



TcP MDT

Digital Terrain Model – V8.5
Professional

aplitop

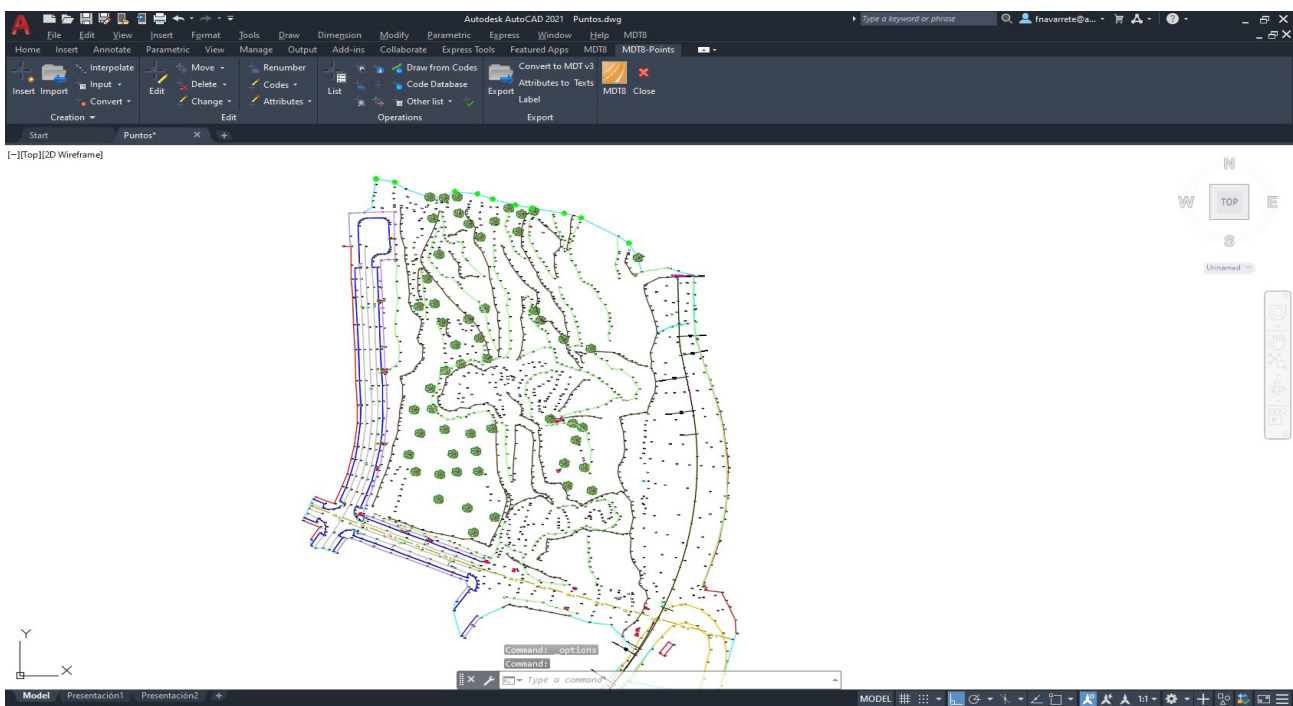
Introduction

The Professional Version is designed to assist the user at all stages of developing a project in the context of Topography and Civil Engineering, including all the functionality of the Standard Version. Its main users are public administrations, construction companies, engineering, architecture and town planning studies and companies involved in earthworks, running quarries, mining, the environment etc. as well as free-lance professionals.

MDT is an application that is installed as a plugin on AutoCAD, BricsCAD, GstarCAD or ZWCAD. It offers a powerful set of tools for easy learning and has a modular structure. It shows great versatility through the import and export of files in the most common formats, such as LandXML, DWG and many more. In addition, APLITOP is a pioneer in the integration of topographic and road data in OpenBIM workflows, through the IFC format and the extensions IFC Alignment and IFC Road.

Topographic Points

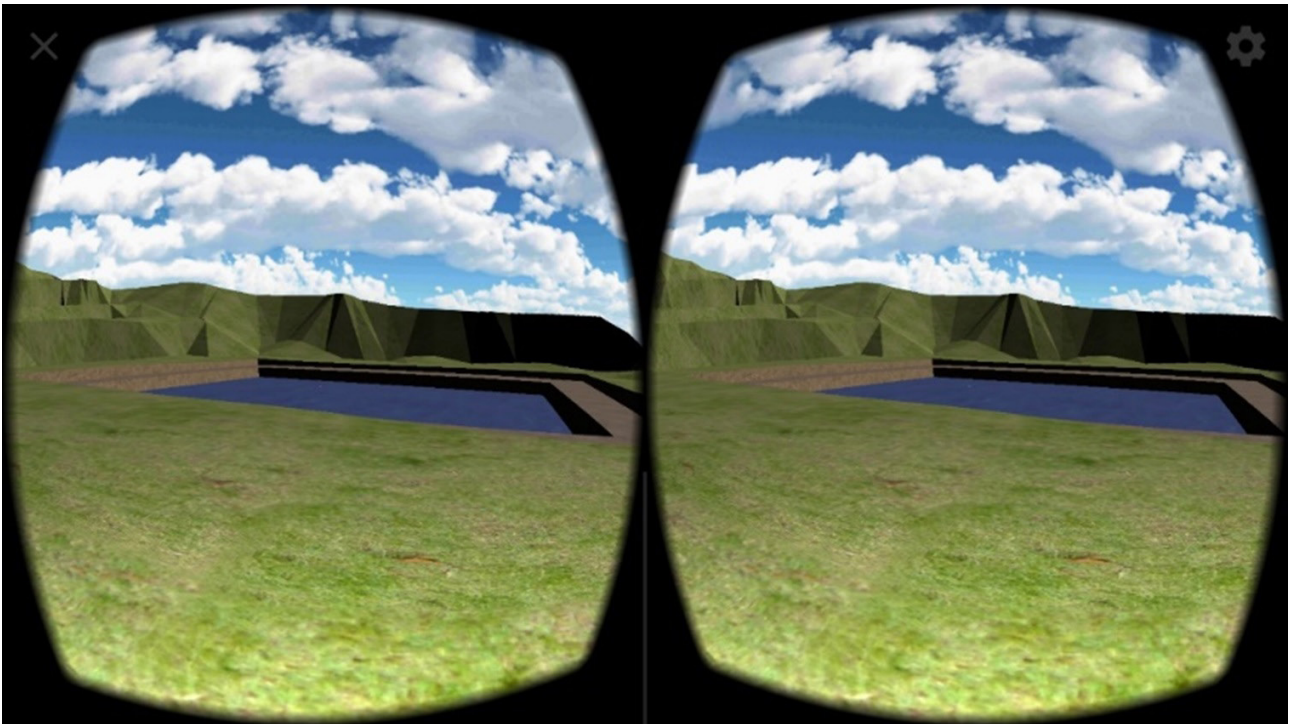
The program starts to run from coordinates obtained by total stations or GNSS receivers, converting files from field applications. If TcP ET or TcP GPS has been used, in addition to the coordinates, the raw data of the observations are imported, as well as the linked photographs and voice notes. It is also possible to create new points from CAD entities drawn by other programs. If codes have been assigned to points in the field, the program will automatically draw the planimetry and blocks defined by the user. In addition, we can run all kinds of editing and filtering operations.



Surfaces

Break lines can be defined graphically, by sequence of points, codes or by importing files. Triangulation can be created from points, with or without break lines and by applying angle or maximum length controls. There are also options for flat triangles minimization and automatic gap repair.

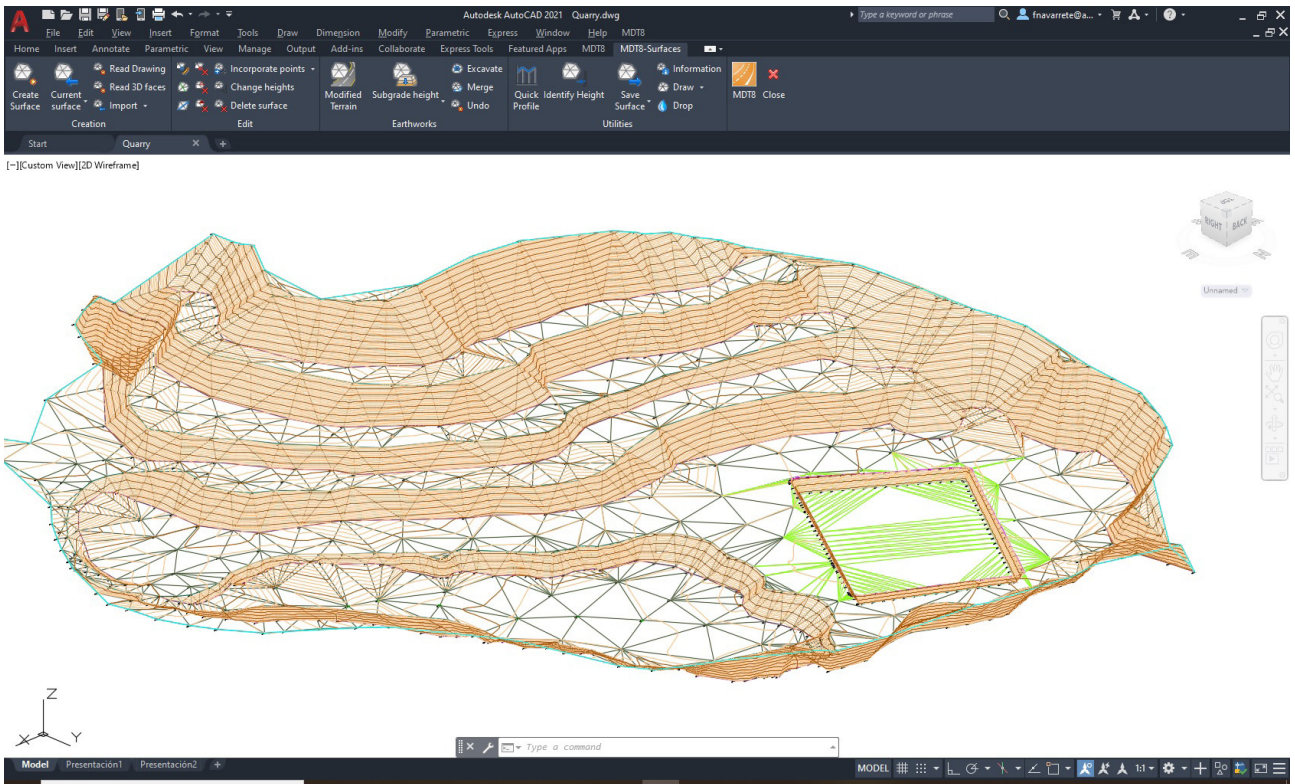
Topographic surfaces of natural terrain and geotechnical layers can be created from survey data or seismic profiles.



There are commands for interactive editing of the surface, and it also offers tools to detect and repair errors. The surfaces can have multiple boundaries or islands, and can be drawn as lines, 3D faces or meshes.

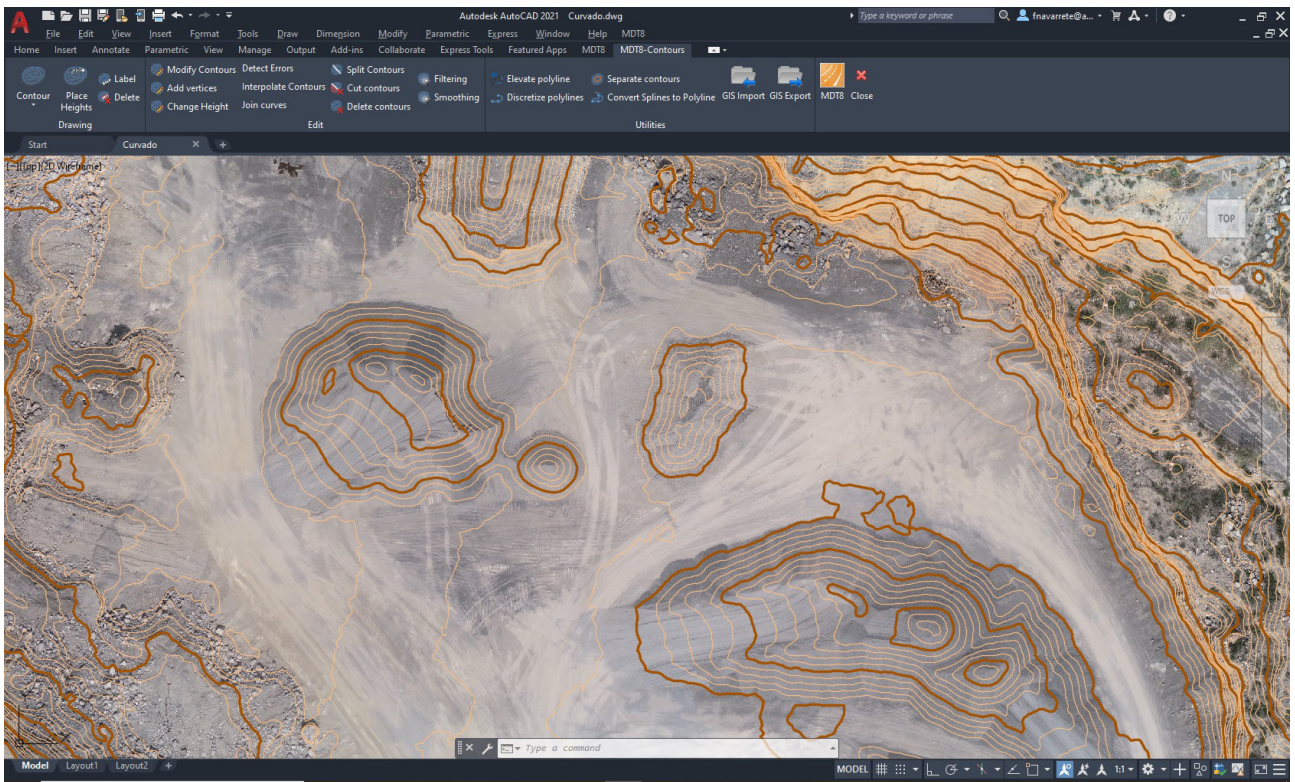
Advanced surface operations include tools for creating subgrades with a fixed or variable elevation for implementing earthworks by site or grading elevations, levelled area top, embankment top or bottom, slope between surfaces etc.

These commands include options for determining the optimum elevation to balance the cut and fill volumes. The program includes the import and export of the most common formats, including CAD applications, BIM, machine control, 3D modeling and virtual reality.



Cartography and Contour Lines

MDT can generate contour lines from surfaces or meshes, with an interval or at special elevations and they are updated automatically with each change in triangulation. The contours can be labeled manually or automatically and additional labels to be placed anywhere on the surface.

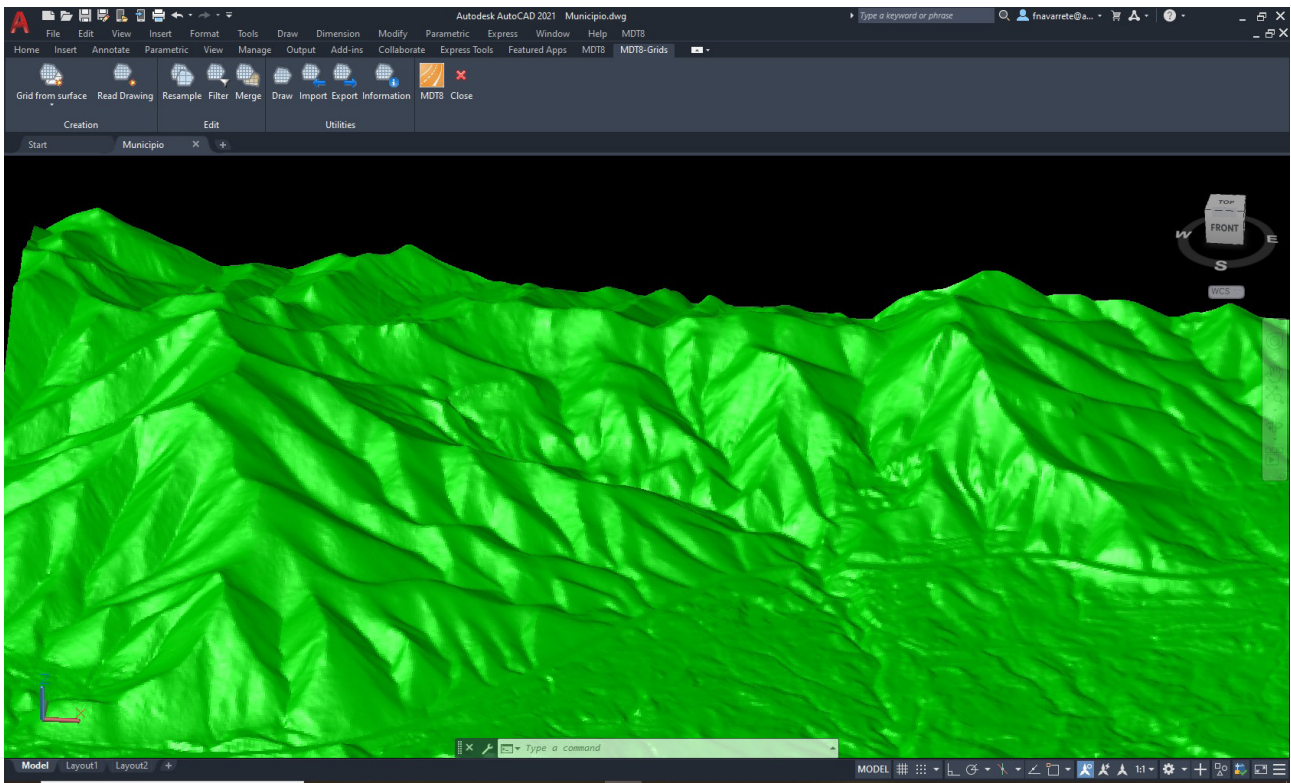


There are also other commands for interpolating, breaking and joining curves, adding vertices, editing curves, discretizing polylines and splines, detecting elevation errors etc. Other tools make it possible to import and export point, lines and polygon GIS files in formats shape, GML, GeoJSON and more. You can also import vector data from entity web services (WFS).

🎯 Meshes

Meshes may be created from a surface, contours, 3D entities or mesh files in various known formats (Arc/Info, LAS, GeoTIFF, etc.) or web coverage services (WCS). Large files can be converted from LiDAR or photogrammetry applications, with the possibility of resampling and without the need to draw them in CAD.

It also has commands for mesh processing such as joins, filtering and resampling, remove spikes, fill gaps, etc. They may be represented as 3D faces, polyface mesh or image, all being suitable for export to realism and animation programs.

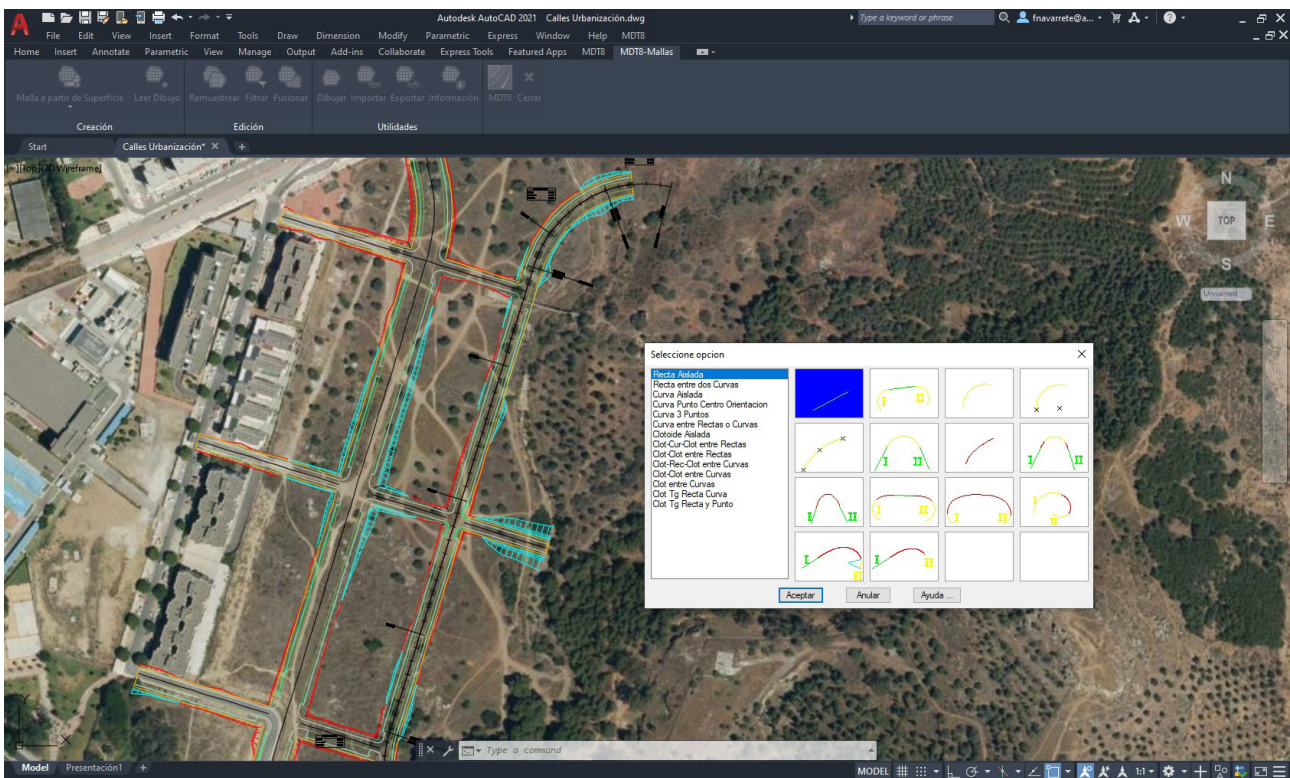


🎯 Horizontal Alignments

The horizontal alignments which will be used on longitudinal and cross sections may be created interactively, drawing on the screen and from polylines, numeric input or importing files in the most usual commercial formats as LandXML, IFC, etc. Other commands also allow alignments to be integrated based on lines, circular arcs and clothoids and which may be fixed, rotating or coupled, greatly making easier the layout drawing.

The alignments are automatically dimensioned with customizable styles and their vertices may be edited. It may also be checked whether the radius and setting values comply with the road standards. MDT includes other tools for labelling curve tables, the generation of reports by intervals, the calculation of distances and intersections between alignments etc.

Once the alignment has been generated, superelevations and widenings can be generated, being able to choose the applicable tables according to the country. An MDT road comprises the horizontal and vertical alignment, longitudinal profiles and cross sections, superelevations, widenings and template sections. Then it is possible to draw the project longitudinal profiles and cross sections, represent the modified terrain and obtain all kinds of reports for measurements, settings out etc.



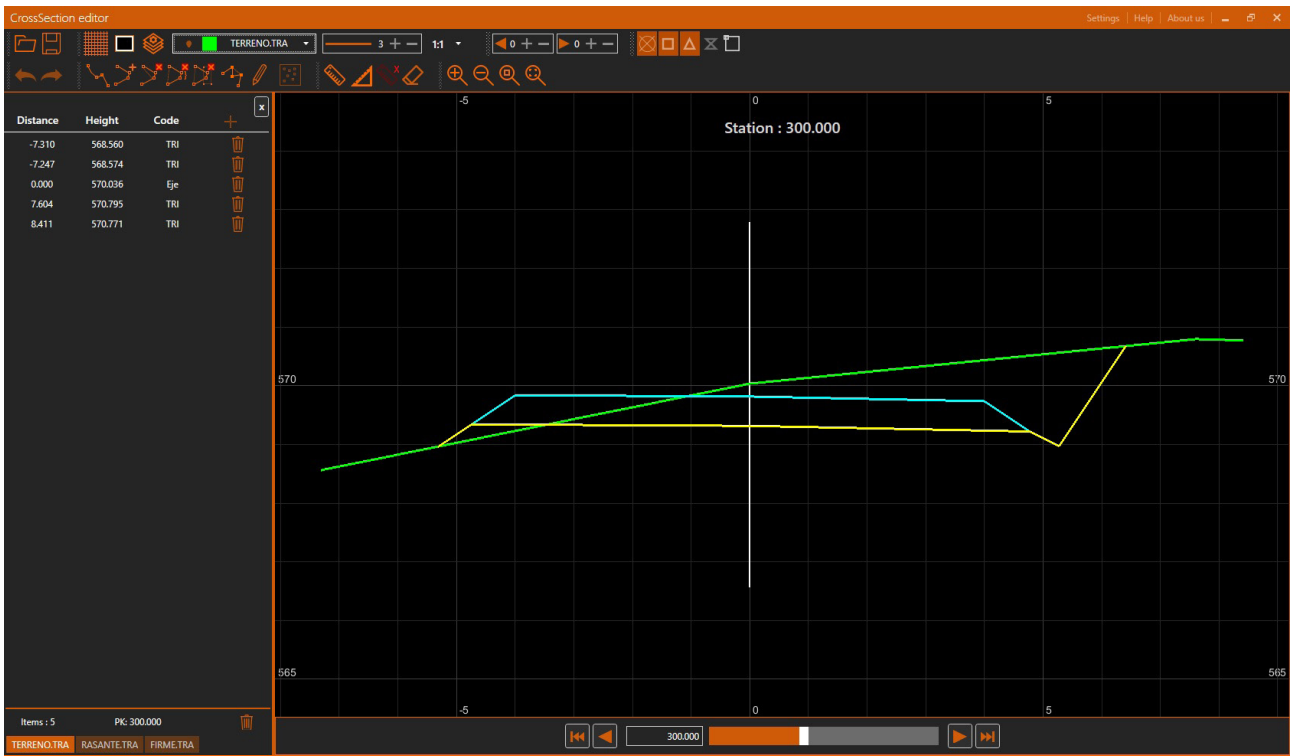
🎯 Longitudinal Profiles

The profiles may be calculated based on a surface, 3D cartography or by regression from points near the alignment. The quick profile command allows the user to draw a line on the surface and quickly show the profile. The profiles may be updated automatically when the original alignment or surface have changed. Furthermore, it has a powerful CAD independent profile editor which allows graphic and numerical editing. The drawing is fully customizable, including the use of paper space or model, sheet templates, style, justification and text sizes. The numerical information to be labelled on the profile can also be chosen from a broad list of elements (distances from origin and partial distances, terrain elevation, gradient elevation, slopes etc.). Blocks defined by the user can also be inserted at the desired locations.

It is possible to represent on one single profile one or several terrains and vertical alignments, including the tables with vertical curve characteristics, curvature diagram and superelevations, intersection with other roads etc. MDT has utilities to draw profiles of power lines including poles, catenaries, etc.

MDT allows users to draw several profiles simultaneously to see different layers or stages of evolution of the project. A powerful editor allows the profiles to be graphically modified by moving the vertices or numerically by modifying distances or elevations.

If the original surface or alignment are modified, the profiles may be automatically updated. MDT also incorporates special commands for drawing piping sections, allowing the definition of their terrain layers, bedding material, pipe diameter etc.

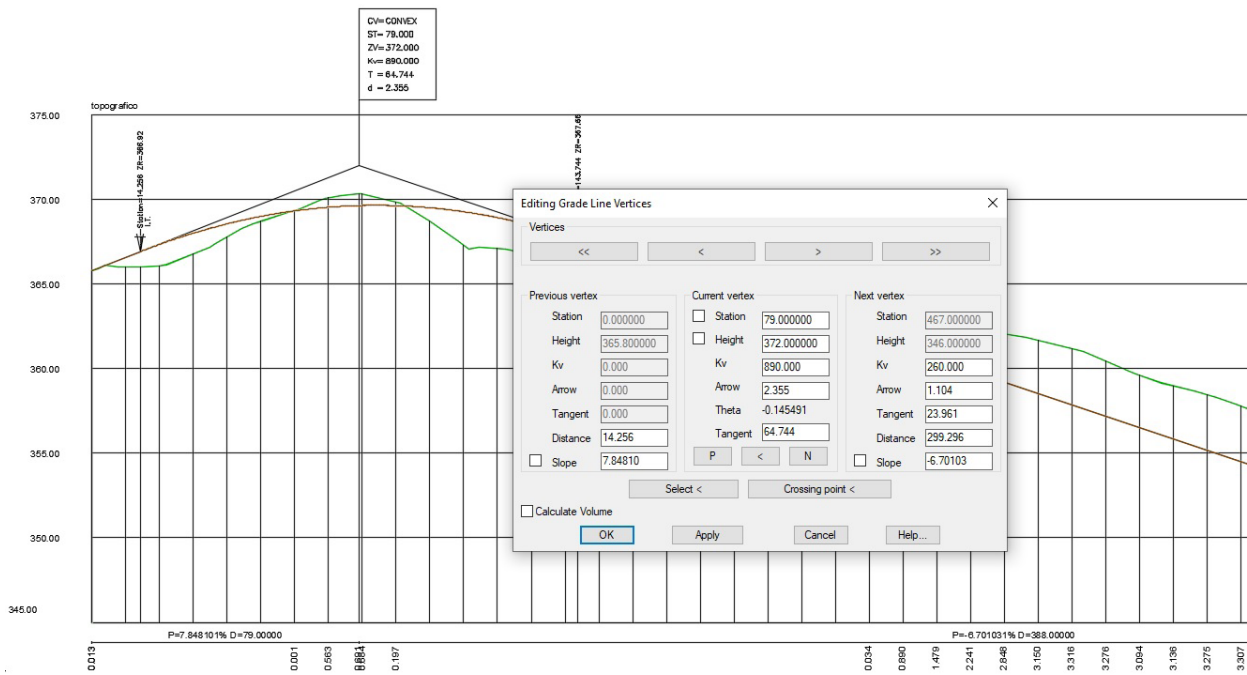


Vertical Alignments

Vertical alignments can be defined from a polyline, parameters (chainage and elevations or distances and slopes) or by importing files. Vertical curves may be circular or parabolic (symmetrical or asymmetrical) and they may be edited by changing their radius or parameter, tangent, maximum ordinate or crossing point, showing all the information about estimated elevations, slopes and volumes in real time.

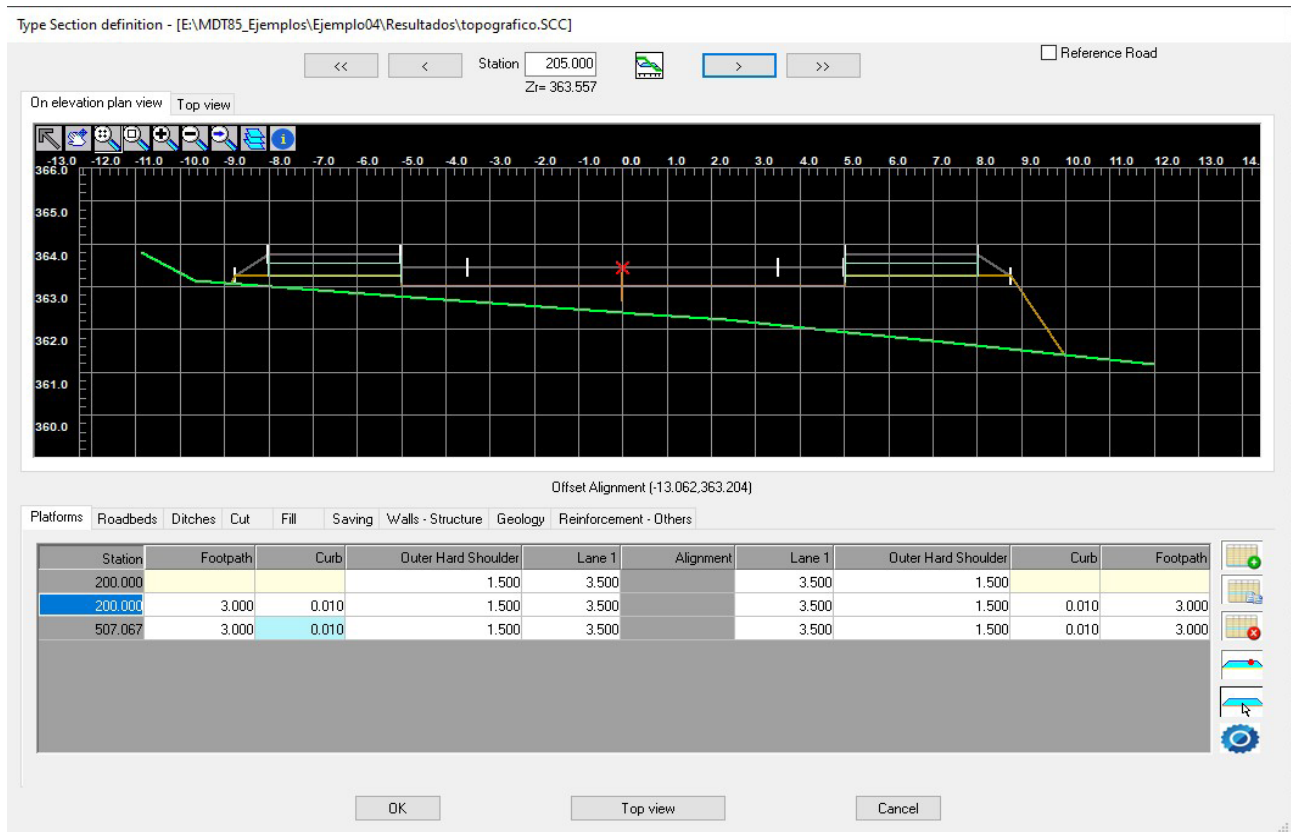
The drawing is updated automatically if the alignment or surface is changed. MDT includes tools for generating the optimum gradient, applying displacements in chainage or elevation, extracting it from a longitudinal profile, comparing two gradients etc.

Compliance with the road standards can also be verified in terms of visibility, slopes and curve characteristics.



Road Templates

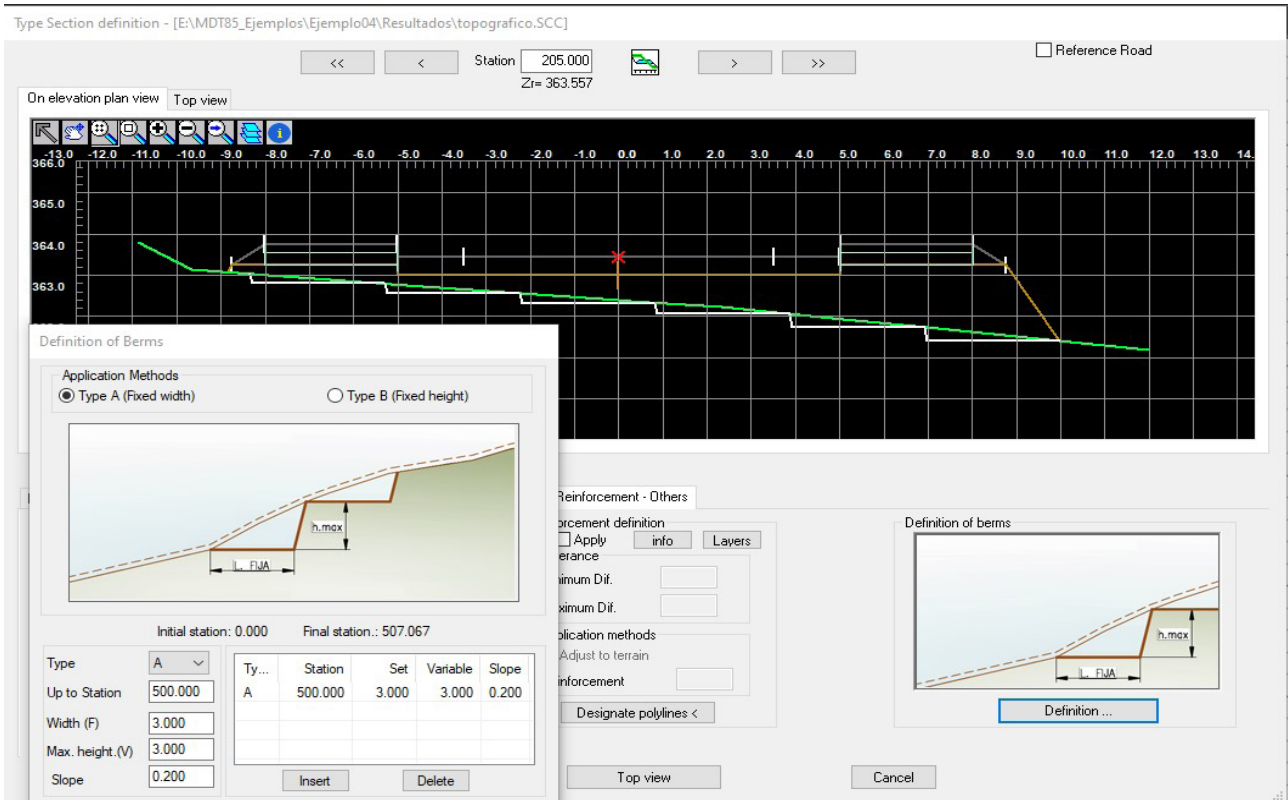
MDT allows the drawing of road sections applicable to each segment of an alignment, both on urban and road projects. The platforms are defined from vectors such as lane, median, berm, hard shoulder... The user may create his own vectors library and he may customize the dimensions and behavior of each to decide how to apply superelevations, textures or road surface layers.



The road surface layers may also be defined separately for each platform vector as well as the sub gradient application conditions (constant slope, parallel, depending on the superelevation or variable). We can also apply different inclinations on the left and right of the alignment as well as in the interior or exterior of the median. Finally, different materials can be assigned to each of the road surface layers.

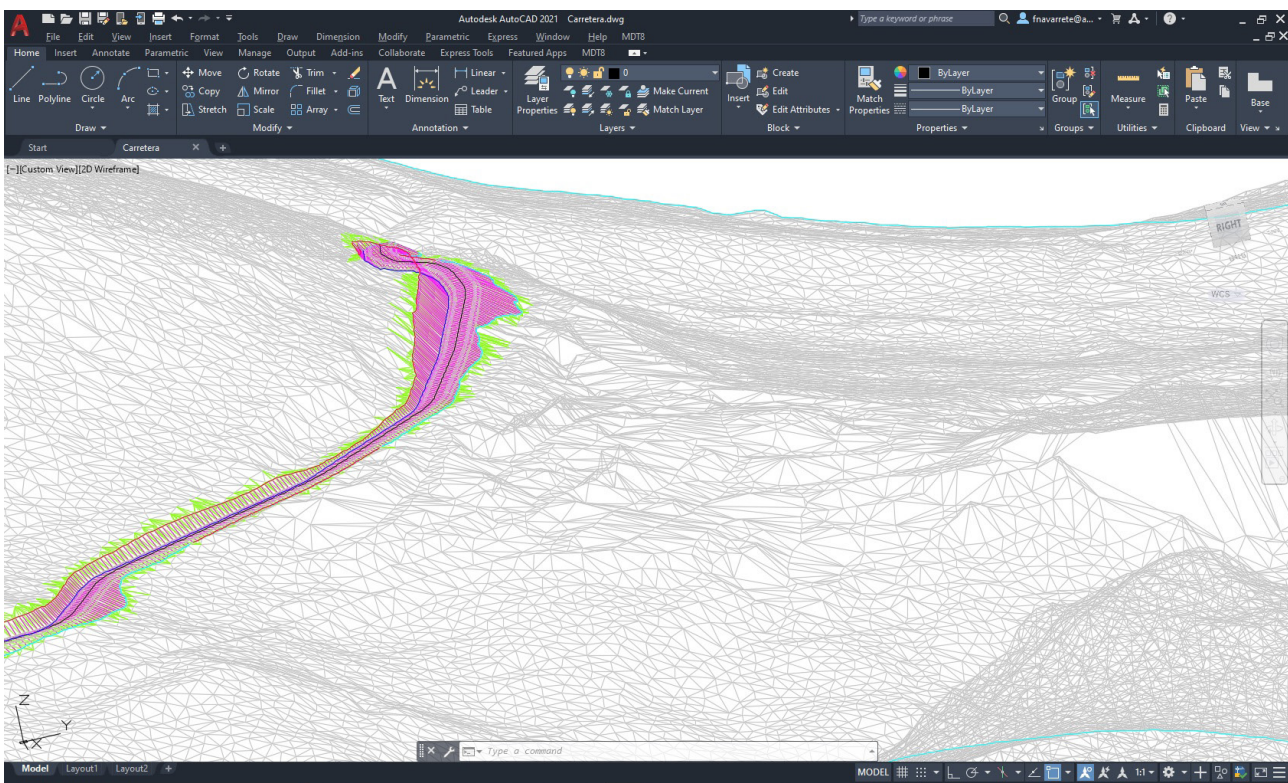
The ditches are defined from vector elements and they may be applied on the left or right and cut or fill. Another option allows the definition of reserve ditches conditioned by the height difference from the natural ground. There are different options for defining the cut and fill slopes: constant slope, berms or variables. You can also assign conditional slopes for height, layers of geology, slope dimensions, etc.

In addition, the standard section may include geology layers, walls and structures, reinforcements and expansions. It also includes tools for the automatic creation of sections from a drawing in top and front views, being able to define geometrically medians, walls, curbs, etc.



🎯 Setting out

Setting out bases can be created using various methods and it is possible to set out isolated points, points on an alignment, chainages and displacement, intervals, polyline vertices etc. with their own coordinates or regarding bases. All set out points are analyzed in line with the alignment, indicating their chainage, displacement and azimuth.



It also includes numerous roads setting out tools with the possibility of calculating and analyzing section elements, generating lists of platform vertices, waysides, slopes, vertices, road surface layers, elevations etc. Other useful commands allow the analysis, control and report on a survey based on a modified terrain digital model and/or on developed design profiles.

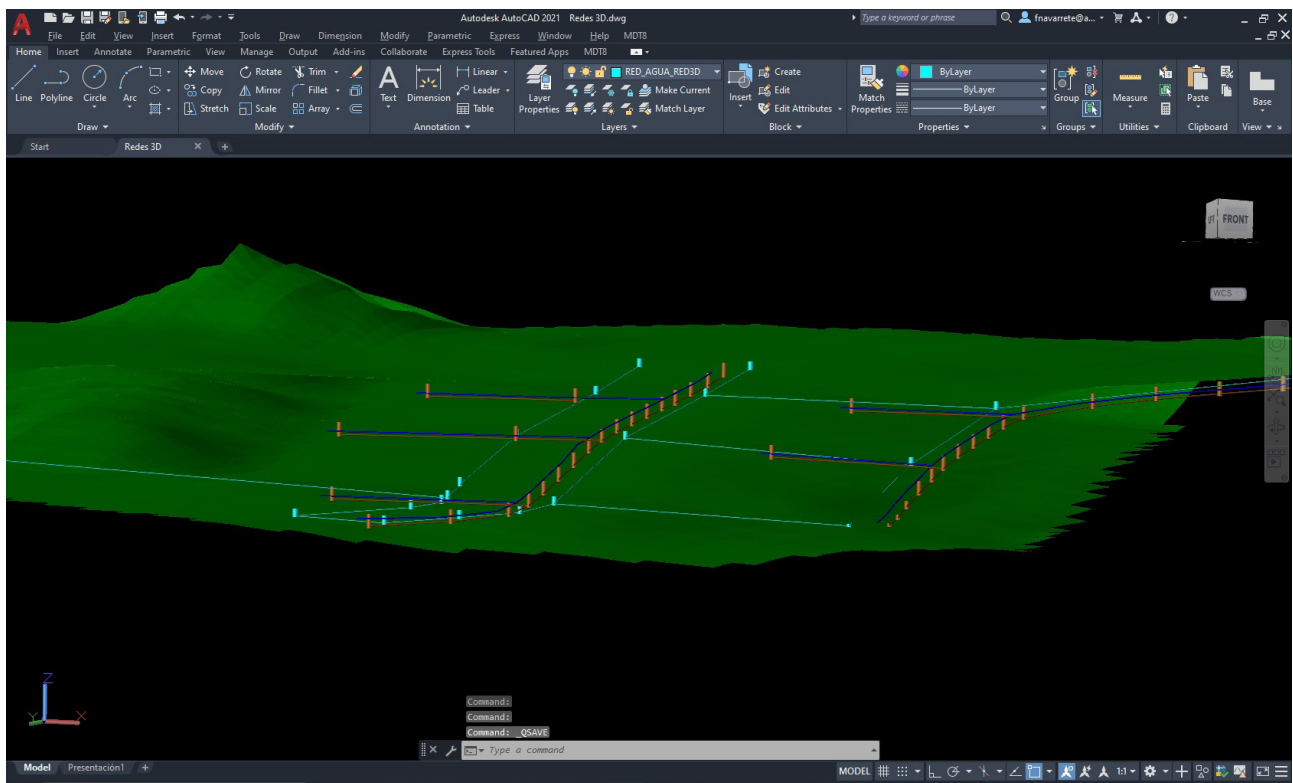
Networks

The networks menu offers functions for the drawing in top or front views of water, sewerage, rainwater networks, etc. The nodes can be imported from file, converted from points or blocks, or inserted manually. The pipe sections are created by joining nodes or converting 2D or 3D polylines, giving diameter and material from a customizable list.

The longitudinal profile draws the wells with their attributes and the pipes, with their diameter, material, slope, intersection with other pipes, etc. The cross profiles include the representation of the pipes at their real position with respect to the ground.

In addition, all networks can be drawn in 3D with their actual dimensions.

Networks can be exported to LandXML formats, shape for integration in GIS and JSON to process with CYPE applications.



🎯 Areas and Volumes

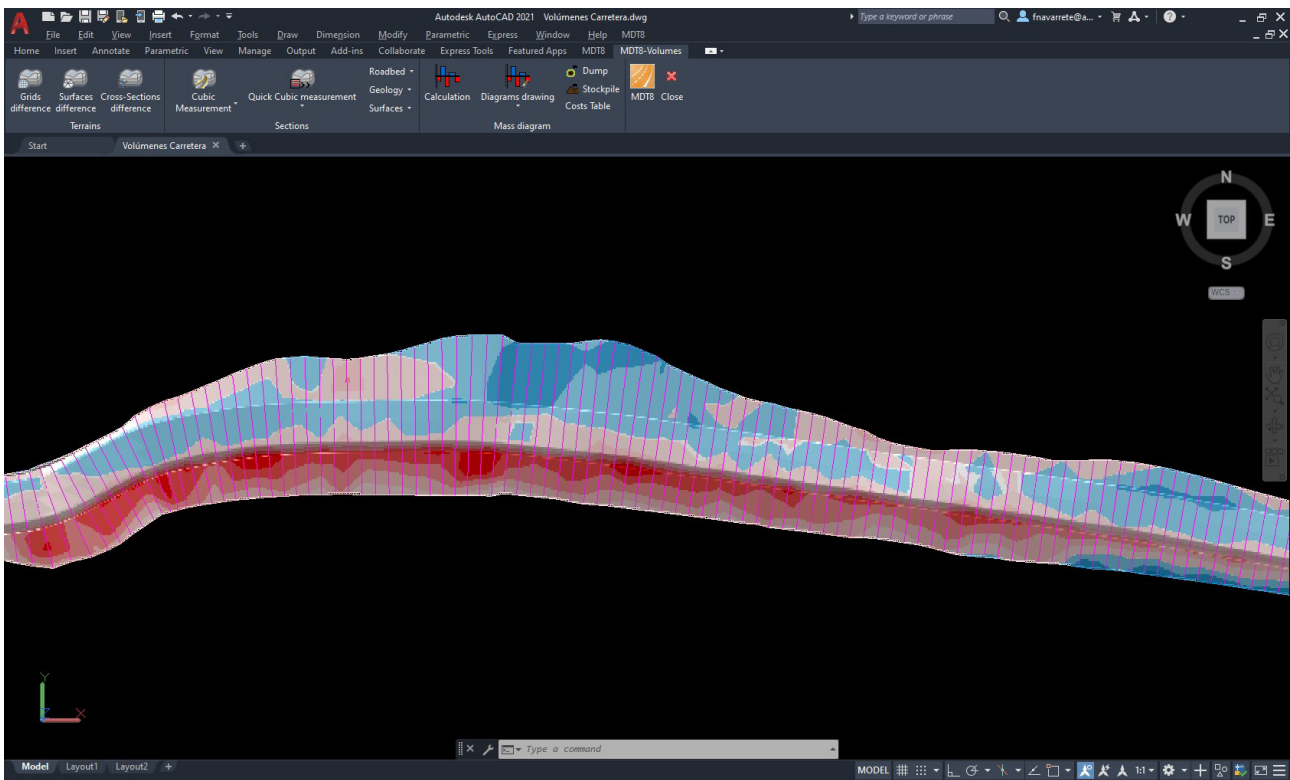
Cut and fill volumes can be calculated from a comparison between meshes, surfaces or cross sections. The results of meshes and surfaces are represented by areas using color palettes, with a customizable legend and interval. Calculation by cross sections allows the application of the curvature corrections in line with the geometry of the horizontal alignment and excluding intervals that do not form part of the measurement.

A utility allows you to quickly calculate the volumes of stockpiles of material defined by polylines drawn on a surface. The calculation of road surface layer volumes includes the detailed breakdown of each of the volumes calculated: cut, fill, topsoil when cutting, topsoil when filling, reinforcements etc.

The quick volume utility allows the ascertainment of the percentage of the works carried out based on a points file X, Y, Z or chainages and elevations, generating different reports for each of the methods and estimating the maximum error.

Other additional reports are the lists of areas, volumes, cross section measurements, road surface measurements, slope measurements, volumes by simple section etc.

Finally, MDT has a group of commands for managing mass diagrams with different representations, the calculation of earthworks, the definition of landfill and stockpiling areas, transport costs table and the generation of reports with an expression of volumes of land displaced, transport distances, associated costs etc.



Quantity Take-off

MDT includes the possibility of selecting a database of work units in BC3 format, organized in chapters, groups and items. In these items you can edit its description, detail, measurement unit, execution price, etc. In addition, it is possible to associate the data on CO2 emissions, water and fuel consumption, energy consumption and waste emissions to each work unit.

These work units can be assigned to earthworks, road surface layers and other elements of the drawing. For example, for the road surface layer the density and factors are indicated, and it can be applied to the total volume, upper surface or lower surface of the layer.

With this data, it is possible to automatically generate the reports: work unit measurements, material execution budget and consumption and emissions for the entire project.

Analysis of Work Unit Life Cycle

Code: 211.0000 Unit: t

Description: ASPHALT BITUM B15/25 (B 13/22)

CO2 emission (Kg)	206.059	Energy (MJ)	122.787
Fuel (l)	10.500	Energy (kWh)	127.333
Water (l)	442.030	Waste (t)	0.050

OK Cancel Help...

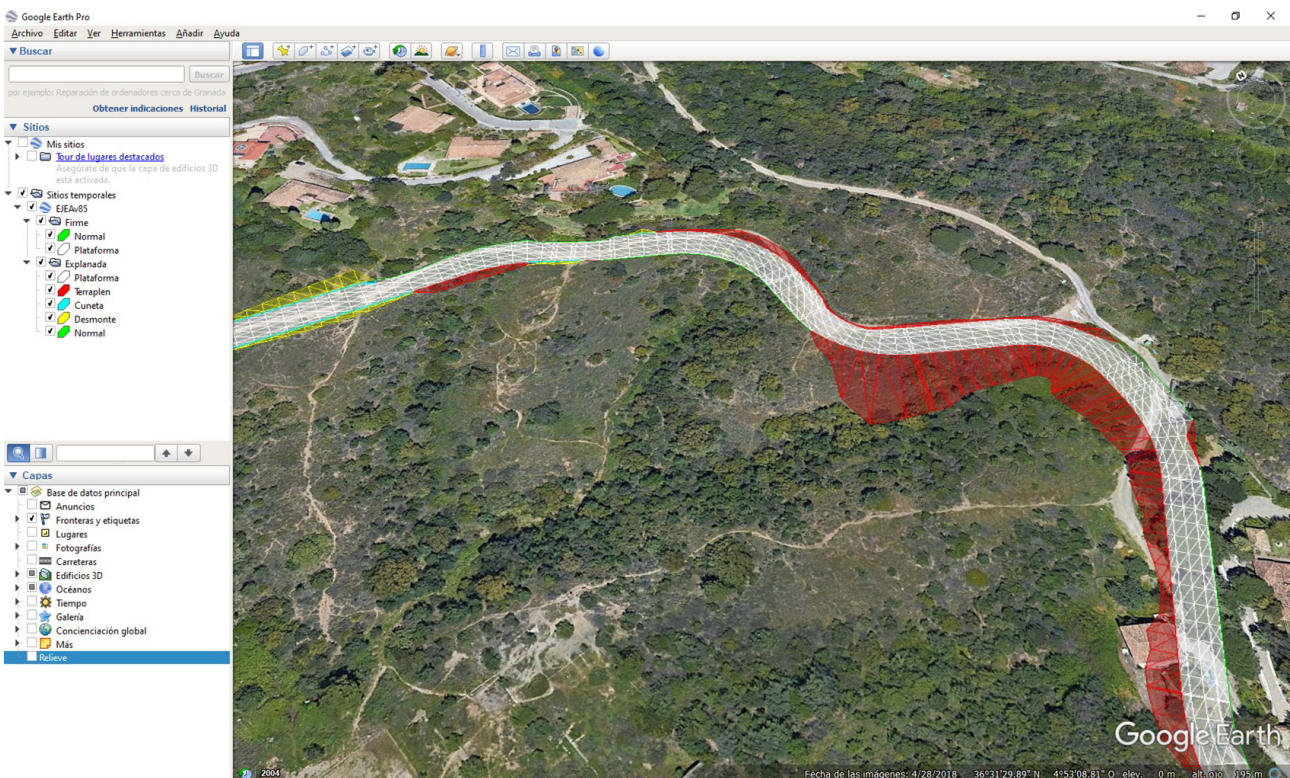
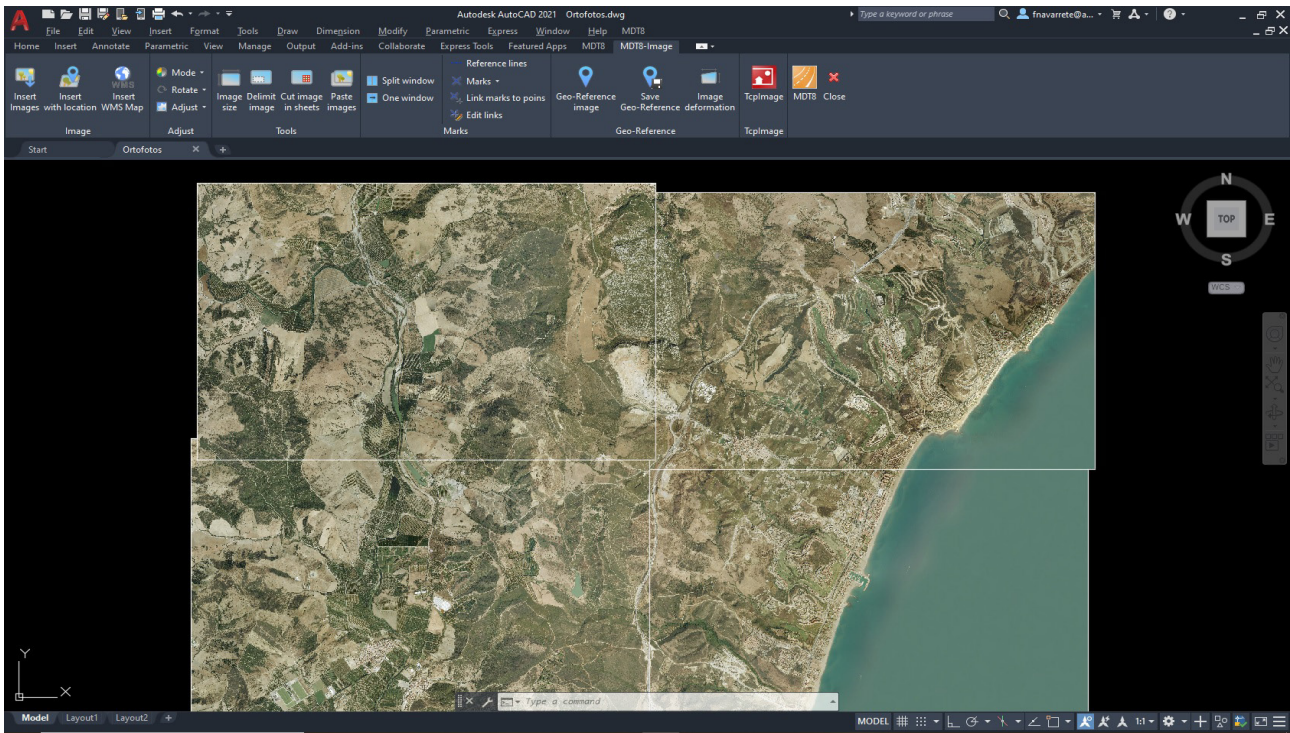
Measurement - Work Units

Measurement - Work Units									
Chapter	Work unit	Code	Description	Geo.Measurement	Measurement	Density	Amount	Total	Unit
02 - DRENAJE	B.R. Mix	211.0000	ASPHALT BITUM B15/25 (B 13/22)	1507.122 m3		1.0000000	1.0000000	1507.122 t	
02 - DRENAJE	B.R. Mix	211.0040	BETUN MEJORADO CON CAUCHO PROCEDENTE DE POLVO DE NFS, TIPO BC35/50	1507.122 m3		1.0000000	1.0000000	1507.122 t	
05 - FIRMES	Soil concrete	513.0010	SUELO-CEMENTO FABRICADO EN CENTRAL	1714.669 m3		1.0000000	1.0000000	1714.669 m3	
05 - FIRMES	Crashed stone concrete	513.0020	GRAVA-CEMENTO FABRICADO EN CENTRAL	1587.555 m3		1.0000000	1.0000000	1587.555 m3	

OK Help Print...

Images

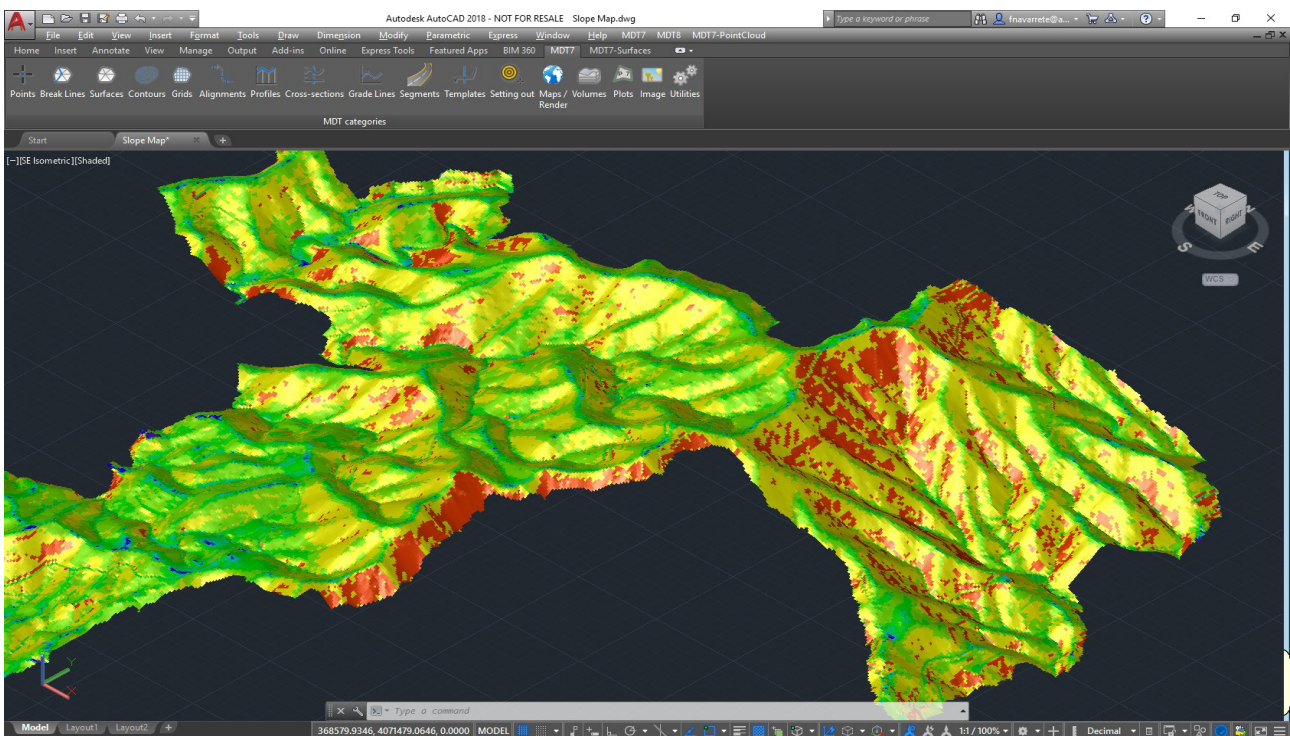
MDT has commands for inserting georeferenced images and orthophotos in their real position on the terrain and assigning them to a surface or assigning predefined textures to surfaces, and place photos with position at their real location on the map. It also allows access to the web map services (WMS, WMTS) provided by public and private entities in such a way that the user must only specify a window, choose the service and the program will automatically insert the image in the right place on the drawing. Another utility enables the user to export points, surface and layers of the drawing to Google Earth.

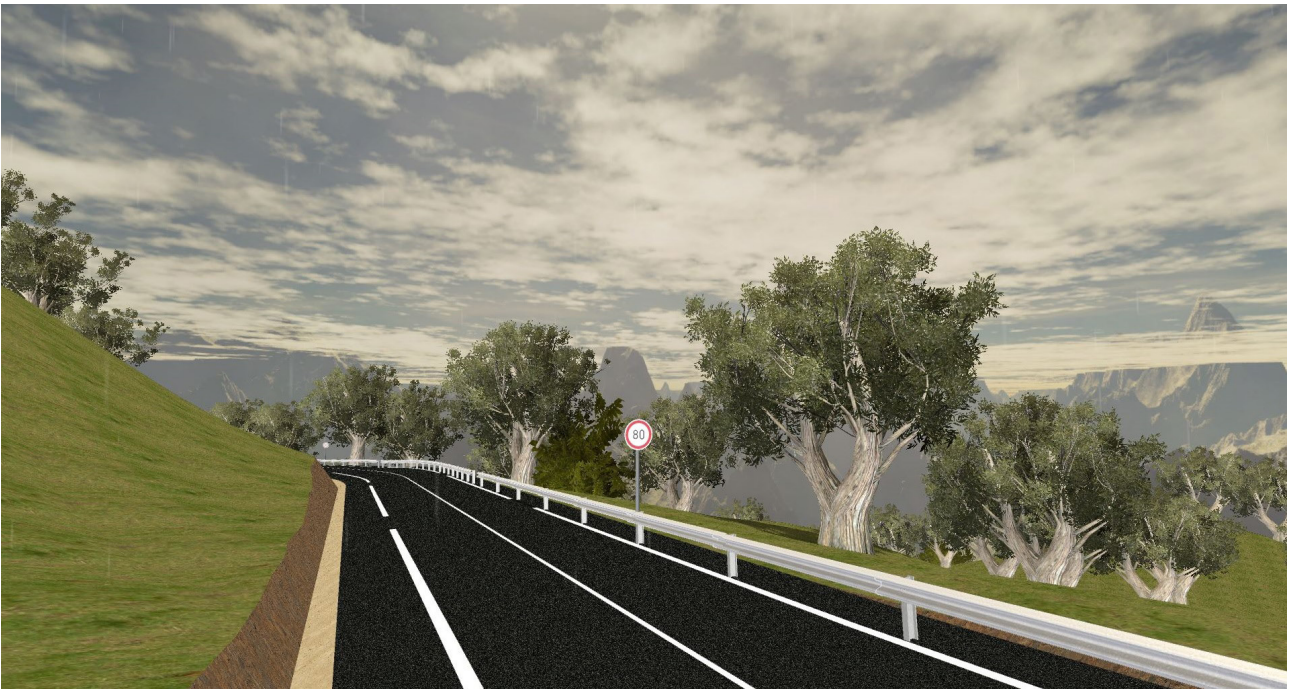


Maps - Render

MDT can draw a 3-D mesh based on contours or surface and maps of heights, slopes, orientations or visibility from a point can be generated. It includes a powerful terrain or road viewer in which the lighting conditions can be changed and simulate phenomena such as fog, rain, wind, etc.

It includes a ready-to-use library of textures to apply to models, and another of 3D objects with trees, vegetation, rocks, signs, street furniture, etc. useful to enhance presentations. Another interesting feature is the total immersion in the field through Virtual Reality technology, using Oculus Rift headset and moving freely with the X-Box gamepad.

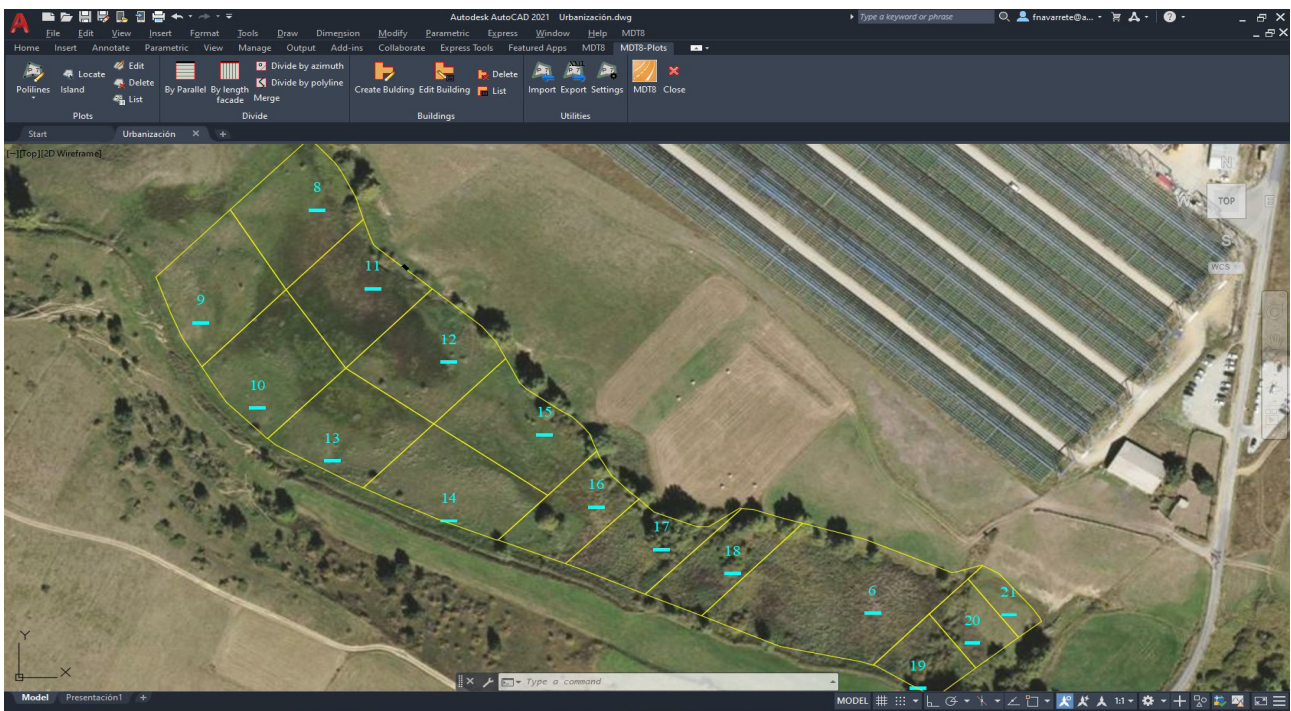




Plots

This menu includes options for creating and editing plots and buildings. It also has tools for plot division by area, parallel and perpendicular to one side, azimuth, length of facade, etc.

Other utilities allow you to dimension parcels, label vertices coordinates and length of sides, generate reports and presentations, etc. The data can be exported to standard formats such as GML and LandXML, shape for GIS projects and other specific ones required by the Cadaster in countries such as Spain, France, etc.

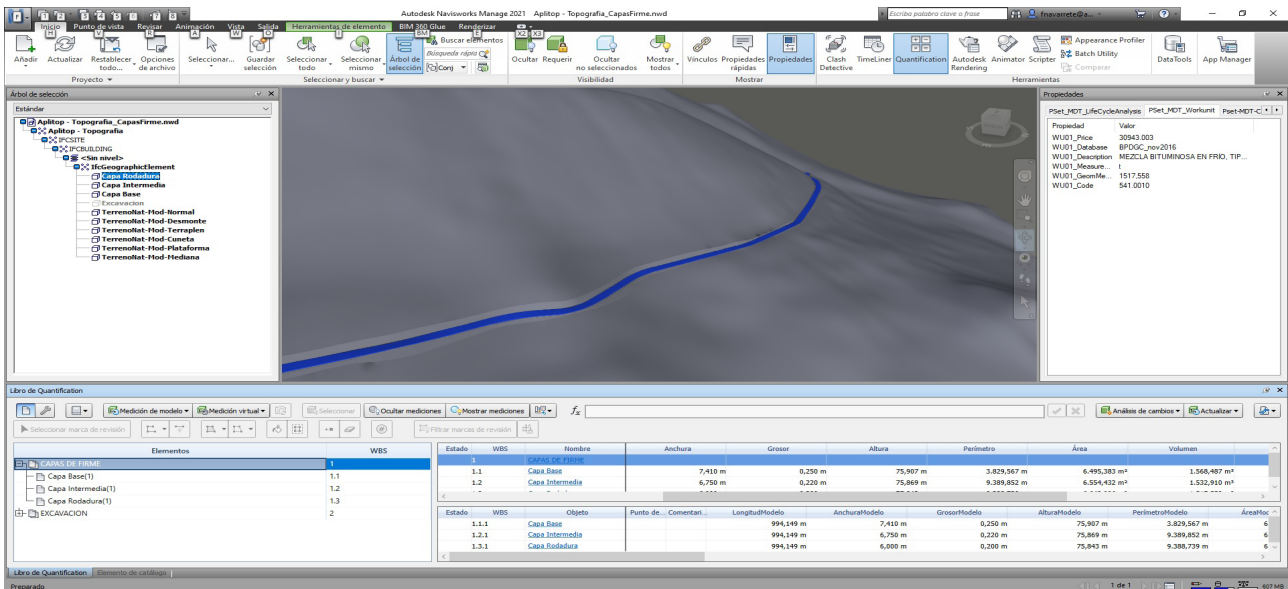


BIM

APLITOP is actively collaborating with buildingSMART International for the development and implementation of the IFC Alignment and IFC Road formats, which aim to simplify the exchange of road and infrastructure data through the BIM methodology.

MDT can import and export IFC (Industry Foundation Classes) format files having surfaces, alignments, road surface layers, etc. Properties and properties sets can be defined as established in the technical specifications and BIM Execution Plans, as well as applying classifications of objects.

In addition, you can export to IFC all the information necessary for preparing measurements and quantity take-off (BIM-5D) as well as consumption and emissions data for sustainability indicators (BIM-6D). It is makes possible to use data generated by MDT in applications such as BIM Vision, Solibri Model Checker, Revit, ArchiCAD, Navisworks, Infraworks, BIMserver center, etc.



The screenshot displays the Autodesk Navisworks Manage 2021 interface. The main window shows a 3D model of a road construction project with a blue line representing the road alignment. The left sidebar shows the project hierarchy, including 'Arbol de selección' and 'Arbol de elementos'. The bottom panel shows the 'Libro de Cuantificación' (Quantification Book) with a table of elements and their properties.

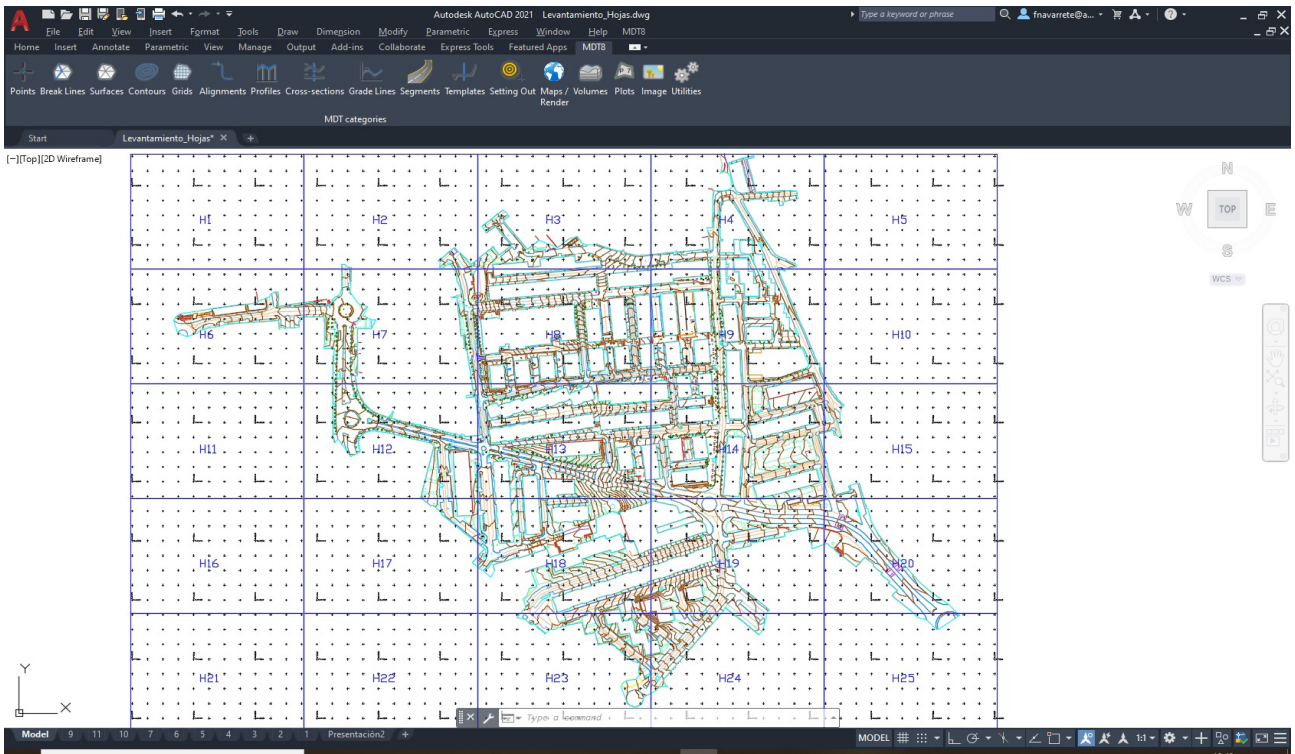
Elementos	WBS	Estado	WBS	Nombre	Anchura	Grosor	Altura	Perimetro	Area	Volumen
Capas de firme	1	1.1	Capa Base	7,410 m	0,250 m	75,907 m	3,829,567 m	4,495,283 m ²	1,568,487 m ³	
Capa Base(1)	1.1	1.2	Capa Intermedia	6,750 m	0,220 m	75,869 m	9,289,852 m	6,554,432 m ²	1,532,910 m ³	
Capa Intermedia(1)	1.2	1.3	Capa Rodadura							
Capa Rodadura(1)	1.3									

Estado	WBS	Objeto	Punto de...	Comentari...	LongitudModelo	AnchuraModelo	GrosorModelo	AlturaModelo	PerimetroModelo	AreaModelo
1.1.1		Capa Base			994,149 m	7,410 m	0,250 m	75,907 m	3,829,567 m	6
1.2.1		Capa Intermedia			994,149 m	6,750 m	0,220 m	75,869 m	9,289,852 m	6
1.3.1		Capa Rodadura			994,149 m	6,000 m	0,200 m	75,845 m	9,588,739 m	6

Utilities

MDT has multiple additional tools for the presentation of drawings such as the numbering of objects, draw coordinates and grids, slope drawing, division onto sheets, layer control, entity elevation etc. The feature elevation utility allows you to quickly assign elevations to features drawn in 2D, using a surface or indicating extreme values to interpolate the rest.

The support submenu offers options to open the help system and training videos, report issues or suggestions, check for updates, etc.



🎯 Reports

The results offered by MDT can be customized by the user, including its graphic representation and reports. In these you can define the header and footer content, font types, sizes and colors, add company logo, configure margins, line spacing... In addition, the reports can be exported directly to Word, Excel, text, PDF and drawing as a table in the CAD itself.

PRINT
< 1 / 3 >
🔍 📄 📏 🖨️

Print Profile

Last print profile Load

Close after print

Print Copies: 1

Excel Word .txt CAD

Printer

VersaLink C7030 PCL 6 Search

All Pages 1 3

Settings

Portrait Orientation

A4 Paper
210mm. x 297 mm. EDIT

Normal Margin
<: 30 mm A; 25 mm
>: 30 mm V; 25 mm EDIT

Header ... Footer ...

Fonts

A4 Titles ... A4 Headers ... A4 Rows ...

Lists

Table borders Alt row colors Alt rows color

Save Profile ...

04/13/2019

SETTING OUT LIST

BR-STATION	Station	X Coord.	Y Coord.	Azimuth	Distance
BR-ORIENTATION	40	275.524	262.211	62.5567	10.684
	41	268.413	273.139		
X Coord.	Y Coord.	Z Coord.	Azimuth	Distance	Code
257.835	264.781	48.570	292.8967	21.824	2
258.914	274.681	48.760	321.8262	21.858	3
360.730	284.925	47.130	348.1274	25.822	5
282.893	293.434	47.430	364.9384	31.952	6
265.617	301.429	47.560	375.7445	36.061	8
270.108	311.152	47.804	386.5428	44.589	9
272.787	316.505	48.100	391.1880	48.750	10
278.382	323.371	48.850	398.7056	55.172	11
282.657	331.671	49.700	404.3252	61.548	12
284.919	338.837	50.290	408.91	71.833	14
285.349	346.624	50.910	416.13	78.626	15
287.688	348.886	51.540	418.848	80.288	16.AB
292.947	347.153	51.120	415.960	81.061	17.AB
296.328	347.670	51.120	413.218	81.630	18.AB
296.273	383.138	51.120	12.2197	87.535	19.AB
294.724	373.268	52.160	3.1880	105.184	20.CB
280.749	372.250	51.240	4.3717	105.295	21.AB
281.682	372.485	51.120	7.3264	105.894	22.AB
276.413	388.948	51.120	9.8872	107.976	23.AB
288.823	343.006	50.600	7.5233	78.327	24.AES1
290.312	339.895	50.840	9.5518	73.150	26.AB-5
290.635	334.829	51.260	9.8232	88.528	27.AES
285.462	333.820	49.960	5.7461	65.877	28.AES
283.558	336.682	48.200	12.7973	70.286	29.BT
288.114	330.585	48.200	9.5596	64.105	30.BT
283.636	324.281	47.820	8.6667	67.786	31.BT
274.145	313.660	47.650	392.5582	45.163	32.BT
267.333	300.542	47.180	377.6775	35.491	33.BT
265.101	292.393	46.730	367.4568	26.873	34.BT
263.682	281.514	46.310	346.7527	21.343	35.BT
261.105	272.171	46.120	316.7470	19.074	36.BT
260.662	268.043	46.090	271.1914	20.972	37.BT
260.417	246.285	45.440	247.8573	28.516	38.BT
270.269	252.746	45.540	201.1222	14.487	39.ARBOL
279.524	267.211	46.020	0.0000	0.000	40.PTE.LITE
286.413	273.139	46.200	62.5567	10.684	41.LTE.LITE

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🎯 Requirements ⁽¹⁾

CAD	AutoCAD versions 2007 to 2022 and compatible versions BricsCAD Pro/Platinum versions 15 to 21 GstarCAD Professional versions 2020 to 2021 ZWCAD Professional/Enterprise versions 2012+ to 2021
Operating System	Windows 7 / 8 / 8.1 / 10 in 32 and 64 bits (2)
Peripherals	Mouse or pointing device
Graphic Card	CD-ROM Reader 1280x720 pixels, compatible with OpenGL Nvidia or ATI chipset recommended
Drive	10 Gb free space
Memory	Minimum 3 Gb
Processor	Dual-core 2 Ghz or superior

(1) Consult the website for further details

(2) Operation via a remote desktop and similar services are not guaranteed, nor on virtualization platforms. Write to soporte@aplitop.com to ask about these special cases.

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The logo for Aplitop, featuring the word "aplitop" in a bold, lowercase, sans-serif font.