

**Data Collection Field to Finish:  
How Sharp is Your Field Pencil?**



**Carlson<sup>TM</sup>**

**B R E A K   N E W   G R O U N D**

**2021 Surveyors Conference**

**Presented By**

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# For the Surveyor...



# It's An Artist's World!





# Discussion Topics



- Feature Code Library (FCL) and Special Codes
- Different Job Settings (NAD83, UTM, etc)
- SurvPC vs. SurvCE, longevity of Windows Mobile
- NGS Control - [https://www.ngs.noaa.gov/cgi-bin/ds\\_mark.prl?PidBox=DP8512](https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=DP8512)
- Spacing of Data, make it uniform
- National CAD Standards
- <ftp://ftp.dot.wi.gov/dtsd/bpd/methods/survey/>
- One shot, multiple lines
- Edit-Process Raw Data
- Data at <https://www.dropbox.com/sh/ojdujdk117nsmgw/AAAxIEDIGq3TsTBjelaoLnIa?dl=0>

# Don't be "Boy Blunder"! Carlson™



# Project Location



- Indian Lake County Park, Dane Co, WI
- Selected because it is open and public area
- Long entrance suitable for roadway example
- Parking lot with islands for grading example
- Happens to have published GPS Control
- Typical meeting location of Madison-area Surveyors Summer Picnic

# The Overall Project...



CONCEPTS

**ROADS**

SITE

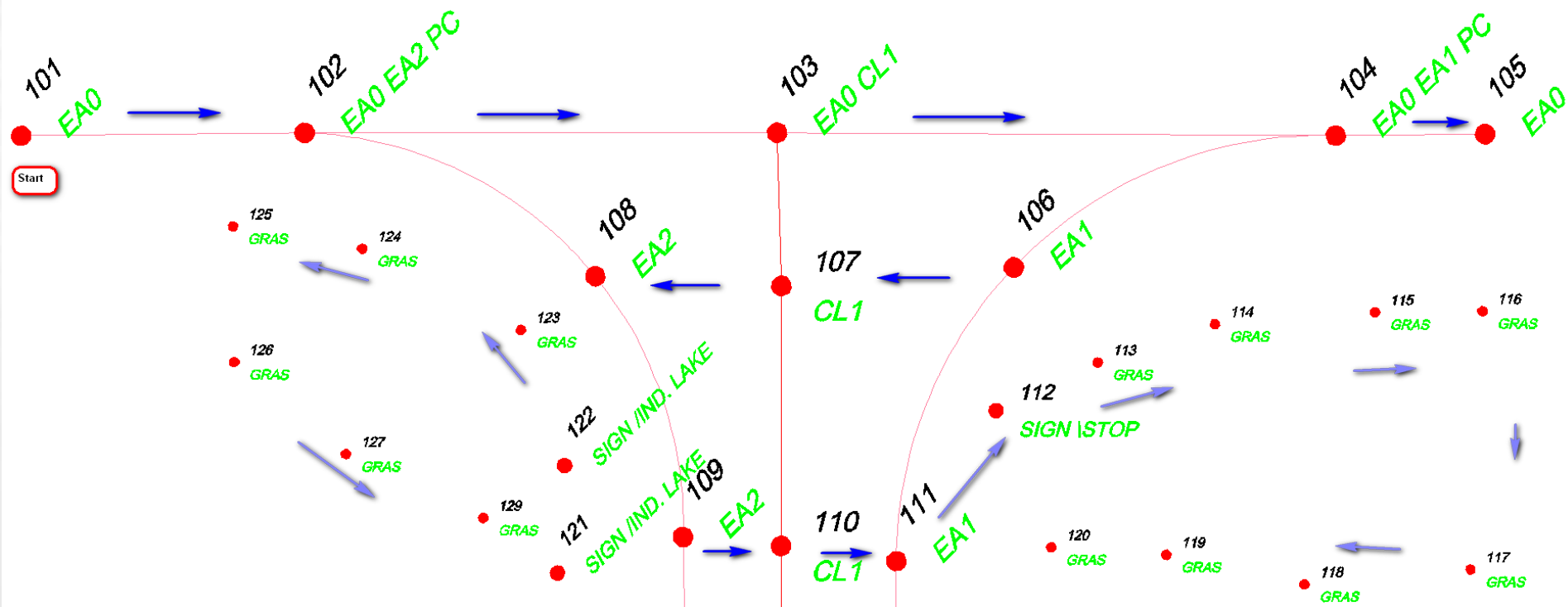
AMALGAMATION



# Roads – Meta Data



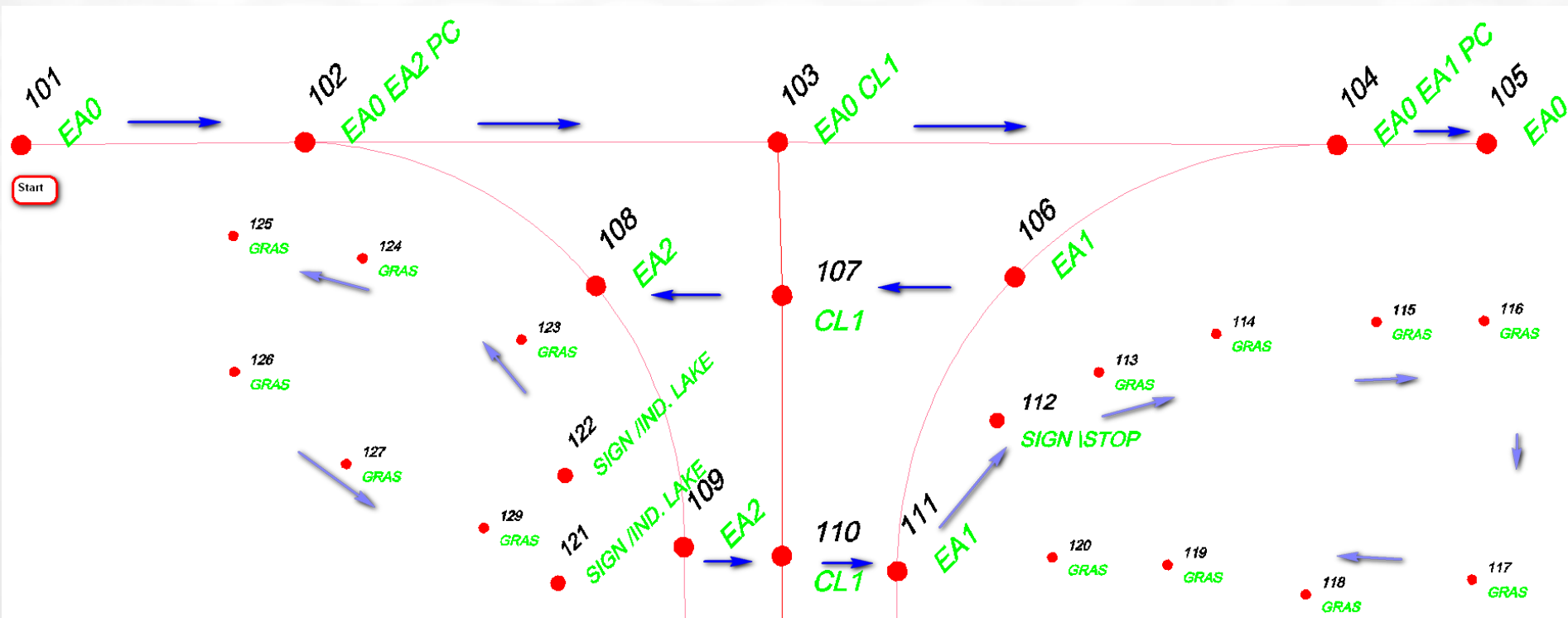
- NAD83, WI South – Specified because DOT projects might span across County lines
- Date Gathered:
  - 10-02-2017 -- 11:19:02 thru 18:06:02
  - 10-03-2017 -- 10:02:45 thru 10:21:40
- Point Range:
  - 101 – 957
  - 958 – 999
- “Hindsight” Issues
  - Lack of familiarity with suggested WI DOT Codes
  - “Lengthy” Codes
  - 25’ Paced Spacing





# Roads – Collection Notes

- 102 & 104: Single shot for line “0” at lines 2 and 1 (respectively) that also define a PC
- 103: Single shot for line “0” at centerline 1
- Roadway cross-sectioning pattern in effect
- 109 & 111: Unless explicitly provided, SurvPC can assume the third shot to be a PT for a 3-point arc
- Filled in the grass areas with random shots with the intent to make a pleasing looking surface model



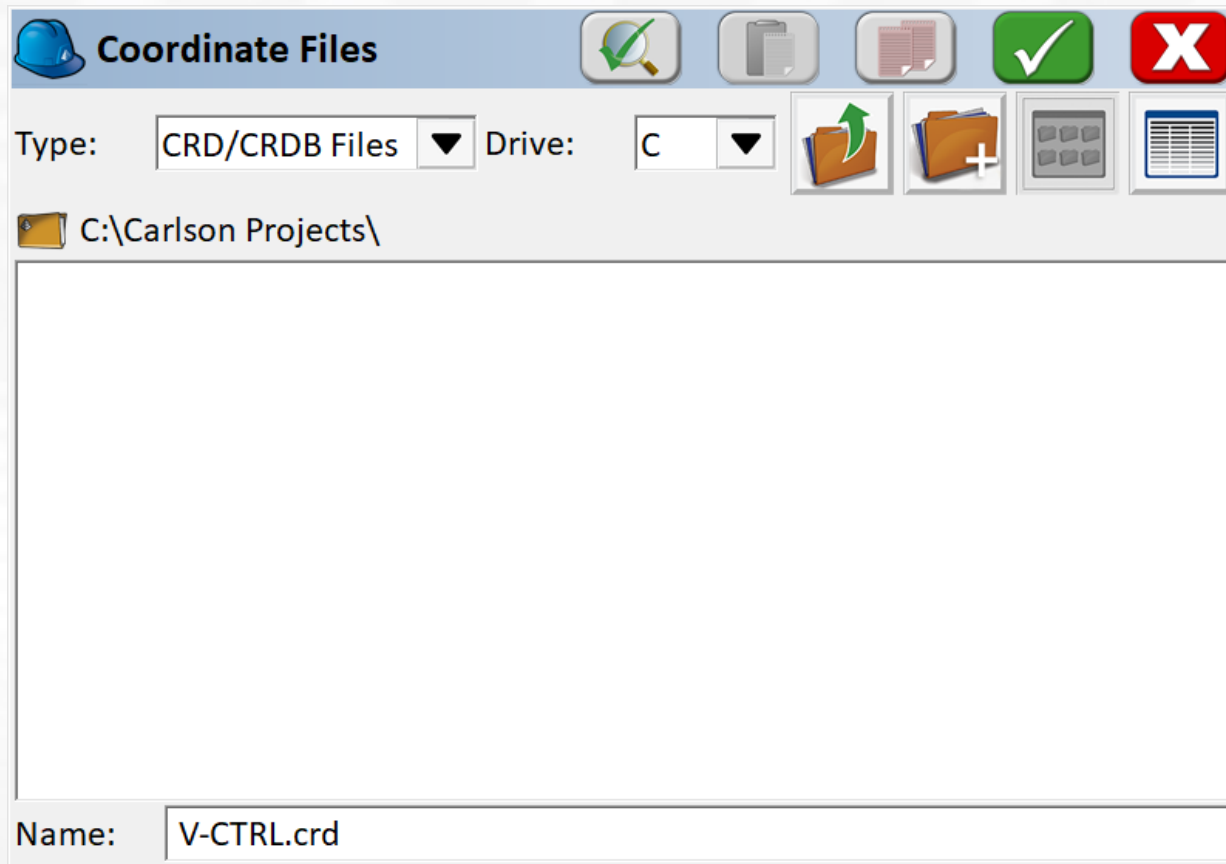
# Roads – Step by Step



The screenshot displays the Carlson SurvPC software interface. At the top, the title bar shows a blue hard hat icon, a red surveying instrument icon, and the text "JOB:NEWJOB". To the right of the title bar are icons for a green battery, a blue surveying instrument with a checkmark, and a globe. Below the title bar is a menu bar with "File" and "Road". The "File" menu is open, showing a list of options: "1 Job", "2 Job Setting", "3 Points", "4 Raw Data", and "5 Feature Code List". A dialog box is overlaid on the "File" menu, containing two buttons: "Continue Last Job" and "Select New/Existing Job". The "Select New/Existing Job" button is highlighted with a blue border. The "Road" menu is also visible, showing icons for a green circular arrow, a yellow folder with a green arrow, a blue recycling bin, and a blue information icon. At the bottom of the interface, there are two more options: "9 About Carlson SurvPC" with a magnifying glass icon, and "0 Exit" with a blue door icon.




File	SurvPC	Road
<u>1</u> Job	Continue Last Job	
<u>2</u> Job Setting	Select New/Existing Job	
<u>3</u> Points		
<u>4</u> Raw Data		<u>9</u> About Carlson SurvPC
<u>5</u> Feature Code List		<u>0</u> Exit

# Roads – Step by Step



# Roads – Step by Step





 **Job Settings**  

New Job	System	Format	Options	Stake
Distance:	<input type="text" value="US Survey Feet"/>			
Display Input	<input type="text" value="Decimal Feet"/>			
Angle:	<input type="text" value="Degrees, Minutes, Seconds"/>	<input type="text" value="Time: Local"/>		
Lat/Lon:	<input type="text" value="Degrees, Minutes, Seconds"/>	<input type="text" value="Date: MM/DD/YY"/>		
Zero Azimuth:	<input type="text" value="North"/>	<input type="button" value="Edit Projection List"/>		
Projection:	<input type="text" value="UTM/WGS 84/Automatic Zone Selection"/>			

# Roads – Step by Step






 **Coordinate Projection** 

Name	Source
UTM/WGS 84/Automatic Zone Selection	Carlson

# Roads – Step by Step





 **Coordinate Projection**  

Country:

Bayfield County	▲
Brown County	
Buffalo County	
Burnett County	
Calumet County	
Chippewa County	
Clark County	
Columbia County	
Crawford County	
<b>Dane County</b>	▼

# Roads – Step by Step



 **Coordinate Projection** 

Name	Source
UTM/WGS 84/Automatic Zone Selection	Carlson
USA COUNTY WI WISCRS/Dane County	Carlson

# Roads – Step by Step



**Job Settings** [Checkmark] [X]

**New Job** | **System** | **Format** | **Options** | **Stake**

Use Control File

Select File

- Time Stamp Each Point
- Note GPS Scale factor per point
- Store GPS Accuracy in Raw File
- Store GPS Vectors in Raw File when available
- Use Feature Codes for Descriptions
- Recall Job Road Files



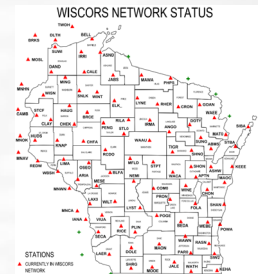
# Roads – Step by Step



# Roads – Step by Step








JOB:V-CTRL		Icons: Battery, Surveying Tools, Globe		
File	Equip	Survey	COGO	Road
<b>1 Total Station</b>		<b>6 Localization</b>		
<b>2 GPS Base</b>		<b>7 Monitor/Skyplot</b>		
<b>3 GPS Rover</b>		<b>8 Tolerances</b>		
<b>4 GPS Raw Only</b>		<b>9 Peripherals</b>		
<b>5 Configure</b>		<b>0 GPS Utilities</b>		



# Roads – Step by Step








 **GPS Base**   

Current	Comms	Receiver	RTK
Manufacturer:	<input type="text" value="Carlson"/> 		
Model:	<input type="text" value="BRx6+"/>		
<div style="border: 1px solid gray; height: 150px;"></div>			
<input type="button" value="Load"/>	<input type="button" value="Save"/>	<input type="button" value="Delete"/>	<input type="button" value="Defaults"/>

# Roads – Step by Step








 **GPS Base**   

Current	Comms	Receiver	RTK
Type:	<input type="text" value="Bluetooth"/>		
BT Type:	<input type="text" value="Windows Mobile"/>		
Device:	<input type="text"/>		

# Roads – Step by Step







 **GPS Base**   

Current	Comms	Receiver	RTK
Antenna Type:	[BRX6 NONE] Inte: ▼		<input checked="" type="radio"/> Vert <input type="radio"/> Slant
Antenna Height:	4.90 ft	Abs. 131.9mm	
Elevation Mask:		10 °	
Position Rate:		1 Hz ▼	
<input type="checkbox"/> Use IMU		<input type="checkbox"/> Auto Start Base	
Advanced			

# Roads – Step by Step





**GPS Base**   

Current	Comms	Receiver	RTK
Device:	Internal UHF		
Network:	None		
RTK Port:	Internal	Baud:	115200
Message Type:	RTCM V3.2		



# Roads – Step by Step



 **Base Configuration** 

**From New Position**      **From Known Position**

Read From GPS

**Enter Lat/Lon**

Enter Grid System Coordinates

# Roads – Step by Step



Ronald J. Ripp served as Dane County Surveyor from 1983 to 2004. Ron was a dedicated public servant, kind friend, historian, humorist, and always eager to share local folklore and survey knowledge. In memory of his service to the citizens of Dane County, Station RON RIPP GPS was established and made a part of the National Spatial Reference System. For the precise geodetic position, please check official records. The approximate position, suitable for recreational use, is:

Latitude N 43° 11' 23.2"

Longitude W 89° 37' 18.2"

Elevation 940 feet

Established in cooperation with: Dane County, National Geodetic Survey, Wisconsin Department of Transportation, Madison Area Surveyors Council, University of Wisconsin-Madison Civil & Environmental Engineering Department, Madison Area Technical College Civil Engineering Technology Program, and Berntsen International.






"Now that you know where you are, do you know where you are going?"

Ronald J. Ripp - 1949 to 2004



# Roads – Step by Step



 Enter Lat/Lon  


Use dd.mmssss format.

Latitude:

North  South

Longitude:




West  East

Height:   ft

Ellipsoid  Orthometric

# Roads – Step by Step



 Enter Lat/Lon  

Use dd.mmssss format.

Latitude:


North  South

Longitude:

West  East


Height:  ft

Ellipsoid  Orthometric



# Roads – Step by Step



 **Base Configuration**

RTK Broadcast ID:

Latitude: N 43°11'23.24502"

Longitude: W 89°37'18.21173"

Ellipsoid Height: 825.9137ft

←

Continue with Base Setup?

# Roads – Step by Step



Software interface showing a menu and a dialog box.

Top bar: JOB:V-CTRL

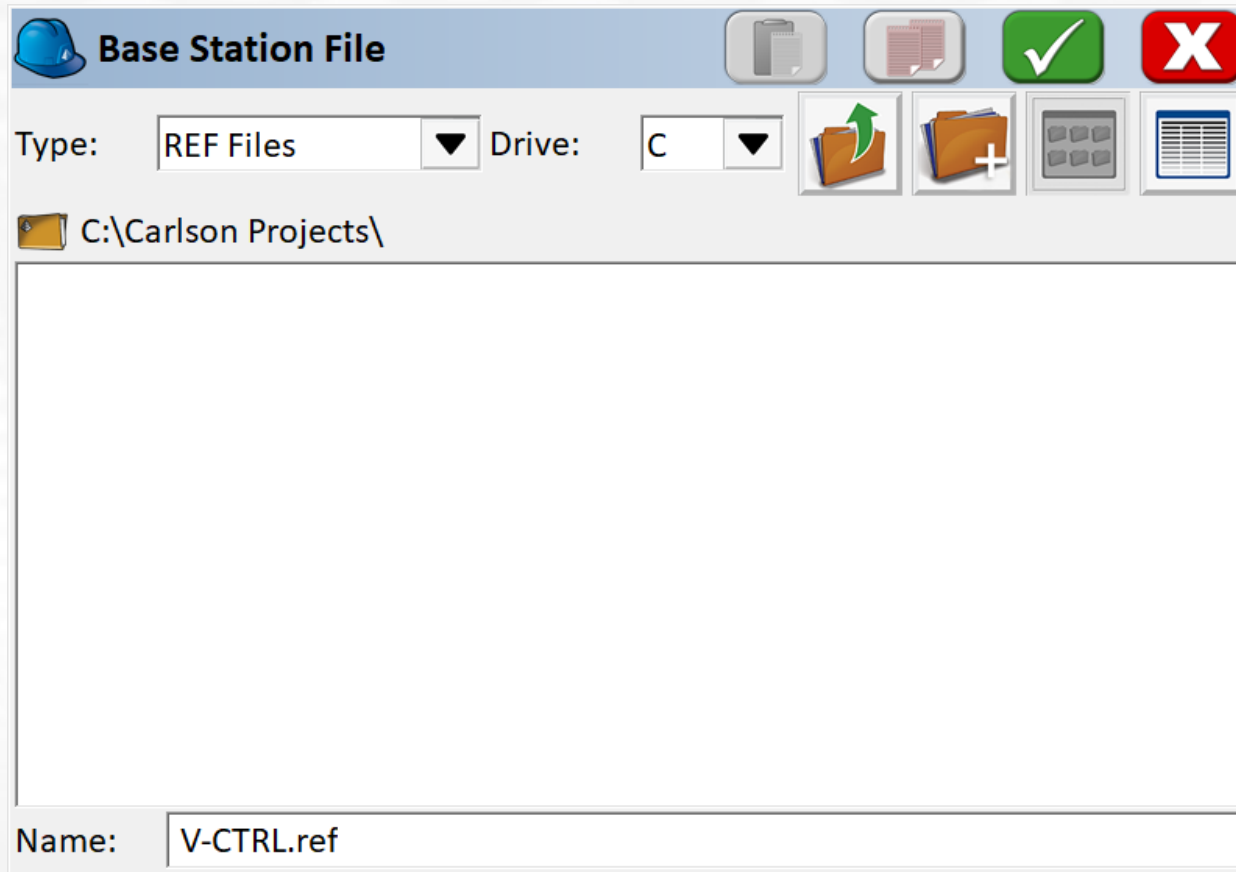
Menu: File | **E**quip | Survey | COGO | Road

Dialog Box: **SurvPC**  
Base Configuration Successful. Save Settings to File?

Background menu items:

- 1 Total Station
- 2 GPS Base Station
- 3 GPS Receiver
- 4 GPS Raw Only
- 5 Configure
- 9 Peripherals
- 0 GPS Utilities

# Roads – Step by Step

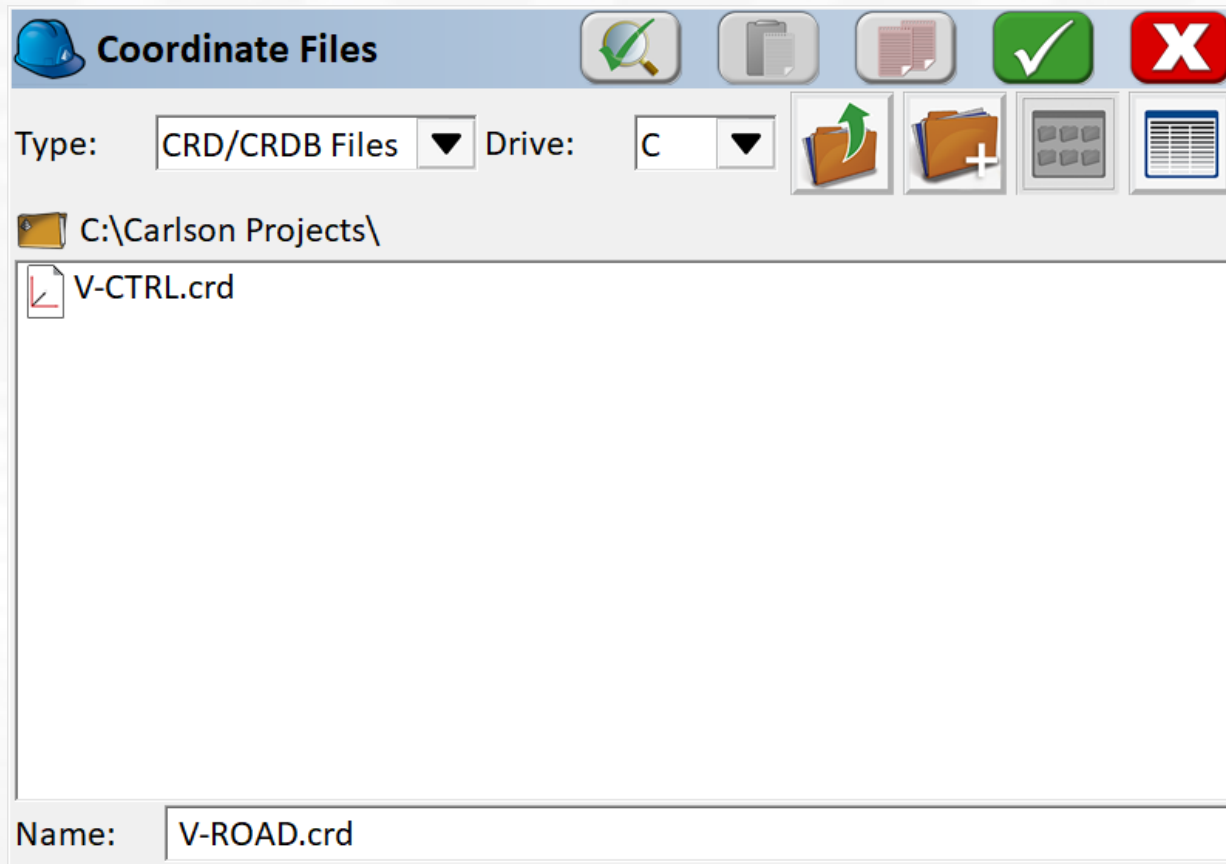


# Roads – Step by Step






JOB:V-CTRL		File		Equip	Survey	COGO	Road
<b>1 Job</b>		<b>6 Data Transfer</b>					
<b>2 Job Settings</b>		<b>7 Import/Export</b>					
<b>3 Points</b>		<b>8 Delete Job</b>					
<b>4 Raw Data</b>		<b>9 About Carlson SurvPC</b>					
<b>5 Feature Code List</b>		<b>0 Exit</b>					

# Roads – Step by Step



# Roads – Step by Step



 **Job Settings**  

New Job	System	Format	Options	Stake
Distance:	US Survey Feet			
Display Input	<input type="text" value="Decimal Feet"/> ▼			
Angle:	<input type="text" value="Degrees, Minutes, Seconds"/> ▼	Time:	<input type="text" value="Local"/> ▼	
Lat/Lon:	<input type="text" value="Degrees, Minutes, Seconds"/> ▼	Date:	<input type="text" value="MM/DD/YY"/> ▼	
Zero Azimuth:	<input type="text" value="North"/> ▼	<input type="button" value="Edit Projection List"/>		
Projection:	<input type="text" value="USA/NAD83/WI South"/> ▼			



# Roads – Step by Step



**Job Settings** [Green Checkmark] [Red X]

**New Job** | **System** | **Format** | **Options** | **Stake**

Use Control File ←














**Select File** C:\Carlson Projects\V-CTRL.crd ←

- Time Stamp Each Point
- Note GPS Scale factor per point
- Store GPS Accuracy in Raw File
- Store GPS Vectors in Raw File when available
- Use Feature Codes for Descriptions
- Recall Job Road Files

◀ ▶



# Roads – Step by Step



JOB:V-ROAD		  		
<u>F</u> ile	<b><u>E</u>quip</b>	<u>S</u> urvey	<u>C</u> OGO	<u>R</u> oad
<b><u>1</u> Total Station</b>		<b><u>6</u> Localization</b>		
<b><u>2</u> GPS Base</b>		<b><u>7</u> Monitor/Skyplot</b>		
<b><u>3</u> GPS Rover</b>		<b><u>8</u> Tolerances</b>		
<b><u>4</u> GPS Raw Only</b>		<b><u>9</u> Peripherals</b>		
<b><u>5</u> Configure</b>		<b><u>0</u> GPS Utilities</b>		

# Roads – Step by Step



 **Base Configuration** 

**From New Position**      **From Known Position**

Previously Surveyed Point




Use Local Coordinates

Read From File



Allows the use of the \*.REF file


# Roads – Step by Step



 **Surveyed Point**  





Please enter a point ID from the current or control job for which raw data exists.


Point From File:   



# Roads – Step by Step






Point ..ails  Job  Control    

Point ID	Northing(ft)	Easting(ft)	Elevation(ft)	Description	Point ID
 1	524847.14	757790.86	938.812	CP /Ron Ripp GPS	1



Select and "Green Check" when ready.

# Roads – Step by Step



 **Surveyed Point**  


Please enter a point ID from the current or control job for which raw data exists.

Point From File:   



# Roads – Step by Step



 **Base Configuration**

RTK Broadcast ID:  From Point:

Latitude: N 43°11'23.24613"


Longitude: W 89°37'18.21189"

Ellipsoid Height: 825.8201ft




Continue with Base Setup?

# Roads – Step by Step



 **Base Configuration**


RTK Broadcast ID:  From Point:

Latitude  **Store Point**  

Longitude

Ellipsoid

Point ID:

Description:  

# Roads – Step by Step



Software interface for 'JOB:V-ROAD' showing a menu structure and a dialog box.

**Top Bar:** Includes a blue hard hat icon, a yellow surveying instrument icon, the text 'JOB:V-ROAD', a green battery icon, a gear and checklist icon, and a globe icon.

**Menu Structure:**

- File**
- Equip** (highlighted)
- Survey**
- COGO**
- Road**














**Dialog Box:** A modal dialog box titled 'SurvPC' is open over the 'Equip' menu. It contains the text 'Base Configuration Successful. Save Settings to File?' and two buttons: 'Yes' and 'No'. The 'No' button is highlighted with a blue border.

**Main Menu Items:**

- 1 Total Station** (with location pin icon)
- 2 GPS Base Station** (with GPS icon)
- 3 GPS Receiver** (with surveying instrument icon)
- 4 GPS Raw Only** (with surveying instrument icon)
- 5 Configure** (with gear icon)
- 9 Peripherals** (with tablet icon)
- 0 GPS Utilities** (with surveying instrument icon)





# Roads – Step by Step




JOB:V-ROAD		  		
<u>F</u> ile	<b><u>E</u>quip</b>	<u>S</u> urvey	<u>C</u> OGO	<u>R</u> oad
<b><u>1</u> Total Station</b>		<b><u>6</u> Localization</b>		
<b><u>2</u> GPS Base</b>		<b><u>7</u> Monitor/Skyplot</b>		
<b><u>3</u> GPS Rover</b>		<b><u>8</u> Tolerances</b>		
<b><u>4</u> GPS Raw Only</b>		<b><u>9</u> Peripherals</b>		
<b><u>5</u> Configure</b>		<b><u>0</u> GPS Utilities</b>		

# Roads – Step by Step








 **GPS Rover**   

Current	Comms	Receiver	RTK
Manufacturer:	<input type="text" value="Carlson"/> 		
Model:	<input type="text" value="BRx6+"/>		
Load	Save	Delete	Defaults

# Roads – Step by Step






 **GPS Rover**   


Current	Comms	Receiver	RTK
Type:	<input type="text" value="Bluetooth"/>		
BT Type:	<input type="text" value="Windows Mobile"/>		
Device:	<input type="text"/>		



# Roads – Step by Step







**GPS Rover**   

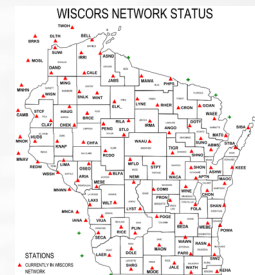
Current	Comms	Receiver	RTK
Antenna Type:	[BRX6 NONE] Intel ▼		<input checked="" type="radio"/> Vert <input type="radio"/> Slant
Antenna Height:	<input type="text" value="2m"/> ft	Abs. 131.9mm	
Elevation Mask:	<input type="text" value="10"/> °		
Position Rate:	<input type="text" value="2 Hz"/> ▼		
<input type="checkbox"/> Use IMU	<input type="checkbox"/> aRTK		
14 Parameter Datum		Advanced	

# Roads – Step by Step






**GPS Rover**   





Current	Comms	Receiver	RTK
Device:	Internal UHF		
Network:	None		
RTK Port:	Internal	Baud:	115200
Message Type:	Auto		
Base ID (0-31)	<input type="text"/>	<input checked="" type="checkbox"/> Use Any Base ID	



# Roads – Step by Step






**GPS Rover**   

Current	Comms	Receiver	RTK
Device:	Data Collector Internet		
Network:	NTRIP		
RTK Port:	Data		
Message Type:	RTCM V3.2		
<input type="checkbox"/> Use server transformations			
WisCORS:	RTCM32		
<input checked="" type="checkbox"/> Send Rover Position to Network			

# Roads – Step by Step



 **NTRIP Broadcasters**  

Name:

IP addr:  Port:

User:  Pwd:

Broadcaster Information

Identifier:

Operator:




Position 0.00S 0.00W ,

Misc:

NMEA: Rover position not needed.

# Roads – Step by Step



 **Bases for HPRTK**  

Name:  ▼

User Name:  Password:

Identifier:

Short Id:

Type:

Format:  ▼

Position:

Misc:

Send Rover Position to Network

# Roads – Step by Step






JOB:V-ROAD		Icons: Battery, Checkmark/Tools, Earth		
<u>F</u> ile	<b>E</b> quip	<u>S</u> urvey	<u>C</u> OGO	<u>R</u> oad
<b>1</b> Total Station		<b>6</b> Localization		
<b>2</b> GPS Base		<b>7</b> Monitor/Skyplot		
<b>3</b> GPS Rover		<b>8</b> Tolerances		
<b>4</b> GPS Raw Only		<b>9</b> Peripherals		
<b>5</b> Configure		<b>0</b> GPS Utilities		



# Roads – Step by Step



  **Monitor/Skyplot** 

Quality	Position	SATView	SATInfo	Ref
Status:	FIXED	Satellites:	16/17	
Latency:	0.7s	Local Elev:	932.2502ft	
Base Selection:	VBN_RTCM3_Hem			
Local Northing:	524849.6838ft			12/19/2020
Local Easting:	757791.0010ft			07:46:56.4
HDOP:	1.10	VDOP:	2.10	
TDOP:	2.00	PDOP:	2.37	
GDOP:	3.10	<input type="button" value="Disconnect"/>		<input type="button" value="Connect"/>
Hrms:	0.023ft			
Vrms:	0.033ft	Connected		




# Roads – Step by Step




JOB:V-ROAD		Icons: Battery, Tools, Globe		
<u>F</u> ile	<b><u>E</u>quip</b>	<u>S</u> urvey	<u>C</u> OGO	<u>R</u> oad
<b>1</b> Total Station		<b>6</b> Localization		
<b>2</b> GPS Base		<b>7</b> Monitor/Skyplot		
<b>3</b> GPS Rover		<b>8</b> Tolerances		
<b>4</b> GPS Raw Only		<b>9</b> Peripherals		
<b>5</b> Configure		<b>0</b> GPS Utilities		


# Roads – Step by Step




 **Configure**  


**General** | **View**

Coding Style: Classic/One Touch(Store Pts-Graphic) ▼ 

Prompt for Total Station Setup 

Prompt for Height & Description 

Prompt for Point Notes

Prompt If Duplicate of Backsight or Last Reading (TS) 

No. of Readings to Avg -      TS:       GPS:

Enter/Store Icon - TS:  ▼

Enter/Store Icon - RTS/GPS:  ▼




# Roads – Step by Step




JOB:V-ROAD		Battery, Tools, Earth		
<u>F</u> ile	<b><u>E</u>quip</b>	<u>S</u> urvey	<u>C</u> OGO	<u>R</u> oad
<b>1</b> Total Station		<b>6</b> Localization		
<b>2</b> GPS Base		<b>7</b> Monitor/Skyplot		
<b>3</b> GPS Rover		<b>8</b> Tolerances		
<b>4</b> GPS Raw Only		<b>9</b> Peripherals		
<b>5</b> Configure		<b>0</b> GPS Utilities		

# Roads – Step by Step



 **Tolerances**  

Min. Solution Type: Fixed 

Hrms Tolerance: 0.060 ft Vrms Tolerance: 0.120 ft

PDOP Tolerance: 1.400














Stakeout Tolerance: 0.080 ft

Proximity Radius: 0.083 ft

Incline Tolerance: 15.0 °




# Roads – Step by Step



JOB:V-ROAD		  		
<u>F</u> ile	<u>E</u> quip	<u>S</u> urvey	<u>C</u> OGO	<u>R</u> oad
<b>1 Job</b>		<b>6 Data Transfer</b>		
<b>2 Job Settings</b>		<b>7 Import/Export</b>		
<b>3 Points</b>		<b>8 Delete Job</b>		
<b>4 Raw Data</b>		<b>9 About Carlson SurvPC</b>		
<b>5 Feature Code List</b>		<b>0 Exit</b>		

# Roads – Step by Step



 **Add Code**  

Code:

Category:

Layer:   Color:

Full Text:

Entity Type:

Point  
 2D Polyline  
 3D Polyline

Width:   in





# Roads – Step by Step




Code	Layer	Entity
BERM	V-BRKL	3D Pline
BLDG	V-BLDG-OTLN	2D Pline
BSL	V-BRKL-BOTB	3D & 2D
CL	V-ROAD-CNTR	3D & 2D
CP	V-CTRL-HCPT	Point
CULV	V-STRM-UNDR	2D Pline
DTCH	V-DTCH-CNTR	3D & 2D
DTRE	V-NODE-TREE	Point
EA	V-ROAD-ASPH	3D & 2D
FL	V-BRKL-FLOW	3D & 2D
GPS	V-NODE-CNTL	Point
GRAS	V-NODE-GRND	Point
INLET	V-NODE-STRM	Point
RIPR	V-RRAP	2D Pline
SHLD	V-ROAD-SHLD	3D & 2D
SIGN	V-NODE-SIGN	Point
SPIL	V-STRM-DTCH	3D & 2D
SW	V-SWLK-CONC	2D Pline
WMH	V-WATR-MHOL	Point



# Roads – Step by Step



 **Code List: WIDOT** 

Category:  

Code	Linework	Line Type	Layer Name	Full Text	Code
CL	Yes	3D	V-ROAD-CNTR	EXISTING CENTERLINE	CL
CP	No	2D	V-CTRL-HCPT	CONTROL POINT (HCPT)	CP
EA	Yes	3D	V-ROAD-ASPH	EDGE OF ASPHALT	EA
GRAS	No	2D	V-NODE-GRND	GRASS AREA	GRAS
SIGN	No	2D	V-NODE-SIGN	SIGN	SIGN

<input type="button" value="Add"/>	<input type="button" value="Edit"/>	<input type="button" value="Remove"/>
<input type="button" value="Load"/>	<input type="button" value="Save As"/>	<input type="button" value="Special Codes"/>

# Roads – Step by Step



**Special Codes**

Code	Action
Space	Code Separator
None	String Designator
<b>BEG</b>	<b>Begin Line</b>
END	End Line
PC	Arc PC
PT	Arc PT
CLO	Close Figure
SMO	Smooth Line
JPN	Join Point
RECT	Close Rectangular
OH	Offset Horizontal

Carlson Code:

# Roads – Step by Step

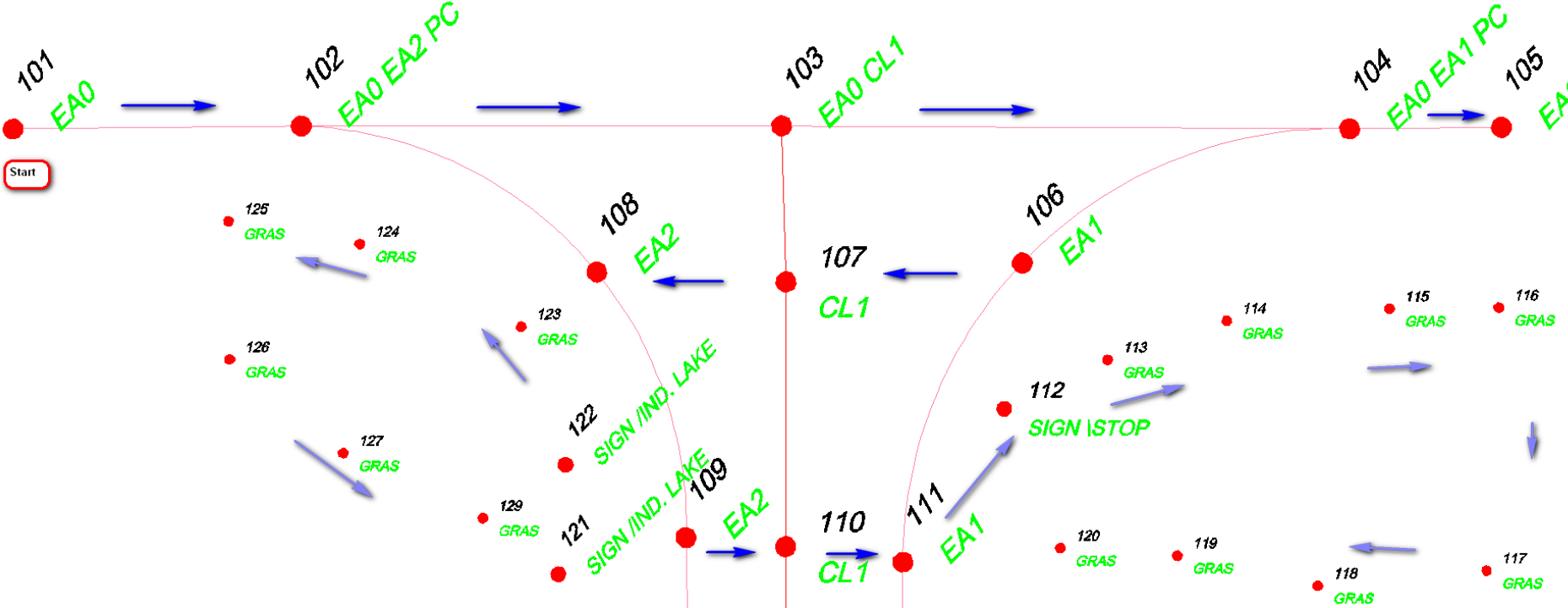


Software interface for road design, showing a menu structure under the 'Survey' tab.

Top bar: JOB:V-ROAD

File	Equip	Survey	COGO	Road
		<b>1 Store Points</b>		<b>6 Auto by Interval</b>
		<b>2 Stake Points</b>		<b>7 Leveling</b>
		<b>3 Stake Line/Arc</b>		
		<b>4 Stake Offset</b>		
		<b>5 Elev Difference</b>		

# Roads – Step by Step



# Roads – Step by Step



**STORE PTS**




**Text** Fixed 16/19 30 ft

Pt: 101 EAO 6.562 ft



N:524990.8714ft E:757798.7194ft Z:932.2502ft  
Hrms:0.023ft Vrms:0.033ft PDOP:2.37 GDOP:3.10 TDOP:2.00


# Roads – Step by Step




 **Configure**  


**General** **View**

Coding Style   


Prompt for Total Station Setup 


Prompt for Height & Description 

Prompt for Point Notes

Prompt If Duplicate of Backsight or Last Reading (TS) 

No. of Readings to Avg -                      TS:                       GPS:






Enter/Store Icon - TS:  

Enter/Store Icon - RTS/GPS:  




# Roads – Step by Step







  STORE PTS   



**FIXED** **SATS:16/17**  One Touch






Pt:    ft  H/D Special Code Buttons


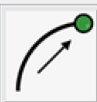
**N:525019.2307ft** **E:757800.2697ft** **Z:932.2502ft**

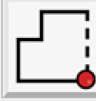

> Category:     

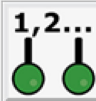

Selectable

Desc:   

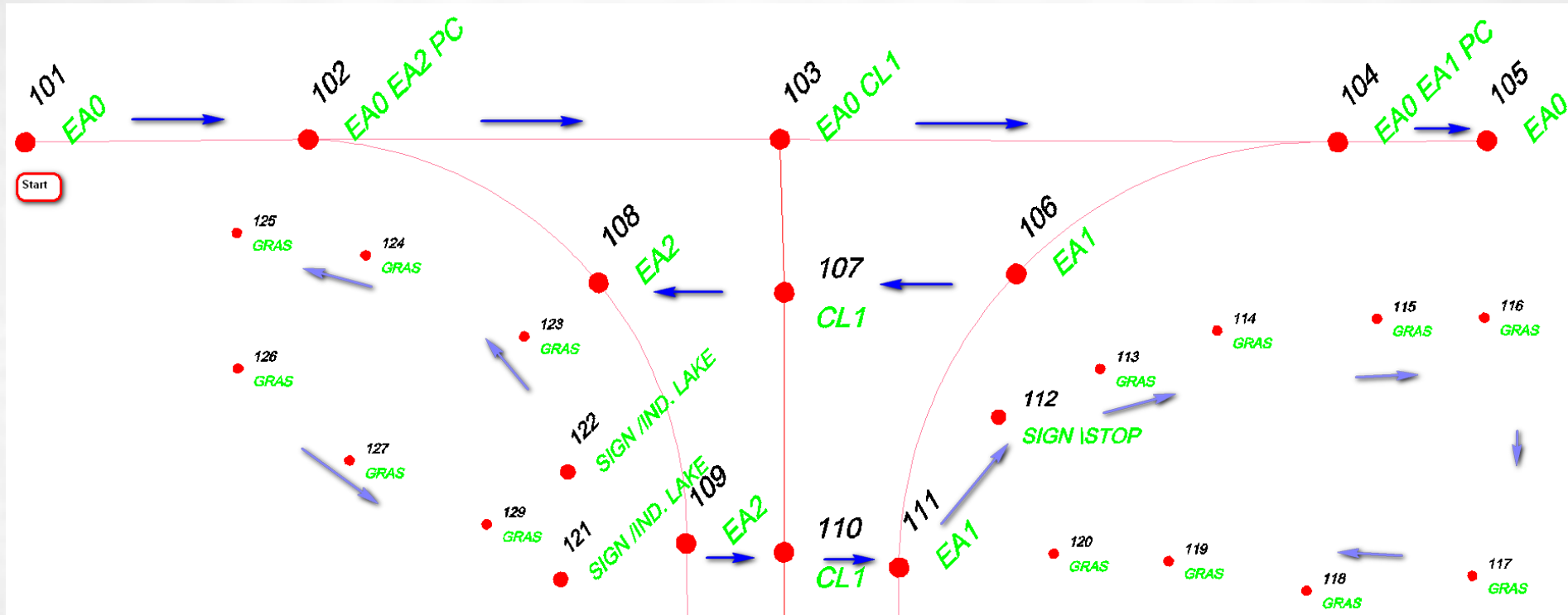
CL 	CP 	EA 	GRAS 	SIGN 
--	--	--	--	--

# Roads – Step by Step



CONCEPTS

ROADS

**SITE**

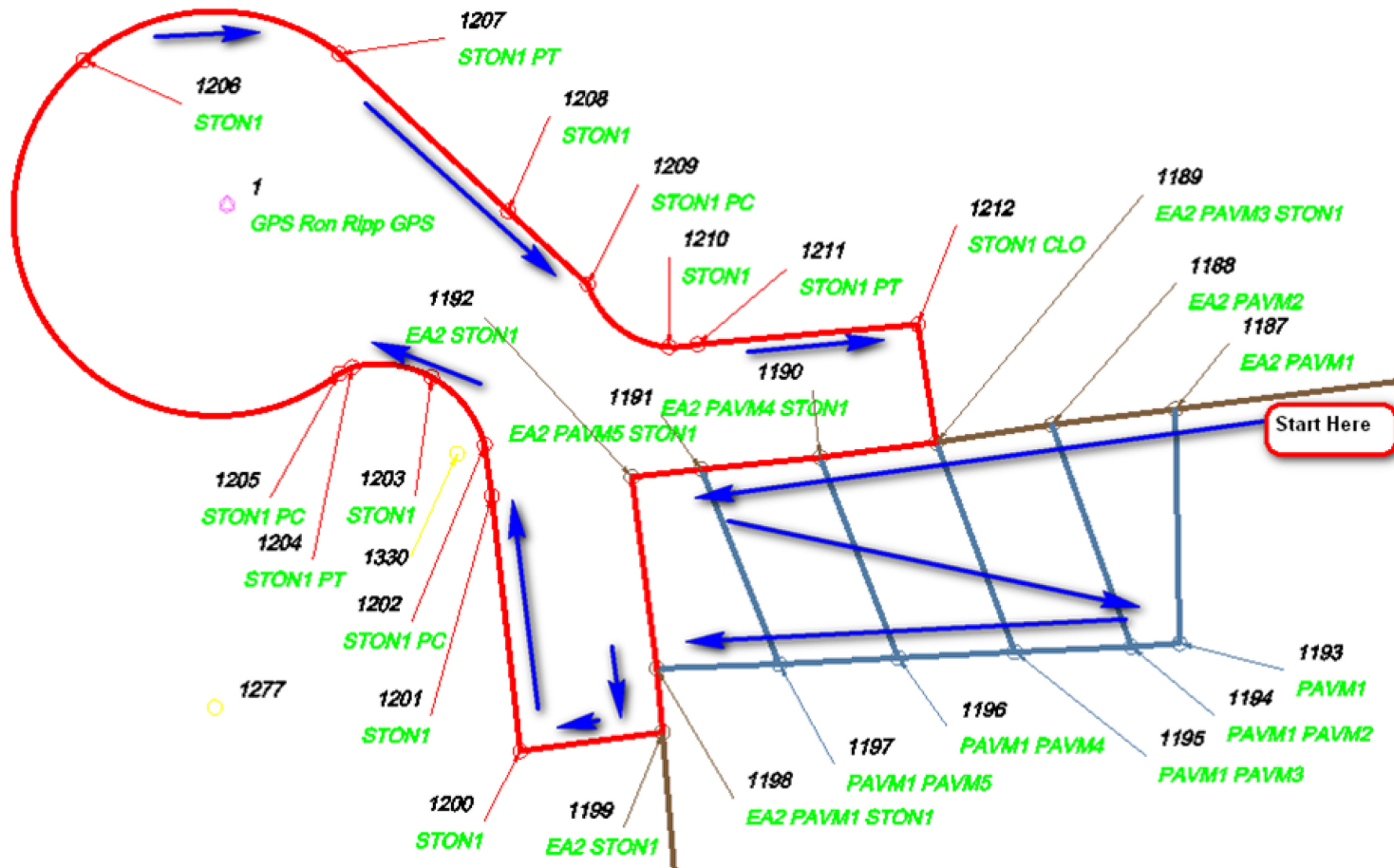
AMALGAMATION



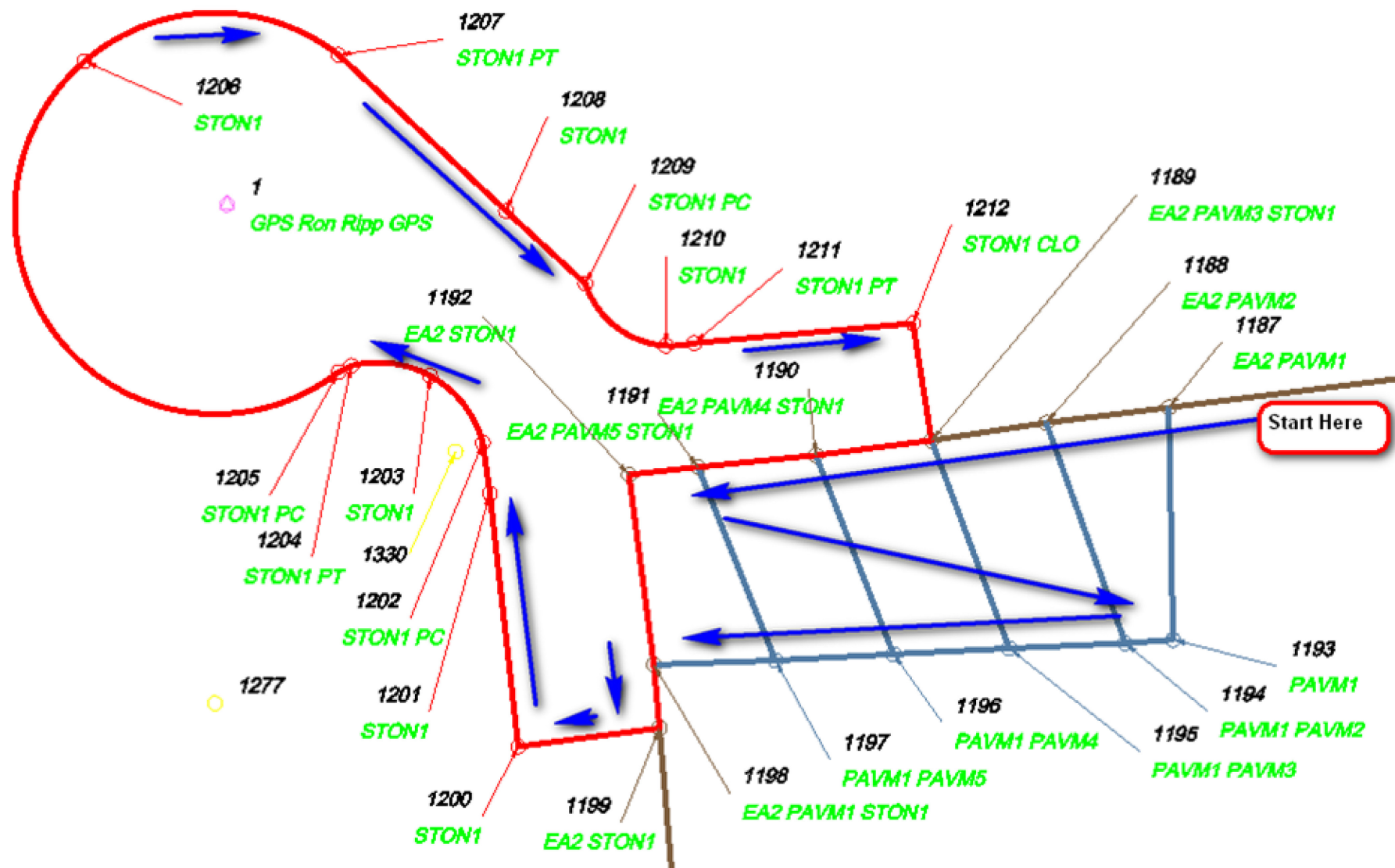
# Site – Meta Data



- WGS 84 UTM – Specified with County GIS Concepts in Mind
- Date Gathered:
  - 10-03-2017 -- 13:17:58 thru 16:19:19
- Point Range:
  - 1001 – 1330

















# Site – Step by Step



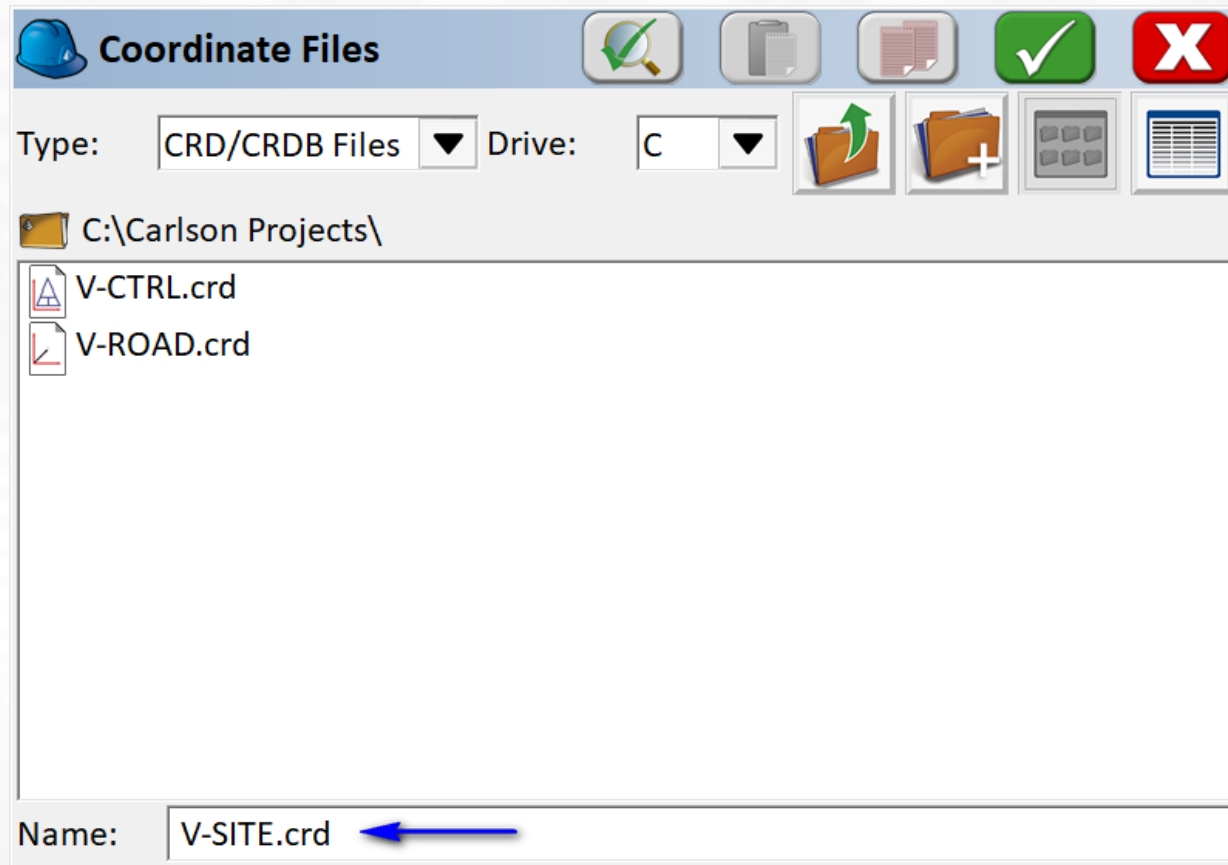
# Site – Step by Step



Blue hard hat icon    **JOB:V-ROAD**         

<u>F</u> ile	<u>E</u> quip	<u>S</u> urvey	<u>C</u> OGO	<u>R</u> oad
<b>1</b> Job		<b>6</b> Data Transfer		
<b>2</b> Job Settings		<b>7</b> Import/Export		
<b>3</b> Points		<b>8</b> Delete Job		
<b>4</b> Raw Data		<b>9</b> About Carlson SurvPC		
<b>5</b> Feature Code List		<b>0</b> Exit		




# Site – Step by Step





# Site – Step by Step



 **Job Settings**  

New Job	System	Format	Options	Stake
Distance:	US Survey Feet			
Display Input	<input type="text" value="Decimal Feet"/>			
Angle:	<input type="text" value="Degrees, Minutes, Seconds"/>	<input type="text" value="Time:"/>	<input type="text" value="Local"/>	
Lat/Lon:	<input type="text" value="Degrees, Minutes, Seconds"/>	<input type="text" value="Date:"/>	<input type="text" value="MM/DD/YY"/>	
Zero Azimuth:	<input type="text" value="North"/>	<input type="button" value="Edit Projection List"/>		
Projection:	<input type="text" value="UTM/WGS 84/Automatic Zone Selection"/>			

# Site – Step by Step



**Job Settings** [Green Checkmark] [Red X]

**New Job** | **System** | **Format** | **Options** | **Stake**




Use Control File ←

**Select File** C:\Carlson Projects\V-CTRL.crd ←

- Time Stamp Each Point
- Note GPS Scale factor per point
- Store GPS Accuracy in Raw File
- Store GPS Vectors in Raw File when available
- Use Feature Codes for Descriptions
- Recall Job Road Files

# Site – Step by Step



 **Edit Code**  

Code:

Category:  ▼

Layer:   Color:

Full Text:

Entity Type:  Point  
 2D Polyline  
 3D Polyline

Width:  ▼  in

# Site – Step by Step



Code	Layer	Entity
ASPH	V-ROAD-ASPH	3D & 2D
BERM	V-BRKL	3D Pline
BLDG	V-BLDG-OTLN	2D Pline
CL	V-ROAD-CNTR	3D & 2D
CP	V-CTRL-HCPT	Point
DTRE	V-NODE-TREE	Point
EA	V-ROAD-ASPH	3D & 2D
GPS	V-NODE-CNTL	Point
GRAS	V-NODE-GRND	Point
PAVM	V-PKNG-MRKG	2D Pline
SHLD	V-ROAD-SHLD	3D & 2D
SIGN	V-NODE-SIGN	Point
STON	V-PKNG-MRKG	2D Pline





# Site – Step by Step




JOB:V-SITE		File Equip Survey COGO Road		
<b>1 Total Station</b>		<b>6 Localization</b>		
<b>2 GPS Base</b>		<b>7 Monitor/Skyplot</b>		
<b>3 GPS Rover</b>		<b>8 Tolerances</b>		
<b>4 GPS Raw Only</b>		<b>9 Peripherals</b>		
<b>5 Configure</b>		<b>0 GPS Utilities</b>		

# Site – Step by Step







 **GPS Base**   

Current	Comms	Receiver	RTK
Manufacturer:	<input type="text" value="Carlson"/> 		
Model:	<input type="text" value="BRx6+"/>		
<div style="border: 1px solid gray; height: 200px;"></div>			
Load	Save	Delete	Defaults

# Site – Step by Step





**GPS Base**   

Current	Comms	Receiver	RTK
Device:	Internal UHF 		
Network:	None		
RTK Port:	Internal	Baud:	115200
Message Type:	RTCM V3.2		

# Site – Step by Step



 **Base Configuration** 

**From New Position** | **From Known Position**

Previously Surveyed Point

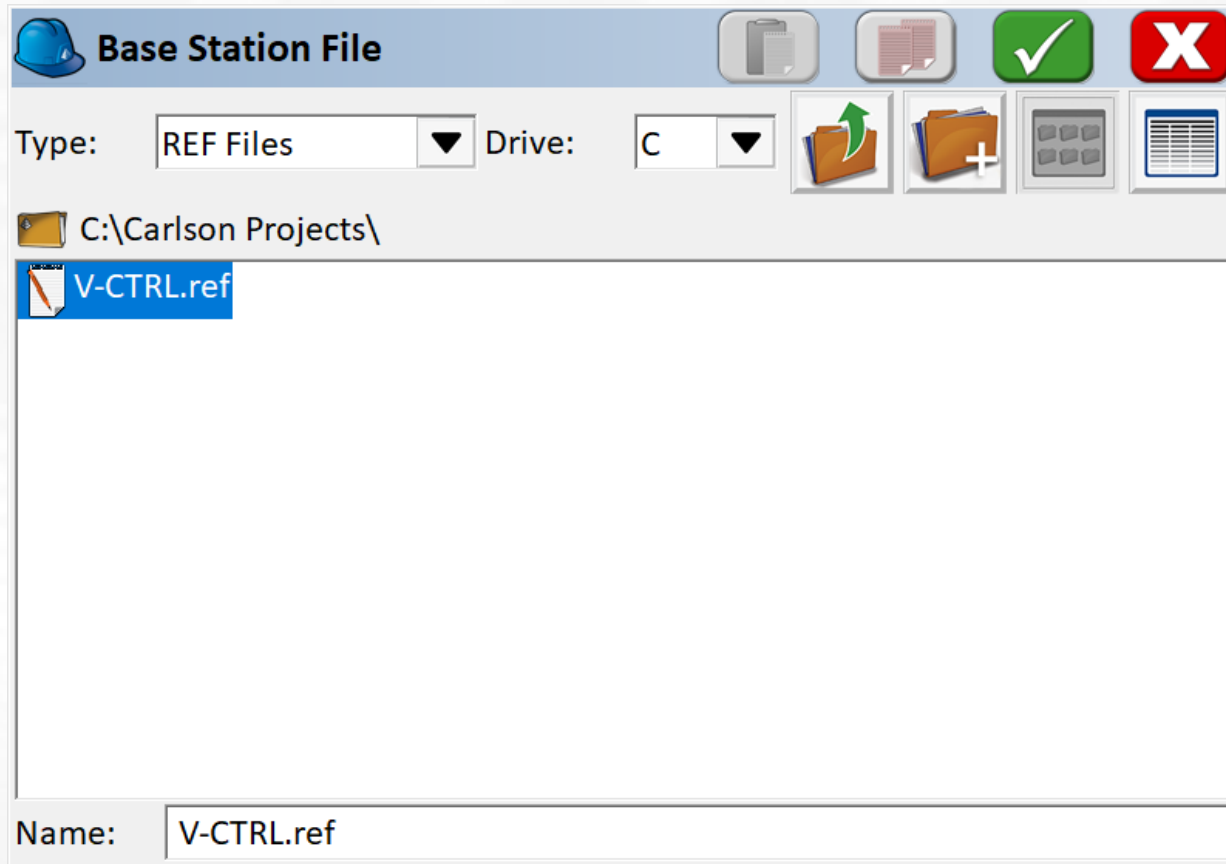
Use Local Coordinates

Read From File

Allows the use of the \*.REF file




# Site – Step by Step



# Site – Step by Step



 **Base Configuration**

RTK Broadcast ID:  From Point:

Latitude: N 43°11'23.24613"

Longitude: W 89°37'18.21189"

Ellipsoid Height: 825.8201ft

Continue with Base Setup?




# Site – Step by Step




JOB:V-SITE		File Equip Survey COGO Road		
<b>1 Total Station</b>		<b>6 Localization</b>		
<b>2 GPS Base</b>		<b>7 Monitor/Skyplot</b>		
<b>3 GPS Rover</b>		<b>8 Tolerances</b>		
<b>4 GPS Raw Only</b>		<b>9 Peripherals</b>		
<b>5 Configure</b>		<b>0 GPS Utilities</b>		

# Site – Step by Step












**GPS Rover**   

Current	Comms	Receiver	RTK
Manufacturer:	<input type="text" value="Carlson"/> 		
Model:	<input type="text" value="BRx6+"/>		
<div style="border: 1px solid gray; height: 150px;"></div>			
<input type="button" value="Load"/>	<input type="button" value="Save"/>	<input type="button" value="Delete"/>	<input type="button" value="Defaults"/>

# Site – Step by Step



Software interface showing the Survey menu options. The menu is titled "JOB:V-SITE" and includes icons for a hard hat, a green battery, a surveying instrument, and a globe. The Survey menu is highlighted, and the "1 Store Points" option is selected, indicated by a blue arrow pointing to it.

File	Equip	<b>Survey</b>	COGO	Road
		<b>1 Store Points</b>  		<b>6 Auto by Interval</b>  
		<b>2 Stake Points</b> 		<b>7 Leveling</b> 
		<b>3 Stake Line/Arc</b> 		
		<b>4 Stake Offset</b> 		
		<b>5 Elev Difference</b> 		

# Site – Step by Step



Code	Desc	Code	Desc	Code	Desc	Code	Desc
1076	PAVM52	1089	EA4 PAVM61	1101	EA4 PT PAVM51	1115	EA4 CLO PAVM62
1077	PAVM53	1090	EA4 PAVM60	1102	EA4 PAVM50	1118	PAVM41
1078	PAVM54	1091	EA4 PAVM59	1103	EA4 PAVM49	1119	PAVM42
1079	PAVM55	1092	EA4 PAVM58	1104	EA4 PAVM48	1120	PAVM43
1080	PAVM56	1093	EA4 PAVM57	1105	EA4 PAVM47	1121	PAVM44
1081	PAVM57	1094	EA4 PAVM56	1106	EA4 PAVM46	1122	PAVM45
1082	PAVM58	1095	EA4 PAVM55	1107	EA4 PAVM45	1123	PAVM46
1083	PAVM59	1096	EA4 PAVM54	1108	EA4 PAVM44	1124	PAVM47
1084	PAVM60	1097	EA4 PAVM53	1109	EA4 PAVM43	1125	PAVM48
1085	PAVM61	1098	EA4 PAVM52	1110	EA4 PAVM42	1126	PAVM49
1086	PAVM62	1099	EA4 PC	1111	EA4 PAVM41	1127	PAVM50
				**	See Next Page	1128	PAVM51

# Site – Step by Step



Code	Desc
1112	EA4 PC
1113	EA4
1114	EA4 PT
1246	DTRE SZ6 \Maple
1247	DTRE SZ6 \Maple
1248	DTRE SZ6 \Maple
1249	GRAS
1250	GRAS

# Site – Step by Step



MAP VIEW

FILE VIEW DRAW COGO TOOLS

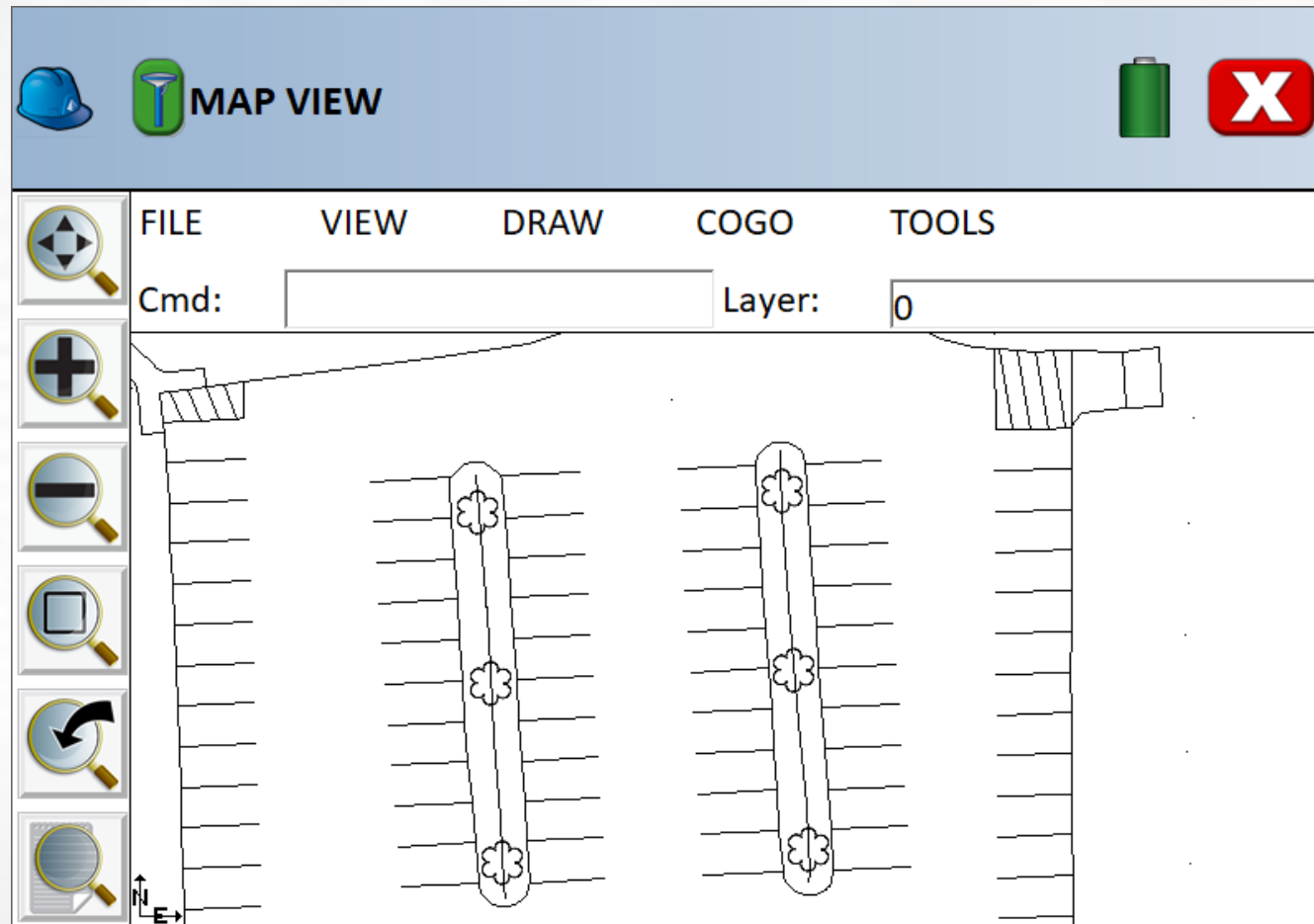
Cmd:  Layer:

↑  
E→

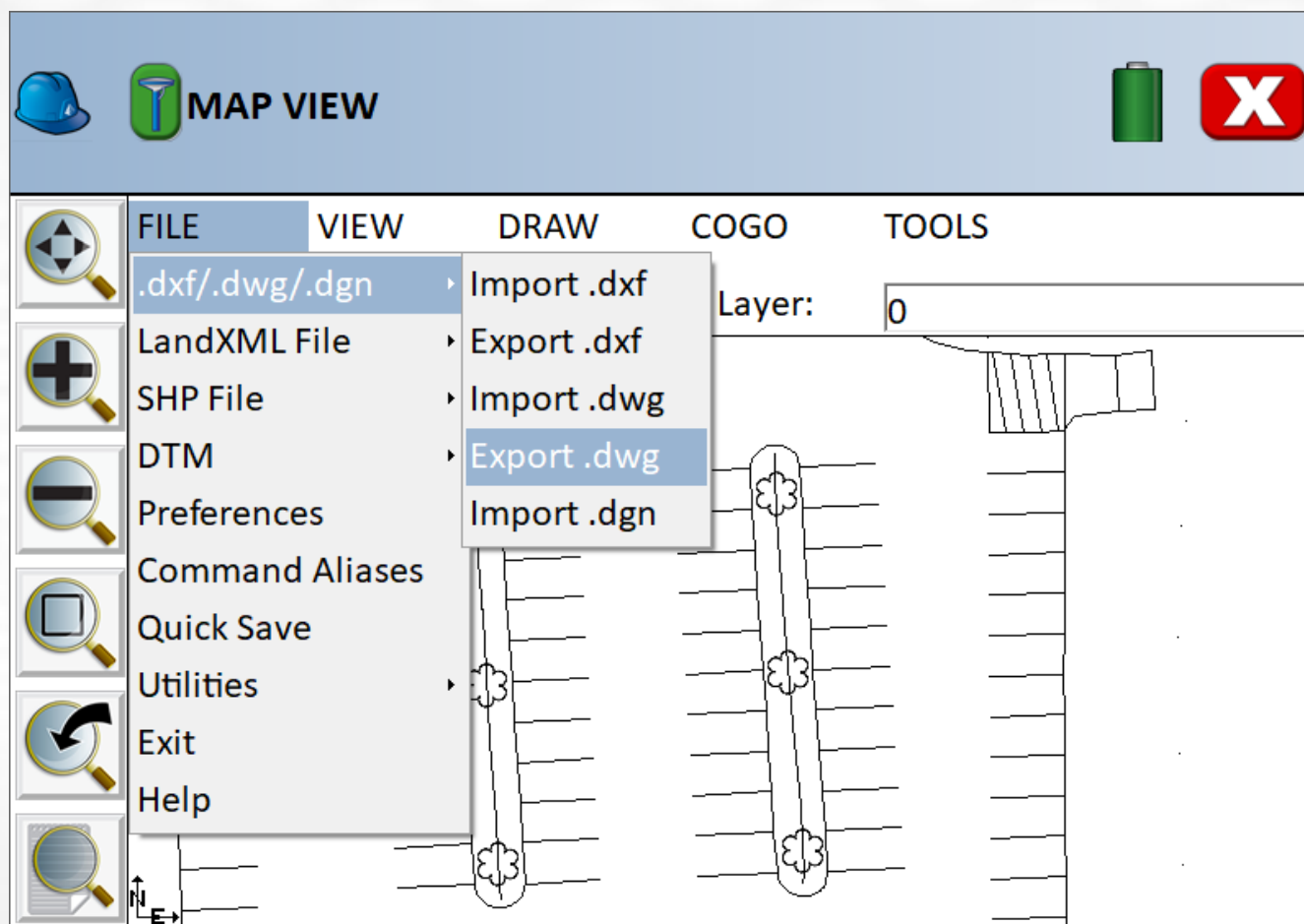
The image shows a software interface for a site plan. At the top, there is a title bar with a blue hard hat icon, a green surveying instrument icon, the text 'MAP VIEW', a green battery icon, and a red 'X' icon. Below the title bar is a menu bar with 'FILE', 'VIEW', 'DRAW', 'COGO', and 'TOOLS'. Under the menu bar, there are two input fields: 'Cmd:' followed by an empty text box, and 'Layer:' followed by a text box containing the number '0'. On the left side, there is a vertical toolbar with seven icons: a four-way arrow, a magnifying glass with a plus sign, a magnifying glass with a minus sign, a magnifying glass with a square, a magnifying glass with a circular arrow, and a magnifying glass with a document icon. The main area of the interface displays a site plan on a grid of 'x' marks. The plan features a large rectangular area with two smaller rectangular sections inside it, and curved lines connecting various points on the grid. At the bottom left of the main area, there are small icons for north-south and east-west directions.



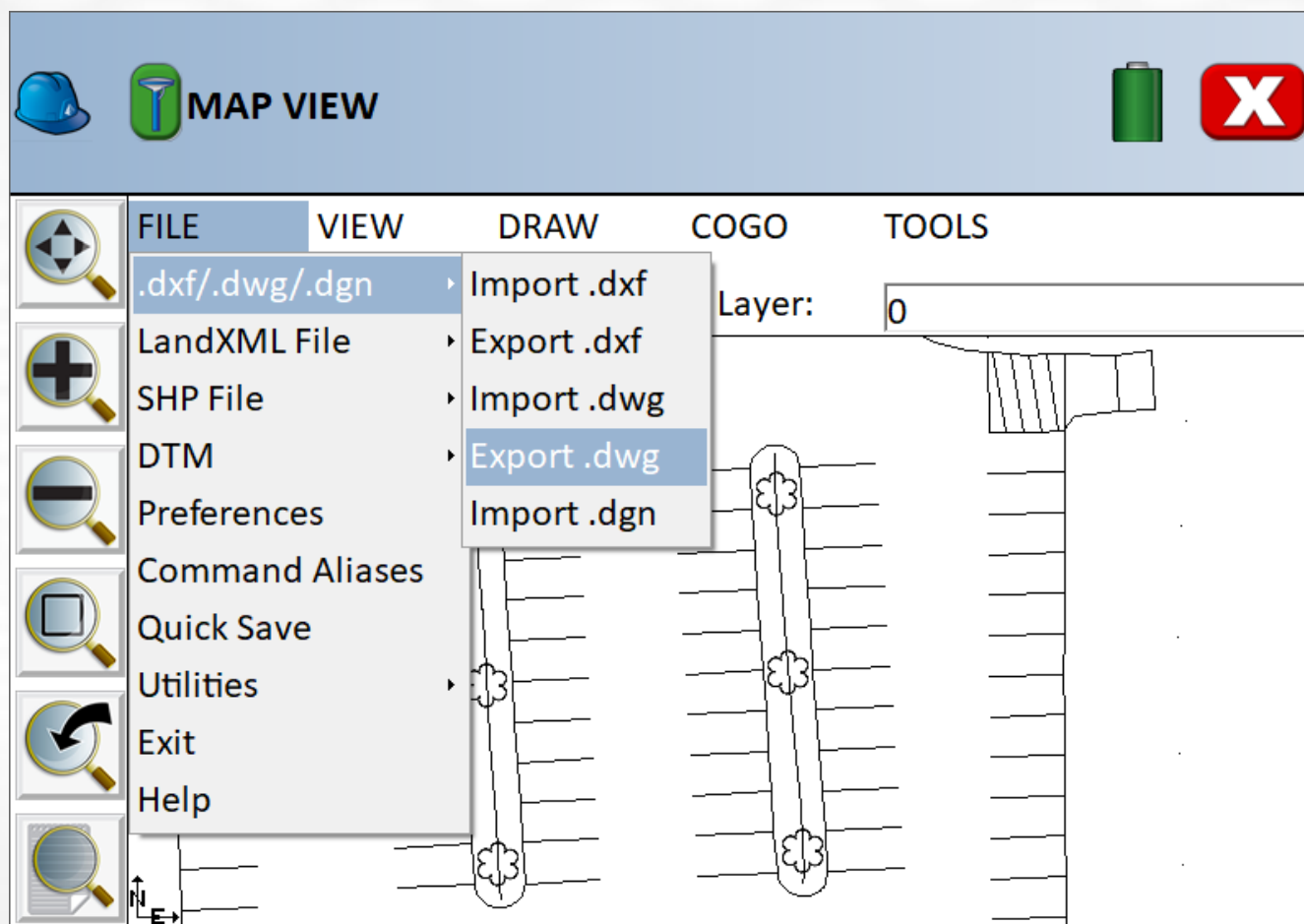
# Site – Step by Step



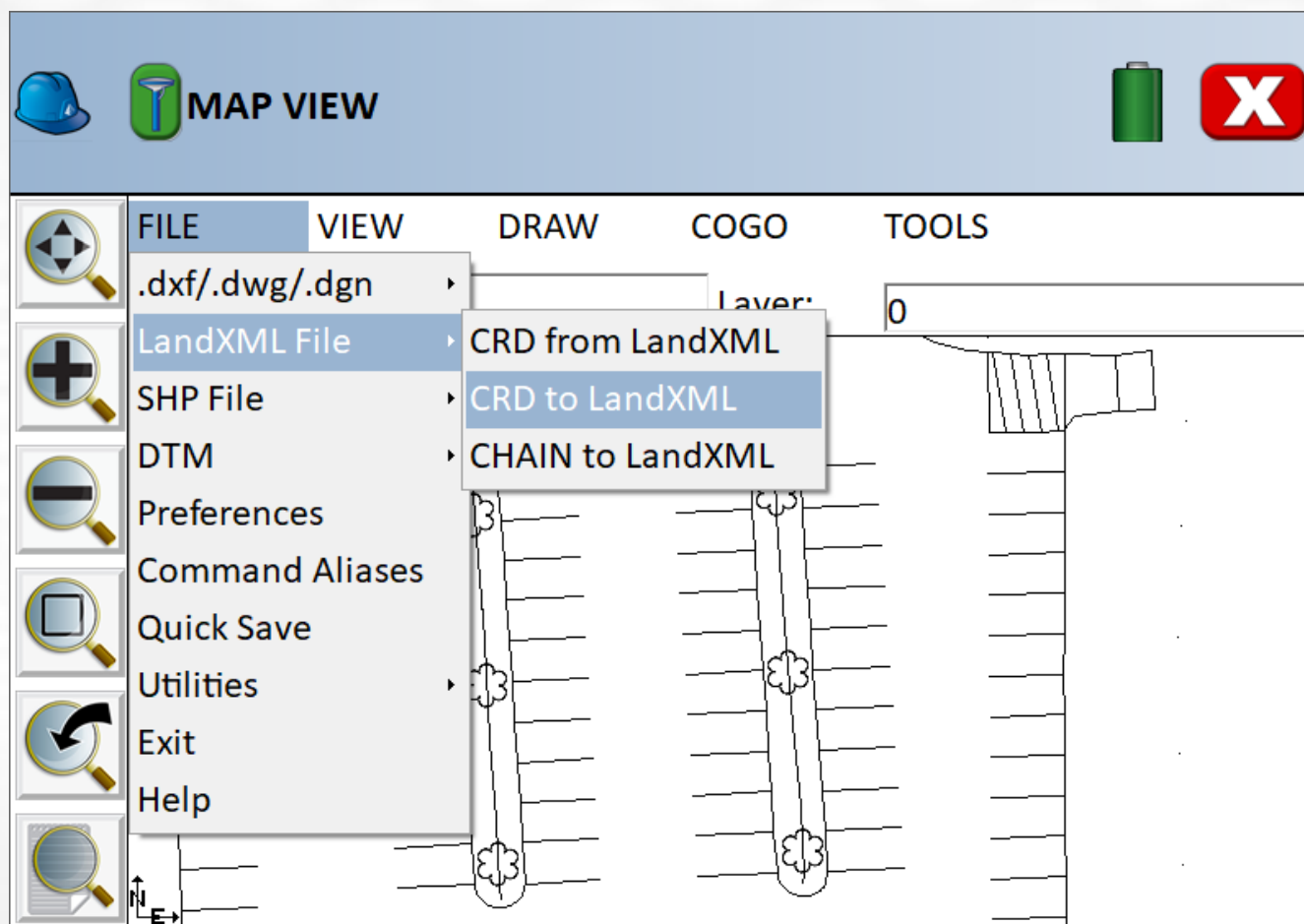
# Site – Step by Step



# Site – Step by Step



# Site – Step by Step



# Site – Step by Step






JOB:V-SITE		[Battery Icon] [Tools Icon] [Globe Icon]		
<u>F</u> ile	<u>E</u> quip	<u>S</u> urvey	<u>C</u> OGO	<u>R</u> oad
<u>1</u> Job		<u>6</u> Data Transfer		
<u>2</u> Job Settings		<u>7</u> Import/Export		
<u>3</u> Points		<u>8</u> Delete Job		
<u>4</u> Raw Data		<u>9</u> About Carlson SurvPC		
<u>5</u> Feature Code List		<u>0</u> Exit		


# Site – Step by Step



# Site – Step by Step



 **Export Ascii**  

File Type:  

Position Source

Geodetic (Lat/Lon/Hgt)

Export Grid (X/Y/Z)

Range:

Remove Arcs (offset cutoff):  ft

Linework  GIS

CONCEPTS

ROADS

SITE

AMALGAMATION





# AMALGAMATION



- Desire WisCRS – Dane County
- Draw F2F
- Make Existing Surface Model
- Export/Validate to Google Earth
- (optional) Integrate with Source LIDAR at [ftp://ftp.ssec.wisc.edu/pub/wisconsinview/lidar/Dane/Dane\\_2010\\_County\\_Delivery/Classified\\_LAS/LAS/](ftp://ftp.ssec.wisc.edu/pub/wisconsinview/lidar/Dane/Dane_2010_County_Delivery/Classified_LAS/LAS/)

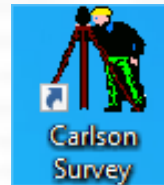
[lc2t80702f.las](#)

[lc2t80701f.las](#)

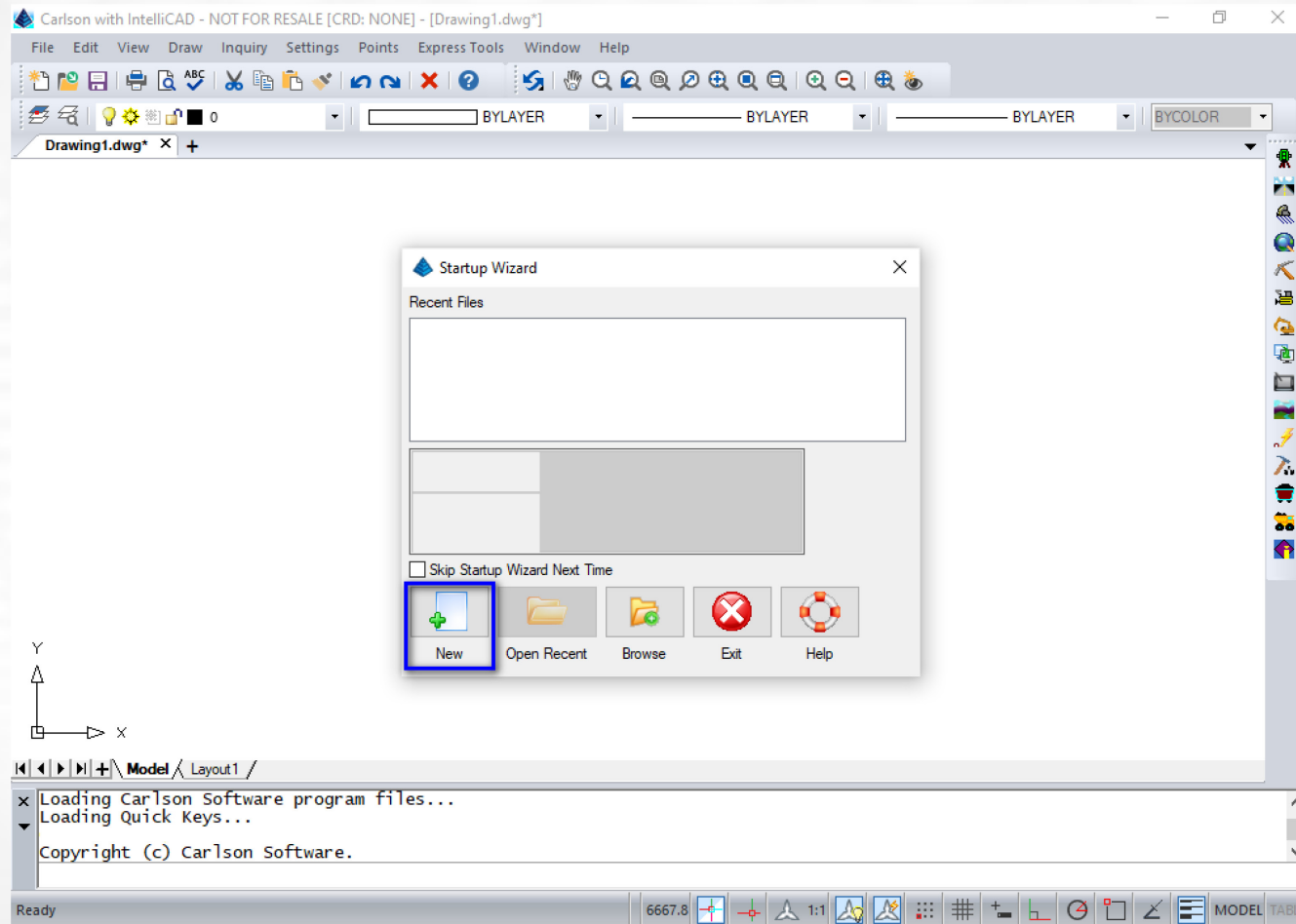
[lc2t80711f.las](#)

[lc2t80712f.las](#)

# AMALGAMATION



# AMALGAMATION



# AMALGAMATION



New Drawing Wizard ✕

A 3D CAD model of a mechanical assembly, possibly a bracket or a small machine component, rendered in yellow, red, and purple. It is shown in a perspective view within a software window.

The New Drawing Wizard enables you to set up a new drawing, configured to your needs.

You can use an existing drawing as a template, or create an entirely new drawing.

Drawing Type:

DWG    DGN    DSF

Use a template drawing

Create an entirely new drawing

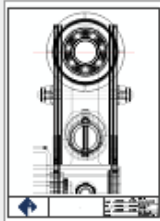
---

< Back   Next >   Cancel   Help

# AMALGAMATION



Template Drawings ✕



You can select an existing drawing to use as a template for your new drawing.

Select a template:

Carlson National CADD Standards-Survey.dwt ▾ Browse...

< Back Finish Cancel Help

# AMALGAMATION



Startup Drawing Wizard

NEW Drawing Name  C:\Carlson Projects\V-PROJ.dwg

Scale Settings

English 1in=?ft  Metric 1m=?m

Horizontal Scale

Symbol Plot Size  Drawing Units

Text Plot Size  Drawing Units

Coordinate System

USA/NAD83(2011)/Wisconsin (South)

Projection

Zone  Lat/Lon Datum

Skip Startup Wizard Next Time

# AMALGAMATION



Select Projection

System Name

OK Cancel **Add Pre-Defined** Add From File Add User-Defined Edit Remove

A screenshot of a software dialog box titled "Select Projection". The dialog box has a title bar with a close button (X) in the top right corner. Below the title bar, the text "System Name" is displayed above a large, empty rectangular text input field. At the bottom of the dialog box, there is a row of seven buttons: "OK", "Cancel", "Add Pre-Defined", "Add From File", "Add User-Defined", "Edit", and "Remove". The "Add Pre-Defined" button is highlighted with a blue rectangular border.

# AMALGAMATION



Select Projection

Region: USA COUNTY WI WISCRS

Zone:

- Adams County
- Ashland County
- Barron County
- Bayfield County
- Brown County
- Buffalo County
- Burnett County
- Calumet County
- Chippewa County
- Clark County
- Columbia County
- Crawford County
- Dane County**
- Dodge County
- Door County
- Douglas County
- Dunn County

OK Cancel



# AMALGAMATION



Select Projection

System Name

USA COUNTY WI WISCRS/Dane County

OK Cancel Add Pre-Defined Add From File Add User-Defined Edit Remove

A screenshot of a software dialog box titled "Select Projection". The dialog box has a standard Windows-style title bar with a close button (X) in the top right corner. Below the title bar, the text "System Name" is displayed above a list box. The list box contains a single entry, "USA COUNTY WI WISCRS/Dane County", which is highlighted with a blue background. At the bottom of the dialog box, there is a row of seven buttons: "OK", "Cancel", "Add Pre-Defined", "Add From File", "Add User-Defined", "Edit", and "Remove".

# AMALGAMATION



Startup Drawing Wizard

NEW Drawing Name  C:\Carlson Projects\V-PROJ.dwg

Scale Settings

English 1in=?ft  Metric 1m=?m

Horizontal Scale

Symbol Plot Size  Drawing Units

Text Plot Size  Drawing Units

Coordinate System

USA COUNTY WI WISCRS/Dane County

Projection

Zone  Lat/Lon Datum

Skip Startup Wizard Next Time

# AMALGAMATION



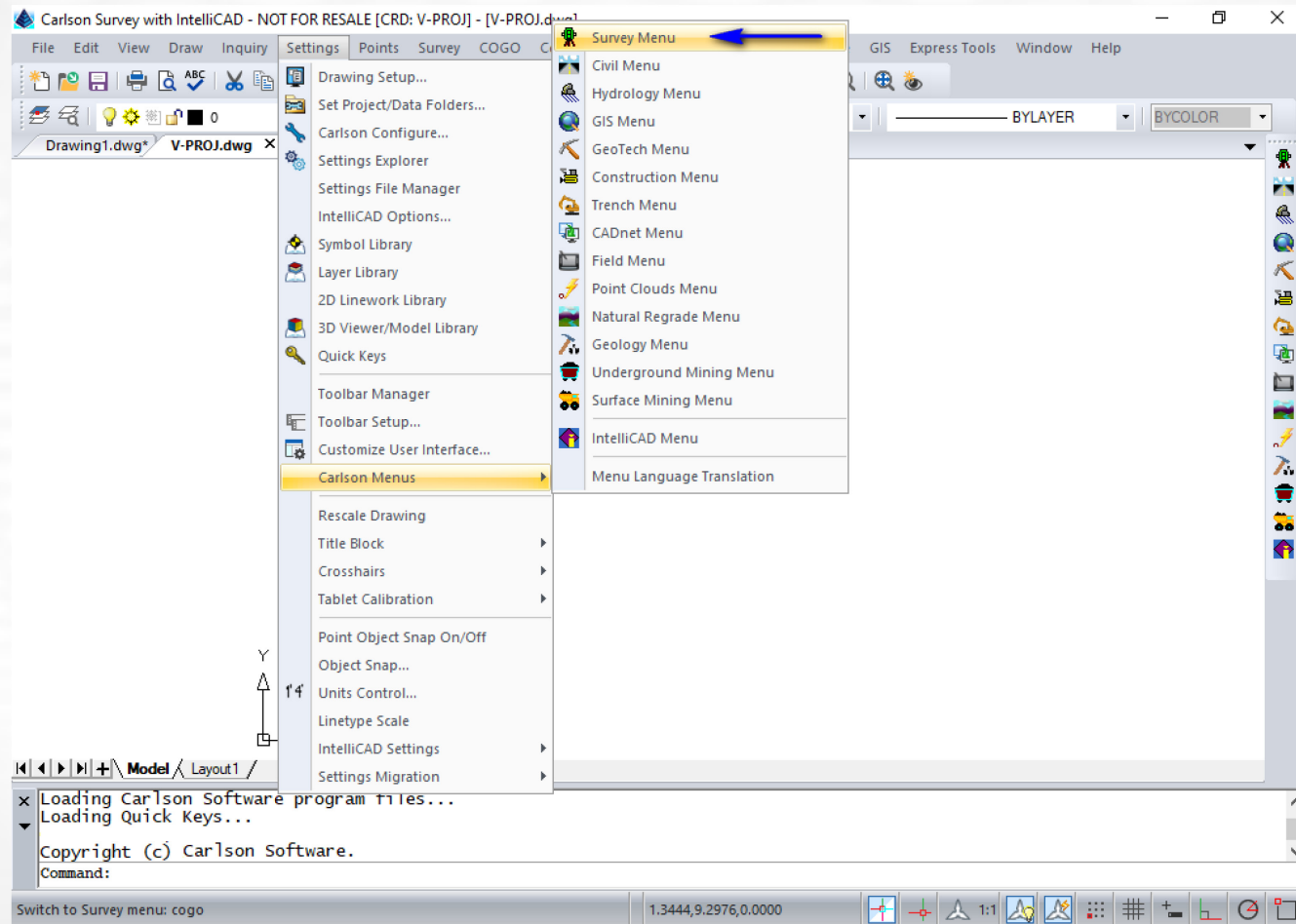
Startup Wizard Data Files ✕

Data Path  C:\Carlson Projects\  
CRD File  C:\Carlson Projects\V-PROJ.crd

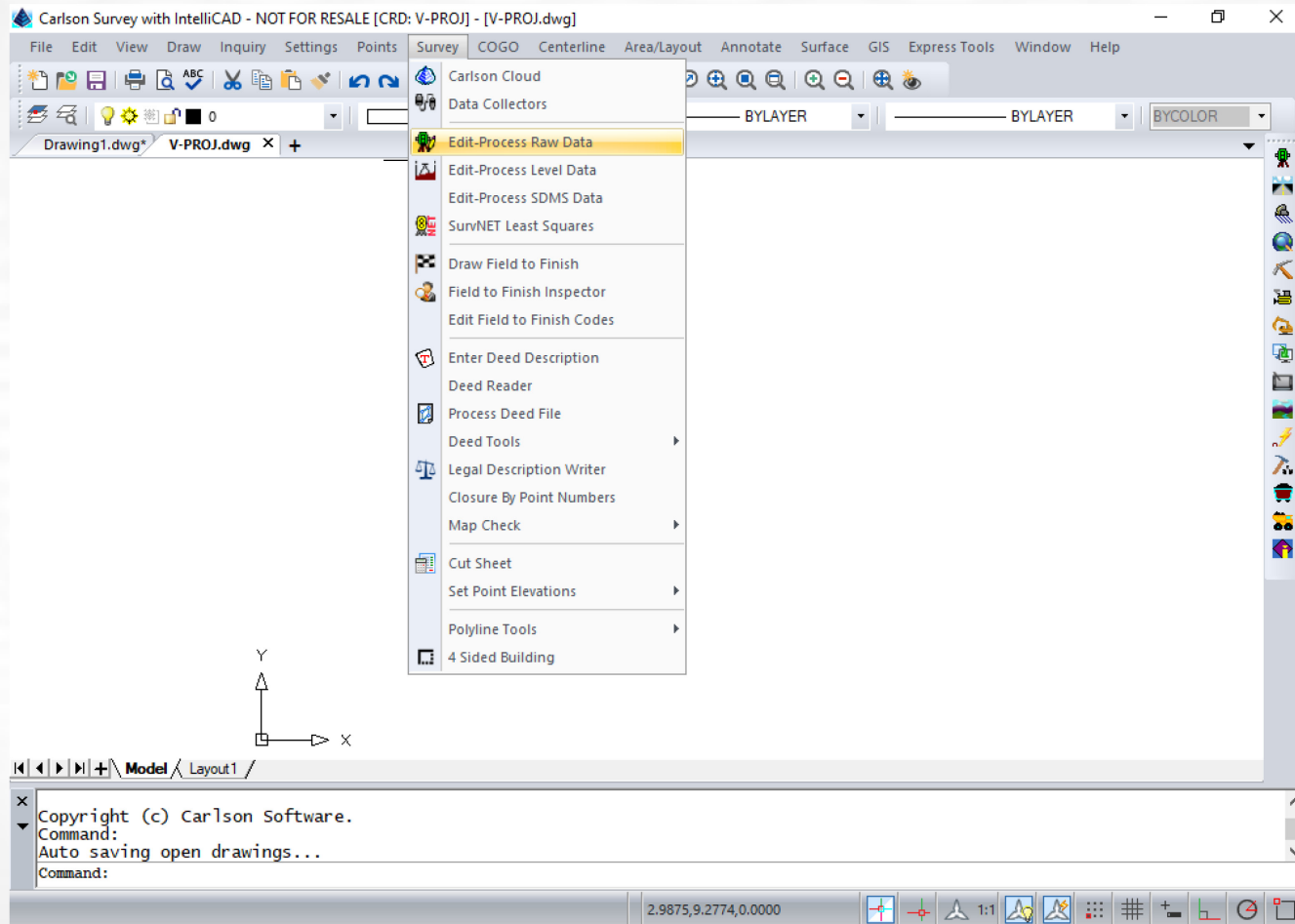
Coordinate File  
 New  Existing

Import Points From ...  
 Data Collector  Text/ASCII File  Current CRD File  None

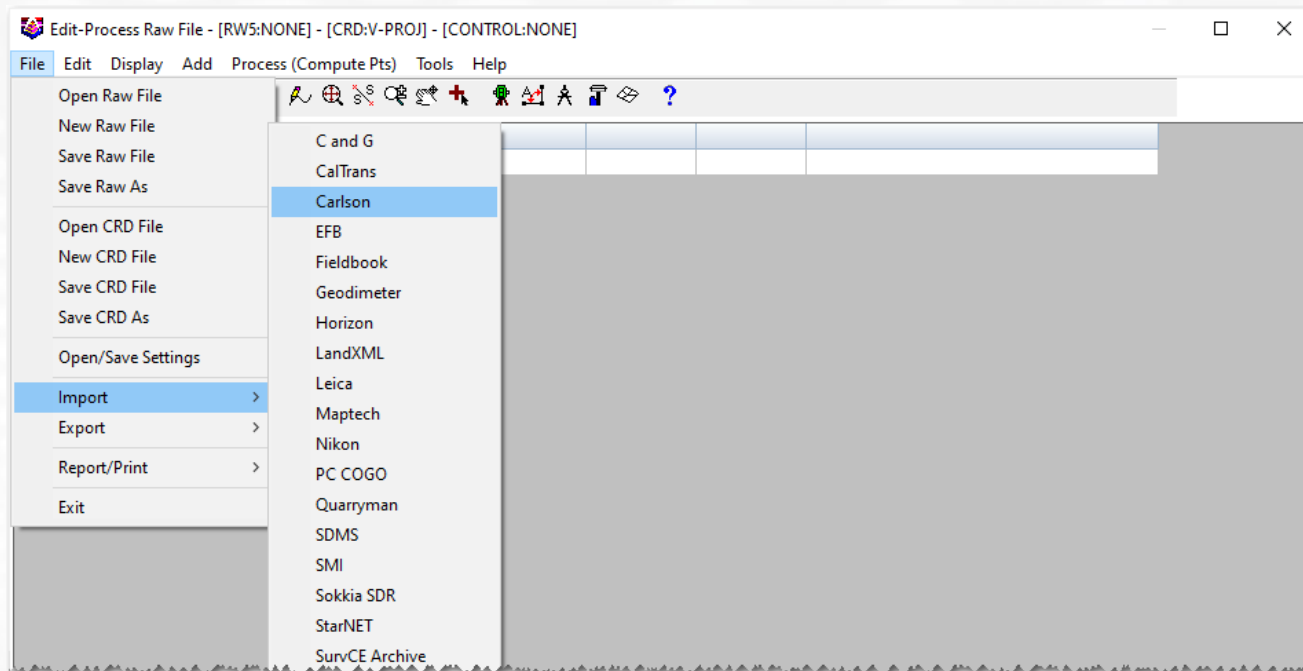
# AMALGAMATION



# AMALGAMATION



# AMALGAMATION



# AMALGAMATION



Raw File to Add - (rw5)

Folder: C:\Carlson Projects\

File Name: V-ROAD.rw5

Current Folder Files

File name	Size	Date
V-CTRL.rw5	5,308	12/19/2020 6:11:02 AM
V-ROAD.rw5	470,697	12/19/2020 6:48:16 AM
V-SITE.rw5	176,198	12/19/2020 11:34:48 AM

Recent Files

File name	Folder	Size	Date
-----------	--------	------	------

Subfolders

- Pictures\_V-ROAD
- Pictures\_V-SITE

Data Preview

File contains non-ASCII characters. No preview is available

Open Cancel Help





# AMALGAMATION



Raw File to Add - (rw5)

Folder: C:\Carlson Projects\

File Name: V-SITE.rw5

Current Folder Files

File name	Size	Date
V-CTRL.rw5	5,308	12/19/2020 6:11:02 AM
V-ROAD.rw5	470,697	12/19/2020 6:48:16 AM
V-SITE.rw5	176,198	12/19/2020 11:34:48 AM

Recent Files

File name	Folder	Size	Date
V-ROAD.rw5	C:\Carlson Projects\	470,697	12/19/2020 6:48:16 AM

Subfolders

- Pictures\_V-ROAD
- Pictures\_V-SITE

Data Preview

File contains non-ASCII characters. No preview is available

Open Cancel Help

# AMALGAMATION



Edit-Process Raw File - [RW5:NONE] - [CRD:V-PROJ] - [CONTROL:NONE]

File Edit Display Add Process (Compute Pts) Tools Help

Direct-Reverse Report  
Reduce Direct-Reverse  
Update Raw from Points  
Find Bad Angle  
Append Another Raw File  
Draw Traverse-SideShot Lines  
Renumber Points  
Control Coordinates >  
Point Groups >

Set Control Coordinate File  
List Control Coordinates  
Edit Control Coordinates

1			
2		Note	
3	DS	JB,NMWSLS2018-ROAD,DT1	
4	DS	MO,AD0,UN2,SF1.00000000	
5	DS	SurvPC Version 5.05	
6	DS	CRD: Alphanumeric	
7	DS	WI South NAD83	
8	DS	JAOperator:LEN	
9	DS	JAWeather:Cloudy, 70 deg	
10	DS	JACounty:Dane Co, WI	
11	DS	DT10-02-2017	
12	DS	TM10:57:51	
13	DS	Equipment: Carlson, BRx6, SN:D155009919029, FW:5.3Aa13,4.07,1.8.160805	
14	DS	Localization File: None	
15	DS	Geoid Separation File: C:\Program Files (x86)\Carlson SurvPC\userdata\geoids\ContinentalUS_NGS2012B.grd N24	
16	DS	Grid Adjustment File: None	
17	DS	GPS Scale: 1.00000000	
18	DS	Scale Point not used	
19	DS	DT10-02-2017	
20	DS	TM10:57:51	
21	DS	Entered Base HR: 4.9000 ft, Vertical	

# AMALGAMATION



Control Coordinate File to Read (Cancel for none) - (crd;crdb;cg;mdb;zak)

Folder: C:\Carlson Projects\

File Name: V-CTRL.crd

Current Folder Files

File name	Size	Date
V-CTRL.crd	236	12/19/2020 6:11:02 AM
V-PROJ.crd	104	12/19/2020 8:20:56 PM
V-ROAD.crd	59,504	2/21/2019 10:34:34 AM
V-SITE.crd	21,884	1/24/2018 6:23:22 PM

Recent Files

File name	Folder	Size	Date
V-PROJ.crd	C:\Carlson Projects\	104	12/19/2020 8:20:56 PM

Subfolders

- Pictures\_V-ROAD
- Pictures\_V-SITE

Data Preview

Carlson Alphanumeric Coordinate File  
Point range: 1-11  
Number of points: 2  
Job Description>  
Job Number> 0.000, Job Date> 10-02-2017

Open Cancel Help

# AMALGAMATION



Edit-Process Raw File - [RW5:NONE] - [CRD:V-PROJ] - [CONTROL:V-CTRL]

File Edit Display Add Process (Compute Pts) Tools Help

No Adjust  
Angle Balance  
Compass  
Crandall  
Transit  
Least-Squares >  
Stadia  
GPS  
Process Settings

1		
2		Note
3	DS	JB,NM
4	DS	MO,AD
5	DS	SurvP
6	DS	CRD: J
7	DS	WI So
8	DS	JAOp
9	DS	JAWes
10	DS	JACounty:Dane Co, WI
11	DS	DT10-02-2017
12	DS	TM10:57:51
13	DS	Equipment: Carlson, BRx6, SN:D155009919029, FW:5.3Aa13,4.07,1.8.160805
14	DS	Localization File: None
15	DS	Geoid Separation File: C:\Program Files (x86)\Carlson SurvPC\userdata\geoids\ContinentalUS_NGS2012B.grd N24
16	DS	Grid Adjustment File: None
17	DS	GPS Scale: 1.00000000
18	DS	Scale Point not used
19	DS	DT10-02-2017
20	DS	TM10:57:51
21	DS	Entered Base HR: 4.9000 ft, Vertical

# AMALGAMATION



Process Settings

Multiple Measurement Settings

Distance Tolerance Horizontal  Vertical

Report Residuals

Average Type

Distance Measurements  Coordinates

Backsight Orientation Settings

Override Backsight Azimuth When Have Backsight Coordinate File

Use Multiple References  Apply Collimation

Check Point Settings

Report Check Points Check Point Code(s)

Distance Tolerance Horizontal  Vertical

Store Point Records

Store Point Records To CRD File

Report Store Pts  Hold Store Pts  Convert OC to PT Records

Angle Only Measurements

Combine Elevations Method

Instrument/Rod Height Ranges

Instrument Height Min  Max

Rod Height Min  Max

Direct-Reverse Settings

Direct-Reverse Vertical Angles

Balance Direct-Reverse  Direct Only

Foresight-Backsight Measurements

Balance Foresight-Backsight  Foresight Only

Horizontal Angle Tolerance (Seconds)

Flip Angle Tolerance (Seconds)

Distance Tolerance

Measurements To Control Pts

Store To Current Coordinate File

Drawing Points and Linework

Draw By Field To Finish

OK Cancel Help

# AMALGAMATION



Edit-Process Raw File - [RW5:NONE] - [CRD:V-PROJ] - [CONTROL:V-CTRL]

File Edit Display Add Process (Compute Pts) Tools Help

No Adjust  
Angle Balance  
Compass  
Crandall  
Transit  
Least-Squares >  
Stadia  
GPS  
Process Settings

1		
2		Note
3	DS	JB,NM
4	DS	MO,AD
5	DS	SurvP
6	DS	CRD: J
7	DS	WI So
8	DS	JAOp
9	DS	JAWes
10	DS	JACounty:Dane Co, WI
11	DS	DT10-02-2017
12	DS	TM10:57:51
13	DS	Equipment: Carlson, BRx6, SN:D155009919029, FW:5.3Aa13,4.07,1.8.160805
14	DS	Localization File: None
15	DS	Geoid Separation File: C:\Program Files (x86)\Carlson SurvPC\userdata\geoids\ContinentalUS_NGS2012B.grd N24
16	DS	Grid Adjustment File: None
17	DS	GPS Scale: 1.00000000
18	DS	Scale Point not used
19	DS	DT10-02-2017
20	DS	TM10:57:51
21	DS	Entered Base HR: 4.9000 ft, Vertical

# AMALGAMATION



**GPS Settings** [Close]

Projection Type: More Pre-Defined/User-Defined [v]

Zone: [v]

User System: USA COUNTY WI WISCRS/Dane County [Setup]

Use Alignment File For Localization

Horizontal Transformation: Plane Similarity [v]

Vertical Transformation: Tilted Plane [v]

One Point Alignment Azimuth: State Plane Grid [v]

Two Point Align Method: Fit & Rotate [v]

Geoid To Apply: USA (Geoid18) [v]

Project Scale Factor: 1.000000000

Decimals for Report: 0.000 [v] Units: US Feet [v]

Multiple Measurement To Same Point: Use Last [v]

Point Protect  Create Point Notes [Note Setup]

Use Report Formatter

[OK] [Cancel] [Help]

# AMALGAMATION



## Process GPS Results

### Raw File:

Coordinate File: C:\Carlson Projects\V-PROJ.crd  
Projection: USA COUNTY WI WISCRS/Dane County  
Geoid: GEOID 2018  
Alignment File: NONE

Point No.	Latitude Northing	Longitude Easting	GPS Z(m) Elevation	Rod Height Description	Geoid
1	43°11'23.24502"	-89°37'18.21173"	253.364	5.333	-113.038
1	524847.029	757790.873	938.951	GPS /Ron Ripp	GPS

GS,PN1,N 433869.9436,E 2069378.3872,EL938.9055,--GPS /Ron Ripp GPS

Base Configuration by Entering Latitude and Longitude

DT10-02-2017

TM10:58:18

Entered Base HR: 4.9000 ft, Vertical

Antenna Type: [HEMS321 NONE],RA0.0730m,SHMP0.1050m,L10.1319m,L20.1389m,--Integrated GNSS an

GS,PNO,N 433869.9436,E 2069378.3872,EL938.9055,--Base

GT,PNO,SW1969,ST143807000,EW1969,ET143807000

Antenna Type: [HEMS321 NONE],RA0.0730m,SHMP0.1050m,L10.1319m,L20.1389m,--Integrated GNSS an

RTK Method: Auto, Device: Internal UHF

Entered Rover HR: 6.5617 ft, Vertical

101 43°11'44.32121" -89°37'14.80426" 251.961 6.994 -113.080

101 526980.411 758048.367 932.728 EAO

GS,PN101,N 436004.8388,E 2069621.1000,EL932.6797,--EAO

GT,PN101,SW1969,ST145146400,EW1969,ET145146400

HRMS:0.013, VRMS:0.022, STATUS:FIXED+, SATS:15, AGE:1.0, PDOP:1.423, HDOP:0.709, VDOP:1.235, TDOP:0

DT10-02-2017

TM11:19:02

102 43°11'44.38584" -89°37'14.42832" 251.992 6.994 -113.081

102 526986.889 758076.232 932.831 EAO EA2 PC

GS,PN102,N 436011.5084,E 2069648.9164,EL932.7826,--EAO EA2 PC

GT,PN102,SW1969,ST145213800,EW1969,ET145213800

HRMS:0.015, VRMS:0.025, STATUS:FIXED+, SATS:15, AGE:2.0, PDOP:1.424, HDOP:0.709, VDOP:1.235, TDOP:0

DT10-02-2017



# AMALGAMATION



Edit-Process Raw File - [RWS:NONE] - [CRD:V-PROJ] - [CONTROL:V-CTRL]

File Edit Display Add Process (Compute Pts) Tools Help


- Open Raw File
- New Raw File
- Save Raw File
- Save Raw As
- Open CRD File
- New CRD File
- Save CRD File
- Save CRD As
- Open/Save Settings
- Import >
- Export >
- Report/Print >
- Exit

2018-ROAD,DT10-02-2017,TM10:52:49  
,SF1.00000000,ECO,E00.0,AU0  
ion 5.05  
umeric  
AD83  
LEN  
Cloudy, 70 deg  
ane Co, WI  
17  
Carlson, BRx6, SN:D155009919029, FW:5.3Aa13,4.07,1.8.160805  
File: None

15	DS	Geoid Separation File: C:\Program Files (x86)\Carlson SurvPC\userdata\geoids\ContinentalUS_NGS2012B.grd N24
16	DS	Grid Adjustment File: None
17	DS	GPS Scale: 1.00000000
18	DS	Scale Point not used
19	DS	DT10-02-2017
20	DS	TM10:57:51
21	DS	Entered Base HR: 4.9000 ft, Vertical

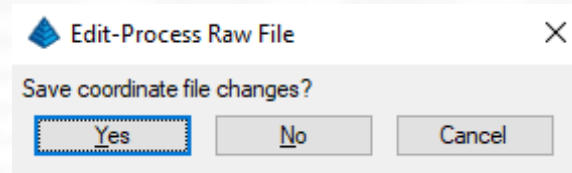
# AMALGAMATION



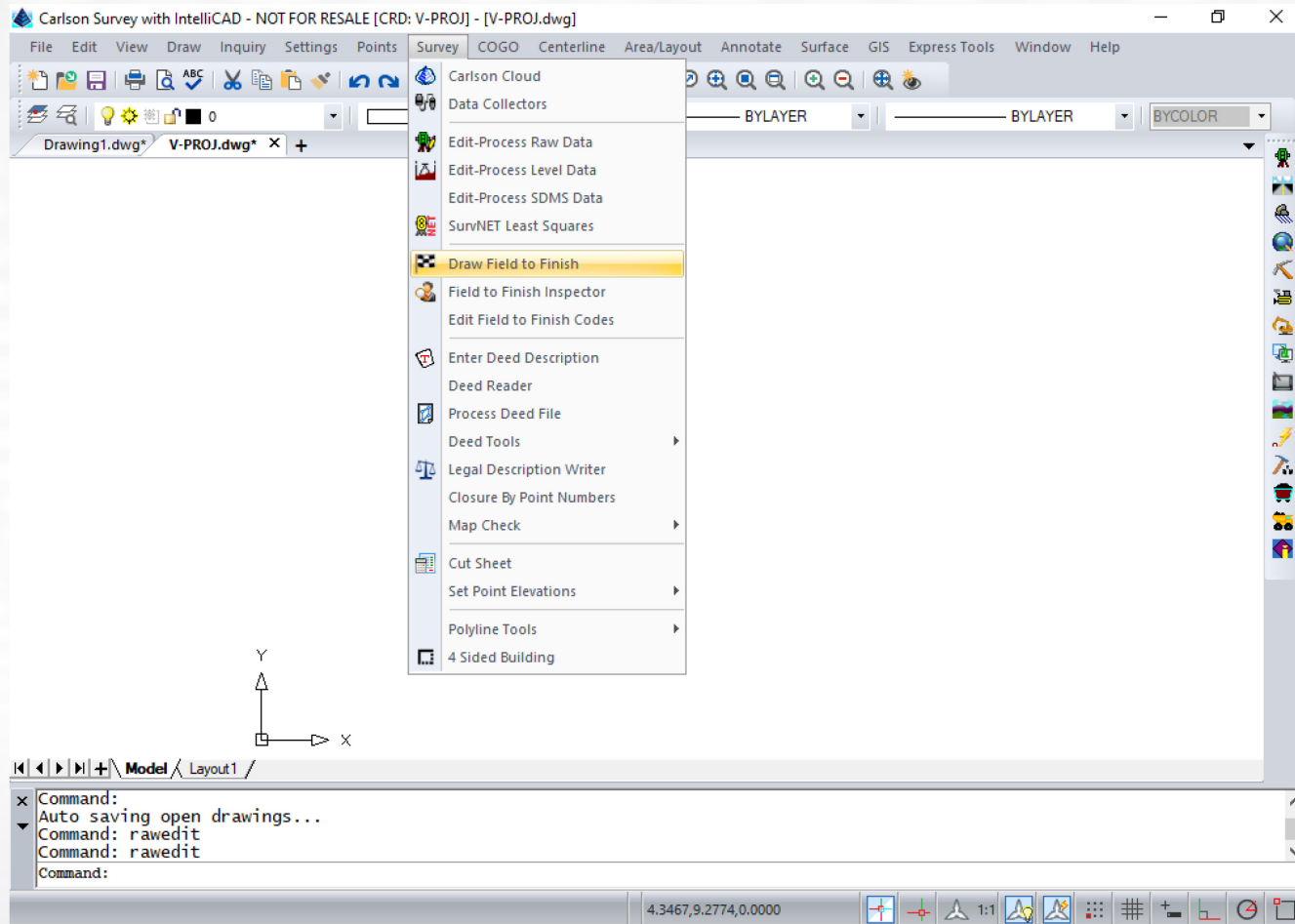
 Edit-Process Raw File ✕

Save raw data changes to RW5 file?

# AMALGAMATION



# AMALGAMATION



# AMALGAMATION



Possible Multiple Codes Found ✕

Multiple codes may have been found on a single point.

Point#:	102
Description:	EA0 EA2

Split all multiple codes  
 Split no multiple codes  
 Split this one for now  
 Don't split this one

OK

# AMALGAMATION



**Draw Field to Finish** [Close]

**Draw Options**  
Highest point number: 1330  
Range of Points:

**Entities to Draw**  
 Points  Lines  Symbols  3D Faces

**Draw within**  
 Polyline  Distance  Window/Coordinate Range

Layer Prefix:

Erase Existing Field to Finish Entities  Erase In Range  
 Preview Only  Fix Overlaps

Code Table: C:\Carlson Projects\Settings\WI\_DOT.fld   
Coordinate File: C:\Carlson Projects\V-PROJ.crd   
GIS Table:

# AMALGAMATION



**Draw Field to Finish** [Close]

**Draw Options**  
Highest point number: 1330  
Range of Points:

**Entities to Draw**  
 Points  Lines  Symbols  3D Faces

**Draw within**  
 Polyline  Distance  Window/Coordinate Range

Layer Prefix:

Erase Existing Field to Finish Entities  Erase In Range  
 Preview Only  Fix Overlaps

Code Table: C:\Carlson Projects\Settings\WI\_DOT.fld   
Coordinate File: C:\Carlson Projects\V-PROJ.crd   
GIS Table:

# AMALGAMATION



Field to Finish

DATA:C:\Carlson Projects\W-PROJ.crd, CODE:C:\Carlson Projects\Settings\WI\_DOT.fld

Field Code Definitions

	Code	Full Name	Description	Symbol	Entity Type	Layer	Attr ID
Edit	ASPH		ASPH	SPT0	3D and 2D	V-ROAD-ASPH	5
Edit	BERM		BERM	SPT0	3D Polyline	V-BRKL	5
Edit	BLDG		BLDG	SPT0	2D Polyline	V-BLDG-OTLN	5
Edit	BSL	BSL	BSL	SPT0	3D and 2D	V-BRKL-BOTB	5
Edit	CL	EXISTING CENTERLINE	CL	SPT0	3D and 2D	V-ROAD-CNTR	5
Edit	CP	CONTROL POINT (HCPT)	CP	SPT8	Points Only	V-CTRL-HCPT	5
Edit	CULV	CULV	CULV	SPT0	2D Polyline	V-STRM-UNDR	5
Edit	DTCH	DTCH	DTCH	SPT0	3D and 2D	V-DTCH-CNTR	5
Edit	DTRE		DTRE	TREE8	Points Only	V-NODE-TREE	5
Edit	EA		EA	SPT0	3D and 2D	V-ROAD-ASPH	5
Edit	FL	FL	FL	SPT0	3D and 2D	V-BRKL-FLOW	5
Edit	GPS	GPS	GPS	SPT0	Points Only	V-NODE-CNTL	5

Categories: NCS, Unassigned, All

Code Table: Code Table Settings, Sort Table, Report Codes/Points, Code Table by Points, Save, Save As

Code Definitions: Edit, Column Options, Select All, Move Category, Add, Copy, Delete, Search, Move Up, Move Down

Feature Settings: Tree Setup, Pipe Setup, Edit Points, Help, Exit



# AMALGAMATION



**Code Table Settings** [Close]

Code File:  [Set]

Coding Method:  
 Process Carlson Coding  
 Process LandXML Coding  
 Process Eagle Point Coding  
 Process SDMS Coding  
 Process CAICE Coding

Split Multiple Codes:  All  None  Prompt

Use Multiple Codes:  [v]

Import SurvCE Codes	Export SurvCE Codes
Import Trimble Codes	Import Eagle Point Codes
Import Land Desktop Desc Keys	Import TDS Codes
Import C&G Description Table	Import Topcon Codes
Import Civil3D Codes	Merge Code File
Import GIS Feature Codes	Import EFB Codes
Spreadsheet Editor	Import Text/ASCII Codes

Draw Field Codes Without a Suffix as Points Only  
 Stop Linework At Gap In Point Numbers

Max Delta-Height for Linework:   
Max Length for Linework:   
Default Distinct Point Layer: Prefix  Suffix

Skip 1st/2nd Symbol Control When Missing 3rd Control  
 Skip Multiple Z Labels For Linework At Same Z  
 Stop Linework For Different Point Groups

Use MText for Linework Descriptions  
Z Tolerance:  Distance Tolerance:   
Point Group Filter:

Use Preceding Special Codes  Interpolate No Elevation Points for 3D Polylines

# AMALGAMATION



**Special Codes**

**General Special Codes**

NE Code (No Elevation)	<input type="text" value="NE"/>	NOS Code (Non-Surface)	<input type="text" value="NOS"/>
YZ Code (Yes Elevation)	<input type="text" value="YZ"/>	ZO Code (Elevation Only)	<input type="text" value="ZO"/>
\ Character (Prefix Description)	<input type="text" value="\"/>	\\ Code (Prefix Field Code Desc)	<input type="text" value="\\"/>
/ Character (Append Description)	<input type="text" value="/"/>	// Code (Append Field Code Desc)	<input type="text" value="//"/>
Bar Separator (End Coding)	<input type="text" value=" "/>	/// Separator (Replace Desc)	<input type="text" value="///"/>
Code Separator (Space)	<input type="text" value=""/>	MULT Code (Multiple Field Code)	<input type="text" value="MULT"/>

Substitute Characters    + (Plus)     - (Minus)     \* (Asterisk)     \_ (Underscore)

**Point Symbol/Attribute Special Codes**

ROT Code (Rotate)	<input type="text" value="ROT"/>	SZ Code (Symbol Size)	<input type="text" value="SZ"/>
AZI Code (Azimuth)	<input type="text" value="AZI"/>	DIST Code (Distance)	<input type="text" value="DIST"/>
Multi-Point 2ND Code	<input type="text" value="2ND"/>	Multi-Point 3RD Code	<input type="text" value="3RD"/>
PHOTO Code	<input type="text" value="PHOTO"/>	LABEL Code	<input type="text" value="LABEL"/>
COLOR Code	<input type="text" value="COLOR"/>		

PHOTO Link     Carlson     Hyperlink    OFB Offset Width     Double     Split

2-Point Circle     Radius     Diameter     Append Desc Auto Space

**Linework Special Codes**

BEG Code (Begin Linework)	<input type="text" value="BEG"/>	END Code (End Linework)	<input type="text" value="END"/>
PC Code (Start Curve)	<input type="text" value="PC"/>	PT Code (End Curve)	<input type="text" value="PT"/>
CTOG Code (Curve Toggle)	<input type="text" value="CTOG"/>	NEAR Code (Nearest Found)	<input type="text" value="NEAR"/>
CLO Code (Close)	<input type="text" value="CLO"/>	RECT Code (Close Rectangular)	<input type="text" value="RECT"/>
OH Code (Offset Horiz)	<input type="text" value="OH"/>	OV Code (Offset Vertical)	<input type="text" value="OV"/>
OFL Code (Offset Left)	<input type="text" value="OFL"/>	OFB Code (Offset Both L/R)	<input type="text" value="OFB"/>
CIR Code (Circle)	<input type="text" value="CIR"/>	JPN Code (Join to Point Name)	<input type="text" value="JPN"/>
SMO Code (Smooth)	<input type="text" value="SMO"/>	JOG Code (Extend By Distance)	<input type="text" value="JOG"/>
GAP Code (Gap)	<input type="text" value="GAP"/>	LTF Code (Linetype Flip)	<input type="text" value="LTF"/>
AFIT Code (Fit Arc)	<input type="text" value="AFIT"/>	LTW Code (Linetype Width)	<input type="text" value="LTW"/>
BFIT Code (Best-Fit Line)	<input type="text" value="BFIT"/>	RAMP Code (Curb Ramp)	<input type="text" value="RAMP"/>
XSCT Code (Template)	<input type="text" value="XSCT"/>	PARKING Code (Parking)	<input type="text" value="PARKING"/>

**3D Face Special Codes**

FACE3D Code (3D Face)	<input type="text" value="FACE3D"/>	HOLE3D Code (3D Hole)	<input type="text" value="HOLE3D"/>
BLOCK3D Code (3D Block)	<input type="text" value="BLOCK3D"/>	WALL3D Code (3D Wall)	<input type="text" value="WALL3D"/>

OK    Cancel    Help    Load Default

# AMALGAMATION



**Draw Field to Finish**

**Draw Options**  
Highest point number: 1330  
Range of Points:

**Entities to Draw**  
 Points  Lines  Symbols  3D Faces

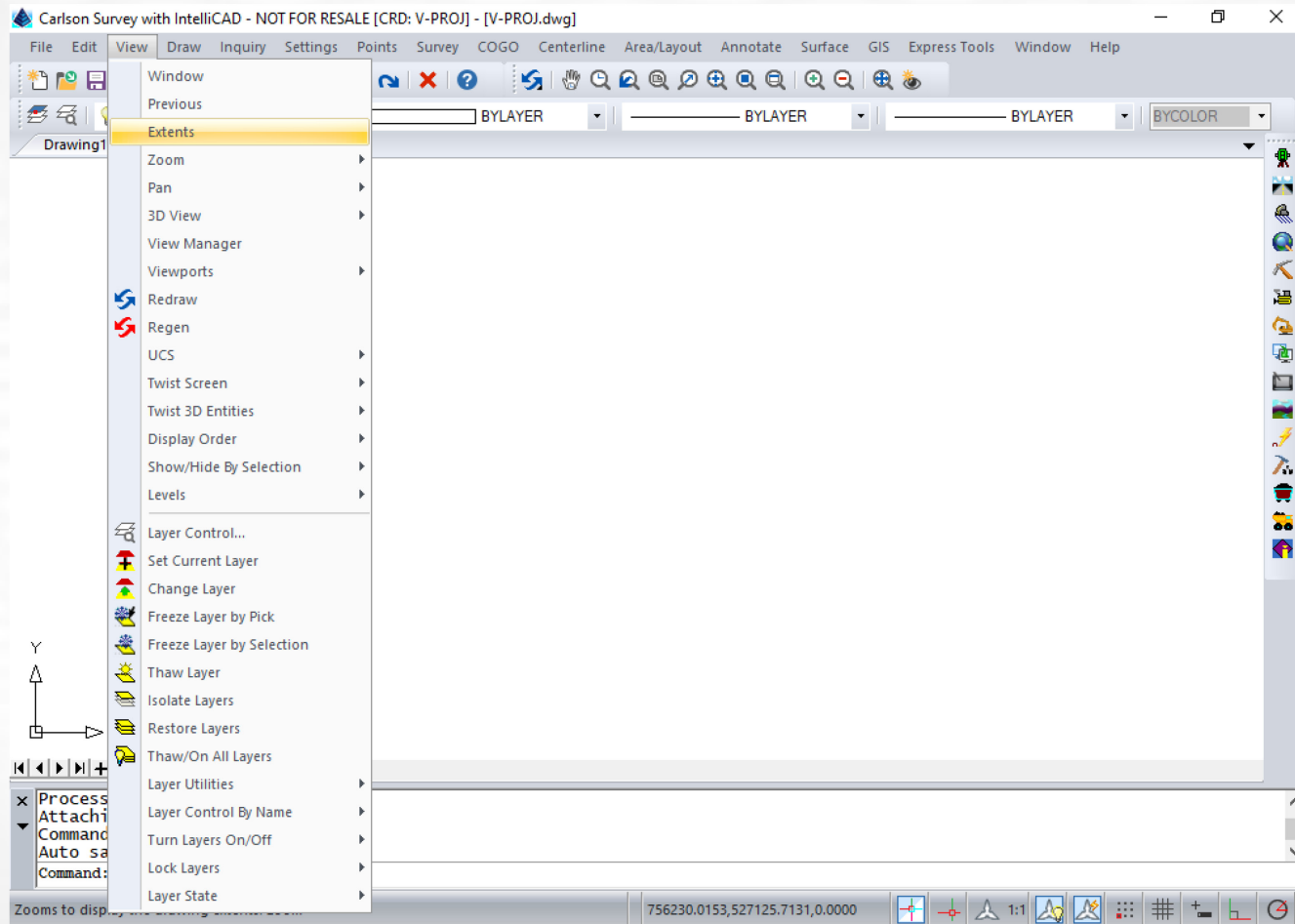
**Draw within**  
 Polyline  Distance  Window/Coordinate Range

Layer Prefix:

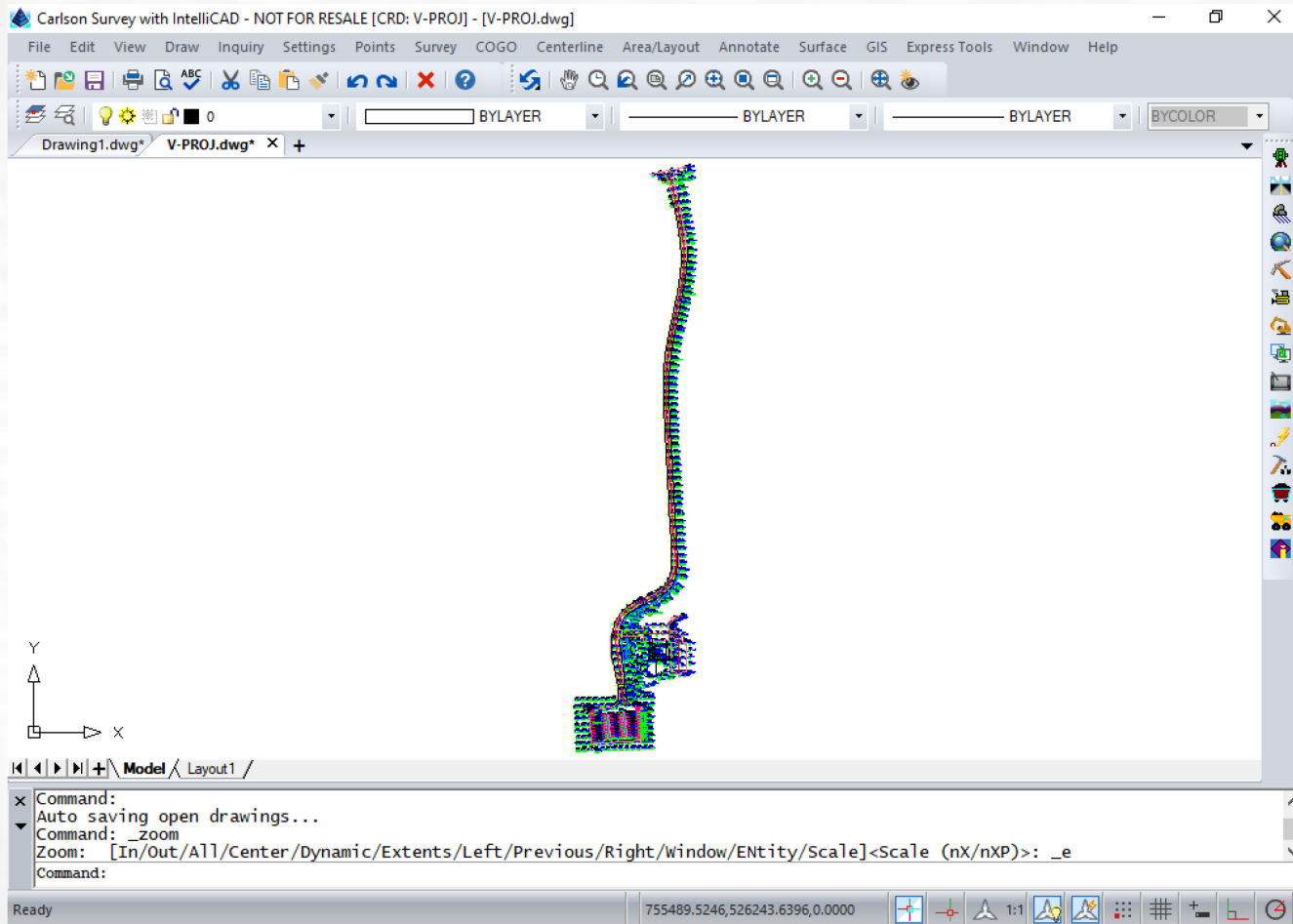
Erase Existing Field to Finish Entities  Erase In Range  
 Preview Only  Fix Overlaps

Code Table: C:\Carlson Projects\Settings\WI\_DOT.fld   
Coordinate File: C:\Carlson Projects\V-PROJ.crd   
GIS Table:

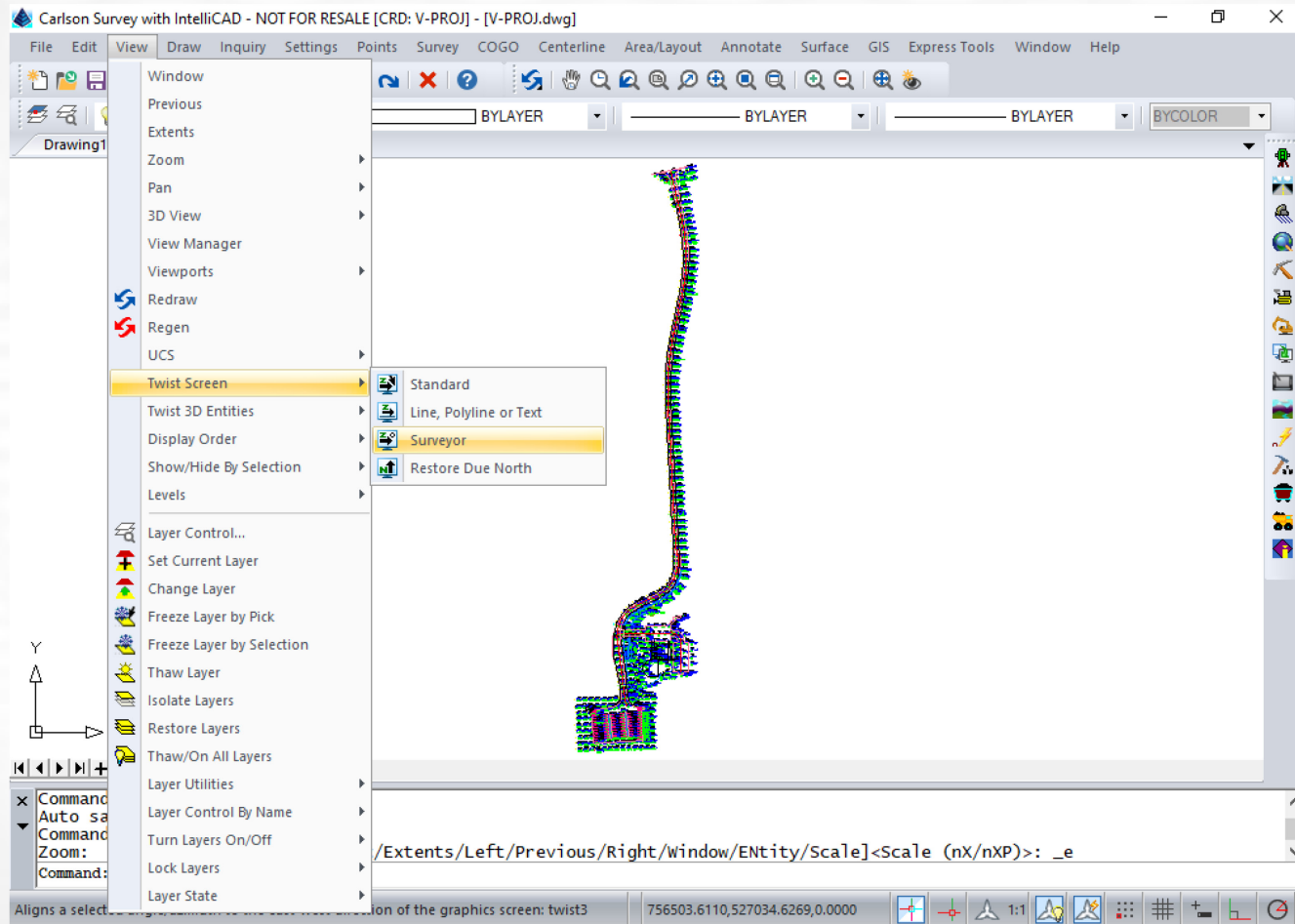
# AMALGAMATION



# AMALGAMATION



# AMALGAMATION



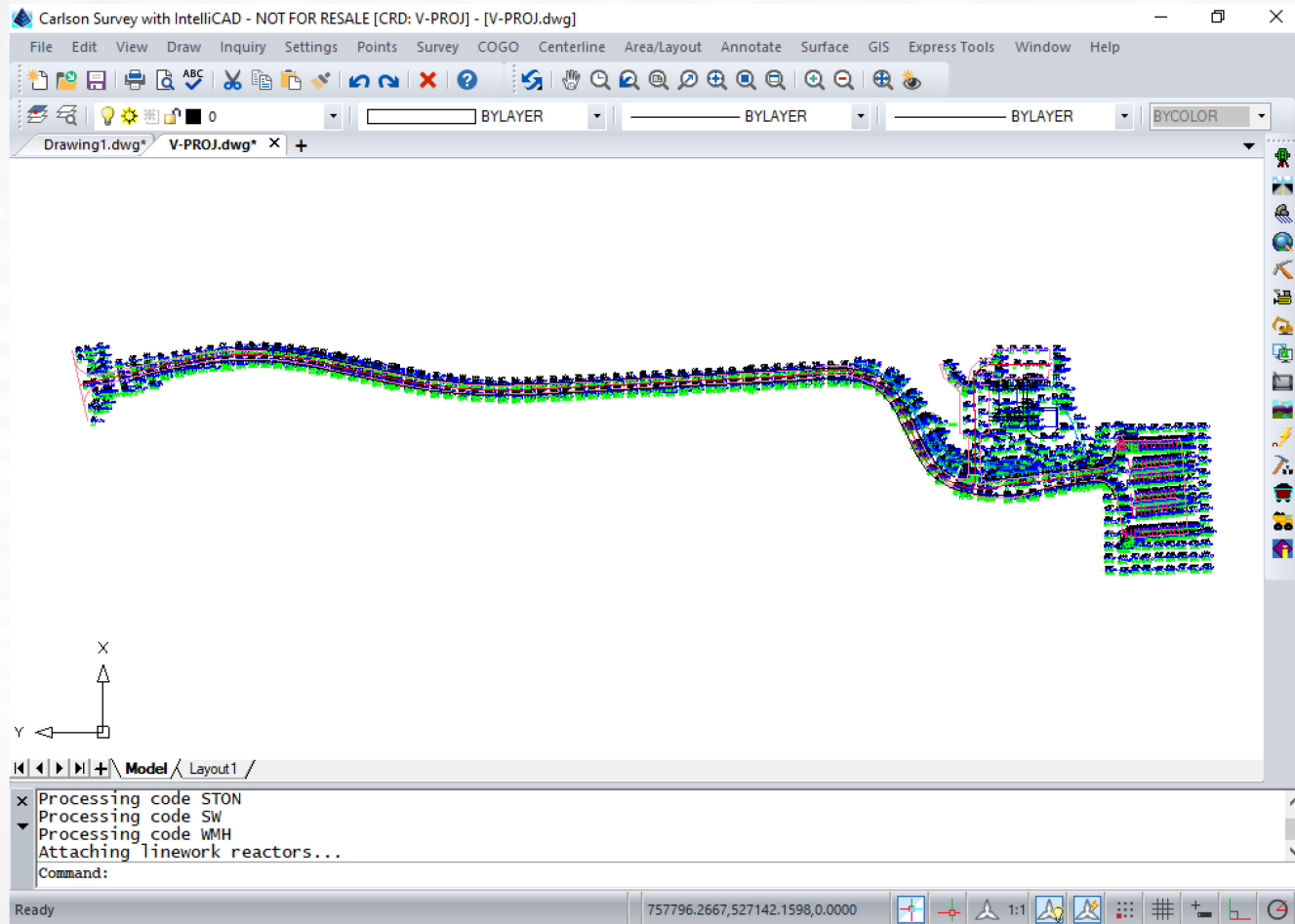
# AMALGAMATION



 Twist Screen ✕

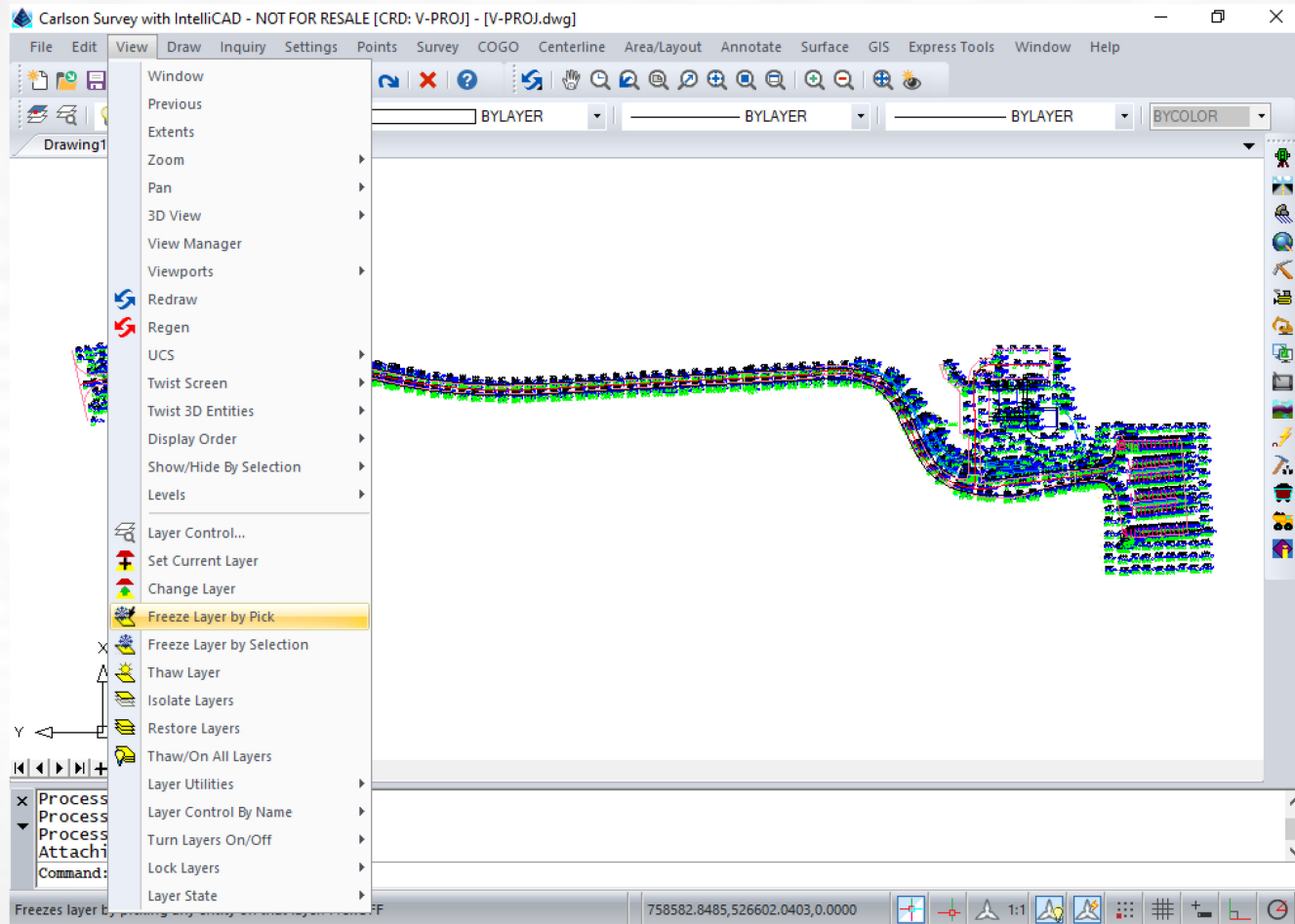
Azimuth to set to horizontal (ddd.mmss)

# AMALGAMATION

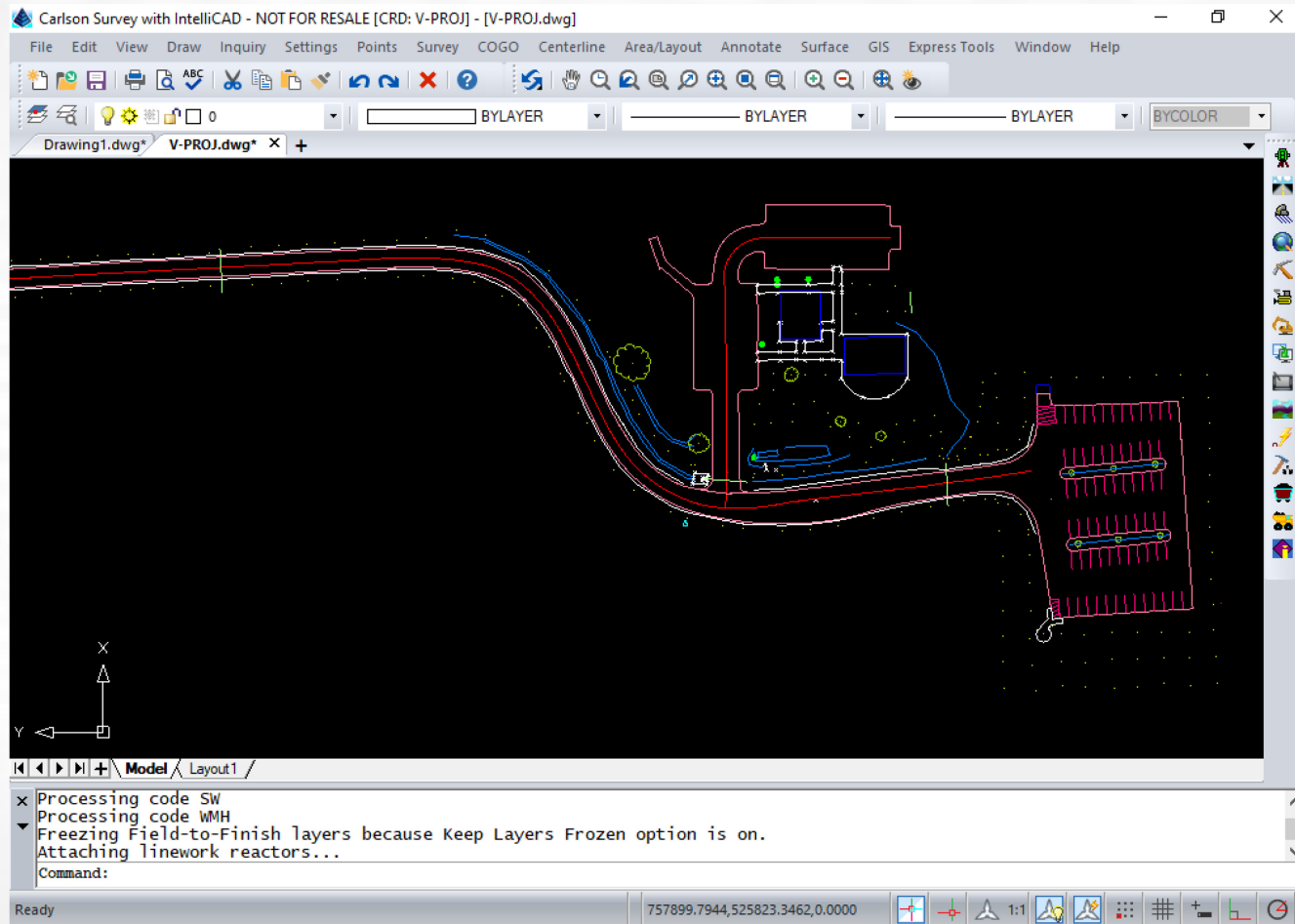




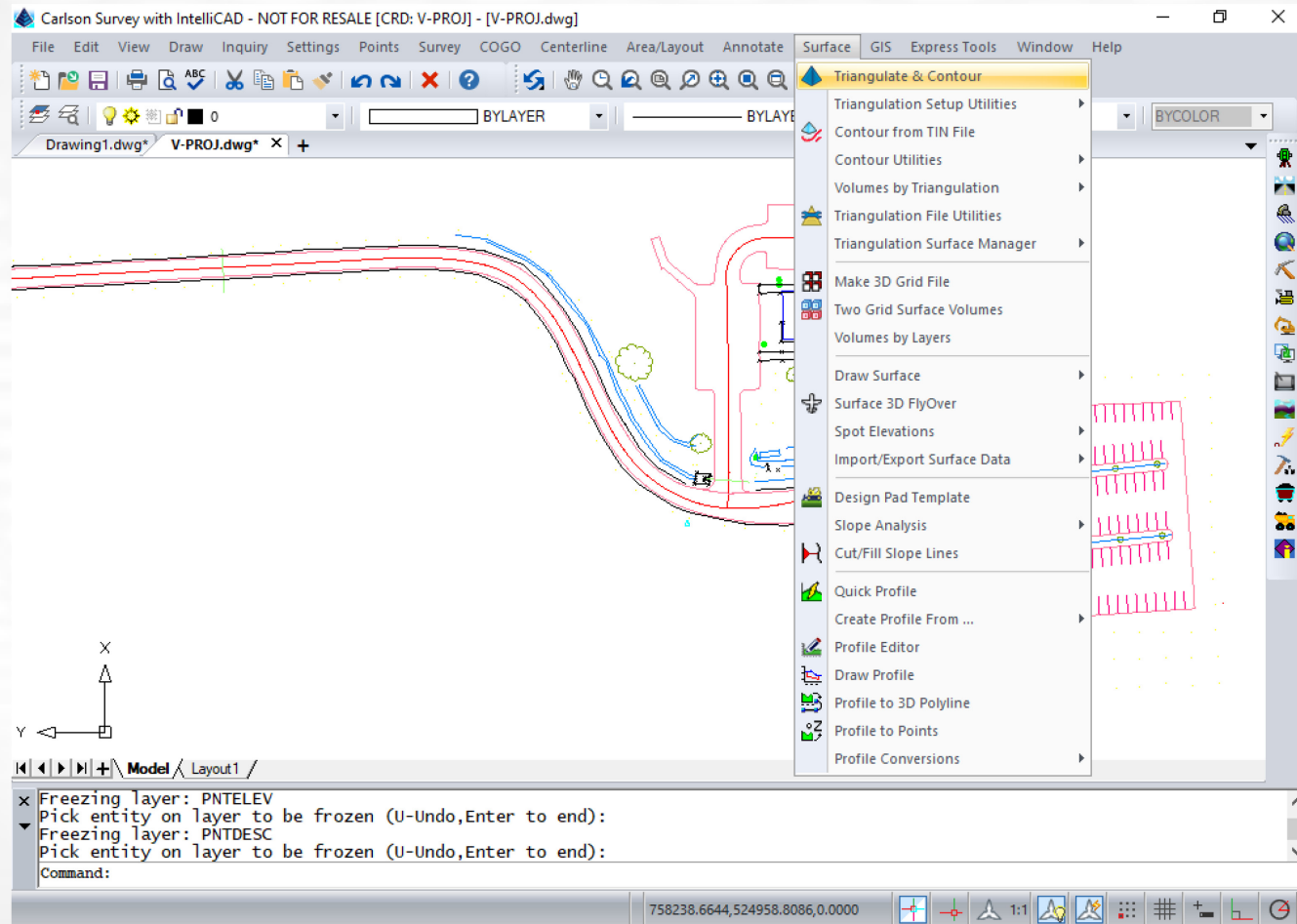
# AMALGAMATION



# AMALGAMATION



# AMALGAMATION



# AMALGAMATION



Triangulate and Contour

Triangulate | Contour | Labels | Selection

Draw Surface Object Layer: V-TOPO-TINN Select

Draw Triangulation Lines Layer: V-TOPO-TINN Select

Draw Triangulation Faces Layer: V-TOPO-TINN Select

Draw Slope Arrows Setup

Write Triangulation File Select

TIN File:

Use Inclusion/Exclusion Areas Boundary Method: Trim Edges At Boundary

Shrink-Wrap Perimeter Reduction Medium Setup

Erase Previous Contour Entities Current Surface

Ignore Zero Elevations  Pick Reference Plane

Specify Input Elevation Range  Highlight Breaklines

Specify Output Elevation Range  Prefix Layers With Surface Name

Maximum Edge Length Interior: 5000.0 Exterior: 5000.0

Densify Breaklines Interval: 100.0

Adjustments for source data of contours

Interpolate Ridges and Valleys  Interpolate Summits and Pits

Minimize Flat Triangles  Interpolate Flow Paths

Adjustments for dense existing ground source data

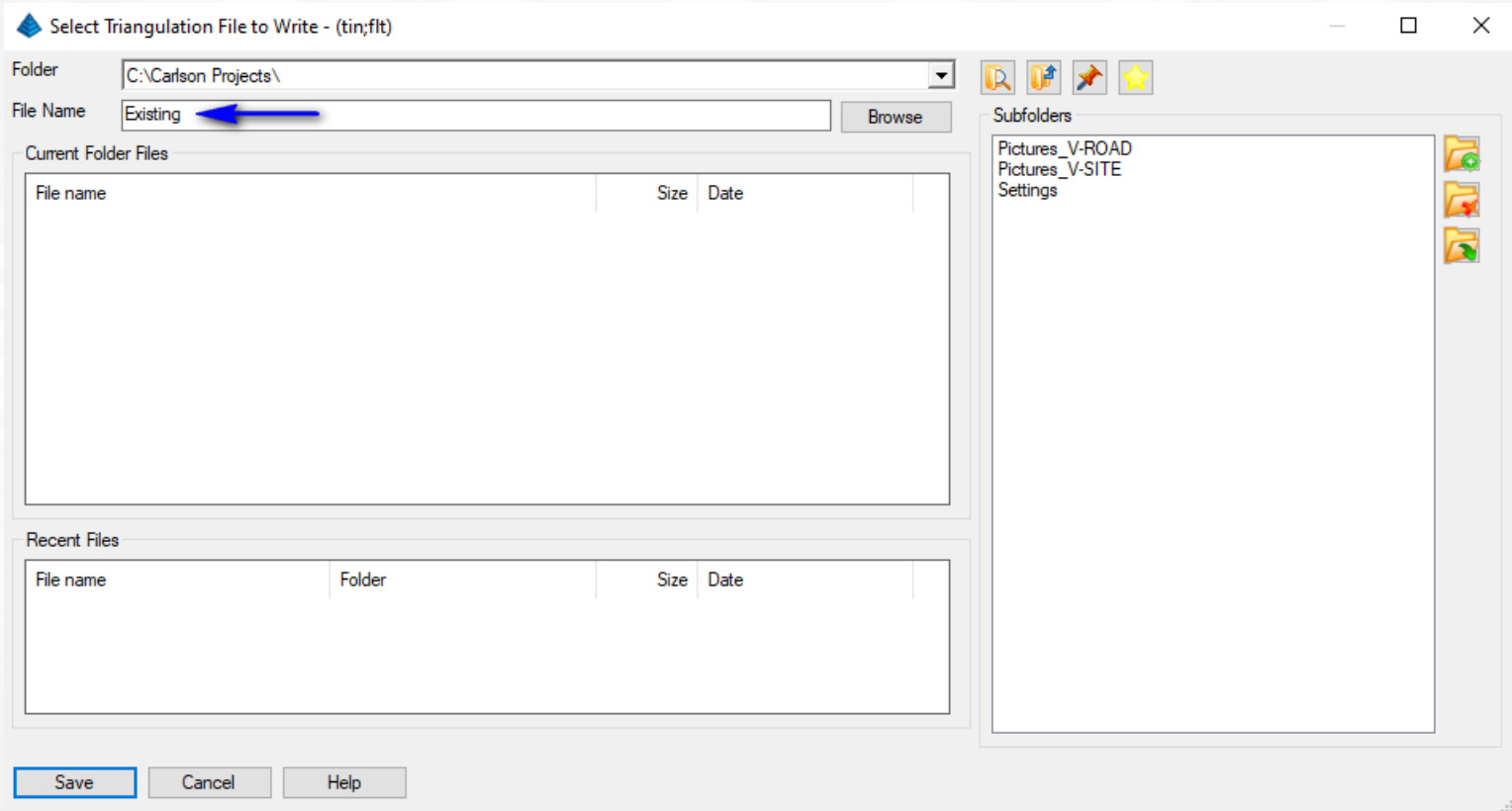
Simplify Surface  Elevation Method Tolerance: 0.050

Preserve Breaklines Breakline Angle: 35.0 Weight: 10.0

Current Settings: Custom Load Settings Save Settings

OK Cancel Help

# AMALGAMATION



# AMALGAMATION



Triangulate and Contour

**Triangulate** | Contour | Labels | Selection

Draw Surface Object Layer: V-TOPO-TINN [Select]

Draw Triangulation Lines Layer: V-TOPO-TINN [Select]

Draw Triangulation Faces Layer: V-TOPO-TINN [Select]

Draw Slope Arrows [Setup]

Write Triangulation File [Select]

TIN File: C:\Carlson Projects\Existing.tin

Use Inclusion/Exclusion Areas Boundary Method: Trim Edges At Boundary

**Shrink-Wrap Perimeter Reduction** Medium [Setup]

**Erase Previous Contour Entities** Current Surface

Ignore Zero Elevations [Pick Reference Plane]

Specify Input Elevation Range [Highlight Breaklines]

Specify Output Elevation Range  Prefix Layers With Surface Name

Maximum Edge Length Interior: 5000.0 Exterior: 5000.0

Densify Breaklines Interval: 100.0

Adjustments for source data of contours

Interpolate Ridges and Valleys  Interpolate Summits and Pits

Minimize Flat Triangles  Interpolate Flow Paths

Adjustments for dense existing ground source data

Simplify Surface  Elevation Method Tolerance: 0.050

Preserve Breaklines Breakline Angle: 35.0 Weight: 10.0

Current Settings: Custom [Load Settings] [Save Settings]

[OK] [Cancel] [Help]

# AMALGAMATION



**Triangulate and Contour** [Close]

Triangulate | **Contour** | Labels | Selection

Draw Contours

Interval Method  
 Contour by Interval  
 Contour an Elevation

Min Contour Length: 1.0

Apply Outlier Reduction Filter  
 Apply Meander Reduction Filter  
 Reduce Vertices

Offset Distance: 0.050

Reduce Before Bezier Smoothing  
Offset Distance: 0.100

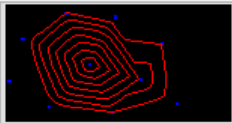
Contour Smoothing Method  
 No Smoothing  
 Bezier Smoothing

Subdivisional Surfaces  
Subdivision Generations = 3

Contour Layer: V-TOPO-MINF [Select]  
Contour Interval: 1  
Contour Line Width: 0.000

Draw Index Contours  
Index Layer: V-TOPO-MAJF [Select]  
Index Interval: 5  
Index Line Width: 0.000

Highlight Depression Contours [Setup]  
 Hatch Zones



Bezier Smoothing Factor = 3

Scan DWG  
Scan CRD

Current Settings: Custom [Load Settings] [Save Settings]  
[OK] [Cancel] [Help]

# AMALGAMATION



Triangulate and Contour

Triangulate | Contour | **Labels** | Selection

Label Contours

Label Layer: V-TOPO-MINR [Select]

Label Style: Standard [Select]

Use Contour Layer as Prefix

Index Label Layer: V-TOPO-MAJR [Select]

Index Label Style: Standard [Select]

Label Integers: All [Label Decimals: Auto]

Label Text Size Scaler: 0.080 [Min Length to Label: 3.0]

Positive Contour Prefix: [Suffix: ]

Negative Contour Prefix: [Suffix: ]

Break Contours at Label [Break Buffer Offset: 0.100]

Draw Box Around Text [Box Buffer Offset: 0.300]

Label at Centerline Offset [CL Offset: 5.0]

Draw Broken Segments [Layer: CTEXT\_BRK [Select]]

Label Contour Ends

Label Index Contours Only

Align Text With Contour

Draw on Real Z Axis

Use Commas

Hide Drawing Under Labels

Use MText

Align Facing Uphill

Internal Label Intervals: [ ]

Label Intervals  Distance Interval

[ ] Distance: 300 Scaler: 1.0

Current Settings: Custom [Load Settings] [Save Settings]

[OK] [Cancel] [Help]



# AMALGAMATION



```
x Command:  
Auto saving open drawings...  
v Command: tri  
Select points and breaklines to Triangulate.  
[Filter]/<Select entities>: all ←
```

# AMALGAMATION



Carlson Survey with IntelliCAD - NOT FOR RESALE [CRD: V-PROJ] - [V-PROJ.dwg]

File Edit View Draw Inquiry Settings Points Survey COGO Centerline Area/Layout Annotate Surface GIS Express Tools Window Help

BYLAYER BYLAYER BYLAYER BYCOLOR

Error Log

Data Problem Log: C:\...User\Trierror.xml

- Crossing Breaklines [2]
  - Crossing Breakline #1 (0.003)
  - Crossing Breakline #2 (0.003)
- Breakline T-Intersections [1]
  - T-Intersection #1 (0.004)

Zoom To Zoom In Zoom Out

Report One Draw One Settings

Exit

X: 757924.13125 Y: 525123.87654  
Zdiff: 0.00285

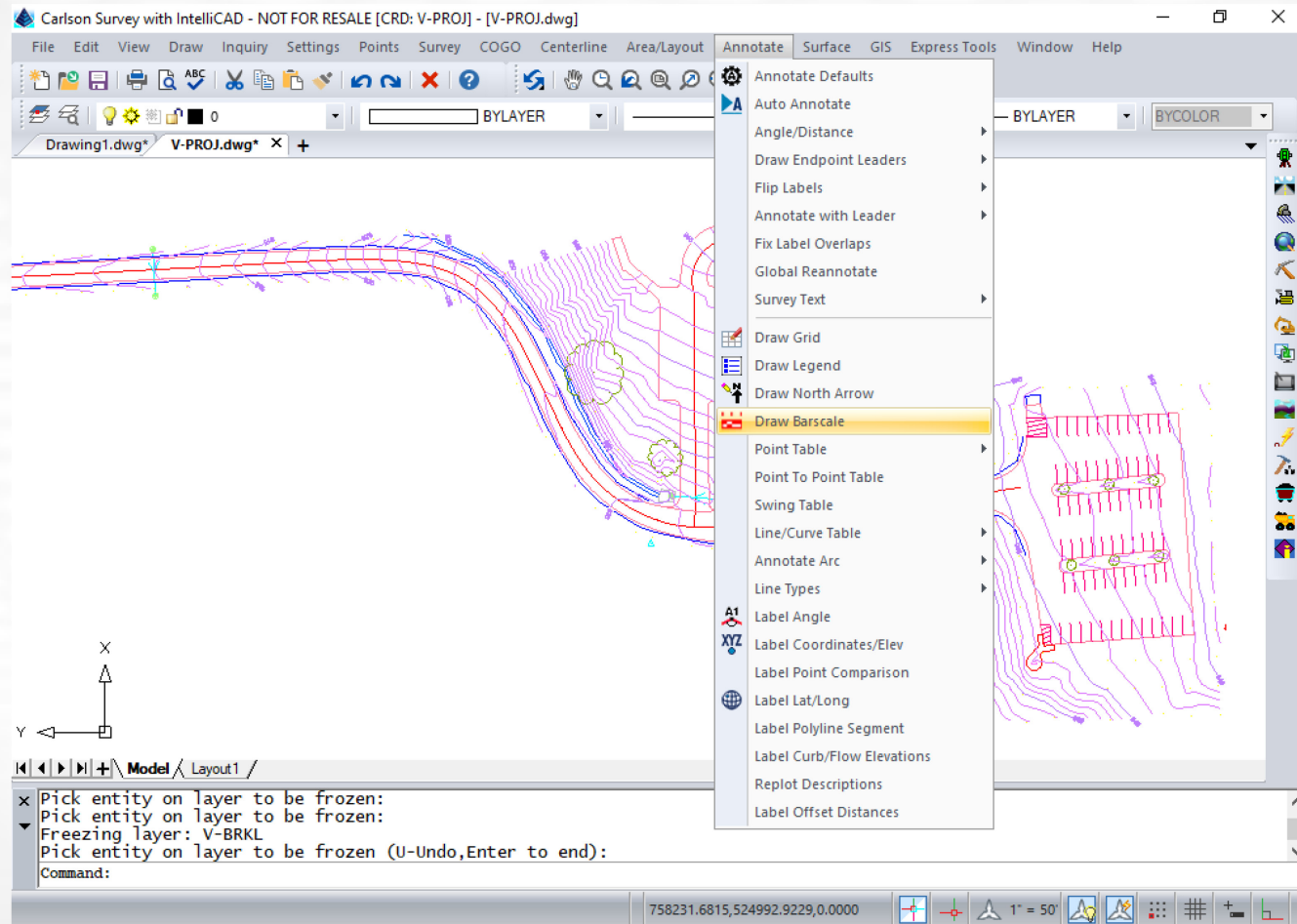
X  
Y

Model / Layout1 /

x Inserted 104044 contour vertices.  
Command: 'd\_hni1'  
Command: 'd\_hni1'  
Command: 'd\_hni1'  
Command:

758497.1716,525166.2647,0.0000 1" = 50'

# AMALGAMATION



# AMALGAMATION



The screenshot displays the Carlson Survey with IntelliCAD software interface. The title bar reads "Carlson Survey with IntelliCAD - NOT FOR RESALE [CRD: V-PROJ] - [V-PROJ.dwg]". The menu bar includes File, Edit, View, Draw, Inquiry, Settings, Points, Survey, COGO, Centerline, Area/Layout, Annotate, Surface, GIS, Express Tools, Window, and Help. The File menu is open, showing options like New..., Open..., Project, Close, Save, Save As..., Plot, PDF, Carlson Community, Carlson Photo Capture, Import, Export, MicroStation .DGN..., Xref, Drawing Explorer..., Drawing Cleanup, Drawing Utilities, Scripts, 1 V-PROJ.dwg, and Exit. The Export submenu is also open, listing Standard Export, LandXML File, RoadXML File, Polyline File, Civil 3D Drawing, 12D File, ePlan File, Google Earth File (highlighted), and Set Google Tags. The main drawing area shows a survey plan with various colored lines (red, yellow, blue, green) representing different features, and a grid of green points. The status bar at the bottom indicates "Model / Layout1 /" and shows command history: "Freezing layer: V-TOPO-MINR", "Pick entity on layer to be frozen (U-Undo,Enter to end):", "Freezing layer: V-BRKL-FLOW", "Pick entity on layer to be frozen (U-Undo,Enter to end):", and "Command:". The bottom status bar also displays "Creates Google Earth KML/KMZ file from selected linework and points: kmlwrite" and the coordinates "758223.4176,525242.1328,0.0000".

# AMALGAMATION



**Export to Google Earth** [Close]

**Elevation Option**

Drape on Google Terrain (2D)  
 Use Elevation from the Drawing (3D)

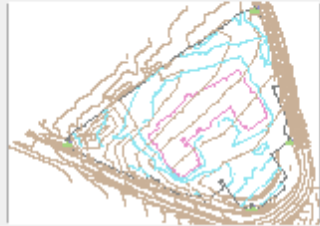
**Export Options**


Line Width (pixels)   
Icon Scale

Include Selected Points  
Placemark Name  [Dropdown]

Include Selected Text  
 Include Layer Information  
 Shade Closed Regions  
 Include Solids and Images  
 Export to KMZ Format  
 Display Results in Google Earth  
 Share Results through Dropbox  
 Include GIS Data

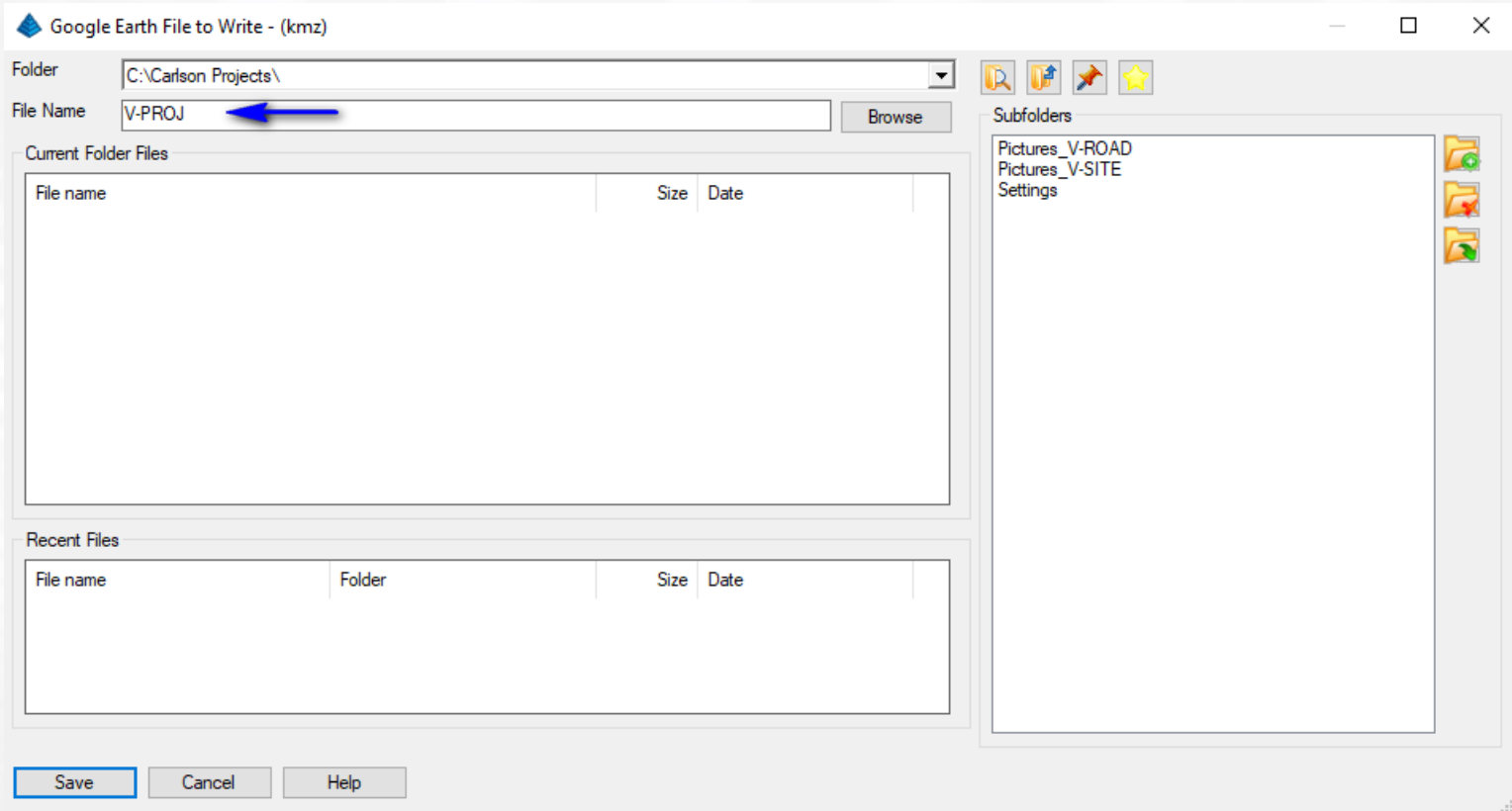
**Opacity Options**

  
Linework Opacity = 60%

  
Solid/Image Opacity = 40%

OK Cancel Help


# AMALGAMATION



# AMALGAMATION

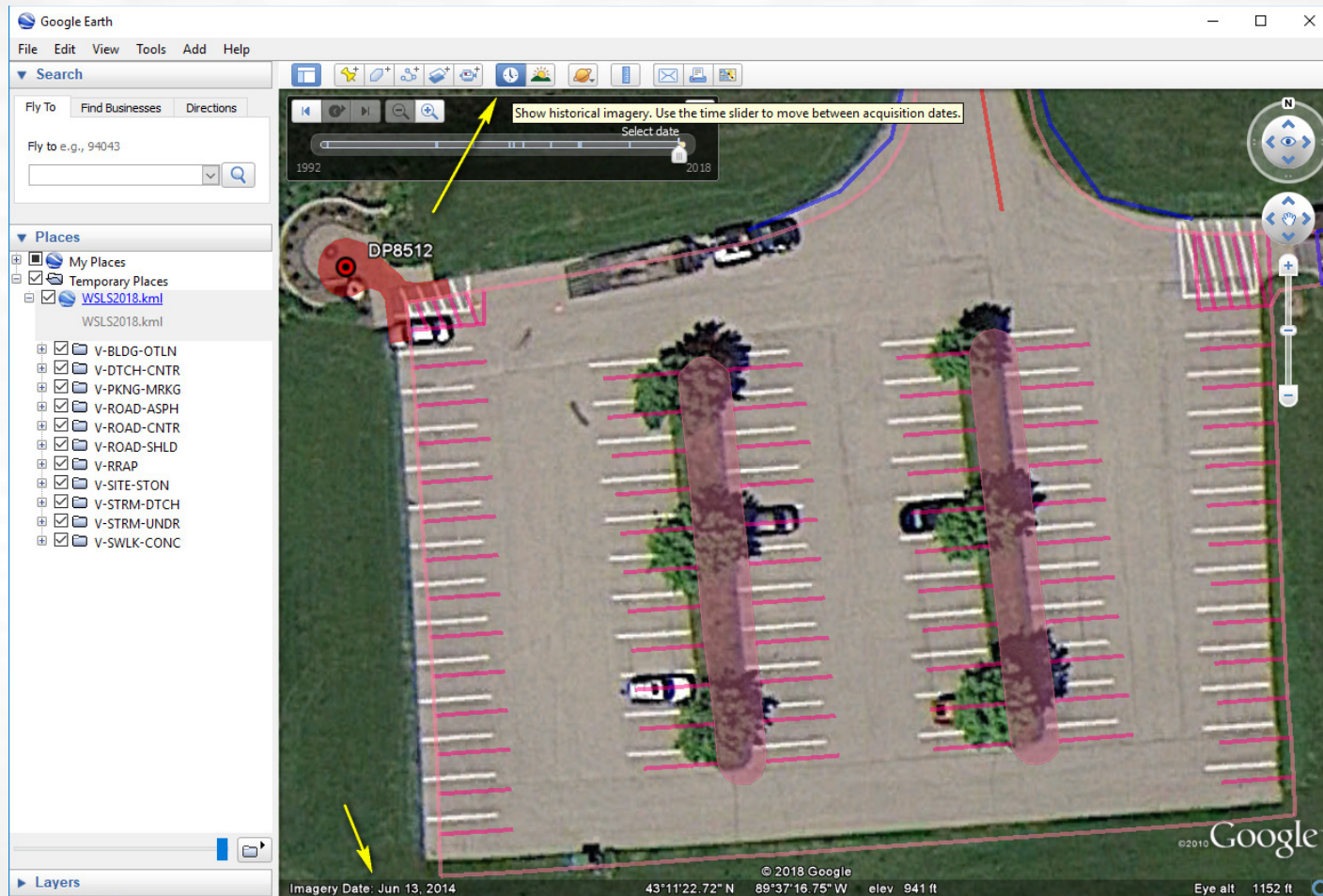


```
x Freezing layer: V-BRKL-FLOW
v Pick entity on layer to be frozen (U-Undo,Enter to end):
Command: kmlwrite
Select points, polylines, text, solids, images, lines and arcs to write.
[FILter]/<Select entities>: all
```



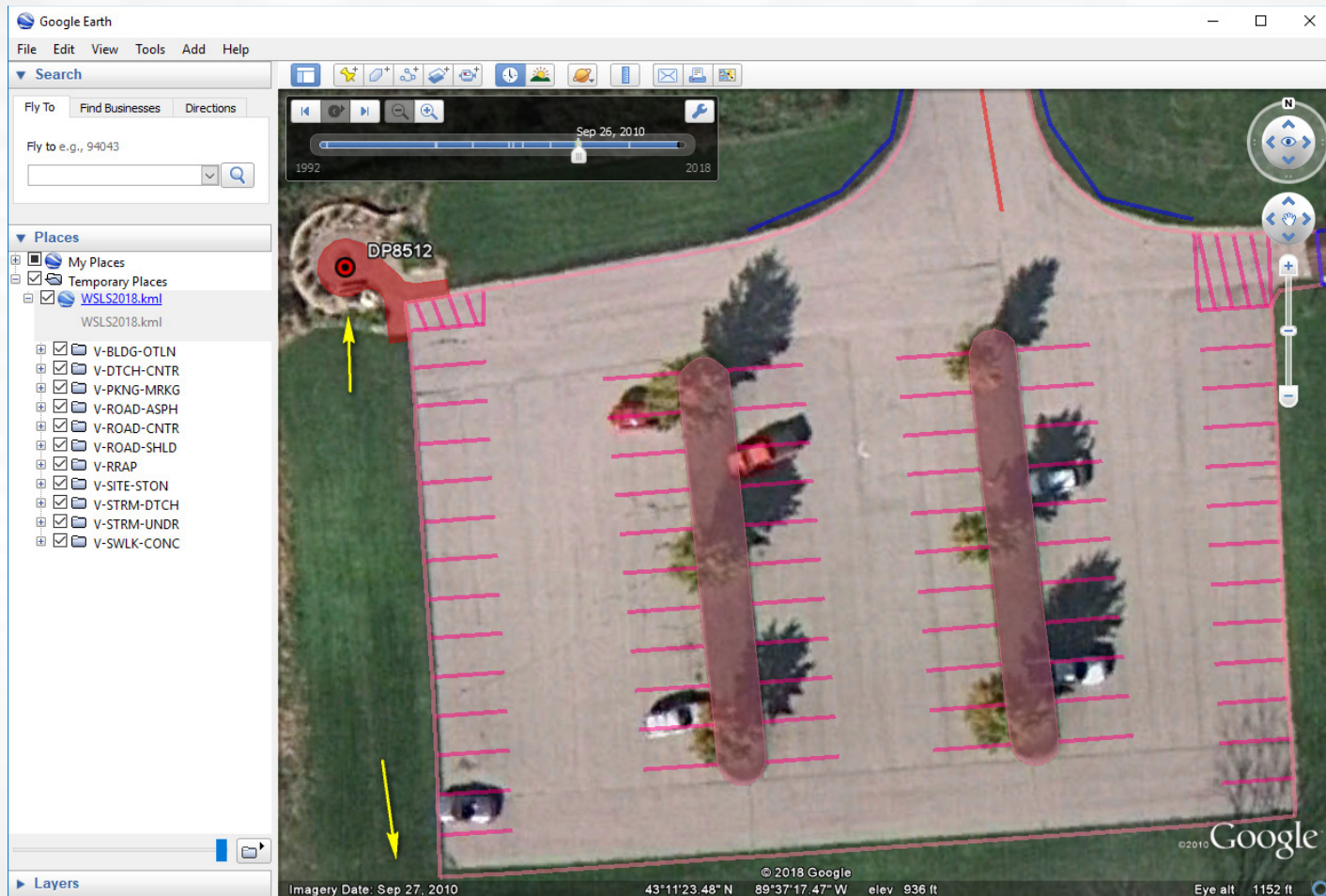


# AMALGAMATION





# AMALGAMATION



# CONCLUSION





# It's An Artist's World!



- Feature Coding and Special Code usage in the Field can dramatically simplify office work
- One shot, multiple lines
- See <ftp://ftp.dot.wi.gov/dtsd/bpd/methods/survey/> for DOT Code Library
- Prepare Your Drawings for Generations to Come! National CAD Standards can Help!

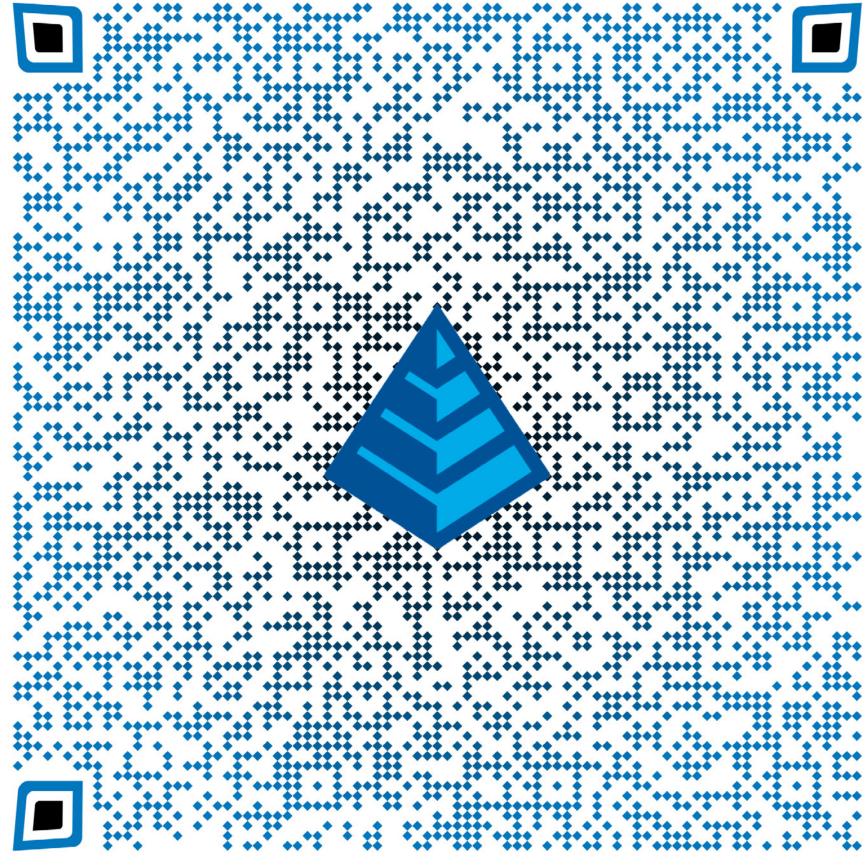
- NGS Control - [https://www.ngs.noaa.gov/cgi-bin/ds\\_mark.prl?PidBox=DP8512](https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=DP8512)
- For Better Looking Contours, Attempt Uniformly Spaced Data When Possible
- SurvPC vs. SurvCE, Consider life-span of Windows Mobile Operating System
- Today's Rugged PC Tablets Have the Horsepower to Process Geoids and Larger Data Sets
- Edit-Process Raw Data, Different Job Settings (NAD83, UTM, etc)



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**THANK YOU!**



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