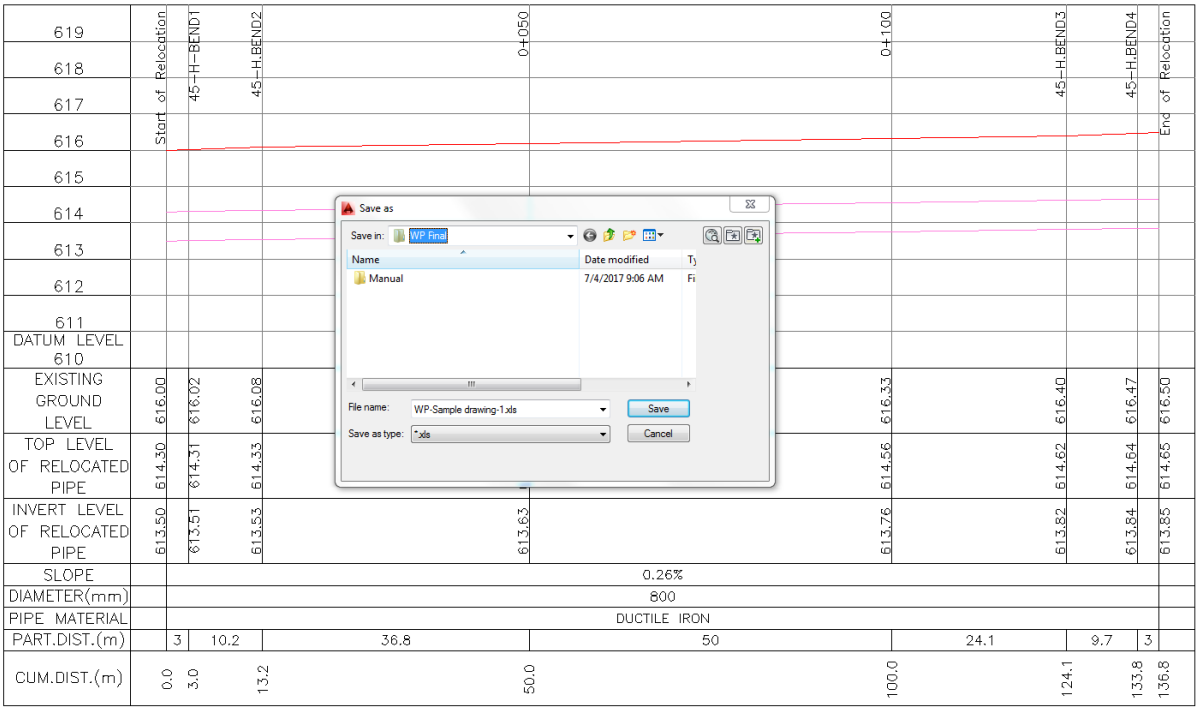
Step 2. Next the user will have to manually pick the points on the pipe route polyline in order to define the point name, ground level and invert level of the chosen points.





Step 3. After picking all the required vertices, the user has to press enter to continue.

Step 4. If "Export data" was checked in step 1 then the AutoLISP will ask the user to save an excel file containing the data of the profile. The AutoLISP will then generate the profile.



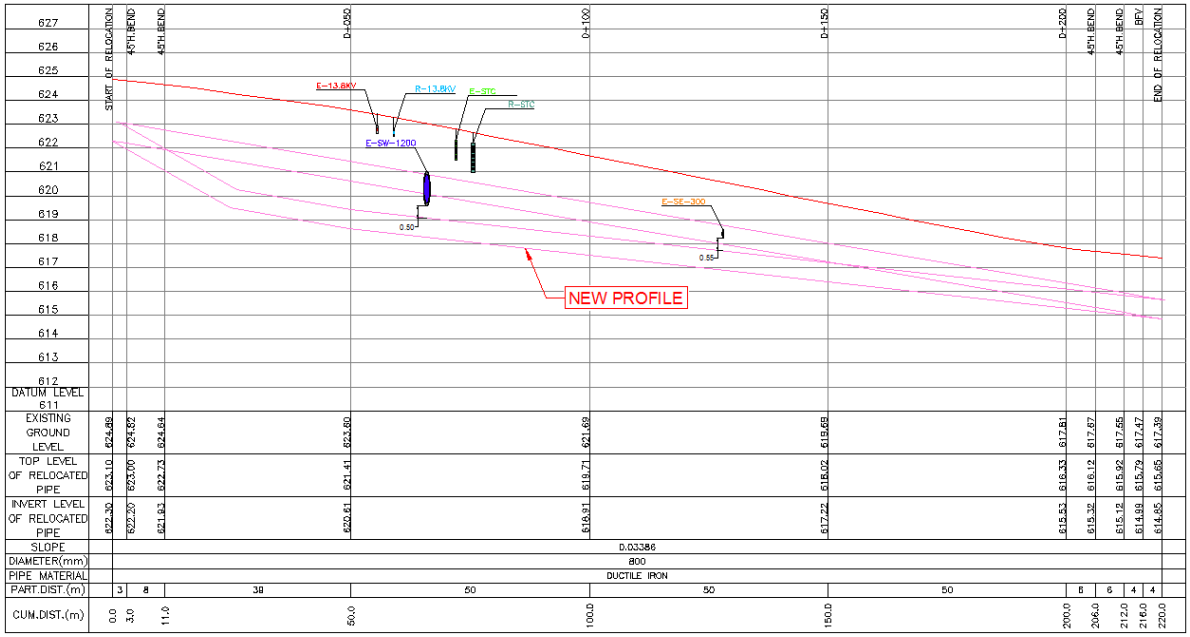
619								
618								
617								
616	Start of Relocation	45-H-BEND1	45-H.BEND2	0+050	0+100	45-H.BEND3	45-H.BEND4	End of Relocation
615								
614								
613								
612								
611								
DATUM LEVEL 610								
EXISTING GROUND LEVEL	616.00	616.02	616.08		616.33	616.40	616.47	616.50
TOP LEVEL OF RELOCATED PIPE	614.30	614.31	614.33		614.56	614.62	614.64	614.65
INVERT LEVEL OF RELOCATED PIPE	613.50	613.51	613.53	613.63	613.76	613.82	613.84	613.85
SLOPE		0.26%						
DIAMETER(mm)		800						
PIPE MATERIAL		DUCTILE IRON						
PART.DIST.(m)		3	10.2	36.8	50	24.1	9.7	3
CUM.DIST.(m)	0.0	3.0	13.2	50.0	100.0	124.1	133.8	136.8

4.4 SECOND RUN MODE:

Step 1. Modify and edit as necessary the ground and invert level polylines of the profile. The user can edit, remove intermediate vertices as needed to get the required profile. Note that each grey vertical line shown on the profile in layer "C-PRFL-CLIN" will stay on the new generated profile unless deleted from the old profile.

In this example, we will use the profile generated in the Survey mode example, where we will edit the profile for potable water line DN800 (new profile) to avoid the existing utilities crossings.

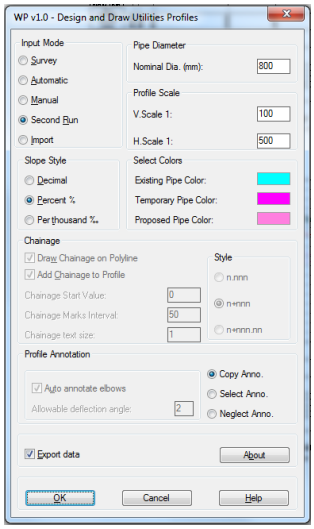
NOTE: Make sure to move the profile that was generated using the Survey mode example, from the location where it was first generated in the model because the new profile that will be produced by the second run mode will be produced at the same location.



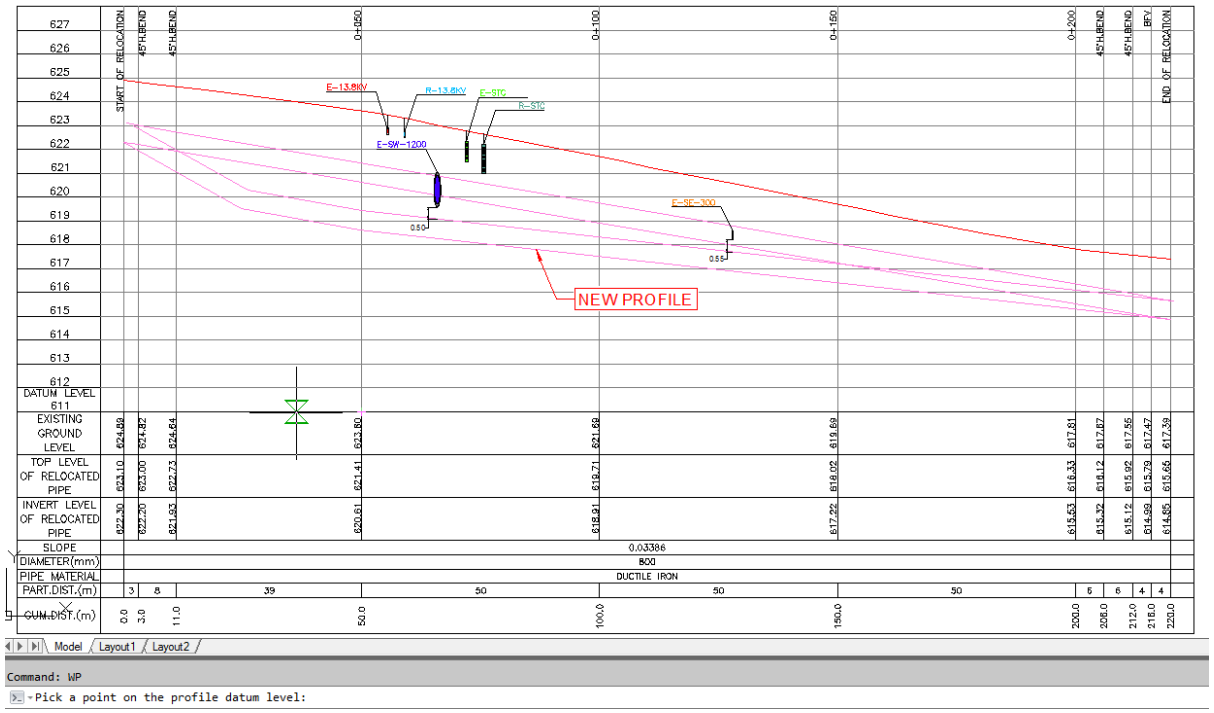
RELOCATED WATER LINE DN800

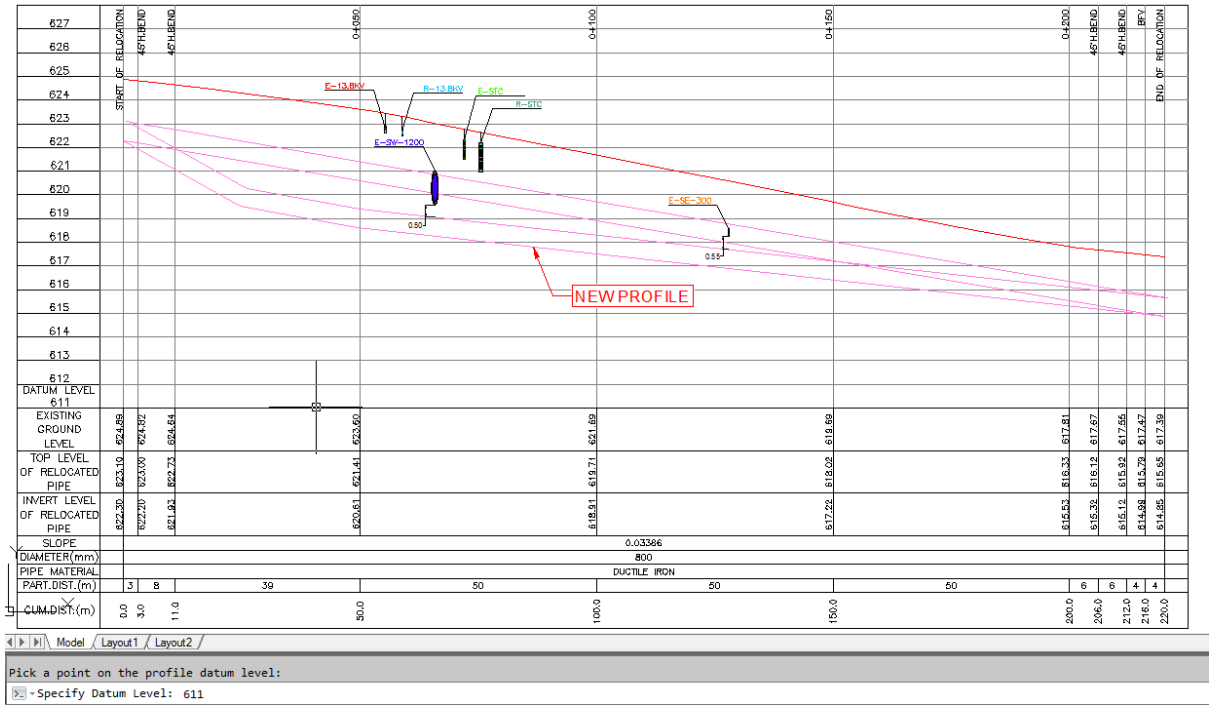
(VER. SCALE = 1/100 HOR. SCALE = 1/500)

Step 2. Select Second Run in Input Mode and then fill in the desired options (diameter, slope style, Profile annotation, colors…etc.). The horizontal and vertical scales should be the same as the original profile which the user wants to modify.

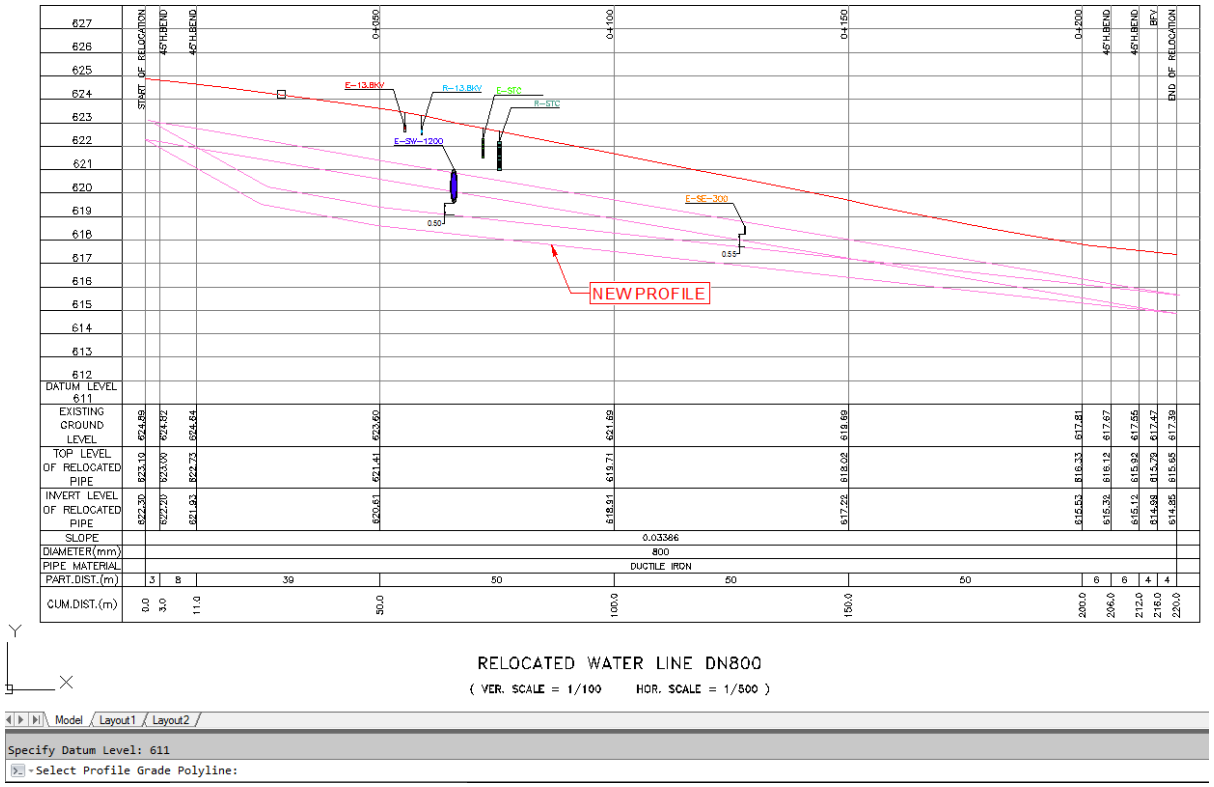


Step 3. Pick a point on the profile datum level and specify the datum level after wise.

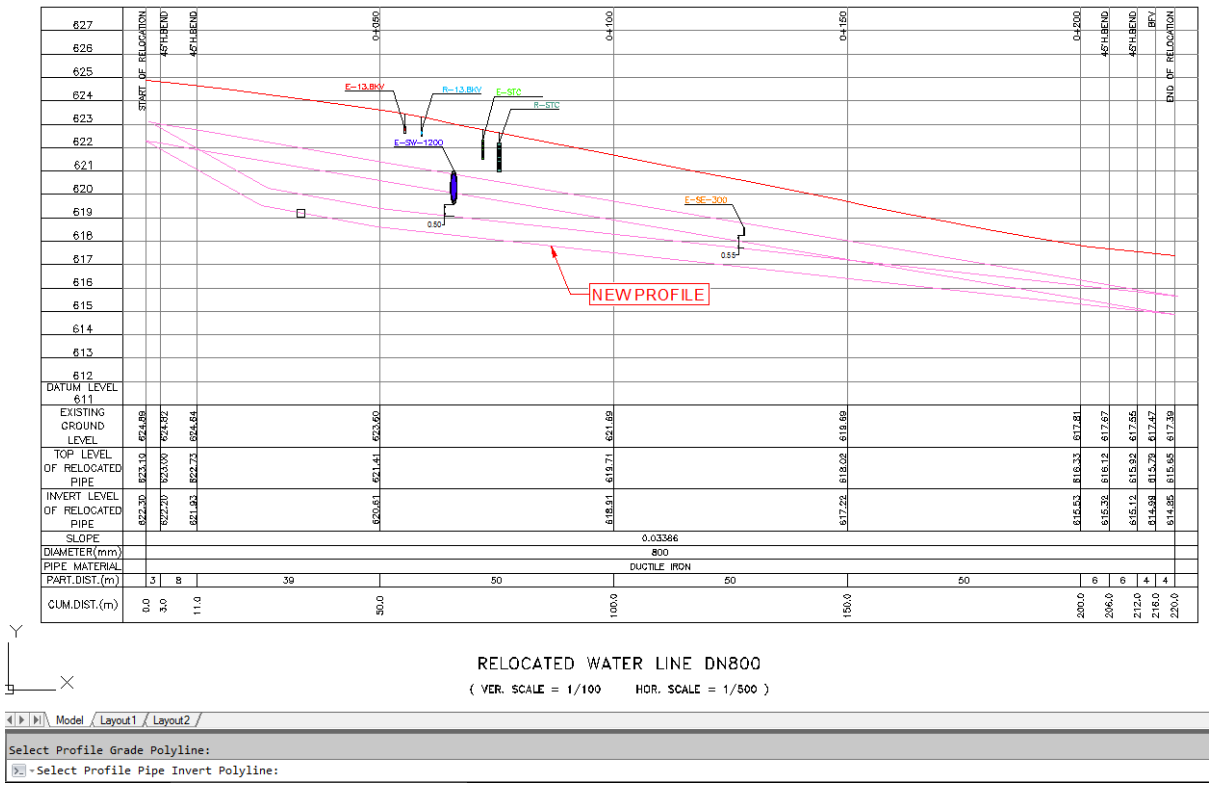




Step 4. Select the profile grade polyline.



Step 5. Select the modified profile pipe invert polyline.

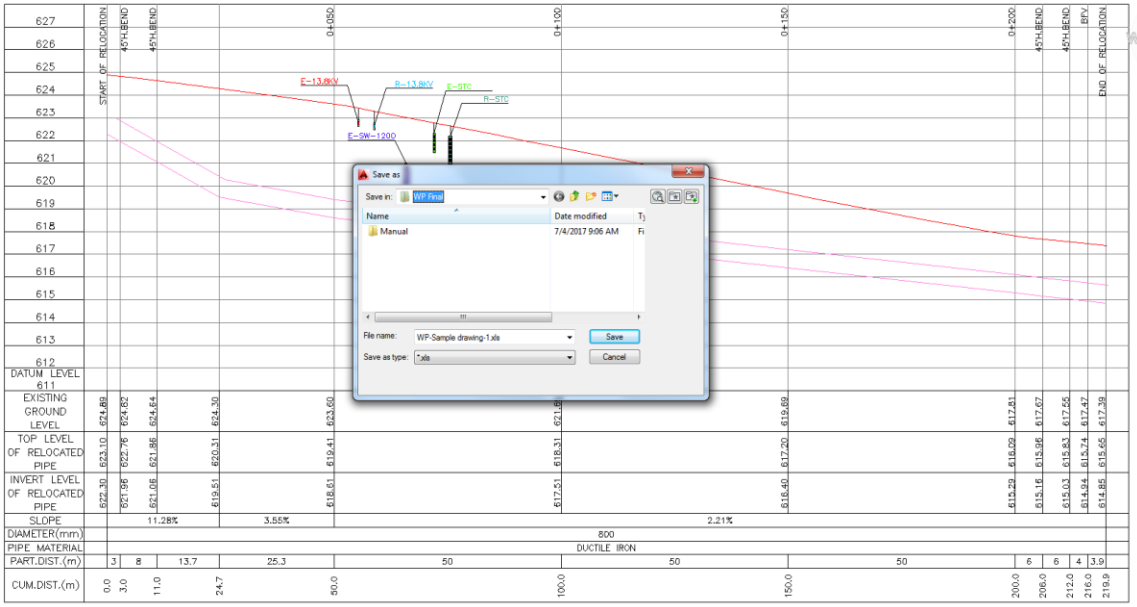


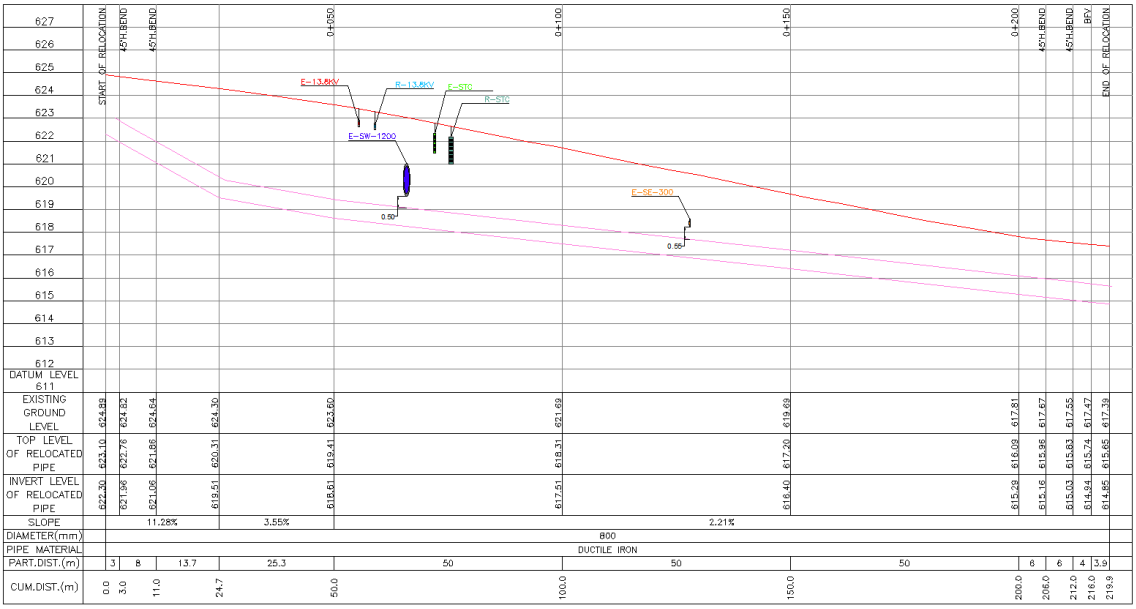
Step 6. If "Export data" was checked in step 2 then the AutoLISP will ask the user to save an excel file containing the data of the new profile. This excel file can be used again to regenerate the file using the import mode. The AutoLISP will then generate the profile.
The output depends on the options the user has specified in step2 so in case the user has chosen:

a) "Neglect anno." in the initial configuration the AutoLISP will then generate the profile without copying the annotations (Point names, crossings, etc.) that were on the original profile.

b) "Copy anno." in the initial configuration the AutoLISP will then generate the profile and will then copy the annotations (Point names, crossings, etc.) that were on the original profile.

c) "Select anno." in the initial configuration the AutoLISP will then generate the profile and will then ask the user to select the required point names on the original profile.

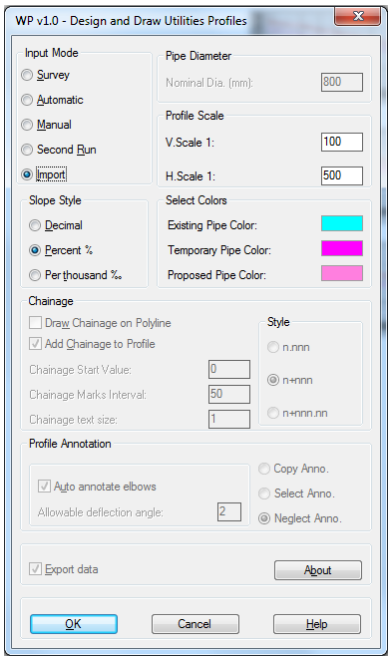




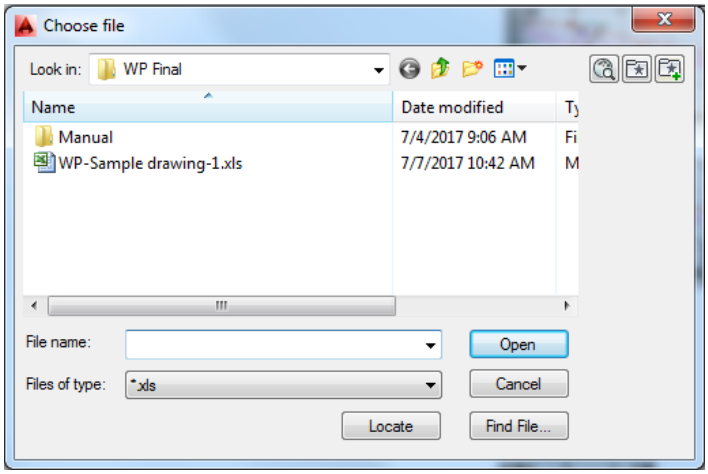
RELOCATED WATER LINE DN800
(VER. SCALE = 1/100 HOR. SCALE = 1/500)

4.5 IMPORT MODE:

Step 1. Select Import in Input Mode, fill in the desired options (scale, slope style, and colors) then select OK.



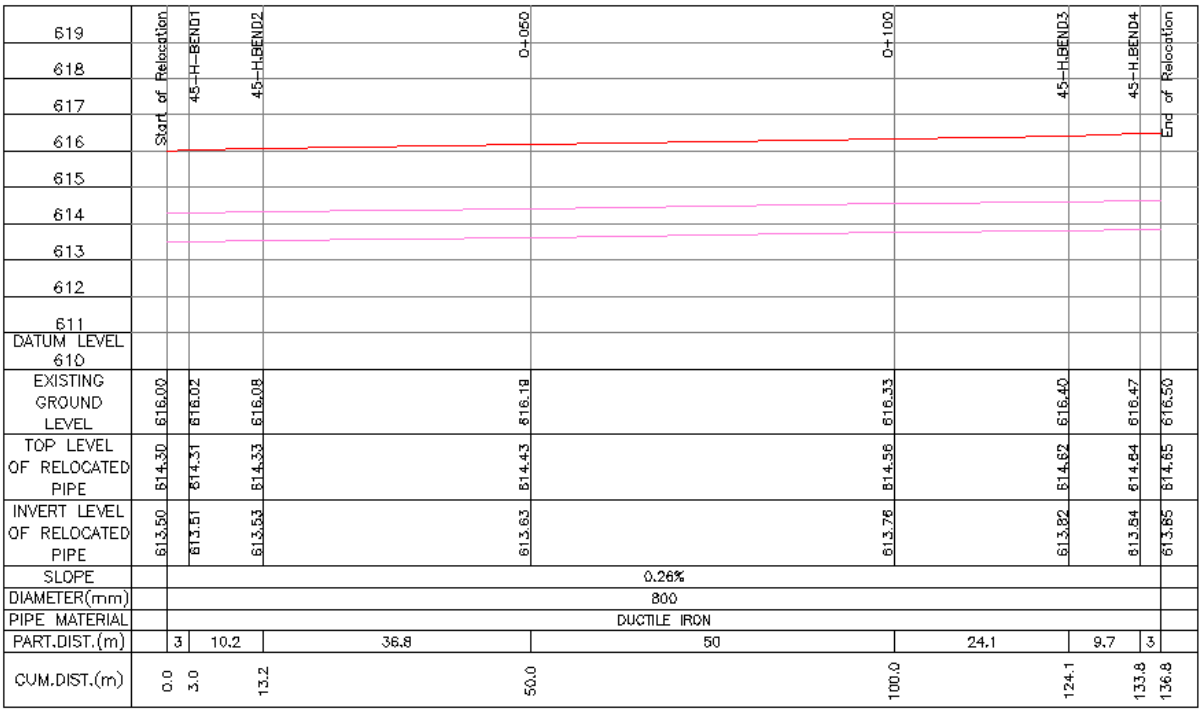
Step 2. The AutoLISP will ask the user to select the excel ".xls" file that contains the profile data.
Before opening the file in the window shown below, the user should save and close all open excel files.



Note that the user can edit the data (ground level, invert level, slope, partial distance, diameter, point names, etc.) in the excel sheet as necessary to obtain required profile.
However, it is important to keep the form of the sheet unchanged.

	A	B	C	D	E	F	G	H	I
1	RELOCATED WATER LINE DN800								
2	Pipe Diameter:	800							
3	Point Name:	Start of Relocation	45-H-BEND1	45-H.BEND2	0+050	0+100	45-H.BEND3	45-H.BEND4	End of Relocation
4	Grade level:	616	616.02	616.08	616.186	616.33	616.4	616.47	616.5
5	Invert level:	613.5	613.5076296	613.533848	613.6279235	613.755847	613.8174769	613.8423579	613.8500005
6	Slope(%):	0.255847	0.255847	0.255847	0.255847	0.255847	0.255847	0.255847	
7	Partial Distance:	2.98209	10.2477	36.7702	50	24.0886	9.72492	2.98718	
8									

Step 3. The AutoLISP will then generate the profile.



RELOCATED WATER LINE DN800

(VER. SCALE = 1/100 HOR. SCALE = 1/500)

5 ADDITIONAL INFORMATION

As it is written in AutoLISP and Visual LISP, WP should work on most versions of AutoCAD. It was tested on AutoCAD 2014, 2016 and 2018.

6 KNOWN ISSUES

1- The user should make sure that the vertices of the polylines (that the user has to select in Survey, Automatic, and Second Run modes) do not coincide or overlap, else there will be division by zero error.
2- Error: no function definition: VLAX-ENAME->VLA-OBJECT.
Error: no function definition: VLAX-GET-ACAD-OBJECT.
If you get one of these errors then some of your AutoCAD libraries are corrupted and you need to re-install AutoCAD to fix this issue. These errors are most probably due to multiple versions of AutoCAD installed on the same platform.