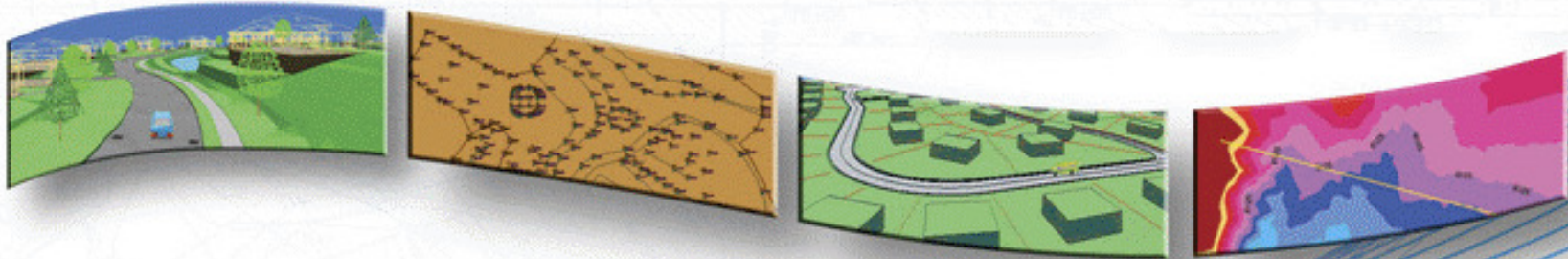


CARLSON

**How to Add DTM Model Building to Your Survey
Firm's Land Development Services**



Jim Carlson - Carlson Software

TAKEOFF



Carlson®
...Works Simply ...Simply Works

Autodesk®
Authorized Developer

About RTK GPS Machine Control/Indicate

MC History

RTK GPS Machine Control History

*Machine Indicate
Late 1990's*

*Fully Automatic
Hydraulic Machine
Control 2000's*

Std Single or
Double Mast MC



Mastless MC 2017



"The key to successfully using GPS in the earthmoving industry is having an accurate site design." Equipmentworld – (This means both DTM and plan view.)

Trimble Inc.

*2000 Trimble
bought Spectra
Precision Group*

*2002 Trimble
& CAT begin
joint venture*

*2008 Trimble &
CAT 2nd joint
venture SITECH*

*CAT offers Trimble
SITECH MC as a STD
factory option*

<http://www.sitechgulf.com/products/3d-machine-control/>

Topcon Positioning Systems

*2000
Bought
Javad GPS*

*2001 Topcon MC
mm accuracy
GPS/Laser released*

*2013 Topcon &
Komatsu announce
joint venture*

*Topcon MC offered as STD
factory option
by John Deere & Komatsu*

<https://www.topconpositioning.com/grading/3d-dozer-systems/3d-mc2-dozer>

Leica Geosystems

*2001
Bought Laser
Alignment MC*

*2005
Hexagon AB
Bought Leica*

*2007
Hexagon AB
Bought Novatel*

*2009
Leica MC
Division founded*

<http://leica-geosystems.com/products/machine-control-systems>

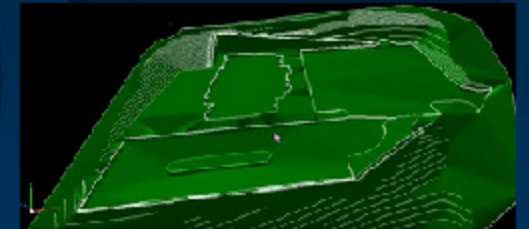
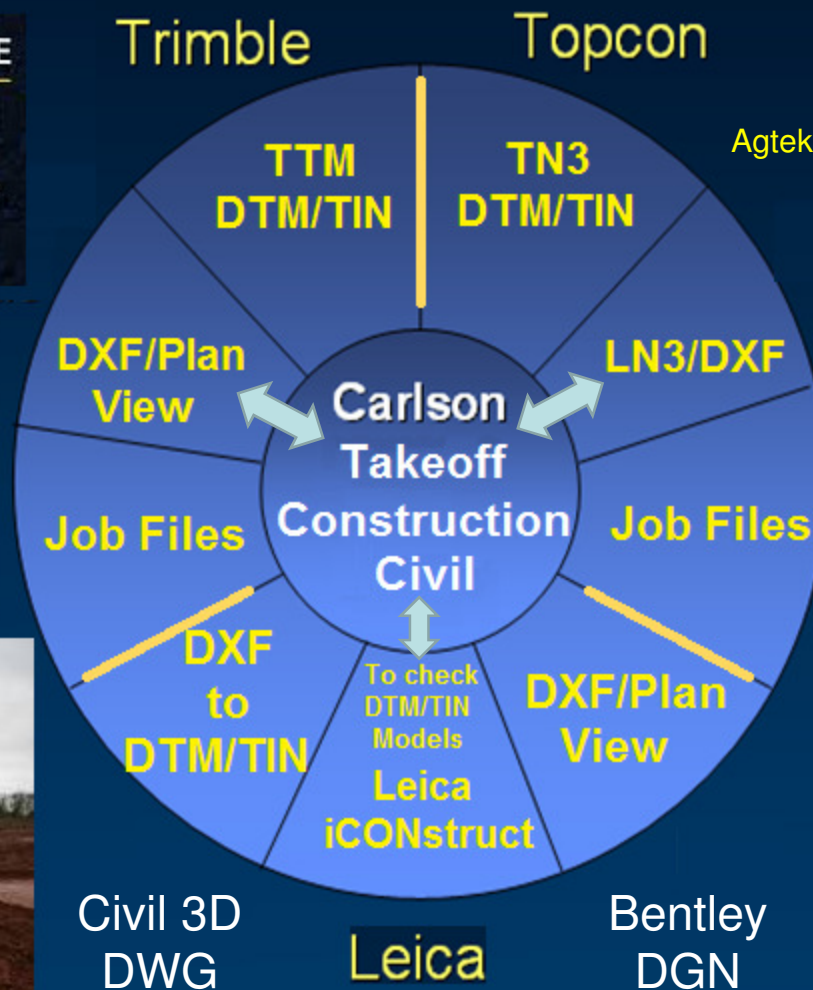
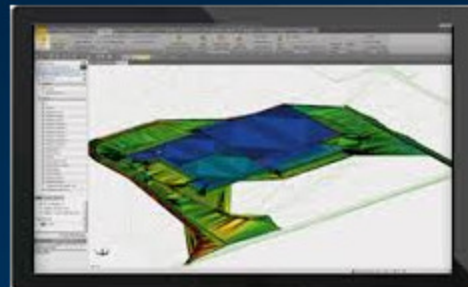
<http://quantumlanddesign.net/services/>

MC Office Software Solutions

Office MC Software
Independent Strategy

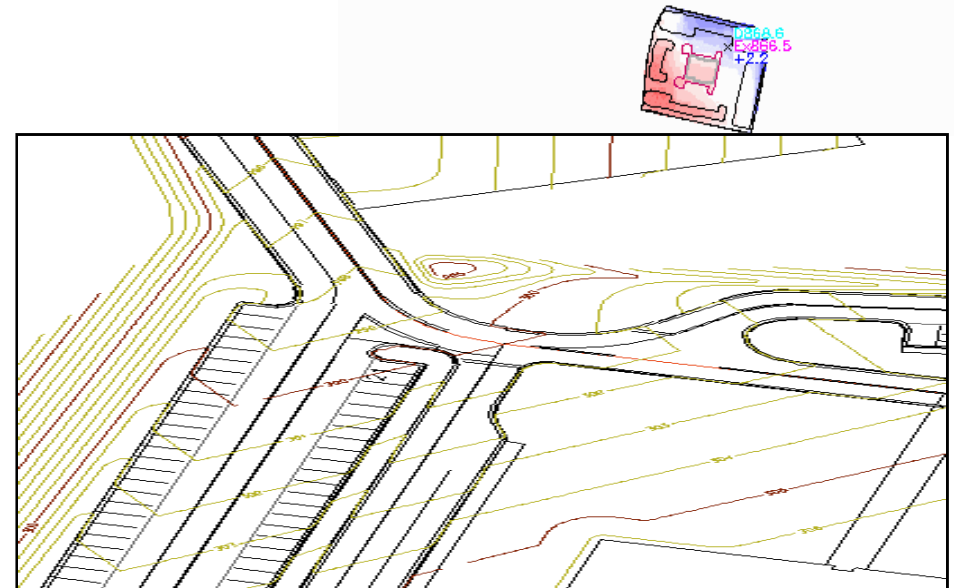
Carlson

or all-in-one Trimble TBC and Topcon Magnet



About Carlson Software





What does Takeoff Do?

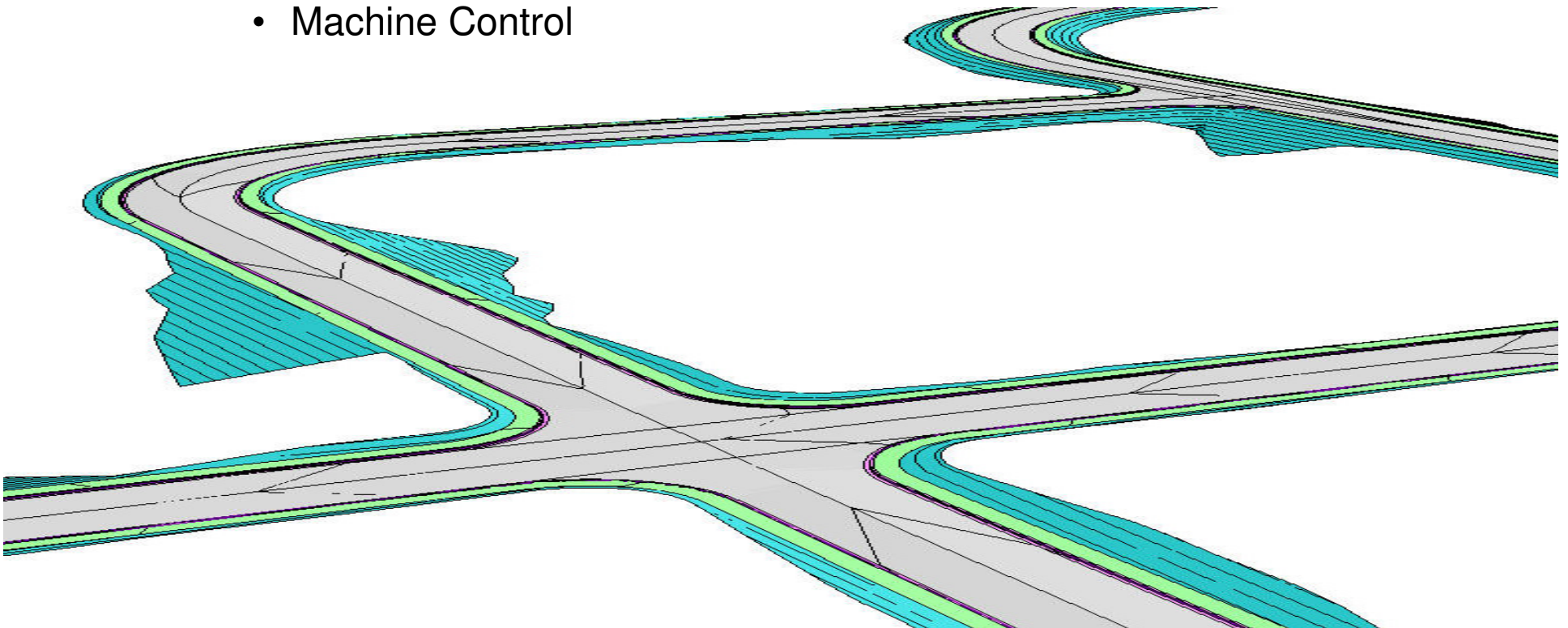
RoadNET - Create 3D Road Surface Models (DTM)s for:

– Cut/Fill Estimating

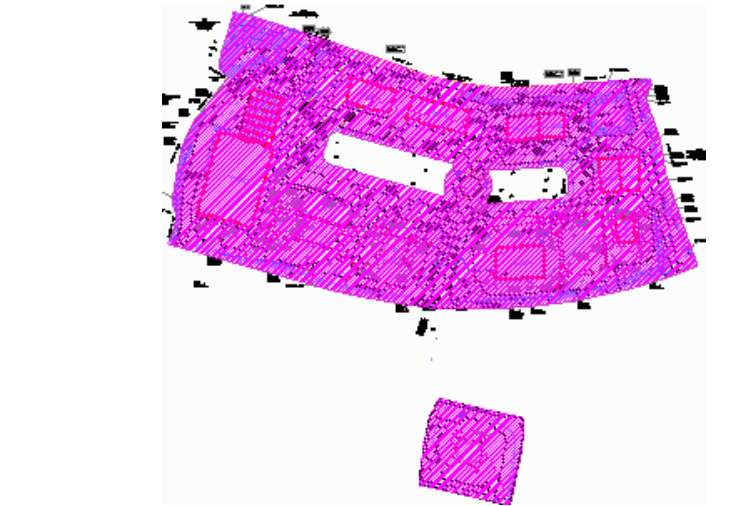
- Material, Trench, Strata, and Roads Volumes and Quantities

– Data Prep for the field MC

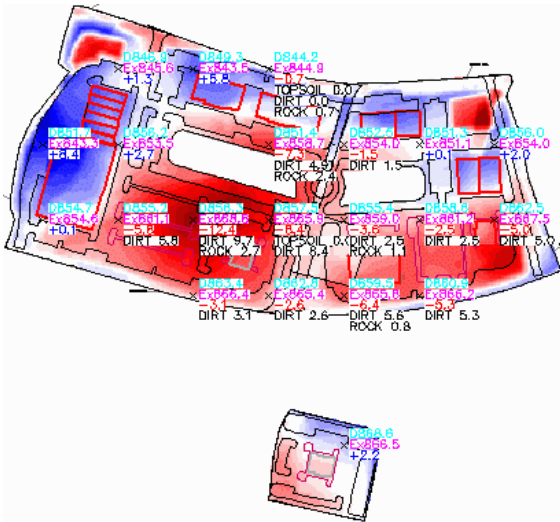
- Stakeout with handheld DC
- Machine Control



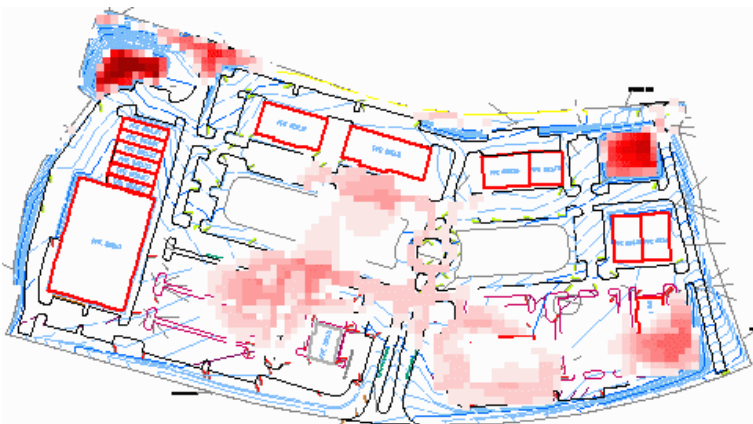
What does Takeoff Do?



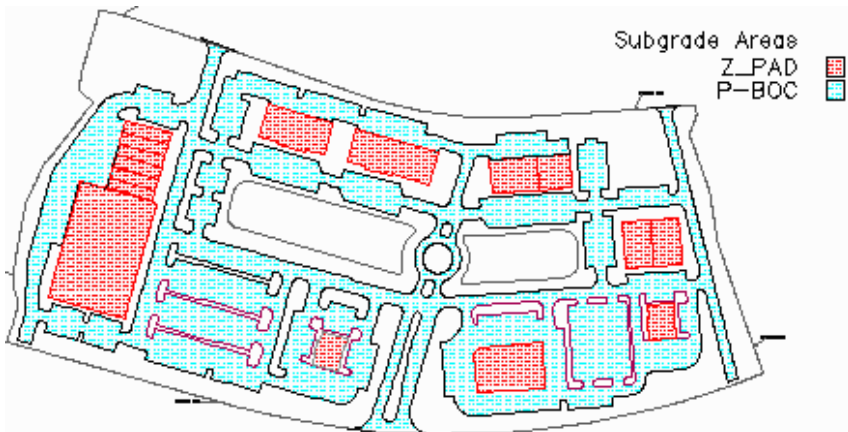
Boundary Area



Cut/Fill Color Map

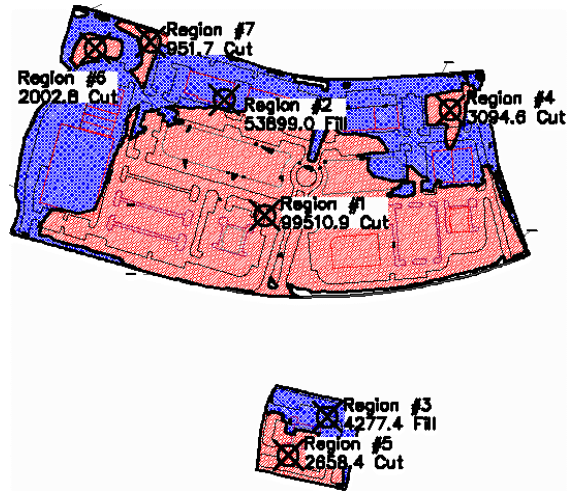


Strata Color Map

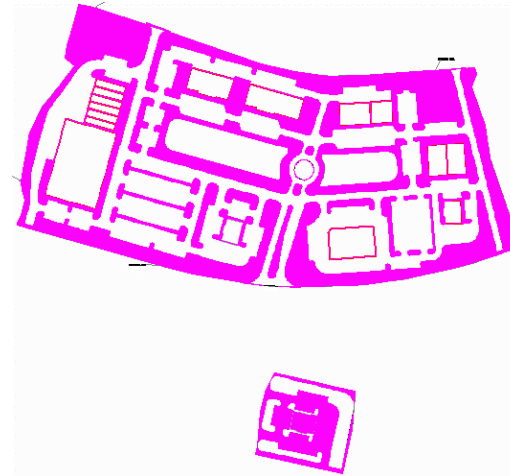


Material Subgrades

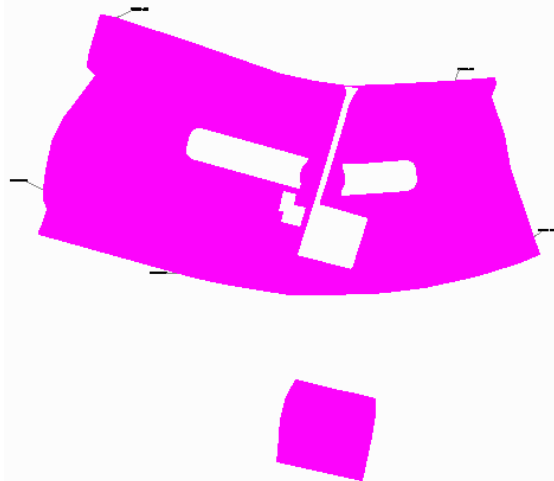
What does Takeoff Do?



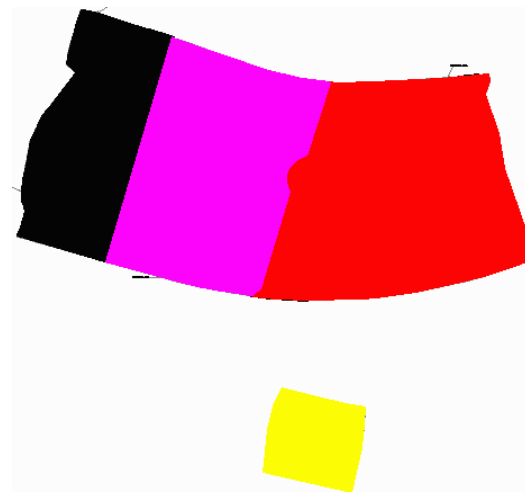
Cut/Fill Centroids



Topsoil Replacement

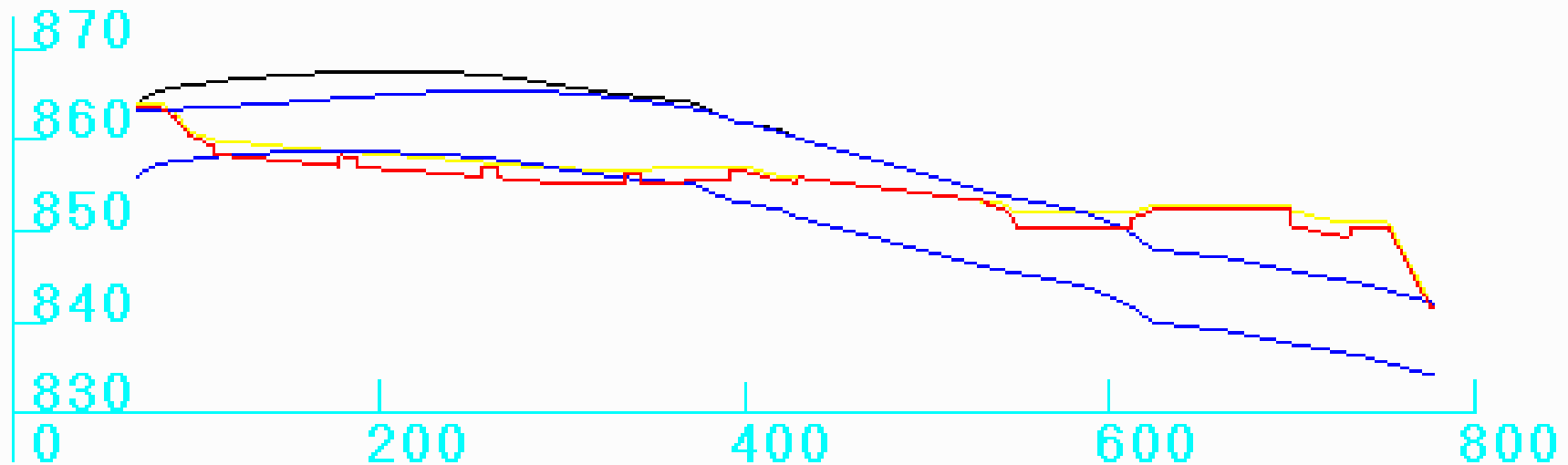


Topsoil Removal



Areas of Interest

What does Takeoff Do?



Surface Profiles in Takeoff

Takeoff Input/Output

Data Received?	Format?	Output?
Planview Linework	Paper Plans	Cut/Fill Volumes
Sections	PDF	Mass Haul
Centerline	Digital Plans	Staking Points
Vertical Profile / Typ. Section	Project Data	Machine Control

Takeoff - Methods for MC/Estimating

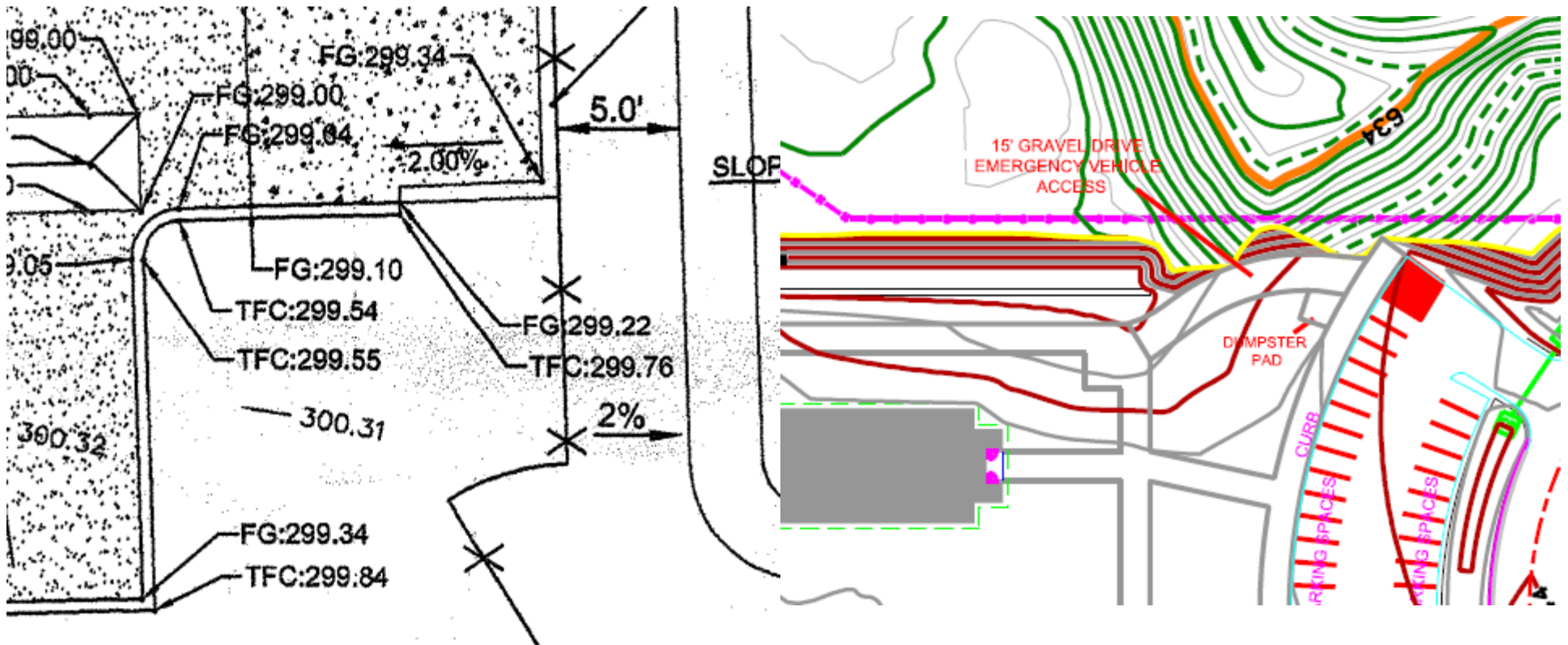
Projects can come in many formats, from most ideal to least:

1. Electronic DWG File for MC (Ready to Model!)
- 2. Estimating* Raster to Vector – PDF to CAD
- 3. Estimating* On Screen Digitizing - PDF
- 4. Estimating* Paper Plan Digitizing

Takeoff - Methods for Estimating

Two types of PDFs for estimating (not MC data prep):

- Vector PDF (Preferred)
- Raster PDF or Monochrome BMP



Carlson Top MC Advantages

DWG Engine – Intellicad or ACAD

Work directly in Carlson ICAD or Autodesk DWG:

- **Less Conversion issues**
- **Drawing Cleanup**
- **Elevating into 3D, Offset 3D Polylines**
- **Edit/Assign 3D elevation on polylines**
- **RoadNET – Output to Carlson TIN**
- **TIN Files Utilities (TFU) – Merge TIN files**

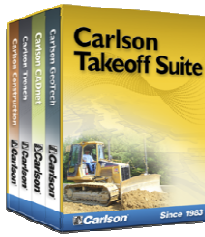
Takeoff Operating System

General Takeoff Features

- **ICAD/ACAD OEM/ACAD Platforms** – Three types of DWG Engines available for Takeoff:
 - 1) Works within Carlson Intellicad 8.2 (ICAD DWG)
 - 2) Embedded AutoCAD 2017 OEM with Autodesk DWG built-in
 - 3) Works within AutoCAD 2010 to 2017 DWG
- **64 Bit** – Added support for running on 64-bit computers in 2010.
- **Windows compatible** – Windows 7, 8 and 10

Difference between Takeoff & Construction?

Carlson Takeoff and Construction compairson



Takeoff good for
Estimating &
MC Data Prep



	Takeoff	Takeoff Suite	Construction	GeoTech	Trench
General Features					
CAD Engine*	OEM	Flex	Flex	Flex	Flex
User Interface - Single Menu	✓	4 Modules*	✓	✓	✓
Standard Features					
CAD Editing Tools	✓	✓	✓	✓	✓
CAD Inquiry Tools	✓	✓	✓	✓	✓
CAD Drawing Tools	✓	✓	✓	✓	✓
CAD Layer Controls	✓	✓	✓	✓	✓
Transfer Data to/from the Field	✓	✓	✓	✓	✓
Earthworks					
Cut/Fill Volumes & Reports	✓	✓	✓		
Subgrade Material Quantities	✓	✓	✓		
Topsoil Removal/Replacement	✓	✓	✓		
Overexcavate Volumes	✓	✓	✓		
Surface Modeling					
Elevate Data into 3D	✓	✓	✓		
Triangulate and Contour	✓	✓	✓	✓	
Design Pad Template	✓	✓	✓		
Machine Control Export	✓	✓	✓		
Road Features					
Cross-Section Conversions	✓	✓	✓		
End Areas Volumes	✓	✓	✓		
Mass Haul Analysis	✓	✓	✓		
Centerlines, Stationing, Profiles, & Typical Sections	✓	✓	✓		
Stakeout & 3D Model Export	✓	✓	✓		
GeoTech Features					
Strata Modeling & Volumes	✓	✓		✓	
Drillhole Reports & Labeling	✓	✓		✓	
Isopach Maps, Geologic Columns & Fence Diagrams		✓		✓	
Trench Features					
Excavation & Backfill Volumes	✓	✓			✓
Pipe & Manhole Reports	✓	✓			✓
3D & Plan View Visualizations	✓	✓			✓
CADnet Features					
Vector PDF to CAD conversion	✓	✓			
Raster Image Trace	✓	✓			
On-Screen Digitizing	✓	✓			
Paper Plan Digitizing	✓	✓			
BIM Import/Export		✓			

*CAD Engine:

OEM: Includes an embedded AutoCAD® "OEM" engine.

Flex: Includes an IntelliCAD® engine or can run with AutoCAD®, AutoCAD Map®, or AutoCAD Civil 3D® sold separately.

*4 Modules: The Takeoff Suite is comprised of the four modules: Construction, GeoTech, Trench, and CADnet.



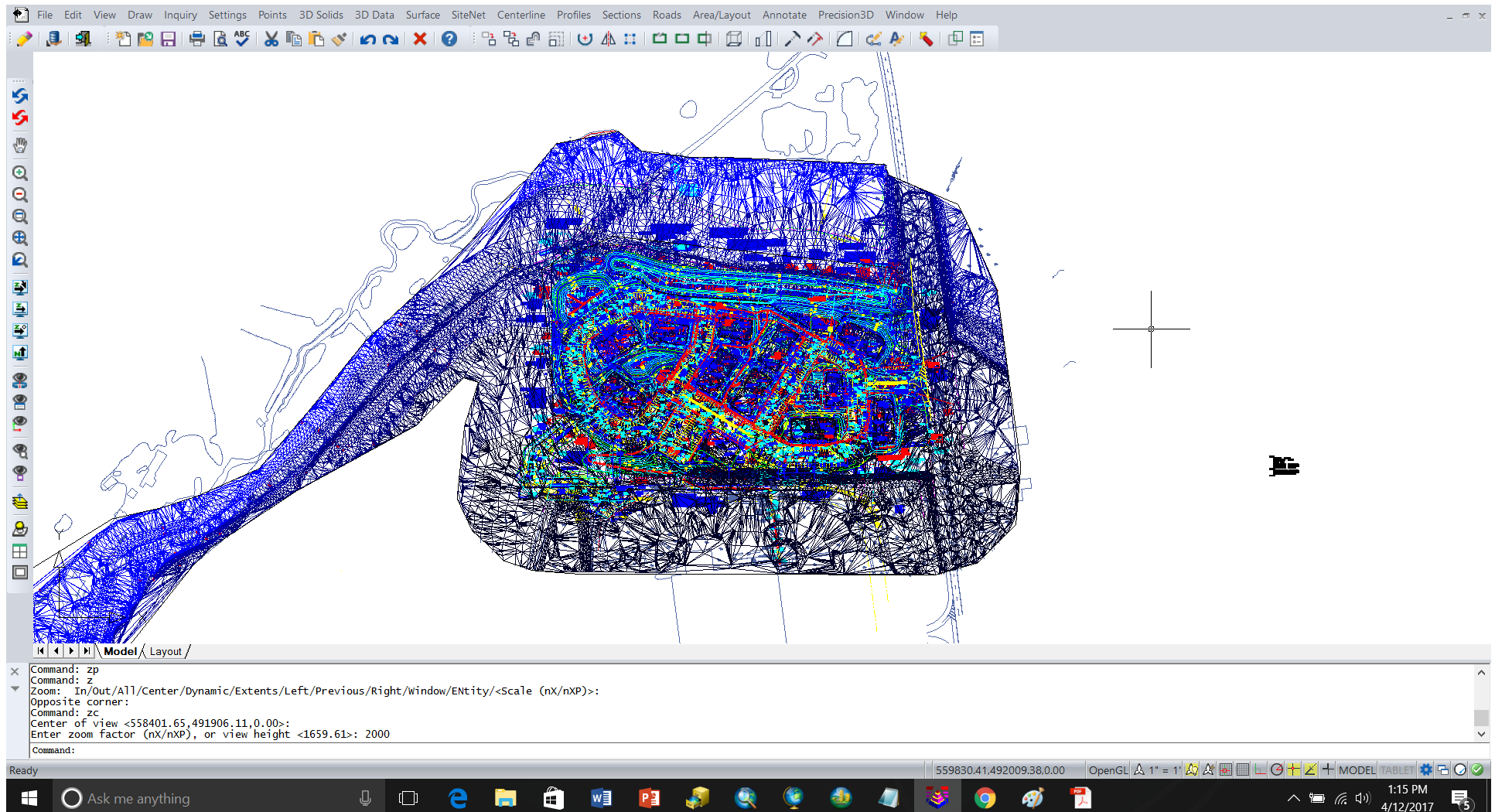
Construction good
for MC Data Prep
and Layout

Today's MC Office Demo Agenda

- Create Site as Carlson DTM/TIN File (.tin file):
By DWG in ICAD, ACAD using DWG, DGN and LandXML
- Create Site as DXF Planview File (.dxf file):
Planview, use Layer State Manager in CAD to output planview
- Machine Control Export to Trimble, Topcon & Leica:
Trimble TTM/DXF/XML, Topcon TN3/LN3/DXF/XML and Leica...
- Commonly used CAD and Carlson 3D commands for building models and merging DTM/TIN models
For those Carlson users who came to only learn new Tips & Tricks
- RoadNET to DTM/TIN Files (.tin files):
Design multiples roads, intersections and cul-de-sacs outputting design to one Carlson TIN file or merged into one Carlson TIN file

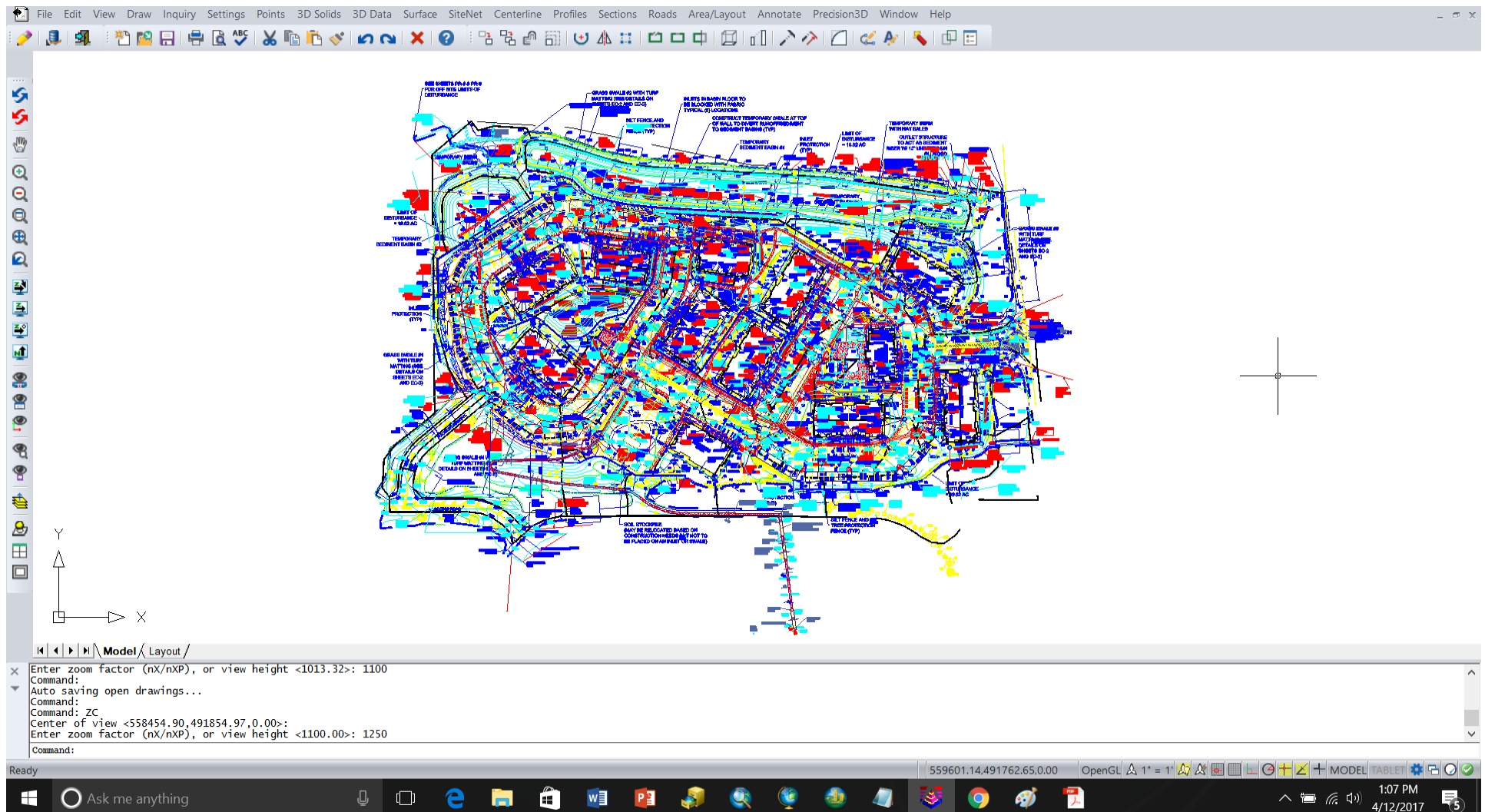
Demo in Takeoff Making New MC Model

Design DWG as given from Civil Engineering firm using C3D
(all layers turned on and a bit busy)



Demo in Takeoff Making New MC Model

Turn off all existing layers leaving only the design layers
(Only design layers on but still very busy)

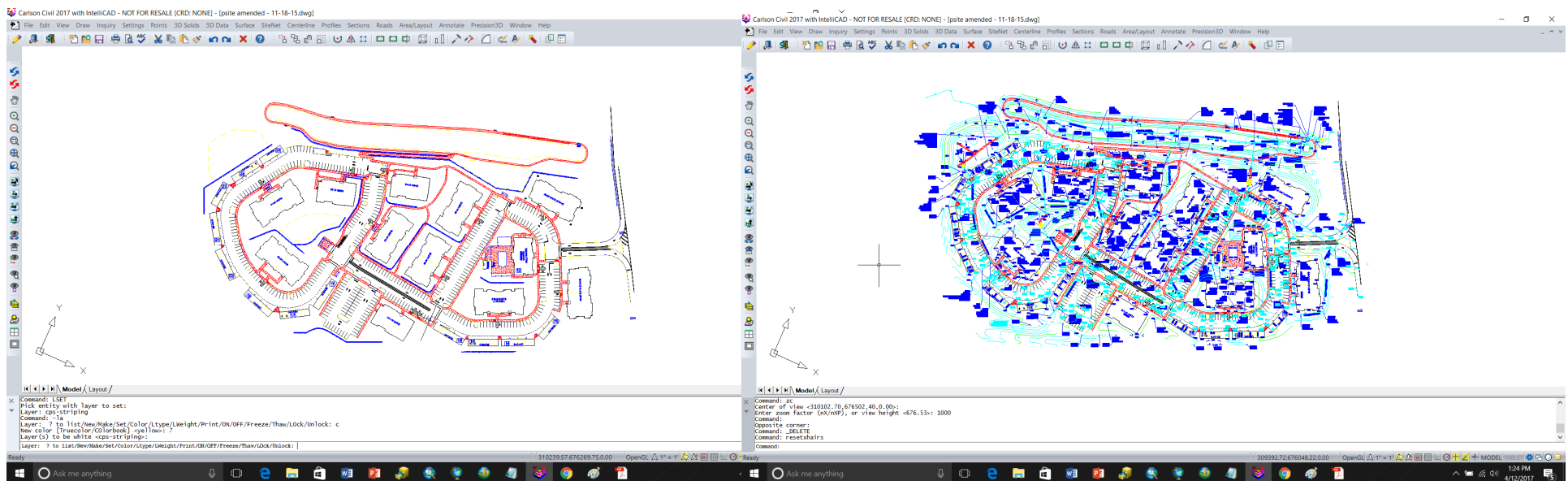


Demo in Takeoff Making New MC Model

Isolate all design structures and surfaces to be built and then add all design contours and spot elevations to use to elevate into 3D structures and surfaces.

(Save in Layer command – Layer State Manager)

Ready to start elevating all structures and surfaces!



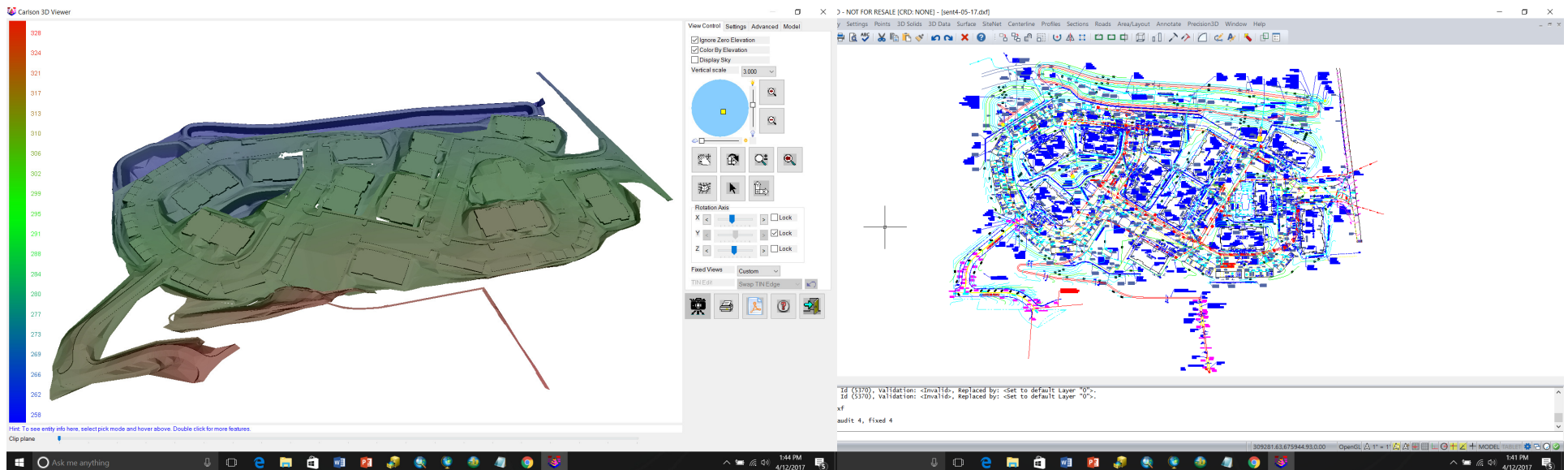
Design structures and surfaces layers isolated

Design structures and surfaces along with all contours and spot-elevation layers isolated

Demo in Takeoff Making New MC Model

Using Carlson Takeoff to elevate all design structures and surfaces to 3D and creating 3DPolylines along all these structures and surfaces create a DTM/TIN surface.

Carlson TIN and Planview DXF files created ready to output to Trimble, Topcon or Leica MC file types!

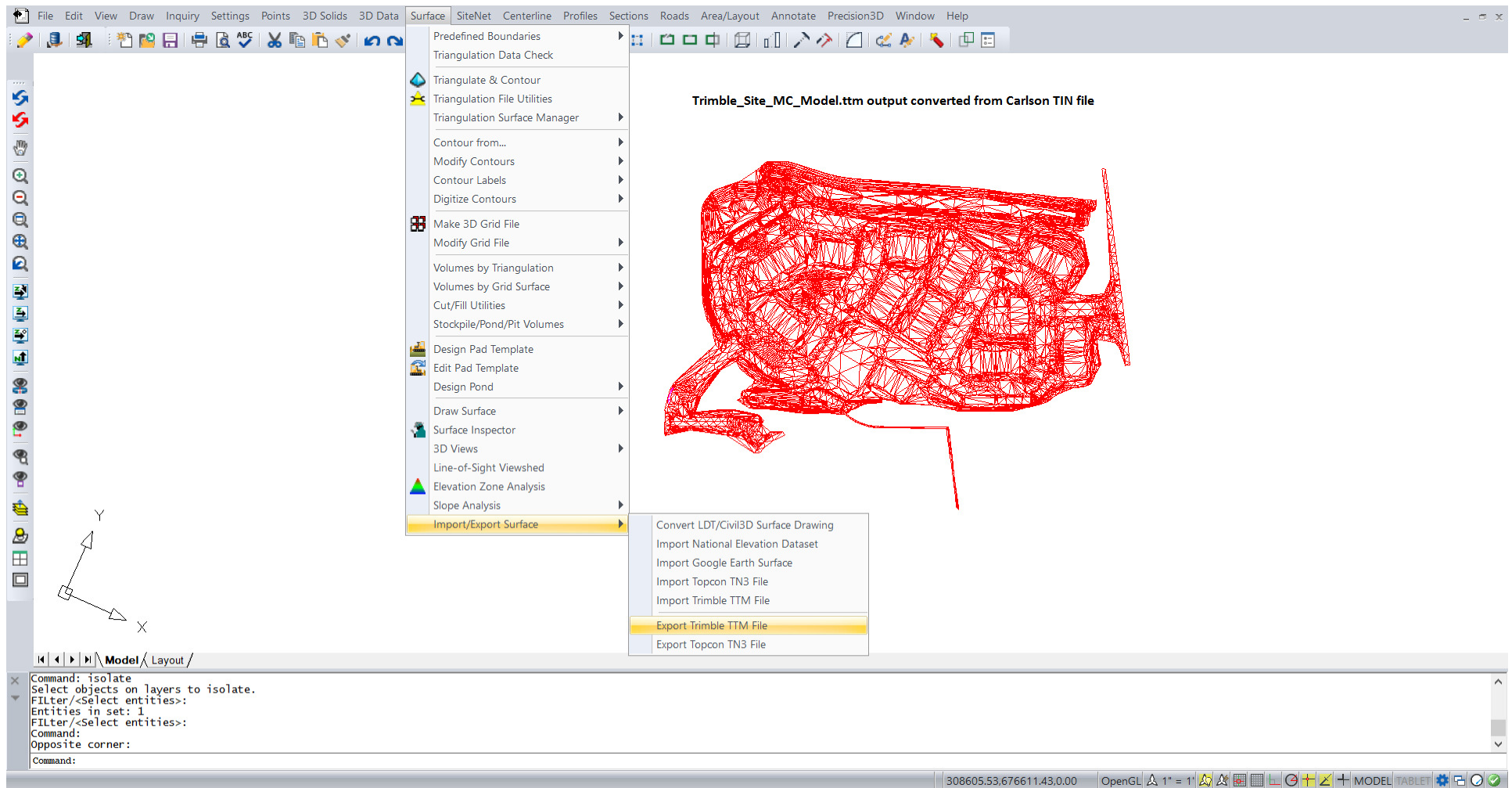


Design structures and surfaces stored as one Carlson TIN/DTM file

Planview stored as DXF file

Export New MC Model to Trimble TTM

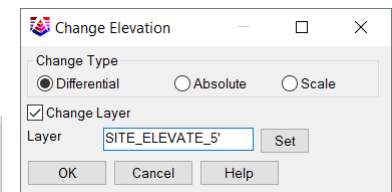
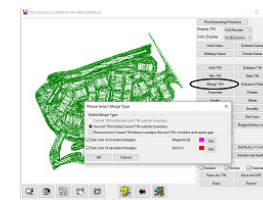
Output Trimble TTM, Topcon TN3 or Leica TIN files for MC



Tips & Tricks Elevating to 3D (will demo)

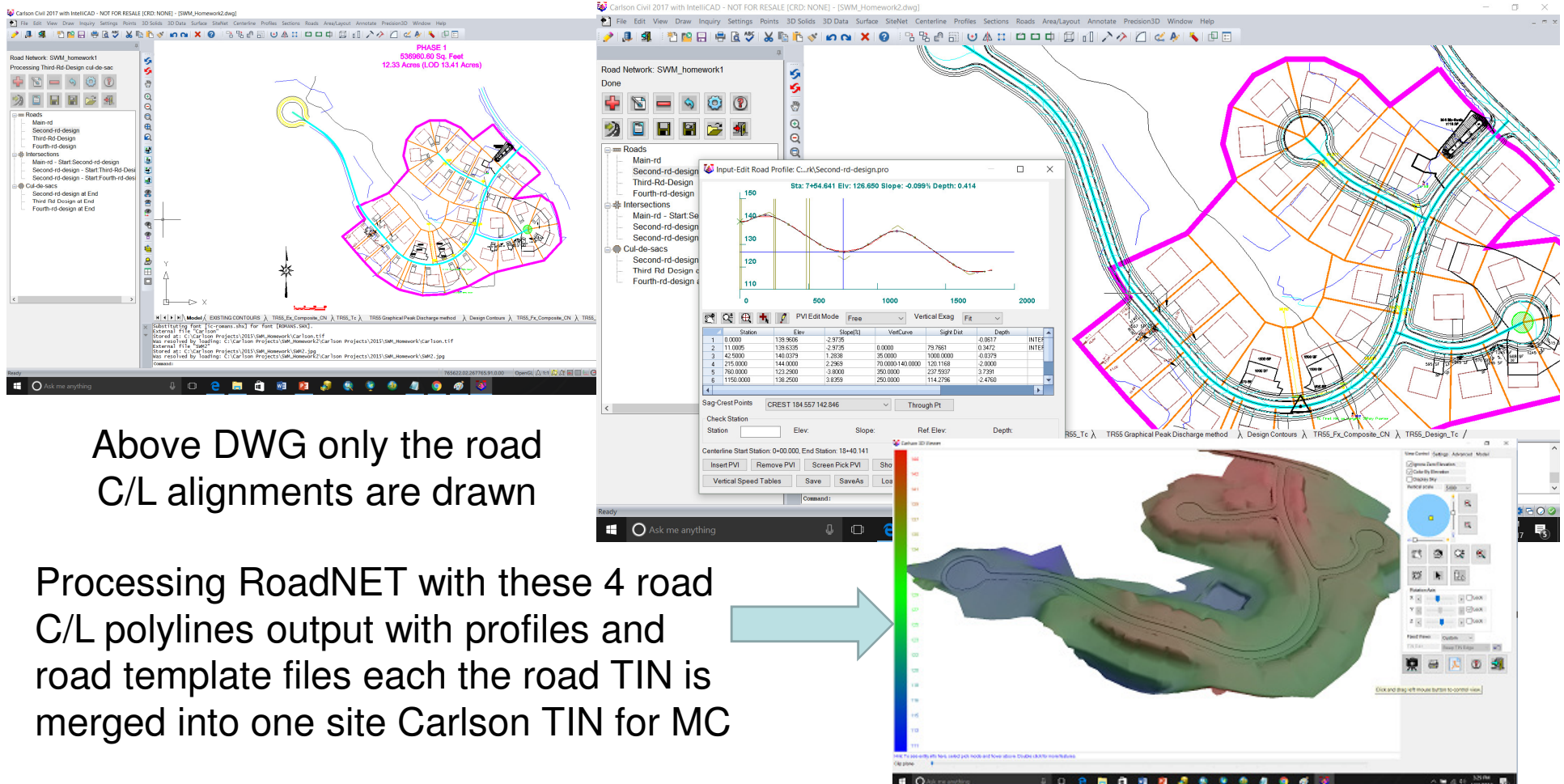
Takeoff/Construction commands commonly used to elevate design entities to 3D and as breaklines for modeling a DTM/TIN

- Edit-Assign Polyline Elevations i.e. curbs, walls, sidewalks ...
- Draw Locate Points & Spot Elevations – Create Spot Elevations, ...
- 2D to 3D Polylines – by TIN, Grid, Screen Entities, Points, Spot Elevation Leader, Text, Slope Reference and Start and End elevations
- Assign Polyline Elevations – Multiple in Series, From Contour Labels, Single
- 3D Polyline Utilities – Offset 3D Polyline, 3DPolyline by Slope on surface, Break 3DPolyline by Surface, ...
- Join Nearest – join command for 2D and/or 3D selected polylines with the same ending elevations and horizontal vertex location within a user input gap
- 2DP and 3DP Carlson polyline commands – ACAD/ICAD PL and 3DPoly commands do not allow picking or inputting point numbers, 2DP and 3DP do
- 3DP Carlson command – Draws 3DPolylines elevating by a Carlson TIN file
- CHGELEV command – Elevates by Differencial up or down
- TINUTIL – Load and merge two Carlson TIN files into one
- Pad Design – Create pad Carlson TIN files
- Bench Pond – Create pond Carlson TIN files
- Valley Pond – Create dam Carlson TIN files



RoadNET – Easily outputs a DTM/TIN for roads

RoadNET in this example processes 4 roads, 3 street intersections and 3 cul-de-sacs, with 2' contours output to one Carlson TIN merged with the design lots Carlson TIN



MSS 2017 Spring Class Info

How to Add DTM Model Building to Your Survey Firm's Land Development Services

Questions & Answers

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Carlson Software

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