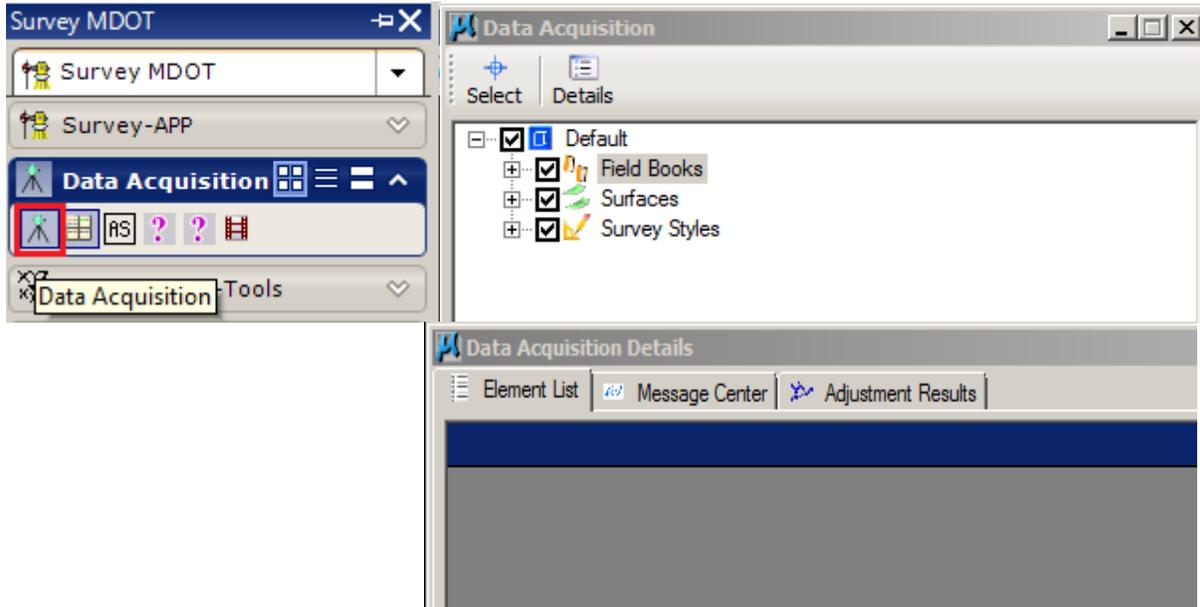


DATA ACQUISITION (NEW SURVEY APP) (07-10-2012)

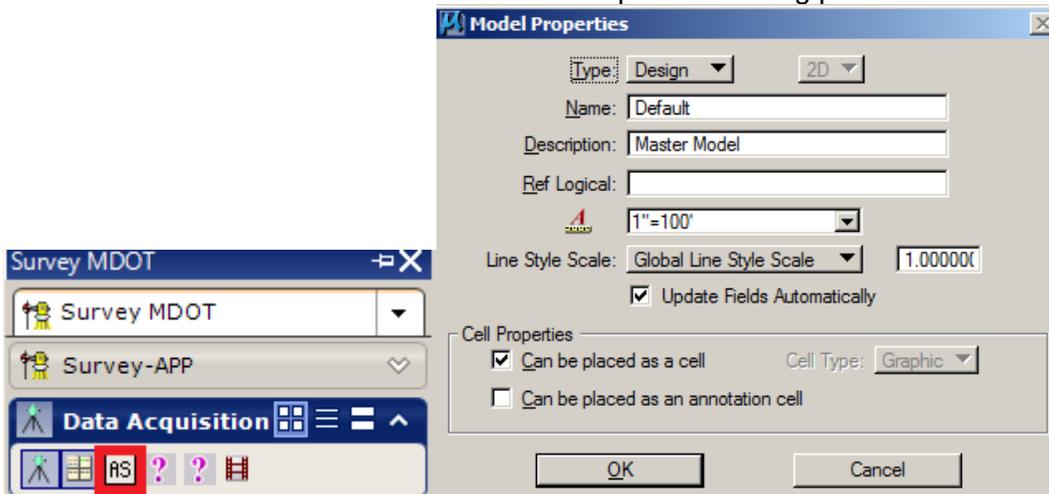


OVERVIEW

This is Bentley's new Survey application which stores elements in Microstation, not the GPK, although Points and Survey Chains can be exported to a GPK. It has drag and drop capabilities of *.cor files with automatic processing based on PCodes. TIN creation is automatic also. This process is quite a bit easier to use than GeoPak Survey and handles large numbers of points better than the GPK. Its use is recommended but not required at this time.

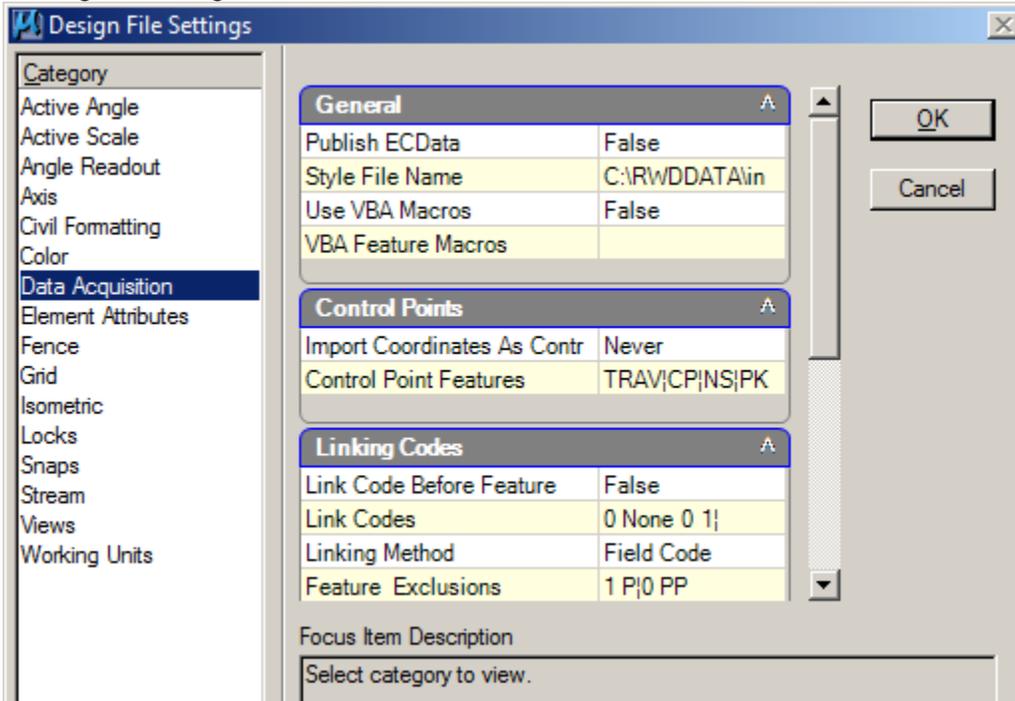
Some notes:

1. Scale – Point Cells, Symbols, Line Styles, & Labels are controlled by Model Property Scale. This needs to be set to the correct scale prior to loading points.



NOTE: A variable has been set in RWD's workspace for DA to scale based on the Model Properties scale instead of using Annotation or Global Line Style Scale. If you need to scale already processed DA data, you can change the global line style scale for line styles and use regular scale commands on cells & text.

2. Settings -> Design File:



GeoPak's Point Codes have been exported to rwdsvy.xml and our Seed files have been set to read this file by default. Other default settings are also established in Microstation's Design File Settings dialog (shown above).

Linking Codes

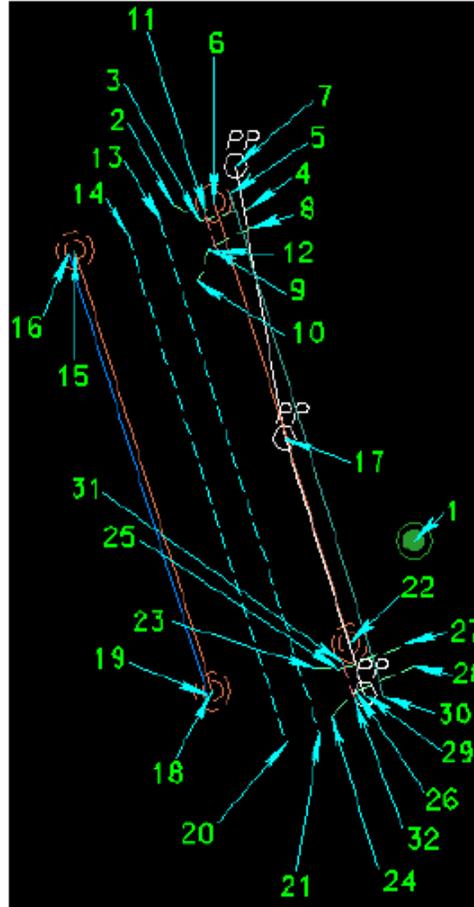
Linking Codes are shown below. **The big change from GeoPak Survey is that you cannot have consecutive Start Codes (L).** You start a Linear Feature with L and do not assign this code on subsequent shots of the same PCODE. When you get to the last shot of the linear feature, you enter EL. An example format follows the table below. Control Codes provide the ability to enable special treatment of specific points to be automatically implemented during the data processing.

LinkCode	Alpha	Numeric	LIKING CODES	CONTROL CODES
None	None	0	Start – used to begin creating a Linear Feature	CircleDiameter – Draws a circle of specified diameter around this point (must be within Linear Feature)
Start	L	1	StartPC – Starts a linear feature in Arc Mode	CircleRadius – Draws a circle with specified radius around this point (must be within Linear Feature)
StartPC	C	2	ArcPC – Used to specify the beginning of a tangential arc or curve within a Linear Feature	RectangleWidth – Draws a rectangle from two points and specified width (must be within Linear Feature)
ArcPC	PC	3	NonTanPC – Used to specify the beginning of a non-tangential arc or curve within a Linear Feature	TapeDistance – Allows field measured distances to be applied to the Linear Feature – All measurements are applied 90 degrees from previous segment. Positive values turn right and negative values turn left. (must be within Linear Feature)
NonTanPC	NTC	4	ArcSingle – Creates a three point arc with previous and next points (does not work at beginning or end of a Linear Feature)	JoinPoint – Joins this point to specified point name (does NOT have to be in linear feature)
ArcSingle	SAP	5	ArcToArc – Ends previous tangent arc and begins another tangent arc (must be preceded by ArcPC)	NewTemplate – Same as InRoads TMPL – Consecutive Start codes will get this linear feature paralleled and translated based off of initial points
ArcToArc	CC	6	NonTanPT – Specifies the end of a non-tangential arc or curve within a Linear Feature	Elevation – Sets the Elevation of this point
NonTanPT	NTT	7	ArcPT – Specifies the end of a tangential arc or curve within a Linear Feature	UpDown – Changes final elevation coordinate of point by value entered
ArcPT	PT	8	ArcToggle – Toggles between NonTanPC and NonTanPT (depends on pairing)	LeftRight – Changes final coordinate of point by adjusting left (-) or right (+) of measured observation by value entered
ArcToggle	OC*	9	End – Ends the linear feature (not necessary in most cases)	FrontBack – Changes final coordinate of point by adding or subtracting a distance from the measured distance
End	EL	10	CloseShape – Closes the ends of the linear feature by adding right angle at both ends and intersecting	AttributeName – One method of getting attributes for a point (pairs with Value)
CloseShape	CS	11	Close – closes the Linear Feature back to the first point	AttributeValue – One method of getting attributes for a point (pairs with Name)
Close	CLOSE	12		AttributeArray – One method of getting attributes for a point (Names and Value in array)
CircleDiameter	CDIA	-1		DtmSpot – Include in DTM as spot
CircleRadius	CRAD	-1		DtmNoSpot – Do not Include in DTM
RectangleWidth	RECT	-1		DtmBreak – Include in DTM as break
TapeDistance	DIST	-1		DtmNoBreak – Do not include in DTM
JoinPoint	JPT	-1		
NewTemplate	TMPL	-1		
Elevation	LV*	-1		
UpDown	UD*	-1		
LeftRight	LR*	-1		
FrontBack	FB*	-1		
AttributeName	AN*	-1		
AttributeValue	AV*	-1		
AttributeArray	AA*	-1		
DtmSpot	DS*	-1		
DtmNoSpot	DX*	-1		
DtmBreak	DB*	-1		
DtmNoBreak	DNC	-1		

Control codes must be assigned **after** the Field code. Control codes can **only** be Alpha values. Control and Linking codes can both be used on the same point as long as the Control code is last. Control codes must be separated from the Field or Linking code with a **space**.

TOPO11.COR

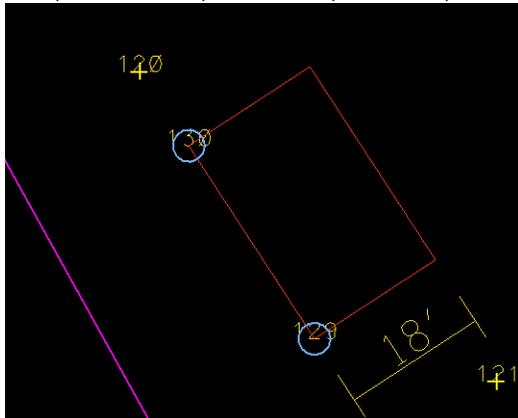
1	10000.00	10000.00	201.00	HVCM
2	11717.89	9333.30	203.21	GD, L; ASPHALT
3	11707.85	9351.25	203.35	GD
4	11716.10	9386.77	202.92	GD, EL
5	11725.15	9372.63	204.35	GAS, L
6	11718.89	9361.48	204.56	XROW, L
7	11718.90	9361.75	204.91	PP, L
8	11702.91	9387.80	203.27	GD, L
9	11689.87	9358.36	202.04	GD
10	11667.83	9349.93	205.02	GD, EL
11	11712.13	9356.29	203.24	RCP18, L
12	11688.69	9363.81	203.00	RCP18, EL
13	11706.99	9325.35	204.20	PEL, L
14	11699.45	9302.57	204.51	PER, L
15	11688.11	9265.71	203.13	XROW1, L
16	11686.64	9261.01	202.32	WATER, L
17	11566.30	9410.56	205.46	PP, L
18	11402.72	9360.82	205.70	XROW1, EL
19	11400.39	9356.91	205.48	WATER, EL
20	11370.10	9411.51	204.10	PER, EL
21	11376.63	9434.96	204.30	PEL, EL
22	11434.13	9455.70	204.10	XROW, EL
23	11417.97	9431.58	204.03	GD, L; GRAVEL
24	11386.86	9442.45	204.36	GD1, L
25	11417.18	9447.19	204.70	GD
26	11402.76	9459.58	204.56	GD1
27	11434.48	9494.19	205.34	GD, EL
28	11419.36	9499.66	203.45	GD1, EL
29	11401.10	9465.65	204.67	PP, EL
30	11398.48	9478.71	203.30	GAS, EL
31	11421.24	9450.68	202.20	RCP24, L
32	11397.94	9458.15	202.45	RCP24, EL



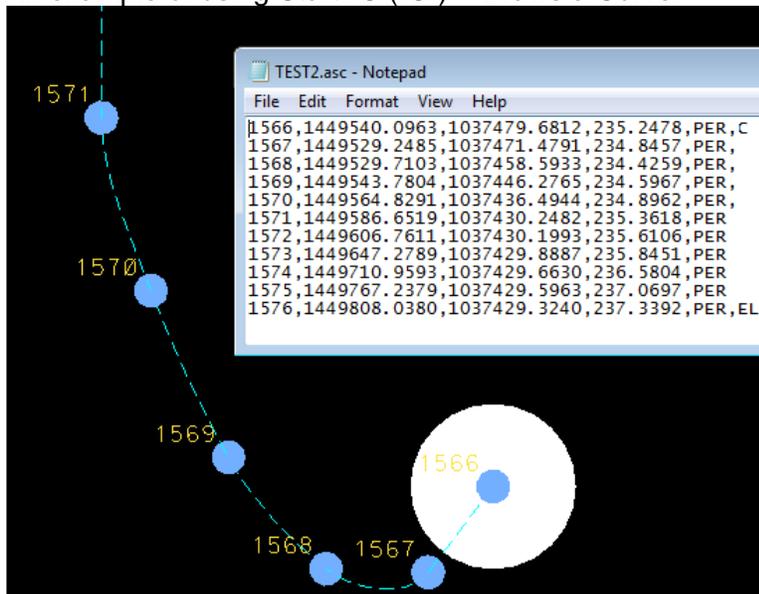
An example of using Control codes:

129,11803.685,9340.780,210.500,1SB RECT18,L

130,11827.698,9325.126,210.500,1SB RECT18,EL



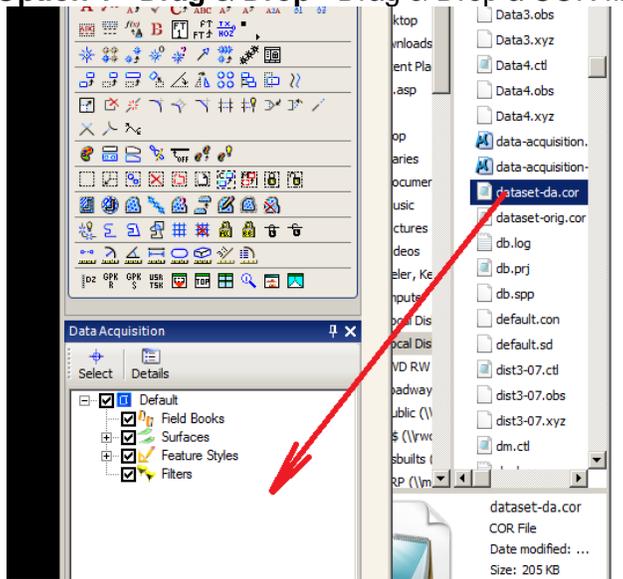
An example of using StartPC ("C") – Draws a Curve.



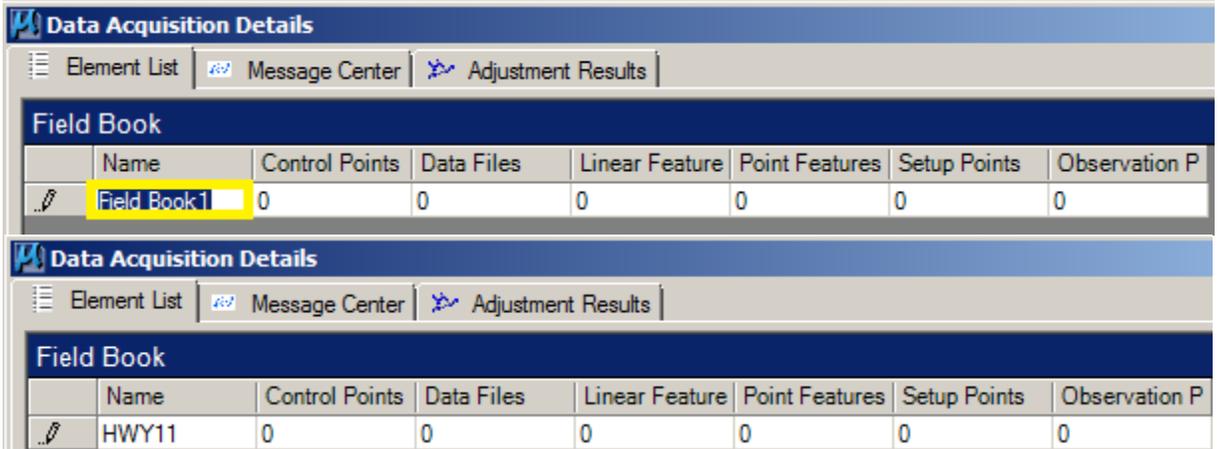
Loading ASCII Points

DA has Drag & Drop ability. You can drag an *.cor or *.asc file to the DA window (on a field book) to process points. You can have multiple Field Books or as long as you don't have duplicate points in different .cor files, you can drag and drop .cor files into one Field Book. The latter is really required because it allows you to combine linear features from different COR files.

- **Option 1 - Drag & Drop** - Drag & Drop a COR file to the Data Acquisition Window.



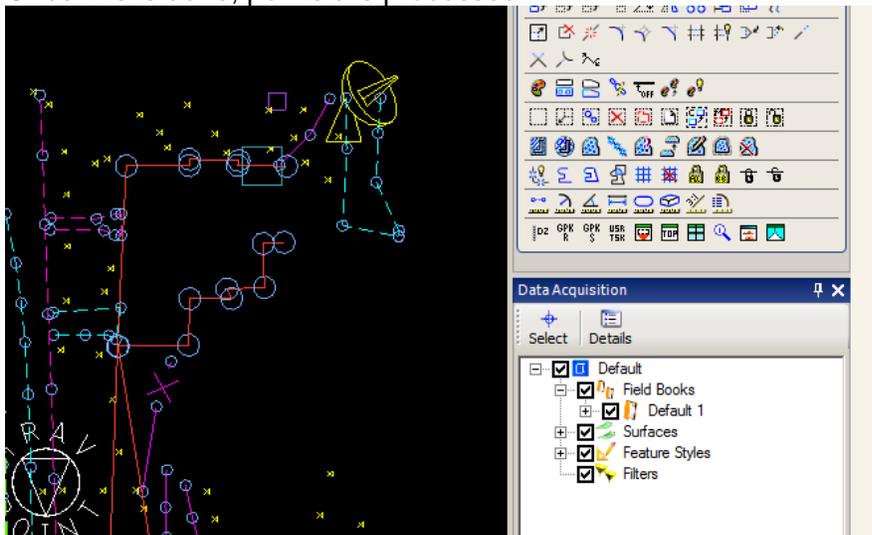
A Field Book called Default 1 is created. You can change the field book name from the default name in the DA Details dialog.



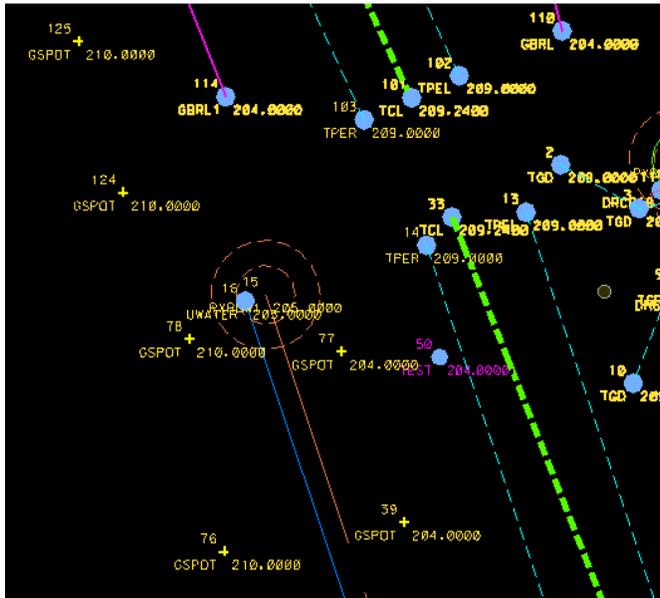
Depending on the extension of the file, you may be prompted to choose the format of the file when you drag & drop. ASCII files are processed with the one selected below. (*.TXT, *.COR, & *.ASC are all read by the data format that will process MDOT's Coordinate file correctly (See below).

- Lietz-Sokkia SDR33 14Char (*.sdr)
- TDS 48,95,FS2 (*.rw5)
- TDS 48,95,FS2 (Australia) (*.raw)
- Geodimeter 500 (*.dat)
- SMI Version 7 (*.raw)
- SMI Version 6 (*.raw)
- Leica Data Pro (*.gsi)
- WildSoft2 GIF-10 (*.fld)
- InRoads AASHTO SDMS (*.sdm)
- InRoads Topcon FC4 (*.fc4)
- InRoads TDS Rw5 (*.rw5)
- InRoads TDS Raw (*.raw)
- Mississippi DOT (*.txt;*.cor)
- Comma delimited PtNumNEZCode (*.txt;*.cor)
- Comma delimited PtNumXYZCode (*.txt)
- Comma delimited PtNumNEZCodeCode (*.txt;*.c
- Space delimited PtNumNEZCode (*.txt)

Once this is done, points are processed.

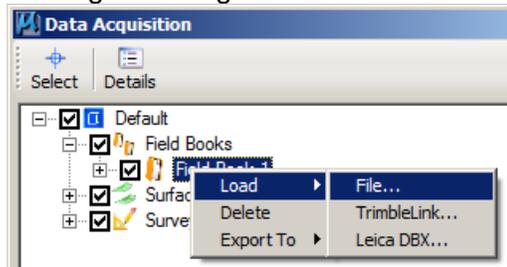


Points with no matching Feature (Pcode) are shown on a different color (purple):

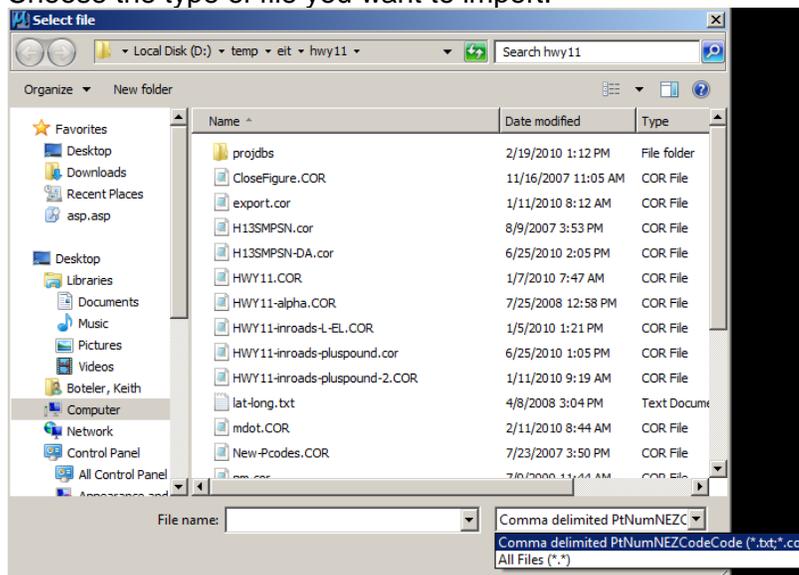


- **Option 2 – File Load**

In lieu of Drag & Drop, you have the ability to right click Field Books and tag NEW and then right clicking the field book created and choosing Load a File.



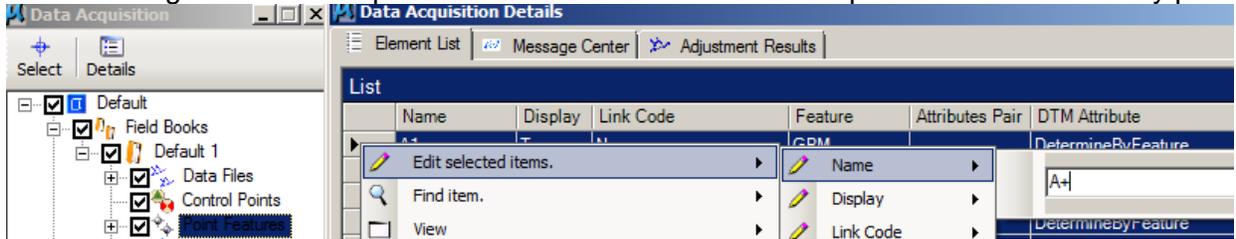
Choose the type of file you want to import.



The points are processed and elements drawn in Microstation when the file is chosen and Open is tagged.

- **Subsequent Data Sets**

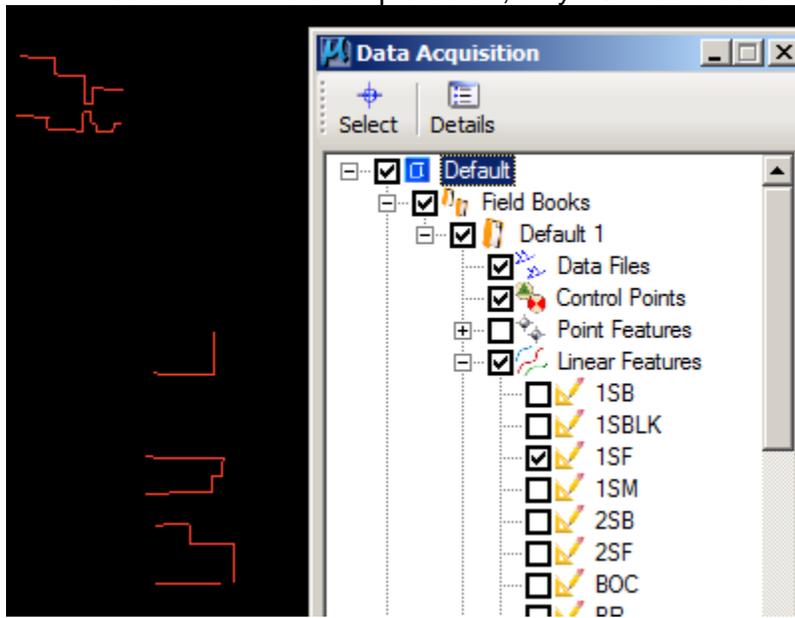
Subsequent data set (*.cor) should be dropped onto the existing field book (if no duplicate points exist) or a new field book (if duplicate points exist) (Not preferred method because you'll have issues combining chains). Note, if duplicate points exist, you can add a suffix to the preceding field book prior to loading subsequent field books. Select all the points in the Details dialog and see example below to add a suffix. A+ would put an A in front of every point.



Survey Features

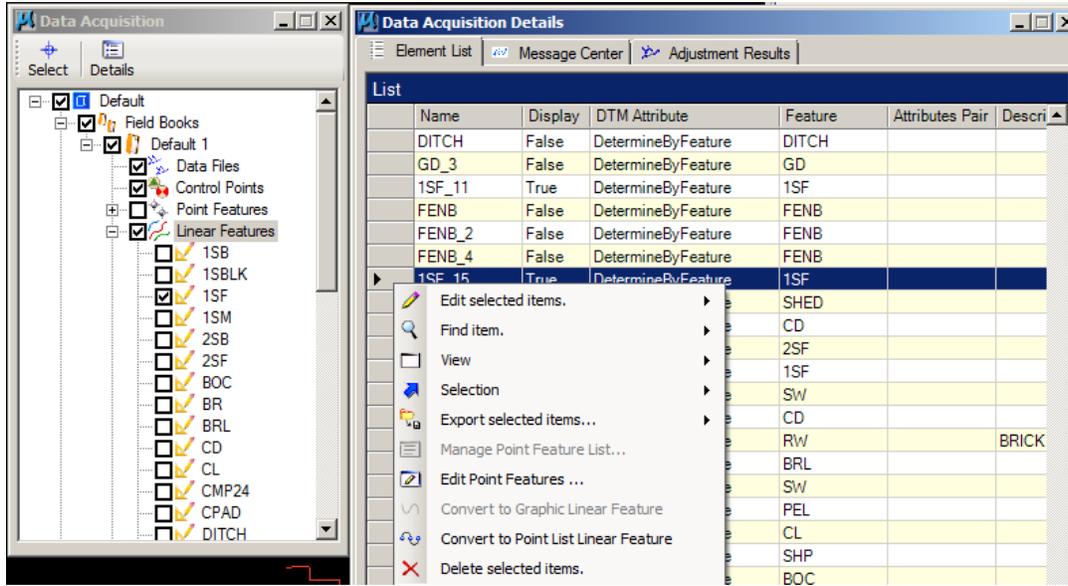
You can expand the Imported Field Book to access the Point & Linear Features.

- 1) **Display** – Control graphical display of the features by checking the button next to the feature. In the example below, only 1SF features are displayed.



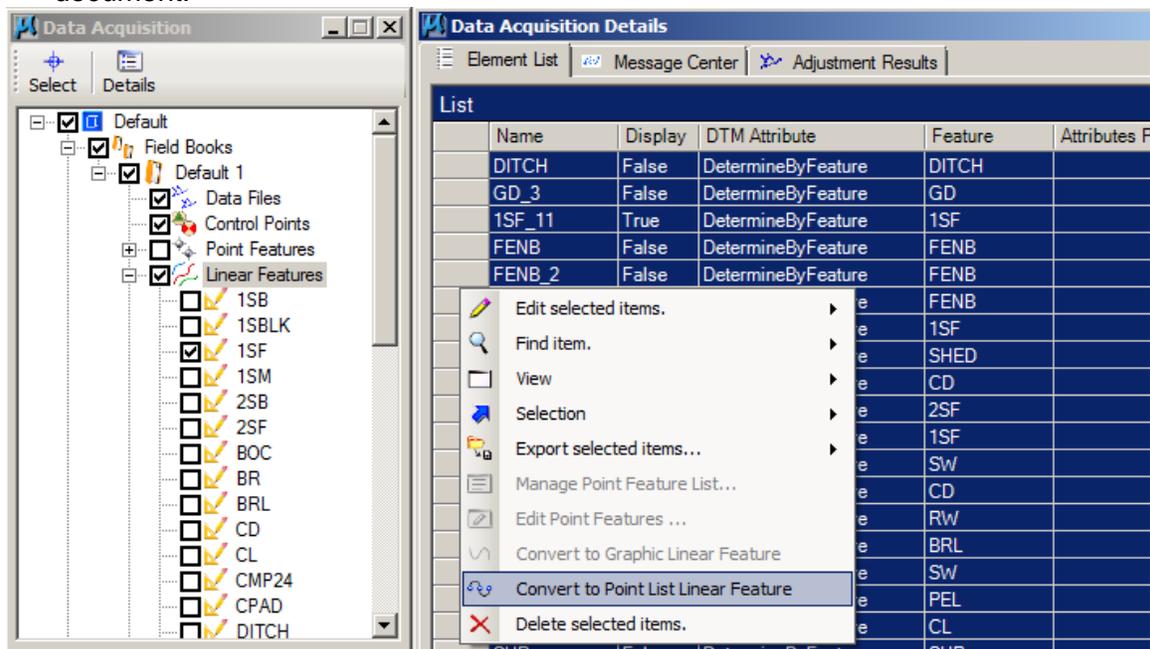
2) Details

The details pane shows specific information on point & linear features from which you can export, visualize, utilize view tools, change linking codes, etc. More of this is discussed later in this document.



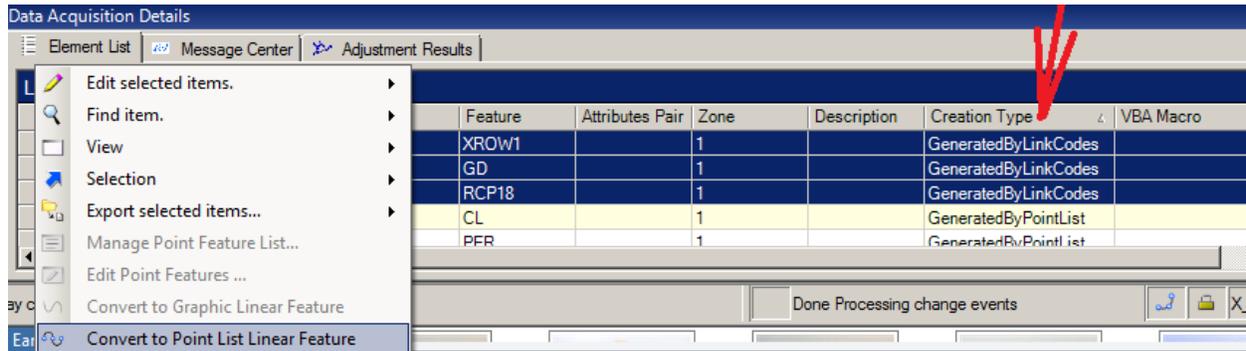
3) Converting to Point List Linear Features

To allow combination/breakage of chains and the ability to add/delete points from a linear element, you need to convert all linear features to Point List Linear Features. This will be automatically done in subsequent versions. Editing done to a Point Chain List is reflected in your TIN. You can go one step further and Convert to Graphical Chains but edits made are not reflected in your TIN but you do have the option of creating the TIN from Graphics which is discussed in the Surface area later in this document.



Bulk Converting Linear Features to Point List Linear Feature.

If you've already converted some Linear Features to Point List Linear Features, the option to convert when you choose all is grayed out. To figure out which ones haven't been converted, select them, & then convert them, sort the data acquisition details dialog by Creation Type, select all rows with a Creation Type of GeneratedByLinkCodes, & then right click and choose Convert to Point List Linear Feature.

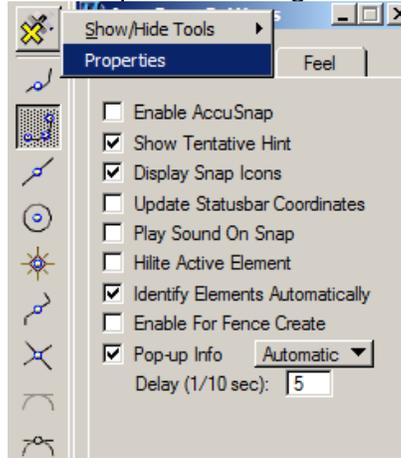


Editing Survey Features

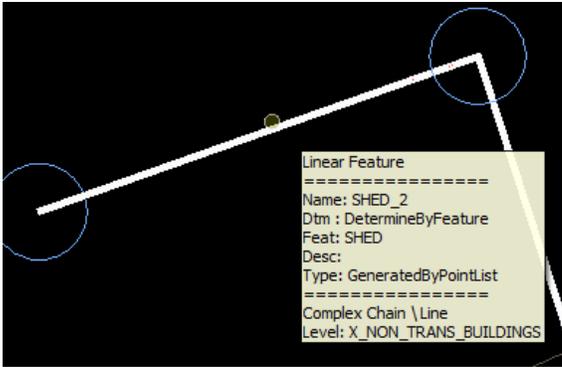
NOTE: Data Acquisition has to be open to edit Survey features.

1) Auto Identify

Make sure Microstation's Identify Elements Automatically is on. Right click the Accusnap button and go to Properties to access this toggle.



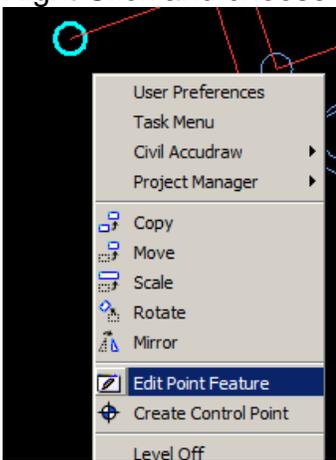
With this enabled, you can hover over elements to see their info.



Also, Toggle ON Accusnap.

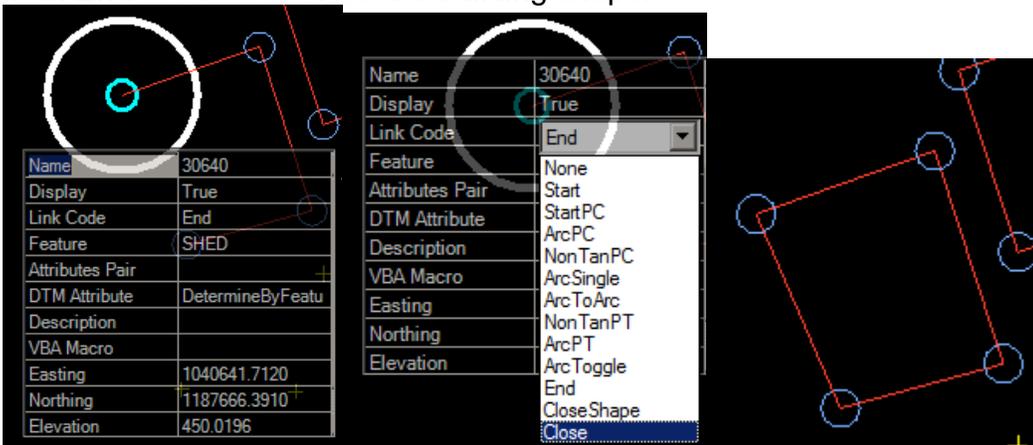
2) Point Feature Editing

Right Click and choose Edit Point Feature.

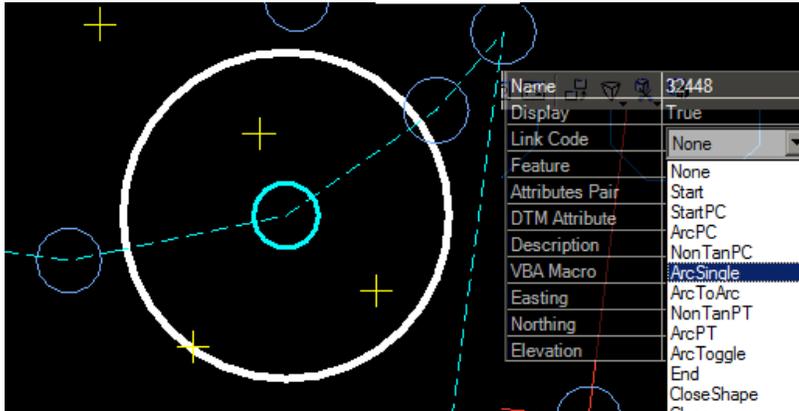


Example 1: Close Shape

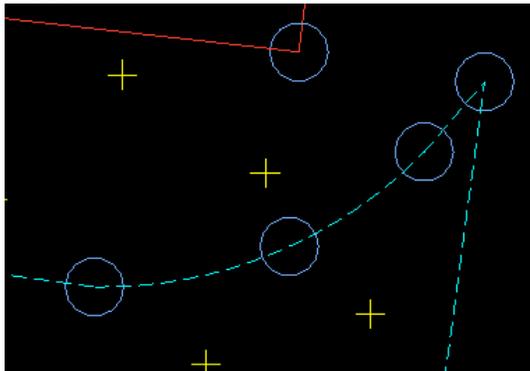
The following dialog is invoked. In this example, the Linking Code was changed from End to Close to close the building shape.



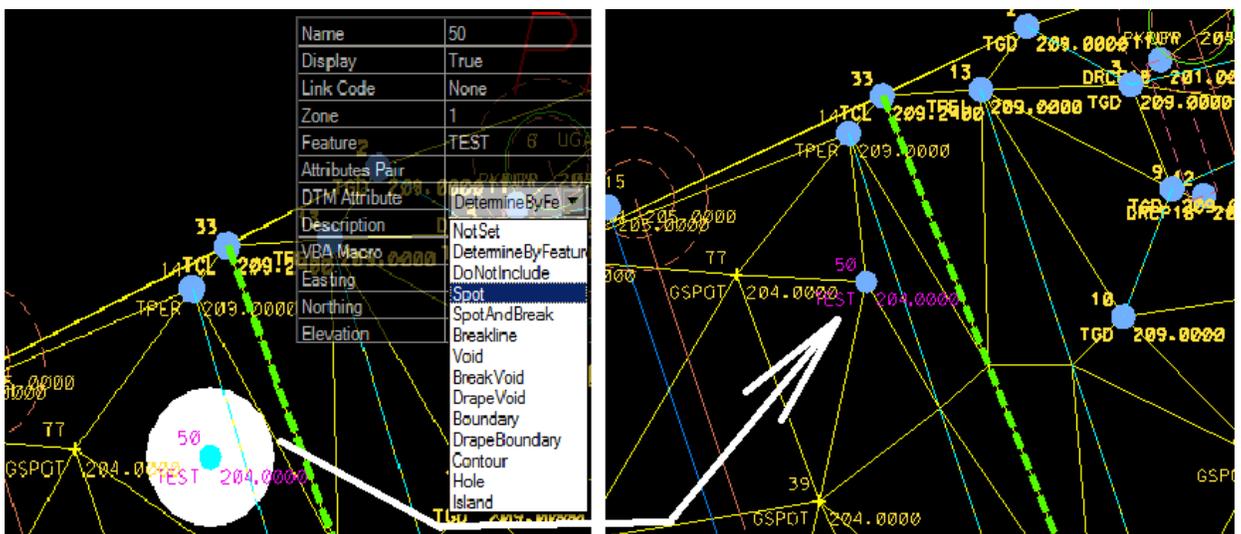
Example 2: ArcSingle – Change the Linking code from None to Arc Single to change this part of the linear feature to an Arc.



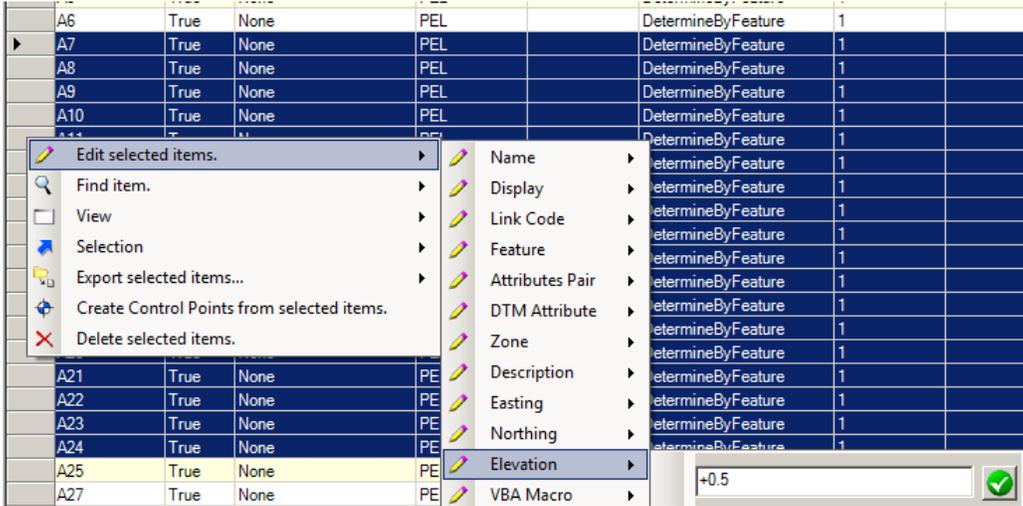
Result



Example 3: Include Point as Spot in DTM. (Note, Displaying triangles is discussed later in the chapter but changing a Point DTM attribute is shown below:

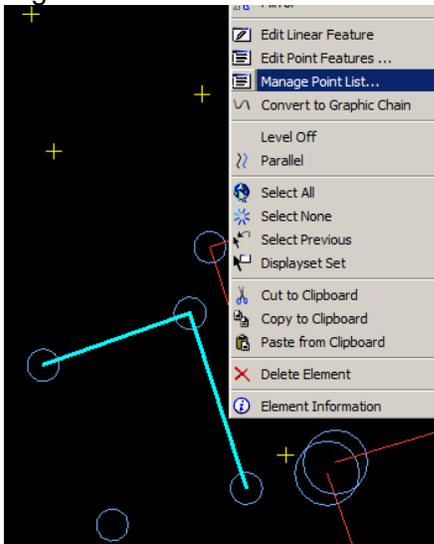


Example 4: Editing the elevation of a group of points.

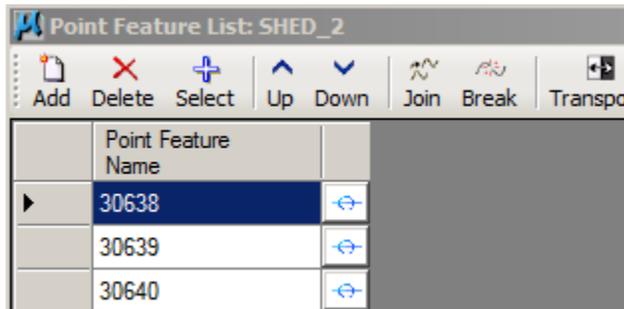


3) Linear Feature Editing

Right Click a linear element & Choose Manage Point List



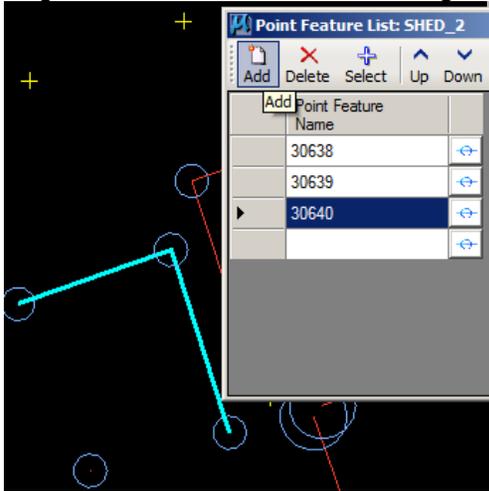
The following dialog is displayed where you can add points to, break, or combine linear elements.



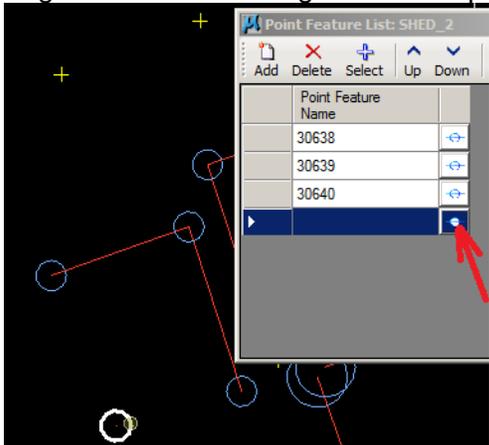
EXAMPLE 1 – Add Point to Chain:

In this example, I am going to add the point in the lower left to be included in this shed.

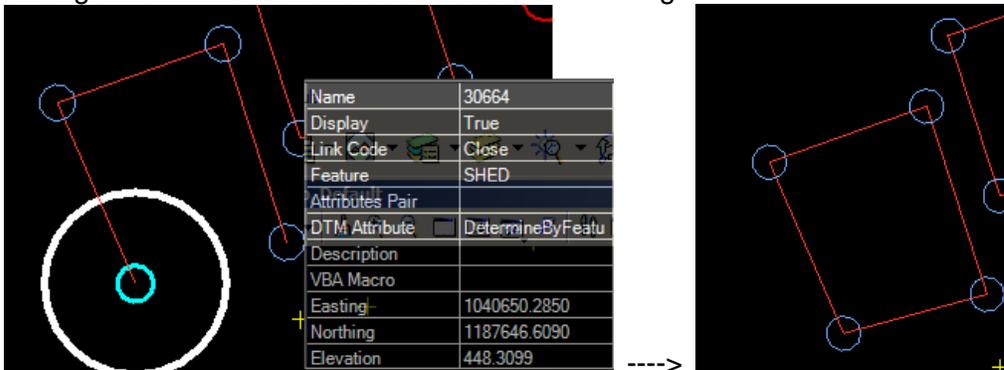
Tag the last Point line and then tag Add.

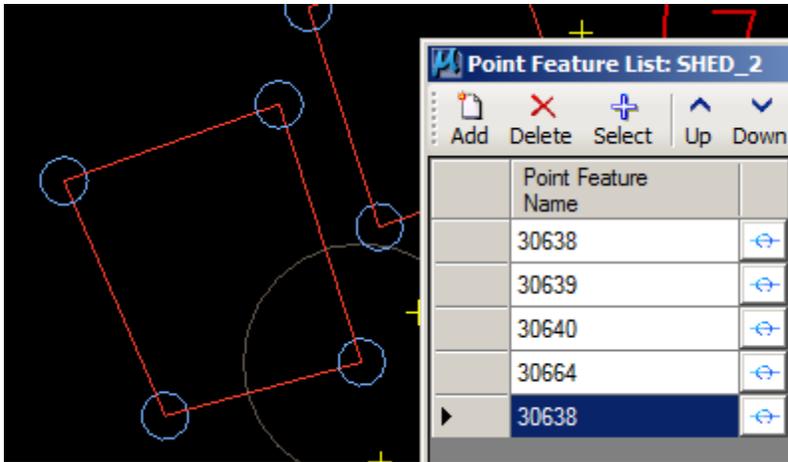


Tag the button to the right and data point the point.



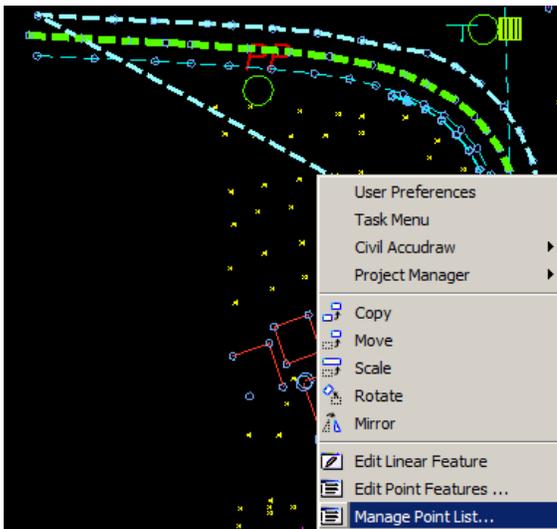
Change the Link Code to Close to close the building.



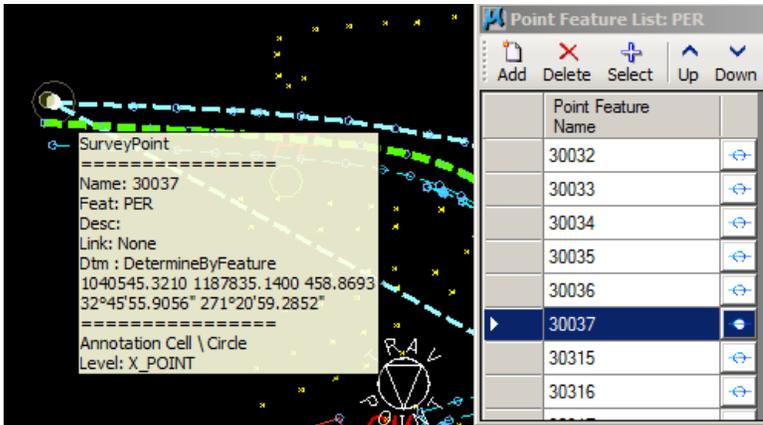


Example 2 – Break a Chain and delete point from chain:

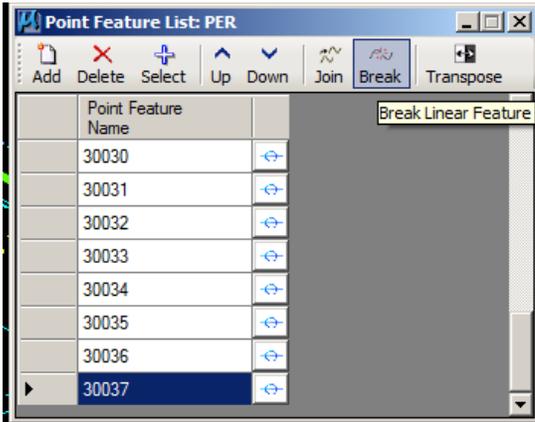
In the following example, I am going to break a chain and delete a point to get rid of a crossing breakline.



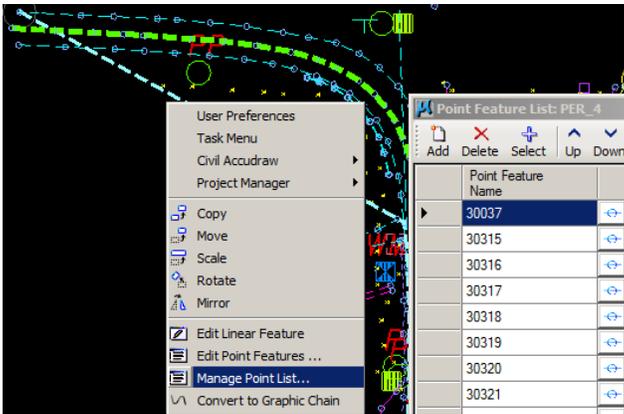
Step 1



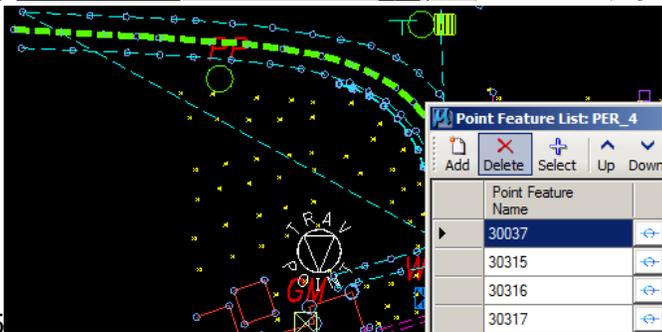
Step2



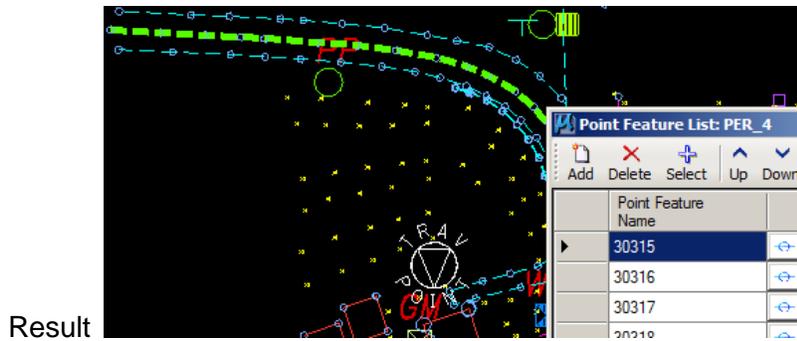
Step 3



Step 4

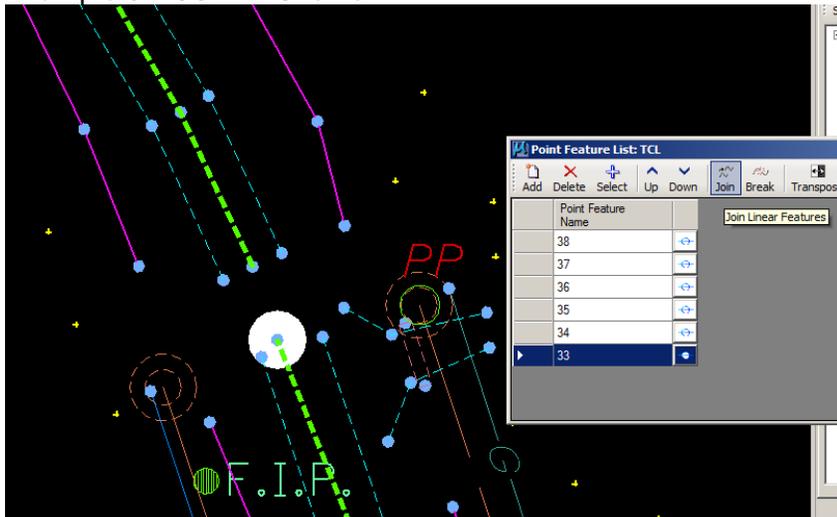


Step 5

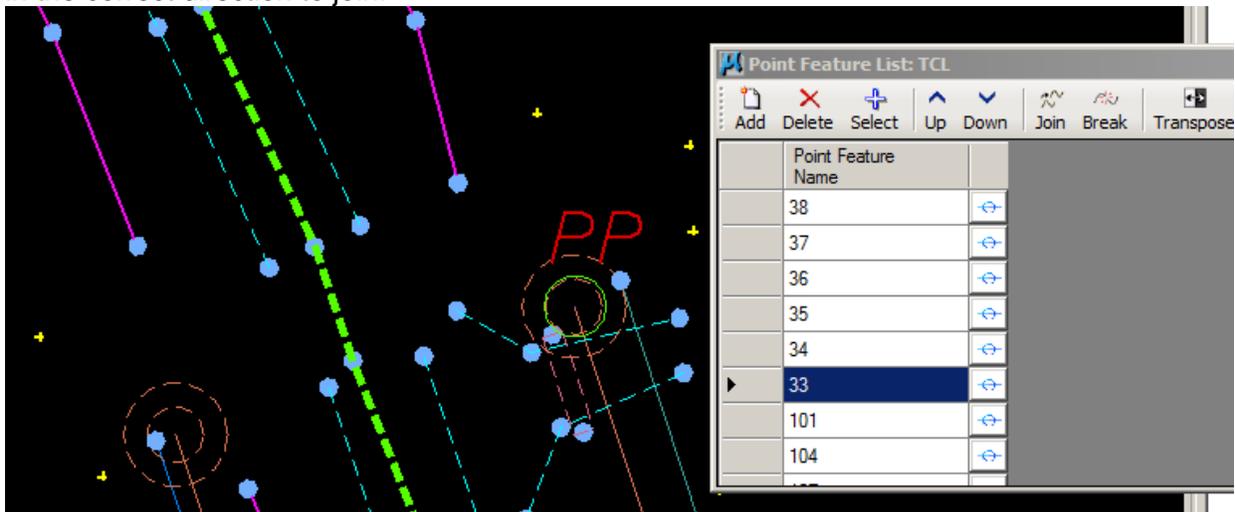


Result

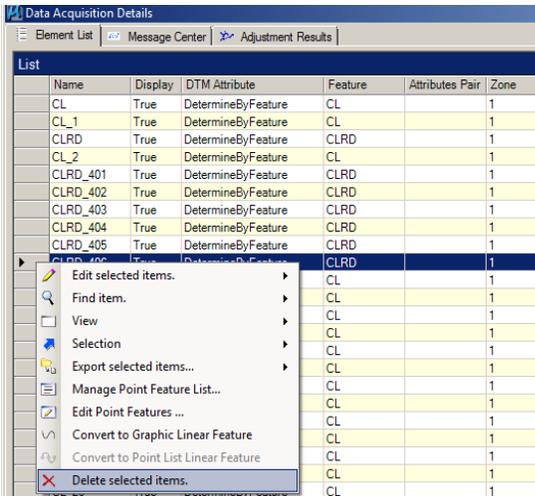
Example 3 – JOIN 2 Chains



Note: You may have to select all the points in the list and Transpose the points to get the chain in the correct direction to join.

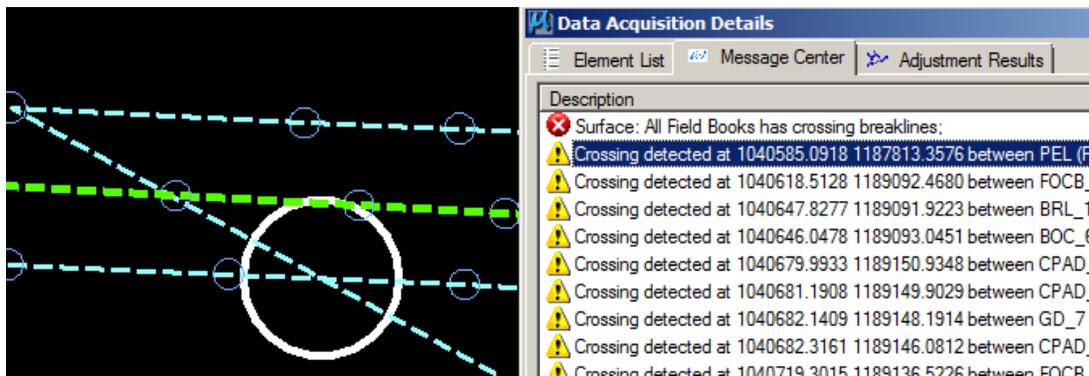


Example 3 – Delete a Chain. Note: Convert to Linear Elements prior to deleting. This process leaves the points in the dataset.



4) Crossing Breaklines

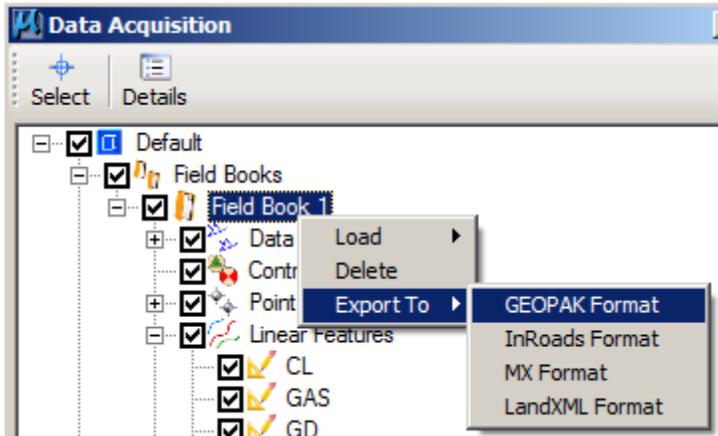
Tag the Message Center Tab on the DA Details dialog and then tag a line to locate crossing breaklines which you can then edit as described above.



Exporting to COGO

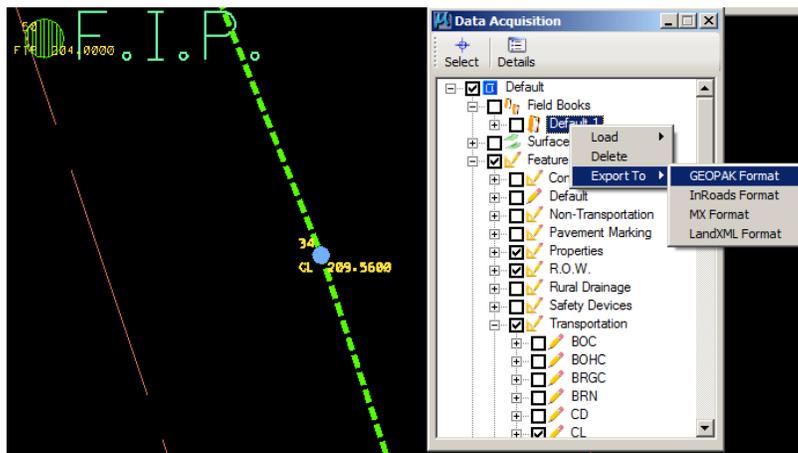
Since Point & Linear Features are stored in the DGN and you can edit this data as discussed above, there is no reason to write all these to a GPK. At this time though, you may want to export specific points or linear features to the GPK to be used to Store Parcels, to be used with the Best Fit Alignment tool, etc.

- 1) Export the whole fieldbook:



2) Display/Exporting points, Survey Chains, or Category of points

Probably the easiest way to Display/Export a Survey Chain, a group of points, or a Category (i.e. All Property related shots) is to turn off Display of the Field Book and enter the Feature Styles Tree and check the appropriate item(s) as shown in the example below which is exporting all Property, CL, & ROW related points.



Surfaces (Creating a TIN File & Contours)

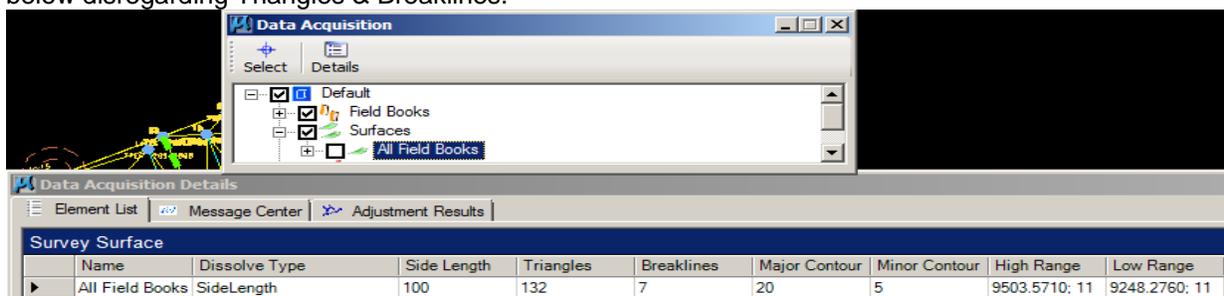
Overview:

The steps below show how to display triangles and contours, how to export the triangles to a GeoPak TIN file, creating Surfaces from 3d Graphics, and merging TIN's. Triangles, Contours, etc. are automatically generated when points are loaded based on whether a Pcode is set by default to be included in the triangulation. Note that if you are dealing with a large number of points, you may want to PCODES included in a TIN:

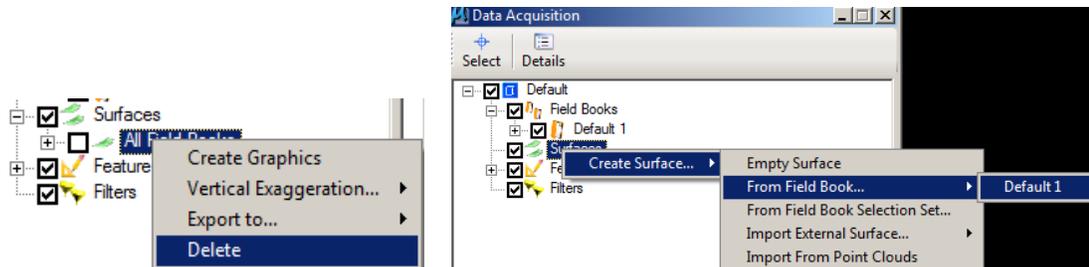
Transportation	Non-Transportation	Rural Drainage
<ul style="list-style-type: none"> • BOC Back Of Curb • BOHC Back Of Header Curb • BRN Bridge End • BRGC Bridge Column • CD Concrete Drive • CL Centerline • CLX Centerline with no CL Stripe • DD Dirt Drive • EP Pavement Edge • FOC Face of Curb • FOCB Face of Curb Bottom • FOCT Face of Curb Top • FOHCB Face of Header Curb Bottom • FOHCT Face of Header Curb Top • GD Gravel Drive • PD Paved Drive • PEL Left Pavement Edge • PER Right Pavement Edge • POC Point on Curve • POT Point on Tangent • PS Secondary Road (Paved) • RW Retaining Wall • SH Shoulder • SHP Shoulder (Paved Edge) • US Secondary Road (UnPaved) 	<ul style="list-style-type: none"> • BBRD Billboard • BUILDINGS • BUSH Bush • CDP Concrete Drive Outside of R. • CEM Cemetary • DDP Dirt Drive Outside of R.O.W. • FENCES • FLAG Flag Pole • GBM Bench Mark • GDP Gravel Drive Outside of R.O. • GP Gas Pump • GRAV GRAVE • HEDGE Hedge • PARK Parking Lots Outside of R.O. • PDP Paved Drive Outside of R.O.W • POND Pond • RRW Residential Retaining Wall • SDISH Satellite Dish • STANK Septic Tank • SW Side Wark • TANK Tank • TREE Tree • TREEL Tree Line • UTANK UnderGround Tank • WELL Well • VAC Commercial Vacum • PKM Parking Meter • SPRINK SPRINKLER • PTANK Propane Tank • SIGN Sign • CPAD Concrete Pad 	<ul style="list-style-type: none"> *DITCH *PDCH *WW * HDW <ul style="list-style-type: none"> • X-Sections • LT Left Spot Shots • RT Right Spot Shots • L Left Spot Shots • R Right Spot Shots • BL Break Line • BRL Break Line • BR Break Line • TB Top of Bank • TOB Top of Bank • TOE Toe of Slope • DCH Ditch Flow Line • DFL Ditch Flow Line • SPOT Spot Shot • TOW Top of Water • OHW Ordinary High Water • HW 100 Year Flood

1) Settings:

Dissolve Option, Side Length of triangles and Major & Minor Contour Intervals can be set by tagging All Field Books under Surfaces. These settings are not used by default so they will need to be set as shown below disregarding Triangles & Breaklines.



2) NOTE: If you have a large number of points, you may see some slowness when editing features because of the automatic triangulation adjustment. You may want to delete the surface (Shown in image left below) and then come back and create a surface from field books (image right below) when editing is complete.

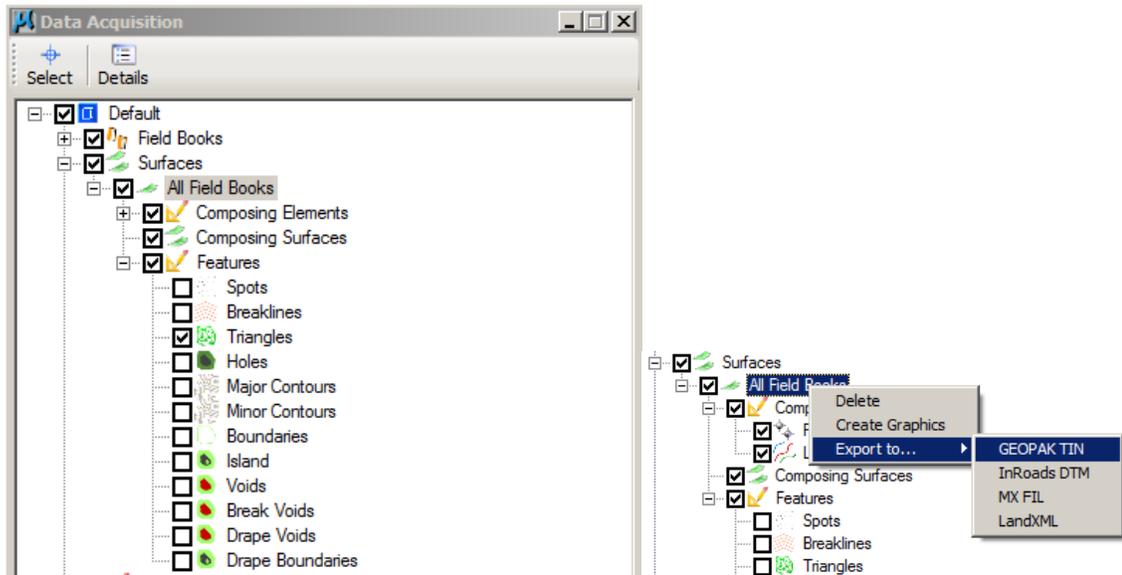


3) Viewing a TIN

Open Surfaces -> All Field Books -> Features and check triangles to view the Triangles.

4) Exporting to a TIN

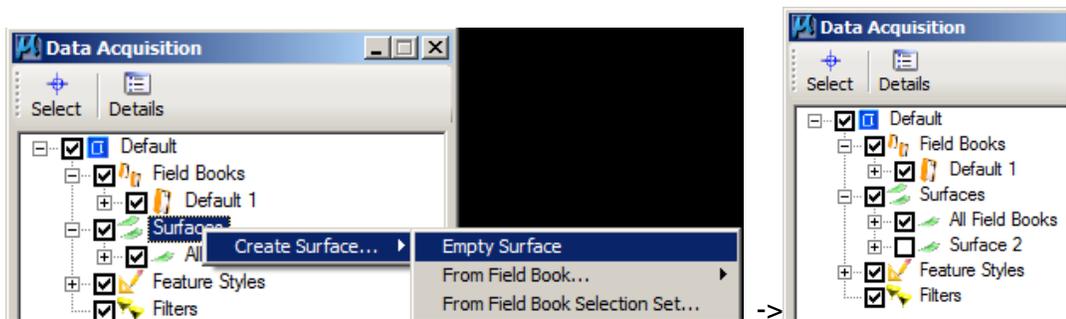
Triangles can be exported to a GeoPak TIN by Right Clicking All Field Books and Export to GeoPak TIN.



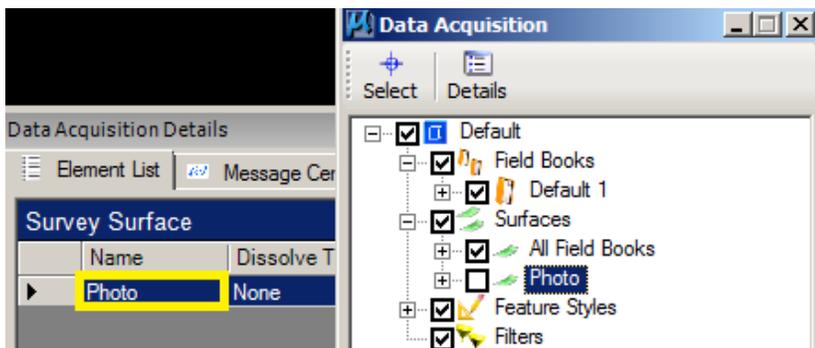
5) To create a surface from 3D graphic elements (i.e. Photo/Lidar):

All Field Books are combined into one surface with a default name of “All Field Books” but there are times when you need to include/create a TIN from graphics such as Lidar & Photo surveys. The steps below show how to create a Surface from 3d Elements (in this example, a photo survey.)

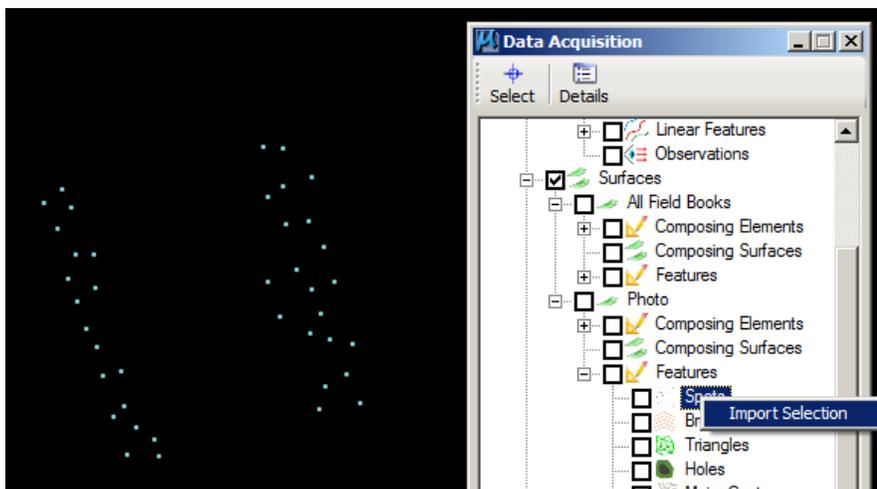
- a. Reference in the 3d DGN containing the 3d elements.
- b. Create an empty surface by right-clicking the Surface branch in the Data Tree then choosing Create Surface from the menu and Empty Surface from the submenu to create a Surface 2 as shown below.



- c. Rename the Surface in the Details Pane if you wish and also set the Side Length option in the Data Acquisition Details dialog.



- d. Use MicroStation's Element Selection functionality to select every instance of a particular graphic feature (spot or breakline or void etc.).
- e. In the Data Tree, expand the Features branch and right-click on the Surface Feature corresponding to the selected DGN 3D graphical data. For example, if you selected breaklines in the workspace, you would then right-click on Breaklines in the Data Tree. In the image above, the selected items were breaklines, so the right-click and import were performed on the Breaklines branch.
- f. On the pop-up, click Import Selection.



- g. Repeat the select and import process for all other Surface feature types you wish to import from the graphical data: Spots, Triangles, Holes, Boundaries, etc. Each type of feature must be imported separately.

Note: This 3d graphics can be in the DGN containing the field survey or another 3D DGN referenced to this file.

6) Merging/Appending Surfaces

Both the Merge and Append functions combine two surfaces into a single surface; the difference is that Merge is a destructive operation while Append is not.

Example: You might combine an aerial survey with field survey data or a LIDAR surface with field survey data.

Example: Merge Surface 1 into Surface 2

When Surface 1 is merged, all the data in Surface 2 underneath the boundary of surface 1 is destroyed and then Surface 1 is used to fill the destructed area.

Example: Append Surface 1 into Surface 2.

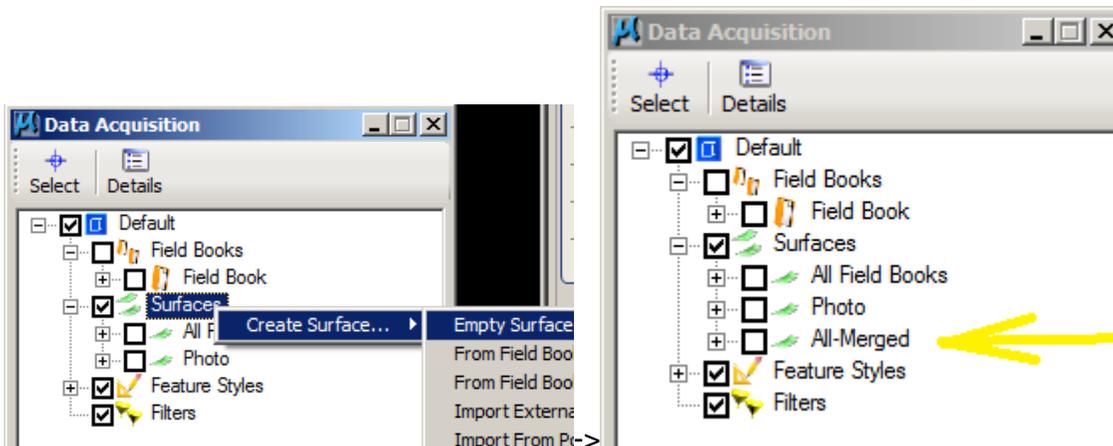
When Surface 1 is appended, Surface 2 remains 100% intact. The data contained in surface 1 is intermingled with the information contained in Surface 2.

Two Methods to Create a Merged/Appended Surface:

1. Merge/Append surfaces already contained in the DGN file
2. Merge/Append external surfaces

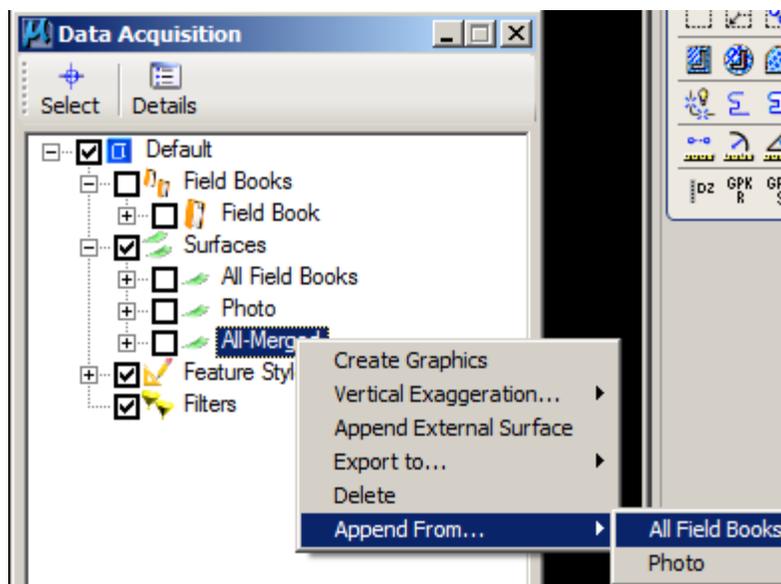
Merge/Append Internal Surfaces

Create a new, empty surface to contain the merged/appended data:

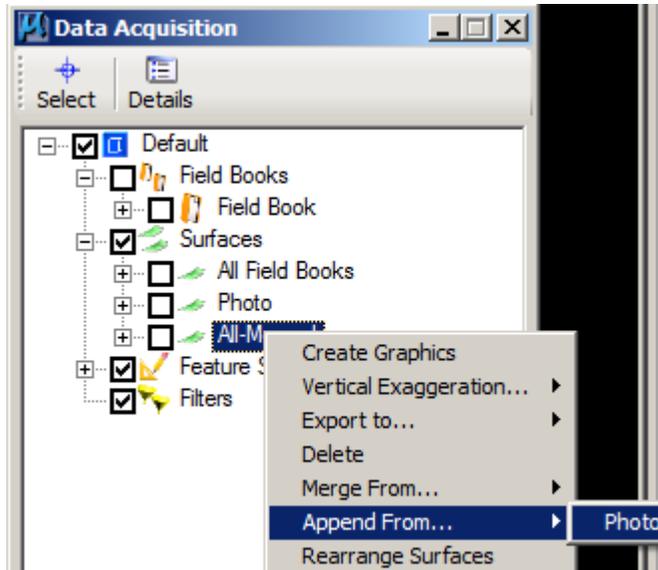


Right-click on the new surface and choose *Append From*.

Select the base surface. This is usually the largest surface or the one that acts as lowest level of information to be superseded or augmented by more detailed information.



Right-click again to merge or append additional surfaces.



Now, You'll have 3 surfaces to display with the All-Merged being a combination of the Field Books & the Photo (3d Graphics) data.

Merge/Append External Surfaces

The process is identical to the internal surface process except that, instead of using surfaces already stored in the DGN, you must select external files with formats supported by Data Acquisition. The external surface can be any of the supported surface type. The external surface is either appended to or merged with the existing surface.

- One Internal Surface\One External Surface

Right-click on the surface to which you wish to add surface data.

Choose *Append External Surface* or *Merge External Surface* from the menu.

Navigate to the desired file and double-click it.

Import Two External Surfaces, Append, then Merge

Import the surfaces you wish to merge (see Importing Surfaces).

Create an empty surface (see Creating an Empty Surface).

Right-click on the newly created empty surface then choose *Append From* and select the first of the imported surfaces.

Right-click on the newly created empty surface then choose *Merge From* and select the second of the imported surfaces.

Right-click again on the previously empty surface then choose *Merge From* and select the second of the imported surfaces.

Merge Two External Surfaces

Import the first surface you wish to merge (see Importing Surfaces).

Right-click on the newly imported surface and choose *Merge External Surface* from the menu.

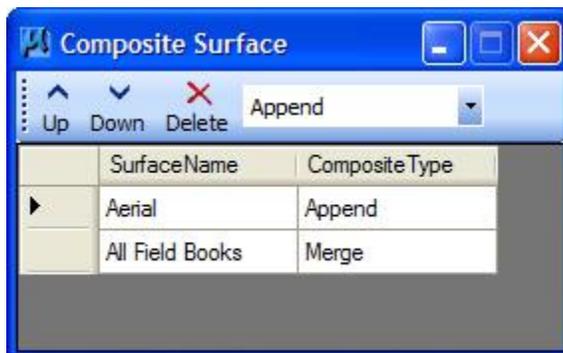
Navigate to the desired surface file then double-click it.

- Changing Merge/Append Order

Surfaces are processed from the top of the surface list to the bottom. Each surface in the surface list is merged/appended to the result of the merge/append operations performed on the items above, thus there may be occasions where the order of surface merging needs to be adjusted. To do so:

Right-click on the surface name in the Data Tree and choose *Rearrange Surfaces* from the menu.

On the Composite Surface dialog:



Select a surface and click the Up arrow to raise the selected surface's position in the surface list.

Select a surface and click the Down arrow to lower that surface's position in the surface list.

Select a surface and click Delete to eliminate the surface.

Expand the drop-down and choose whether you wish the surfaces to be Appended or Merged.

Adding graphical elements

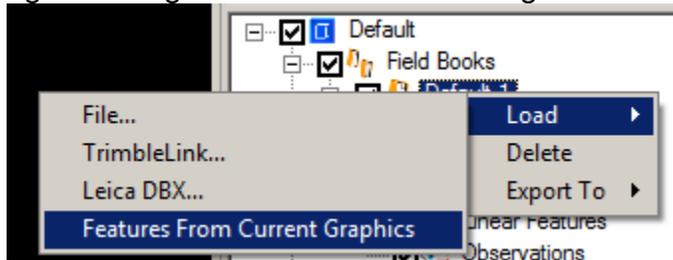
You do have the ability to add graphical elements to DA.

1. Copying linear elements - An example is that the Survey crew picks up Face of Curb only & you need to generate the Top of Curb (Copy 6" over & 6" up). You

can just use Microstation's Copy Parallel in a Top View and copy it 6" and then use Microstation's Move command with a dx=0,0,0.5 keyin to move it up 6".

The linear element is included in the TIN automatically

2. Elements drawn in 3d can be added to a Field Book as graphical elements by right clicking a field book and Loading Features from current Graphics.



This feature examines all graphical data in the current DGN model and compares the symbology against the currently loaded style file. Where the graphical data symbology matches a style file feature, the graphical data is converted to Data Acquisition Point and Linear features.

If a style is not matched, it's just added as a linear feature which can be edited to be included as a spot, breakline, etc. in the TIN.

Implementing with existing projects processed with GeoPak Survey

You can import visualized graphics as mentioned in the #2 item in the section above but this does not maintain point numbers & survey chain names.

To maintain GeoPak Survey processed point numbers & chain names, you would:

- 1) Go through GeoPak Survey, open a dataset, then tag Update OBS & XYZ, and then Process Update or Create New which updates/creates new .OBS & .XYZ files.
3. Drag & Drop the XYZ files into DA choosing XYZ CTL Type as the data format (if prompted).