Carlson

SURVEYORS'

# From Drone… To Field… To Finish…

with Carlson Software

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## Objectives

- Project Setup and Settings to best utilize Field To Finish Projects for both the Field and Office with Carlson Software
- Perform steps processing field collected data with SurvPC Field Collection Software
- Perform steps processing field data with Carlson Survey and best practices gathering data from your field surveying software
- Field/Group Exercise on Creating and Sharing a Field To Finish file…
- Explore the options within Point Cloud Data from Drone (or Terrestrial) and utilize what you've learned in F2F
- Explore and Learn the Feature Extraction Options within Carlson Software

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## Objectives

Yes, learning can be fun….

Let's make that a **Goal of Today**!

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# Field-to-Finish

What is a Field-to-Finish program within your origination?

A Field-to-Finish program has a user defined code table that controls how field surveyed points with these codes or descriptions will draw in CAD as connected line work and symbols in pre-defined layers

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# Field-to-Finish

**Setup your Office CAD Standards with Field to Finish**

Field/Description Codes Definitions
***(BLD, BC, FH, UP, …)***

Layers for:

- *2D Polylines Layer (zero elevation)*
- *3D Polylines Layer (at their true elevation)*
- *Both 2D & 3D Polylines Drawn in Separate Layers*
- *Symbols and their Layers*
- *Point Labels and their Layers*

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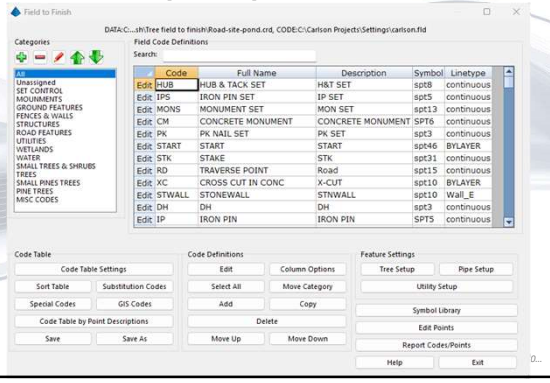
# Field-to-Finish

***Carlson Survey: Survey → Draw Field to Finish***

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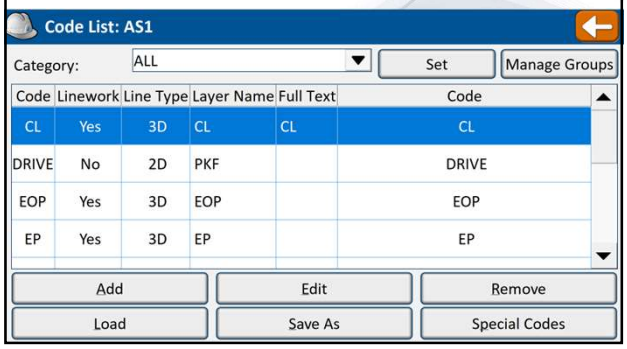
# Field-to-Finish

***SurvPC: File → Code List…***

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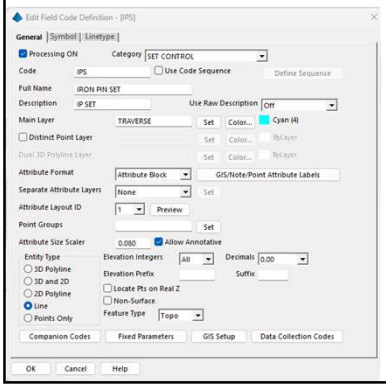
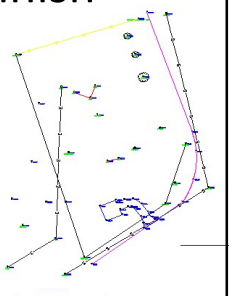
# Field-to-Finish



Allows for a customized setting for each “Code Definition”



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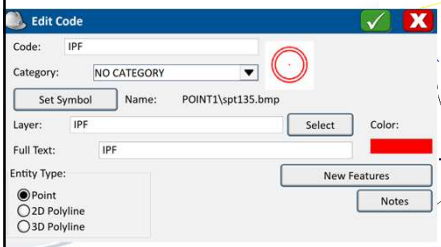
# Field-to-Finish




Allows for a customized setting for each “Code Definition”



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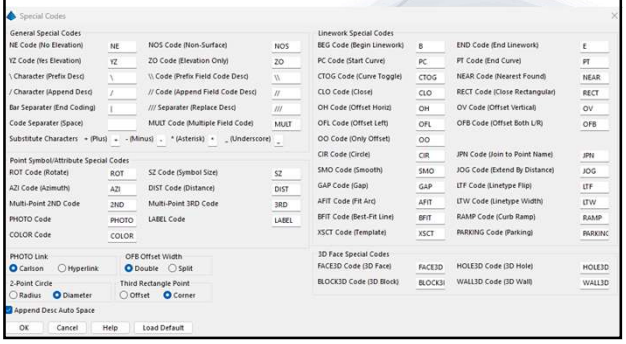
# Field-to-Finish

***"Special Codes"***

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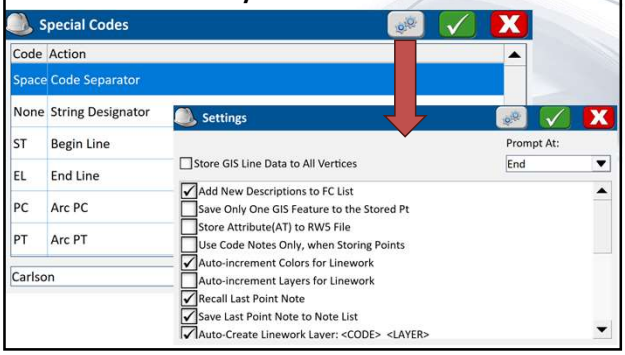
# Field-to-Finish

***"Special Codes"***

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# Field-to-Finish

- Why Field-to-Finish
  - *"…I've tried in the past, but just can't get it to work!"*
- Who is using Field-to-Finish?
  - Small Companies
  - Medium Companies
  - Large Companies
  - Small and Large Government Agencies

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## Where is your Field-to-Finish…

- *No preset Code List // No Standards*
- *Symbols not set up properly*
- *Special codes not used properly (start/stop/2D/3D)*
- *Field crews using incorrect codes or inconsistent use*
- *"…We're Getting There…"*
- *Change… "…I've done it this way for years, why change now!"*

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# Field-to-Finish

## History

- ✓ Been around for more than 20+ years
- ✓ Assist surveyors with 'connecting the dots' *(aka. Linework…)*
- ✓ Ability to place map symbols at specific locations

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# Field-to-Finish

## Why Field-to-Finish

- ✓ Speed up the process of connecting points with linework and symbols – *Map Making Bussiness*
- ✓ Create a cleaner map that also helps with the quality
- ✓ Assists with creating an accurate DTM
- ✓ Assists with maintaining proper CAD standards (color/line-type/layers)

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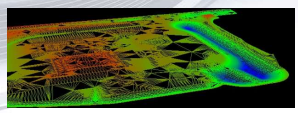
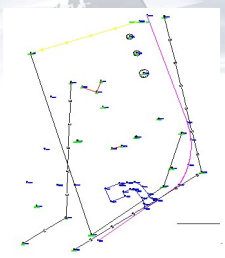
# Field-to-Finish

What to expect

Expect these results from the beginning?





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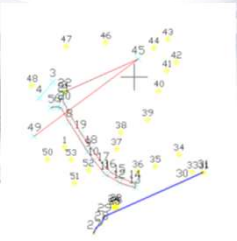
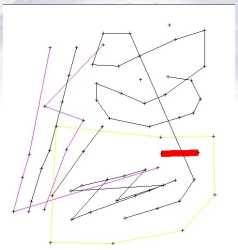
# Field-to-Finish

*To get the Good…*

*…You have to go through the bad and the ugly*





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# Field-to-Finish

Field Codes – Alpha

Recommended *

"FIELD CODES w/LINE CONNECTS"

HORIZONTAL & VERTICAL CONTROL:

CONTROL:

| | |
|---|---|
| BS | Back Sight (Check) |
| BM | Bench Mark (Check) |
| Trav | Traverse Point (Set) |
| TS | Topo Point (Set) |

FOUND MONUMENTATION:

| | |
|---|---|
| MB | Monument Box (Fnd) |
| ROWMF | Right Of Way Mon. (Fnd) |
| HUBF | Hub (Fnd) |
| SPF | Spike (Fnd) |
| SIPF | Solid Iron Pin (Fnd) |
| REBF | Rebar (Fnd) |
| IPF | Iron Pipe (Fnd) |
| PKNF | P.K. Nail (Fnd) |
| WPF | Wood Post (Fnd) |
| HTF | Harrow Tooth (Fnd) |
| CXF | Chiseled "X" (Fnd) |
| DHF | Drill Hole (Fnd) |
| ACF | Aerial Control (Fnd) |
| GPSMF | GPS Monument (Fnd) |
| STF | Stone (Fnd) |

SET MONUMENTATION:

| | |
|---|---|
| SPS | Spike (Set) |
| SIPS | Solid Iron Pin (Set) |
| REBS | Rebar (Set) |
| IPS | Iron Pipe (Set) |
| PKNS | P.K. Nail (Set) |
| CXS | Chiseled "X" (Set) |
| DHS | Drill Hole (Set) |
| ACS | Aerial Control (Set) |

ADDITIONAL FEATURES & SIGNS (CONT.):

| | |
|---|---|
| TM | Ticket Machine |
| ATM | ATM Machine (Corner)" |
| BOL | Bollard |
| BBC | Bumper Block, Concrete (End)" |
| TE | Timber Edging (Edge)" |
| PAT | Patio (Edge)" |
| SAT | Satellite Dish |
| MBOX | Mailbox, Drop-off |

SUBSURFACE MONITORING:

| | |
|---|---|
| SB | Soil Boring |
| MW | Monitor Well |
| TP | Test Pit |

NATURAL GROUND FEATURES & VEGETATION:

GROUND TOPOGRAPHY & WATERWAY

| | |
|---|---|
| GS | Ground Shot |
| TOS | Toe Of Slope" |
| TOB | Top Of Bank" |
| SL | Slope (On) |
| GB | Grade Break" |
| WE | Water (Edge)" |
| DC | Ditch (Centerline)" |
| CRC | Creek (Centerline)" |
| SWC | Swale (Centerline)" |
| WWD | Waterway (Deepest Part)" |
| SWE | Swamp/Marsh (Edge)" |
| RE | Rock(S) (Edge)" |
| FA | Fill Area (Perimeter)" |

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# Field-to-Finish

## Field Codes - Numeric


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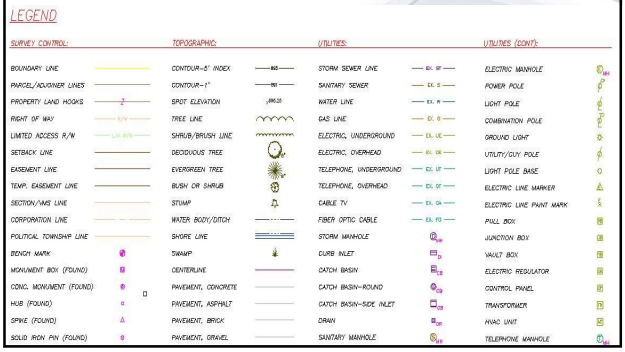
## Field Codes – Symbols and Linework

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# Field-to-Finish

*Now we have codes…*

*How do we connect the points?*

- What do I do ???
- What order do I collect points ???
- How is my software going to connect the dots ???
  - Field Software
  - Office Software

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# Field-to-Finish

Collecting the:

Point(s)… Data… Linework…

*Sequential* – connect in the order the points were collected

*Nearest Found* – connect based on distance between points



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# Field-to-Finish

Field-to-Finish ~ *" doesn't start in the office "*

- Need codes (points) for field-to-finish
- Get Input from Field Crews… *Empower the crews within the process and be apart of the team!*
- Ability to see the Field-2-Finish, in the field…
  - *Good*
    - *Eliminate missed shots before get back to the office*
    - *Make sure code used is correct*
  - *Bad*
    - *Missed shots which require another trip to job*
    - *Might get the shot, but forgot the code*
  - *Ugly*
    - *Multiple missed shots in the field*
    - *Having bad day and can't remember any codes*
    - *Costs You $$$$*



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# Field-to-Finish

Is that all Field-to-Finish does??

✓ *Buildings are not flat*
✓ *Earth is not round*
✓ *Land is not level*



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# Field-to-Finish

## *Field-to-Finish for 3D*

- Correct Field-to-Finish for Contours
  - ❑ **Good** : Smooth Contours / Accurate Map
  - ❑ **Bad** : Crossing Breaklines = Wavy Contours
  - ❑ **Ugly** : No Breaklines = Contours Everywhere

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# Field-to-Finish

## Simplify

*How???*

- *Set a standard for codes within your company*
- *Cut down on time spent connecting the dots*
- *Place linework and symbols in correct location*
- *Cut down on missed points in the field*
- *Drawings being turned out are more uniform*
- *Eliminate time figuring out what does a code mean*



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# Field-to-Finish

*Bottom Line…*

## Field-to-Finish:

"Improves your process of Map Making…"

Makes your Company More Profitable…
And produces a better high-quality product



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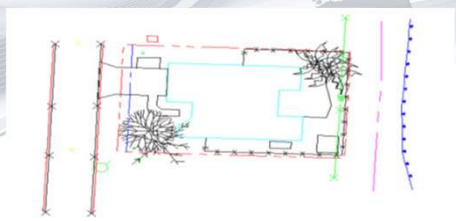
## Field-to-Finish

- Start out slow
  - Work on one or two codes a month
- Before you know it…





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Lets take a look how this is done!

First with Carlson SurvPC


then… with Carlson Survey


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## Getting Started with Carlson Point Cloud Module



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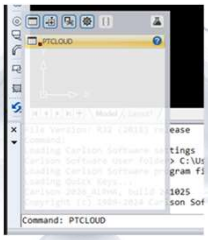
## Launching

- Point Clouds Icon
- “PTCLOUD” command



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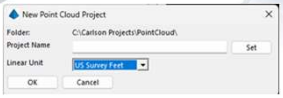
## Start a new project


Enter name and linear unit. Defaults to drawing unit



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## Project Page

- Upper toolbar
- Project tree
  - Outlines all entities in the project
  - Most data is in “Processed Data” folder
- Command History

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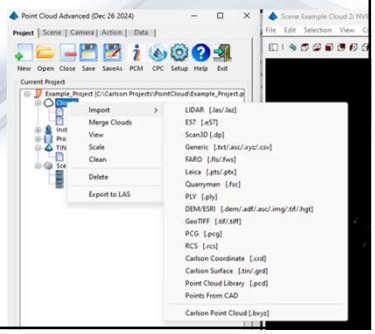
## Import a Point Cloud

Clouds must be imported to an internal format “bxyz” before use.

On the project page right-click the Clouds folder and select import. Then select the type of file to import from the available options

LAS/LAZ, E57 and Scan3D are the most common

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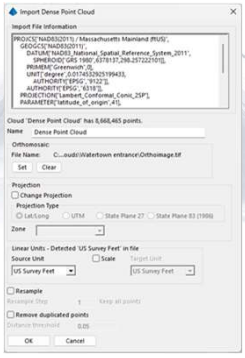
## Import a Point Cloud

- Import File information: WKT string saved with the file if available
- Set name for imported file
- Select Orthomosaic if available
  - Used with certain actions
- Change projection (optional)
- Set Linear unit
- Resample or Remove duplicates (optional)
  - If point cloud has 500 million+ points “Remove duplicated points” will be on by default



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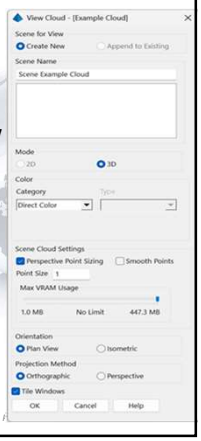
## View the Point Cloud

<Cloud to view>->Right-Click->View

Create Scene Dialog

- Select Color Mode
- Set Rendering options
- Set Projection mode

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Requires a scene viewer window open

## Scene Page

- Scene Entity tree
- Click on entities in tree for specific controls and settings
  - Hide/Show
  - Color Mode
  - Point Cloud Classifications

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Requires a scene viewer window open

## Action Page

- Selection
- Point Cloud Editing and Transformation
- Create entities
- Extract features

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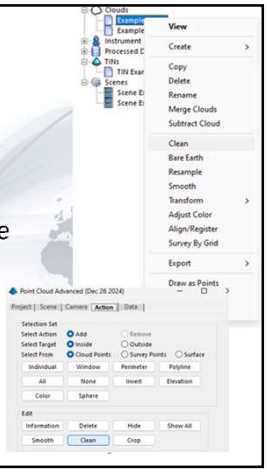
## Point Cloud Clean

- Project Tree->Right-click cloud->Clean
- With a scene open with the cloud:

  Action Page-> Edit->Clean

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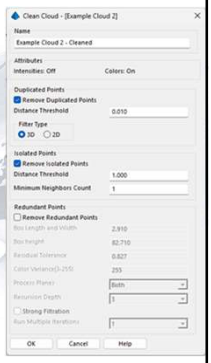
## Point Cloud Clean

- Remove Duplicated Points - Results in the point cloud have approximately even spacing of Distance Threshold
- Remove Isolated Points - can remove small clumps of points
- Remove Redundant Points - decimates point cloud for surface model creation (least common).





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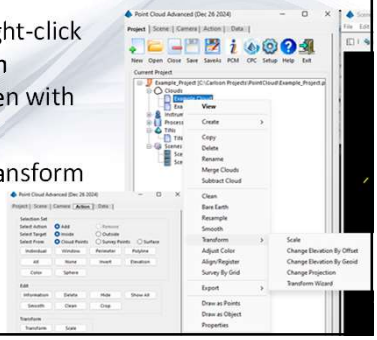
## Point Cloud Transformations

- Project Tree->Right-click cloud->Transform
- With a scene open with the cloud:

  Action Page-> Transform



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## Point Cloud Transformations

- Scale - Quickly scale between common units such as US Feet and Meters
- Elevate by Geoid or offset - Changes elevation of all points
- Change Projection - Transform from one projection system to another.
  - Must know the current point cloud projection and target projection
- Transformation Wizard offers advanced options for scaling, offset and rotation by matrix.



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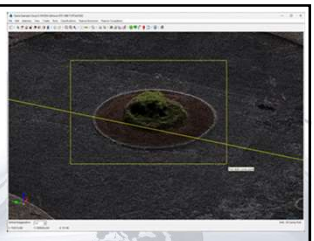
## Making a selection

- By perimeter polyline
- By rectangle
- By sphere
- By color





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## Selection Actions

- Hide
- Delete
- Create new entity
- Classify - from Scene Page with a cloud selected in the tree
- Use with supported extraction routines
  - Bare Earth
  - Building
  - Contours
  - Paint Lines



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## Field to Finish

Carlson Point Cloud Module



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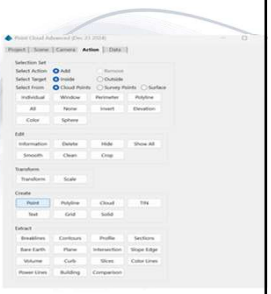
## Create Point Panel

Available from Action Page->Create->Point

Allows for placement of Coordinate points with Field to Finish codes





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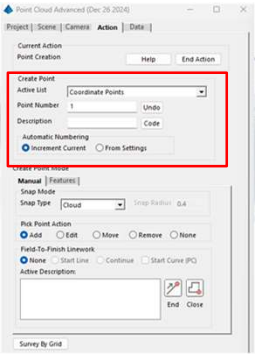
## F2F Code Setup

- Set if points will be added to CRD point list (most common), control point list or scan position list
- Designate starting point number
- Set F2F code in description box
- Increment point number or use custom settings



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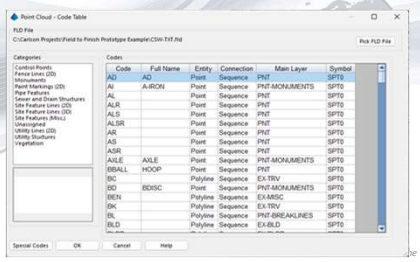
## F2F Code Setup

- Code button allows setting a code from FLD file



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# Manual Drafting



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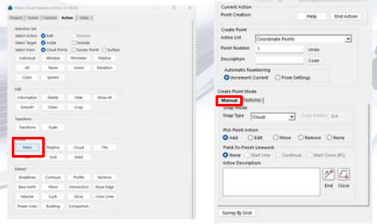
## How to access

Action Page->Create->Point->Manual





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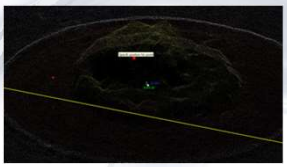
## Create Point Entity

- Use Point Entity code
- Select “Add” Pick Point Action
- Click on point in the cloud to place CRD point





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## Create Polyline Entity

- Use a Polyline Entity code
- Select “Add” Pick Point Action
- Click on points along feature. A polyline will be drawn as points are picked
- Special codes for Begin and End are added automatically.

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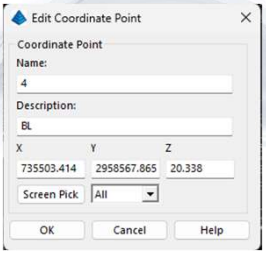
## Point Editing

- Select “Edit” pick point action and click on crd point
- Edit parameters as needed
- Screen Pick allows for re-pick of point

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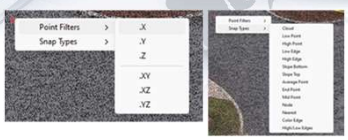
## Shortcuts

- E key to end current polyline
- C to close current polyline
- Right-Click
  - Undo
  - Edit
  - Remove
  - Move
- Shift Right-Click
  - Point Filters
  - Snap Types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# Tree and Pole extraction



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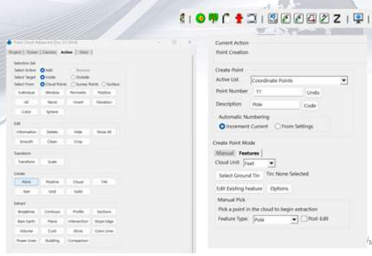
## How to access

Action Page->Create->Point->Features or by clicking the Tree or Pole icons in the Scene View Window





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## Requirements

Point Cloud must have the Poles, Tree Trunks and Canopies captured well for extraction to work

Tree trunk and canopy captured
Extraction is possible

No tree trunk captured. Cannot extract



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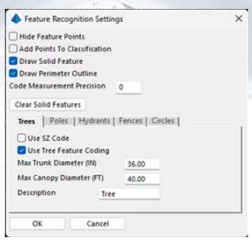
## Extraction Options - Options Button

- All Feature options
  - Hide points
  - Add to classification
  - Draw Solid
  - Draw perimeter
- Entity specific parameters
  - Max Diameter properties need to be tuned for best results
  - Set a Description or Code per entity



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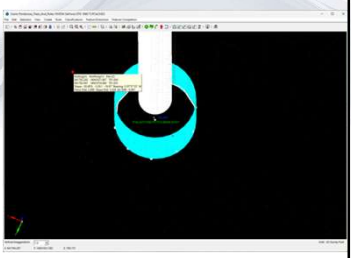
## Point Description

Descriptions include

- Feature type
- Height
- Diameter
- Lean
- Tree type





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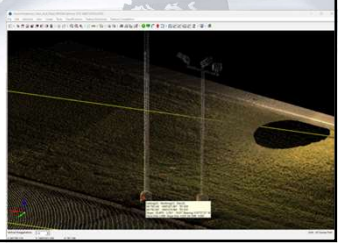
## Extract a pole or tree

- Locate a pole or tree with the trunk or base of pole well defined and isolated
- Click on the base of the pole or trunk 6-24 in from the base of the ground
- If extraction fails, read warning in command history and adjust pick position or parameters. Edit extracted feature if necessary.



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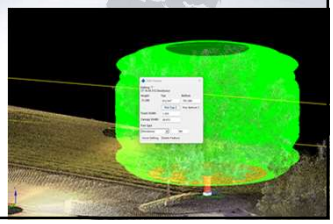
## Edit a Feature Point

Press “Edit Existing Feature” and click on feature point

Can adjust

- Bottom/Top positions
- Diameters
- Lean
- Tree Type
- etc



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## Feature Extraction

Carlson Point Cloud Module

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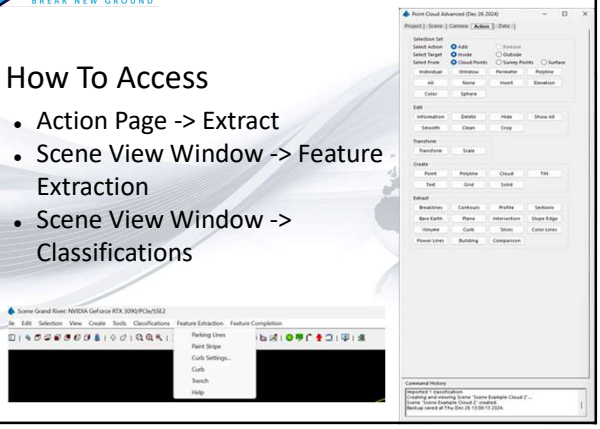
## How To Access

- Action Page -> Extract
- Scene View Window -> Feature Extraction
- Scene View Window -> Classifications



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## Feature Extraction from the Action Page

- Bare Earth
- Contours
- Volumes
- Power Lines
- Building Outline
- More…

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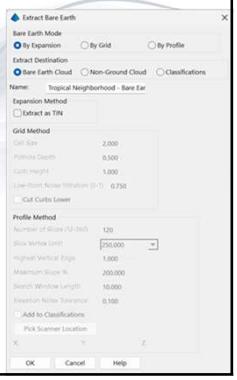
## Bare Earth

- By Expansion Method
  - No parameters
  - Can extract direct to TIN
  - Works best for terrain with gradual slopes
  - Cloud Linear Unit must be accurate
- By Grid
  - Use if Expansion gives poor results
  - Set Cell Size to minimum 5x the average point spacing in the point cloud
  - Increase Cell Size if the point cloud has a large area and extraction runs slower than desired.
- By Profile
  - For use with Ground LIDAR scans.
  - Typically not needed over other methods

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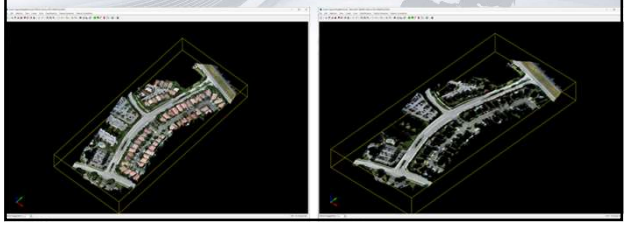
## Bare Earth By Expansion Example



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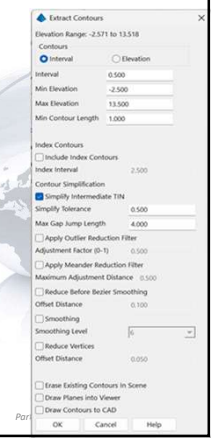
## Contours

- Create contours at regular interval or at a specific elevation
- Option to add Index contours
- Uses intermediate TIN which can be simplified as needed

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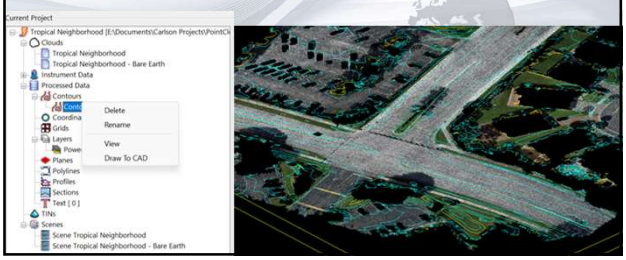
## Contours

Contours appear in the project tree where they can be drawn to CAD

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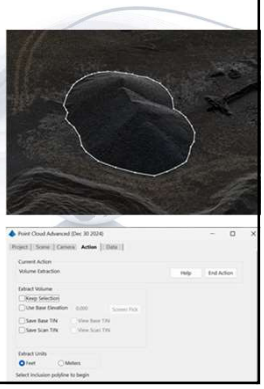
## Extract Volumes

- Draw a Polyline using the Create Polyline Panel surrounding the mound
- Set Extract units
- Optionally extract Tins used for calculation
- Screen Pick the Polyline

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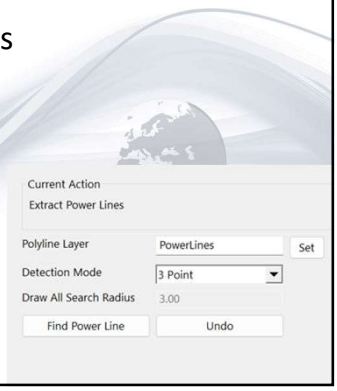
## Extract Power Lines

Detection Modes

- 3-Point solves Catenary curve from 3 screen picked points
- 1-Point follows wire points from one screen pick
- 1-Point Draw all works same as above but also looks for nearby parallel powerlines in the search radius

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## Extract Power Lines

3-point mode is best when the wire is not captured in the point cloud well

1-point require the wire be well captured in the cloud to follow accurately.

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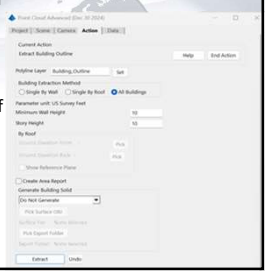
## Extract Buildings

- Extracts rough polylines of building footprints, calculates approximate areas and heights
- Recommended to use “Single By Wall” for cloud made with ground lidar. Requires clicking on a wall
- Recommended to use “All Buildings” for other cases.
  - Works with Selection
- Set Minimum Wall Height above height of fences for better results



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## Extract Buildings

Extracted outlines are numbered with floor count, height, and rea

Using Extract All Buildings

Using Extract Single By Wall

Building_Outline 1-1-10-2280



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## Feature Extraction with Cloud and Orthomosaic Image

- Parking Lines / Paint Stripes
- Curbs
- Smart Classifications

These routines utilize Machine Learning techniques to detect features. Send us your datasets to help us improve the detection!



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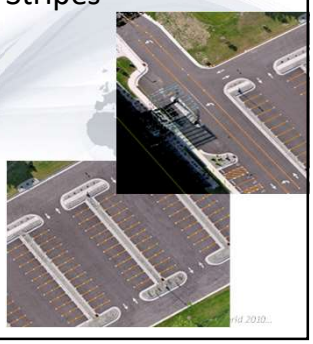
## Parking Lines / Paint Stripes

- Paint lines - Extracts all paint lines including road lines
- Parking Lines - Extracts parking lines only as 3-point polylines
- Recommended to use Auto Detection mode which requires orthomosaic image.
- Use Selection Mode if orthomosaic is not available. Requires paint points be selected well



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## Parking Line Editor

Access from Line Editor button on Parking Line extraction panel

- Create new
- Fill in missing
- Edit existing
- Review low confidence parking lines


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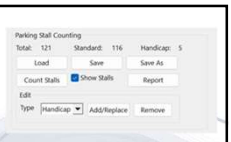
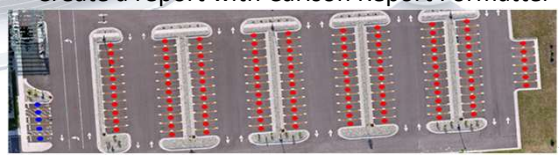
## Parking Stall Counting

- Requires polylines from Parking Lines routine
- Counts stalls in between parking lines
- Manually edit spaces as Standard or Handicap
- Visualizes parking stalls with colored markers
- Create a report with Carlson Report Formatter



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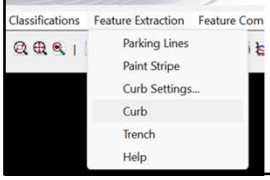
## Curbs

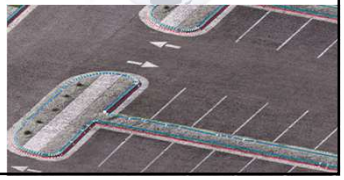
"Curbs" on the action page is legacy routine

Use Feature Extraction drop down -> Curbs.

Requires Orthomosaic Image

Detects the base of curb line and then offsets the line to create top and back of curb lines



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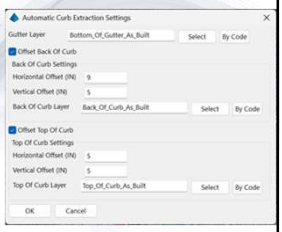
## Curb Settings

Access from Feature Extraction drop down menu -> Curb Settings…

- Set Layer names
- Enable/disable back and top of curb offset polylines
- Set horizontal and vertical offset values



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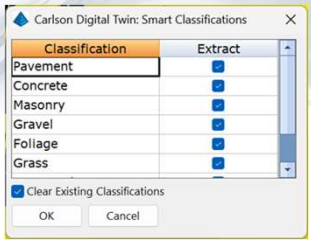
## Smart Classifications

Access from Classifications drop down menu -> Smart Classifications from Image

Set Classifications to extract from menu

Sets color more to classification for visualization of results



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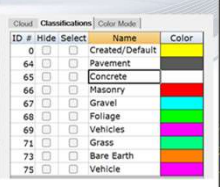
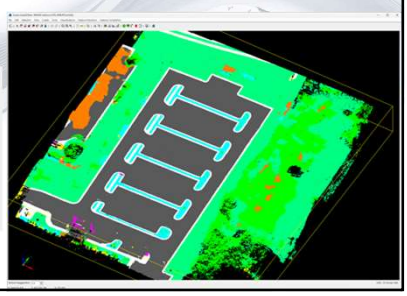
## Smart Classifications



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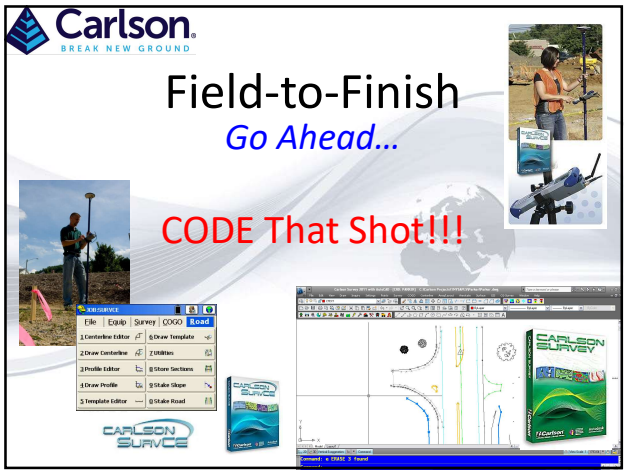
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BREAK NEW GROUND
Field-to-Finish
Go Ahead…
CODE That Shot!!!
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