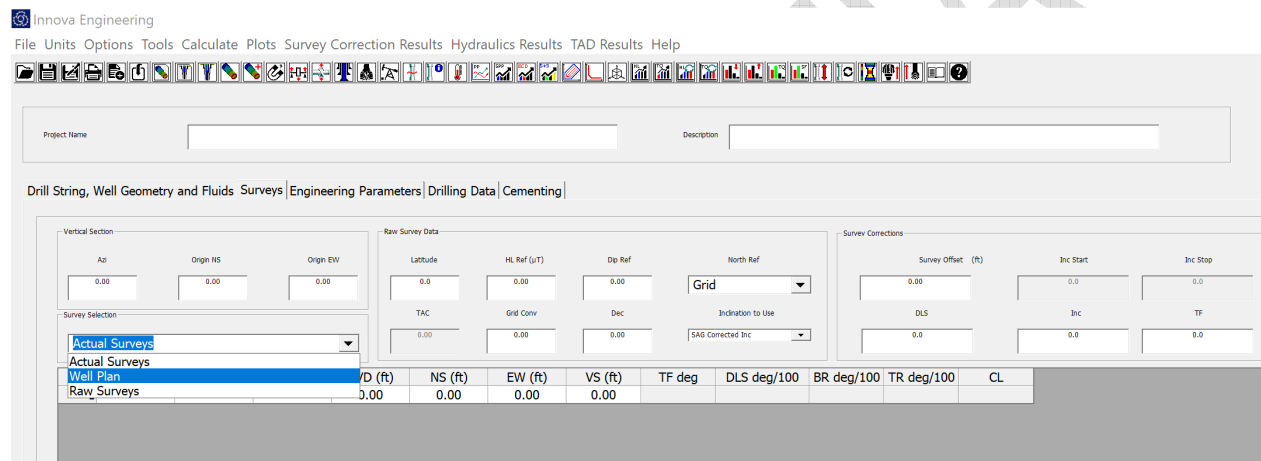


Innova Engineering - Survey Import Example

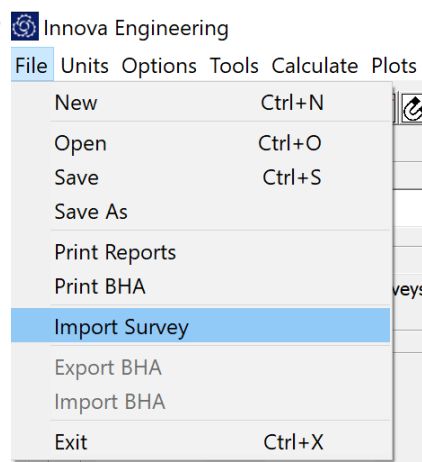
This tutorial will demonstrate the steps required to import Calculated and Raw survey data into Innova Engineering. All survey data can be copy and pasted directly in to Innova Engineering's survey tables. However, in certain circumstances it may be more convenient to use an import function as described within this example.

This example project guide comes as part of the standard install and can be found in the following location: **C:\Program Files (x86)\Innova Drilling and Intervention\Innova Engineering\Manuals**

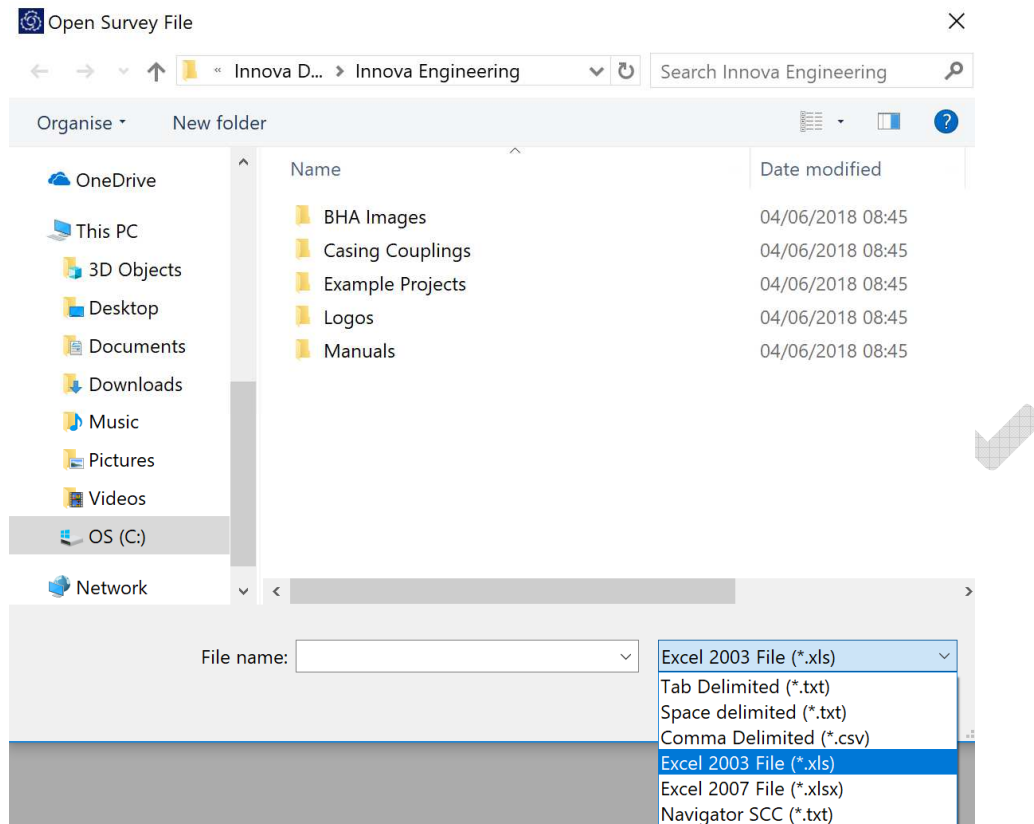
Open Innova Engineering and select the "Survey Tab". From the survey selection combo box select "Well Plan".



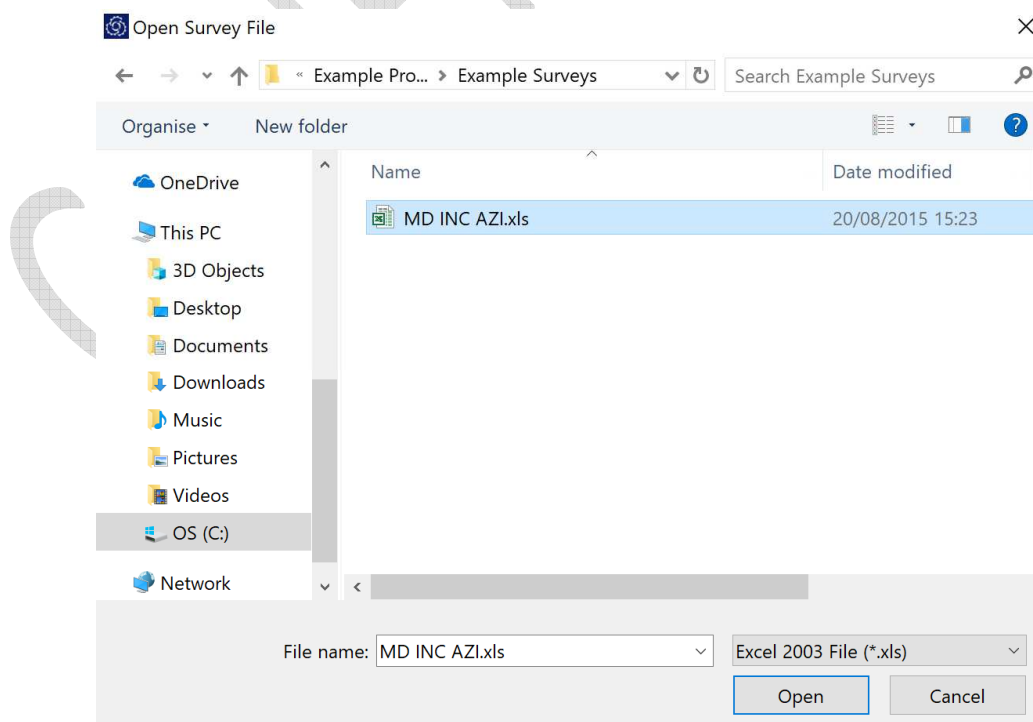
From the file menu select Import Survey.



Change the type of file to “Excel 2003 (.xls)” from the file filter drop down menu.



Locate the MD INC AZI.xls file from the example surveys folder. This will be in the Innova Engineering install directory, which by default is **C:\Program Files (x86)\Innova Drilling & Intervention\Innova Engineering\Example Projects\Example Surveys\MD INC AZI.xls**.



Open the file and the survey import dialog will be displayed, this will show a preview of the survey file.

Import Survey

Start Row End Row

1	2	3	4	5	6	7	8	9	10
MD	INC	AZI	N/A	N/A	N/A	N/A	N/A	N/A	N/A

1	2	3	4	5	6	7	8
MD	INC	AZI	TVD	NS	EW	DLS	BUILD
0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
20.00000000	0.00000000	0.00000000	20.00000000	0.00000000	0.00000000	0.00000000	0.00000000
120.00000000	0.11000000	140.34000000	120.00000000	-0.07000000	0.06000000	0.11000000	0.11000000
220.00000000	0.16000000	127.15000000	220.00000000	-0.23000000	0.23000000	0.06000000	0.05000000
320.00000000	0.08000000	312.19000000	320.00000000	-0.27000000	0.29000000	0.24000000	-0.08000000
420.00000000	0.14000000	332.75000000	420.00000000	-0.11000000	0.19000000	0.07000000	0.06000000
520.00000000	0.13000000	34.58000000	520.00000000	0.09000000	0.19000000	0.14000000	-0.01000000
620.00000000	0.12000000	82.07000000	620.00000000	0.20000000	0.36000000	0.10000000	-0.01000000
720.00000000	0.09000000	96.98000000	720.00000000	0.20000000	0.54000000	0.04000000	-0.03000000
820.00000000	0.09000000	67.33000000	820.00000000	0.22000000	0.69000000	0.05000000	0.00000000
920.00000000	0.12000000	78.26000000	920.00000000	0.27000000	0.87000000	0.04000000	0.03000000
1020.00000000	0.16000000	14.31000000	1020.00000000	0.43000000	1.01000000	0.15000000	0.04000000
1120.00000000	0.12000000	44.50000000	1120.00000000	0.64000000	1.11000000	0.08000000	-0.04000000
1220.00000000	0.12000000	59.90000000	1220.00000000	0.77000000	1.28000000	0.03000000	0.00000000
1320.00000000	0.14000000	65.71000000	1320.00000000	0.87000000	1.48000000	0.02000000	0.02000000
1420.00000000	0.14000000	54.96000000	1420.00000000	0.99000000	1.69000000	0.03000000	0.00000000
1520.00000000	0.12000000	79.63000000	1520.00000000	1.08000000	1.89000000	0.06000000	-0.02000000
1620.00000000	0.14000000	80.83000000	1620.00000000	1.12000000	2.12000000	0.02000000	0.02000000
1720.00000000	0.16000000	83.30000000	1720.00000000	1.15000000	2.38000000	0.02000000	0.02000000
1820.00000000	0.44000000	7.78000000	1820.00000000	1.55000000	2.57000000	0.43000000	0.28000000
1845.00000000	0.61000000	5.37000000	1844.99000000	1.78000000	2.59000000	0.69000000	0.68000000
1900.00000000	0.61000000	5.37000000	1899.99000000	2.36000000	2.65000000	0.00000000	0.00000000
2005.00000000	0.61000000	5.37000000	2004.98000000	3.47000000	2.75000000	0.00000000	0.00000000

Import Cancel

As you do not wish to import the headers change the start row to 2. To include all the surveys, change the end row to 206. Make sure that column 1 has MD selected from the drop-down list, column 2 has INC and column 3 has AZI.

Click the import button.

Drill String, Well Geometry and Fluids | Surveys | Engineering Parameters | Drilling Data | Cementing

Vertical Section			Raw Survey Data			Survey Corrections		
Ap	Origin NS	Origin EW	Latitude	HL Ref (uT)	Dip Ref	North Ref	Survey Offset (ft)	Inc Start
0.00	0.00	0.00	0.0	0.00	0.00	Grid	0.00	0.0
Survey Selection			TAC	Grid Conv	Dec	Inclination to Use	DLS	Inc
Well Plan			0.00	0.00	0.00	SAG Corrected Inc	0.0	0.0

	MD (ft)	Inc	Azi	TVD (ft)	NS (ft)	EW (ft)	VS (ft)	TF deg	DLS deg/100	BR deg/100	TR deg/100	CL
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	20.00
2	20.00	0.00	0.00	20.00	0.00	0.00	-0.00	0.00	0.1100	0.1100	0.0000	100.00
3	120.00	0.11	140.34	120.00	-0.07	0.06	-0.07	140.34	0.0586	0.0500	-13.1900	100.00
4	220.00	0.16	127.15	220.00	-0.23	0.23	-0.23	-38.57	0.2398	-0.0800	174.9600	100.00
5	320.00	0.08	312.19	320.00	-0.27	0.29	-0.27	-178.32	0.0709	0.0600	20.5600	100.00
6	420.00	0.14	332.75	420.00	-0.11	0.19	-0.11	43.90	0.1390	-0.0100	61.8300	100.00
7	520.00	0.13	34.58	520.00	0.09	0.19	0.09	124.45	0.1011	-0.0100	47.4900	100.00
8	620.00	0.12	82.07	620.00	0.20	0.36	0.20	118.94	0.0403	-0.0300	14.9100	100.00
9	720.00	0.09	96.98	720.00	0.20	0.54	0.20	144.97	0.0461	0.0000	-29.6500	100.00
10	820.00	0.09	67.33	820.00	0.22	0.69	0.22	-104.82	0.0359	0.0300	10.9300	100.00
11	920.00	0.12	78.26	920.00	0.27	0.87	0.27	39.28	0.1521	0.0400	-63.9500	100.00
12	1020.00	0.16	14.31	1020.00	0.43	1.01	0.43	-109.09	0.0825	-0.0400	30.1900	100.00
13	1120.00	0.12	44.50	1120.00	0.64	1.11	0.64	133.00	0.0322	0.0000	15.4000	100.00
14	1220.00	0.12	59.90	1220.00	0.77	1.28	0.77	97.70	0.0239	0.0200	5.8100	100.00
15	1320.00	0.14	65.71	1320.00	0.87	1.48	0.87	36.32	0.0262	0.0000	-10.7500	100.00
16	1420.00	0.14	54.96	1420.00	0.99	1.69	0.99	-95.37	0.0589	-0.0200	24.6700	100.00
17	1520.00	0.12	79.63	1520.00	1.08	1.89	1.08	121.72	0.0202	0.0200	1.2000	100.00
18	1620.00	0.14	80.83	1620.00	1.12	2.12	1.12	8.35	0.0210	0.0200	2.4700	100.00
19	1720.00	0.16	83.30	1720.00	1.15	2.38	1.15	19.15	0.4289	0.2800	-75.5200	100.00
20	1820.00	0.44	7.78	1820.00	1.55	2.57	1.55	-96.69	0.6856	0.6800	-9.6400	25.00
21	1845.00	0.61	5.37	1844.99	1.78	2.59	1.78	-8.61	0.0000	0.0000	0.0000	55.00
22	1900.00	0.61	5.37	1899.99	2.36	2.65	2.36	0.00	0.0000	0.0000	0.0000	105.00
23	2005.00	0.61	5.37	2004.98	3.47	2.75	3.47	0.00	0.4947	-0.4947	0.0000	95.00
24	2100.00	0.14	5.37	2099.98	4.09	2.81	4.09	180.00	0.5185	-0.5185	-19.8889	27.00
25	2127.00	0.00	0.00	2126.98	4.13	2.81	4.13	-180.00	0.0000	0.0000	0.0000	73.00
26	2200.00	0.00	0.00	2199.98	4.13	2.81	4.13	0.00	0.0000	0.0000	0.0000	100.00
27	2300.00	0.00	0.00	2299.98	4.13	2.81	4.13	0.00	0.0000	0.0000	0.0000	100.00

The surveys will now be imported.

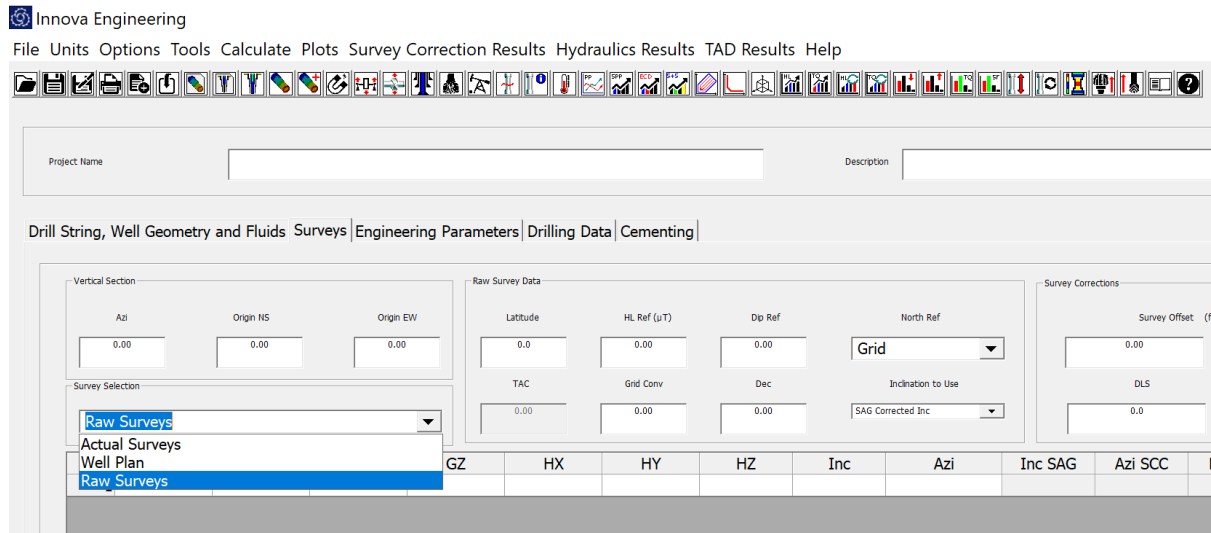
The last thing to do is set the survey tie on details for TVD, NS, EW and VS. If the survey listing is from surface it is likely these values will be 0, 0, 0, 0. However, if the well is a side-track the values for NS EW and TVD will need to come from the side-track point in the parent well. Failure to do this will mean that the TVD's will be calculated incorrectly and ECD and Surge and Swab values will calculate incorrectly.

	TVD (ft)	NS (ft)	EW (ft)	VS (ft)	Tot
	20.00	0.00	0.00	-0.00	0.00
	120.00	-0.07	0.06	-0.07	1.00
	220.00	-0.23	0.23	-0.23	-3.00
	320.00	-0.27	0.29	-0.27	-1.00

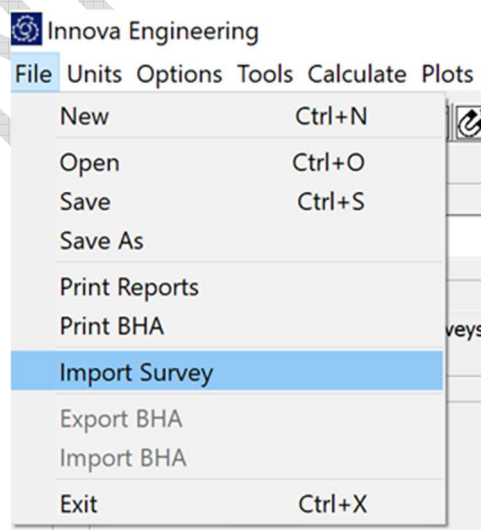
Raw Survey Import Example

Raw surveys will need to be imported into Innova Engineering if you wish to run the short collar correction algorithm or Multi Station Analysis.

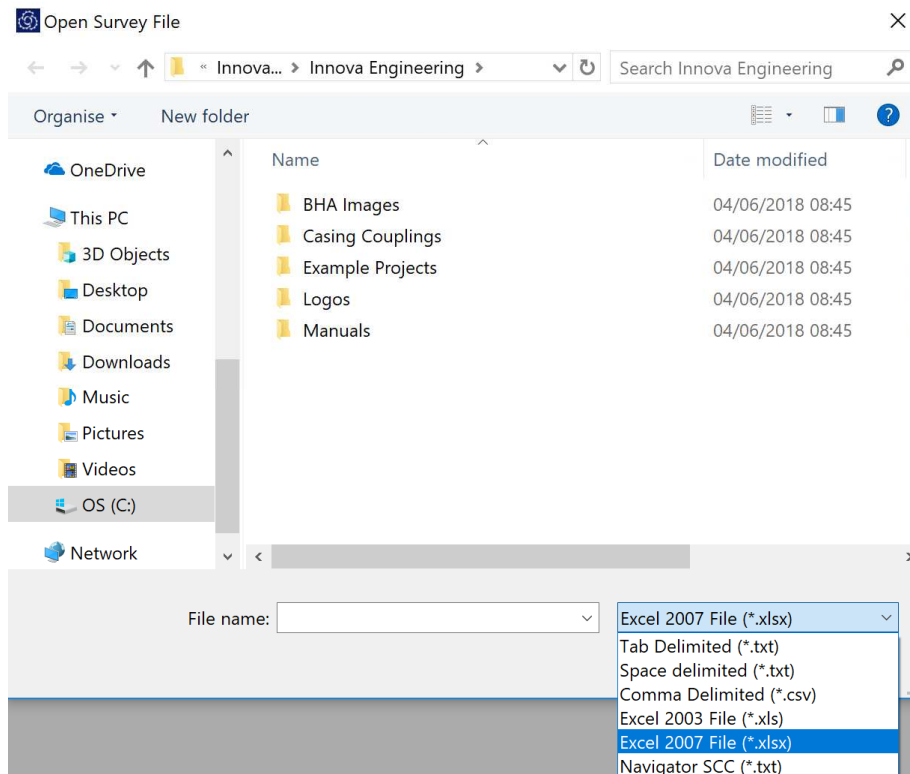
Open Innova Engineering and select the “Survey Tab”. From the survey selection combo box select “Raw Surveys”



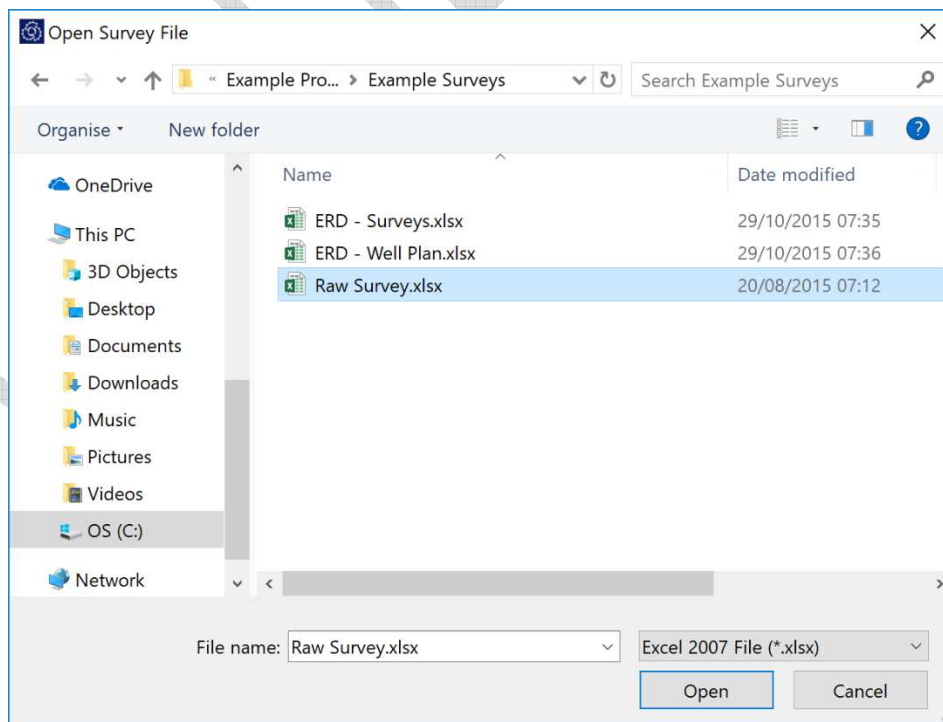
From the file menu select Import Survey.



Change the type of file to “Excel 2007 (.xlsx)” from the file filter drop down menu



Locate the Raw Survey.xlsx file from the example surveys folder. This will be in the Innova Engineering install directory which by default is **C:\Program Files (x86)\Innova Drilling & Intervention\Innova Engineering\Example Projects\Example Surveys\Raw Survey.xlsx**.



Open the file and the survey import dialog will be displayed, this will show a preview of the survey file.

Import Survey X

Start Row End Row

	1	2	3	4	5	6	7	8	9	10	
	MD	GX	GY	GZ	HX	HY	HZ	N/A	N/A	N/A	N/A
1	MD	GX	GY	GZ	HX	HY	HZ				
2	78.50000000	-0.01960000	0.01380000	1.00010000	-0.06770000	-0.17440000	0.49670000				
3	163.50000000	-0.01790000	-0.00090000	1.00070000	-0.00030000	-0.18490000	0.48910000				
4	274.00000000	0.01550000	0.00910000	1.00070000	-0.06770000	0.17140000	0.48850000				
5	371.50000000	0.00440000	-0.01440000	1.00070000	0.18080000	0.03900000	0.48850000				
6	383.50000000	-0.00260000	-0.01260000	1.00070000	0.18370000	0.03900000	0.48730000				
7	395.50000000	-0.01140000	-0.01260000	1.00070000	0.18670000	0.04480000	0.48560000				
8	407.50000000	-0.02670000	-0.00210000	1.00070000	0.19550000	-0.02900000	0.48320000				
9	420.00000000	-0.03660000	-0.01730000	1.00010000	0.19190000	0.06830000	0.48030000				
10	432.00000000	-0.05660000	-0.00500000	0.99960000	0.21010000	0.02140000	0.47680000				
11	444.00000000	-0.03370000	0.06300000	0.99840000	0.11580000	-0.18430000	0.47380000				
12	456.50000000	-0.06830000	0.04890000	0.99780000	0.19310000	-0.11160000	0.47150000				
13	469.00000000	-0.09470000	-0.03310000	0.99600000	0.20950000	0.09520000	0.46680000				
14	481.00000000	0.05070000	-0.11220000	0.99310000	-0.11690000	0.20950000	0.46100000				
15	493.00000000	-0.09000000	-0.11580000	0.91580000	0.11520000	0.20950000	0.45680000				
16	505.50000000	-0.13100000	-0.08820000	0.98840000	0.18490000	0.17380000	0.45270000				
17	529.50000000	-0.19310000	-0.00320000	0.92600000	0.26050000	0.06070000	0.44450000				
18	541.50000000	-0.08530000	-0.19550000	0.97790000	0.05360000	0.28450000	0.43870000				
19	554.50000000	0.23000000	0.02320000	0.97440000	-0.26810000	-0.08880000	0.43460000				
20	566.50000000	-0.22070000	0.09930000	0.97140000	0.28100000	-0.05480000	0.43160000				
21	578.50000000	-0.21830000	0.14100000	0.96670000	0.27630000	-0.09820000	0.42640000				
22	591.00000000	-0.24590000	0.12690000	0.96260000	0.29100000	-0.07000000	0.42170000				
23	603.00000000	-0.27460000	0.09230000	0.95850000	0.30330000	-0.02200000	0.41820000				
24	615.00000000	-0.29860000	0.06360000	0.95330000	0.30860000	0.01790000	0.41410000				

Import Cancel

As you do not wish to import the headers change the start row to 2. To include all the surveys, change the end row to 107.

Make sure that column 1 has MD selected from the drop down list, column 2 has GA and column 3 has GB, Column 4 has GC, column 5 has HX, column 6 has HY and column 7 has HZ.

Click the import button.

The raw survey data will have been imported in to the Surveys tab in the Raw Surveys table.

Innova Engineering
File Units Options Tools Calculate Plots Survey Correction Results Hydraulics Results TAD Results Help

Drill String, Well Geometry and Fluids Surveys | Engineering Parameters | Drilling Data | Cementing

Survey Selection: Raw Surveys

MD (ft)	GX	GY	GZ	HX	HY	HZ	Inc	Azi	Inc SAG	Azi SCC	HL SCC	Dip SCC	HL	GT	Dip	HSTF	Delta Inc	Delta Azi	TVD (ft)	NS (ft)
1	78.50	-0.019600	0.013800	1.000100	-0.067700	-0.174400	0.496700	1.37	259.66				53.0783	1.0004	69.6502	35.1487			0.00	0.00
2	163.50	-0.017900	-0.000900	1.000700	-0.000300	-0.184900	0.489100	1.03	275.67				52.2883	1.0009	69.2140	357.1216			84.98	-0.1
3	274.00	0.015500	0.009100	1.000700	-0.067700	0.171400	0.488500	1.03	281.54				52.2105	1.0009	69.1408	149.5829			195.46	0.15
4	371.50	0.004400	-0.014400	1.000700	0.180800	0.039900	0.488500	0.86	277.08				52.2343	1.0008	69.1227	253.6092			292.95	0.46
5	383.50	-0.002600	-0.012600	1.000700	0.183700	0.039900	0.487300	0.74	246.13				52.2234	1.0008	69.2094	281.6593			304.95	0.44
6	395.50	-0.011400	-0.012600	1.000700	0.186700	0.044800	0.485600	0.97	215.81				52.2179	1.0008	69.2229	312.1376			316.95	0.33
7	407.50	-0.026700	-0.002100	1.000700	0.195500	-0.029000	0.483200	1.53	193.84				52.2057	1.0011	69.2459	355.5028			328.95	0.06
8	420.00	-0.036600	-0.017300	1.000100	0.191900	0.068300	0.480200	2.32	186.31				52.1727	1.0009	69.2238	394.7009			341.44	-0.3
9	432.00	-0.056600	-0.005000	0.999600	0.210100	0.021400	0.476800	3.25	179.12				52.1477	1.0012	69.3632	354.8516			353.42	-0.9
10	444.00	-0.033700	0.063000	0.998400	0.115800	-0.184300	0.473800	4.09	175.25				52.1404	1.0010	69.4076	61.8568			365.40	-1.6
11	456.50	-0.068300	0.048900	0.997800	0.193100	-0.111600	0.471500	4.81	173.20				52.1388	1.0013	69.4693	35.6011			377.86	-2.6
12	469.00	-0.094700	-0.033100	0.996000	0.209500	0.095200	0.468600	5.75	173.47				52.0448	1.0010	69.4033	340.7342			390.31	-3.7
13	481.00	0.050700	-0.112200	0.993100	-0.116900	0.209500	0.465000	7.07	173.60				51.9689	1.0007	69.5413	245.6831			402.23	-5.1
14	493.00	-0.090000	-0.115800	0.915800	0.115200	0.209500	0.456800	9.10	166.85				51.9585	0.9275	71.3075	307.8544			414.11	-6.7
15	505.50	-0.131000	-0.088200	0.988400	0.184900	0.173800	0.452700	9.08	166.91				51.8972	1.0009	69.6383	326.0483			426.46	-8.6
16	529.50	-0.193100	-0.003200	0.926000	0.260500	0.060700	0.444500	11.78	151.16				51.8775	0.9248	70.3366	359.6506			450.06	-12.8
17	541.50	-0.085300	-0.195500	0.977900	0.053600	0.284500	0.438700	12.30	160.47				52.5615	1.0009	68.4167	293.5725			461.79	-15.2
18	554.50	0.230000	0.023200	0.974400	-0.268100	-0.088800	0.434600	13.35	159.90				51.8395	1.0014	69.8219	174.2401			474.47	-17.9
19	566.50	-0.220700	0.099300	0.971400	0.281000	-0.054800	0.431600	13.99	158.54				51.7921	1.0011	69.8377	24.2245			486.13	-20.5
20	578.50	-0.218300	0.114100	0.966700	0.276300	-0.088200	0.428400	15.05	157.76				51.7466	1.0010	69.8644	32.8594			497.75	-23.3
21	591.00	-0.245900	0.126900	0.962600	0.251000	-0.070000	0.421700	16.04	156.37				51.7119	1.0016	69.8921	27.2966			509.79	-26.4
22	603.00	-0.274600	0.092300	0.958500	0.303300	-0.022000	0.418200	16.82	154.78				51.7075	1.0013	69.8799	18.5788			521.30	-29.5
23	615.00	-0.298600	0.063600	0.953300	0.308600	0.017900	0.414100	17.76	152.57				51.6753	1.0010	69.9031	12.0240			532.76	-32.7
24	627.50	-0.259900	0.103700	0.947400	0.295100	-0.199300	0.409400	18.89	149.92				51.6371	1.0013	69.8953	36.6967			544.62	-36.1
25	639.50	-0.306800	0.154400	0.940400	0.316200	-0.055400	0.403500	20.06	148.34				51.5820	1.0012	69.9773	26.7143			555.94	-39.6

In this example the raw survey magnetometer data was in mV, as such the default magnetics units of 'Geolink / Tensor (mv)' was correct. In the event that the raw survey magnetometer data is in a different unit, the magnetics unit can be selected from Units>Magnetics.

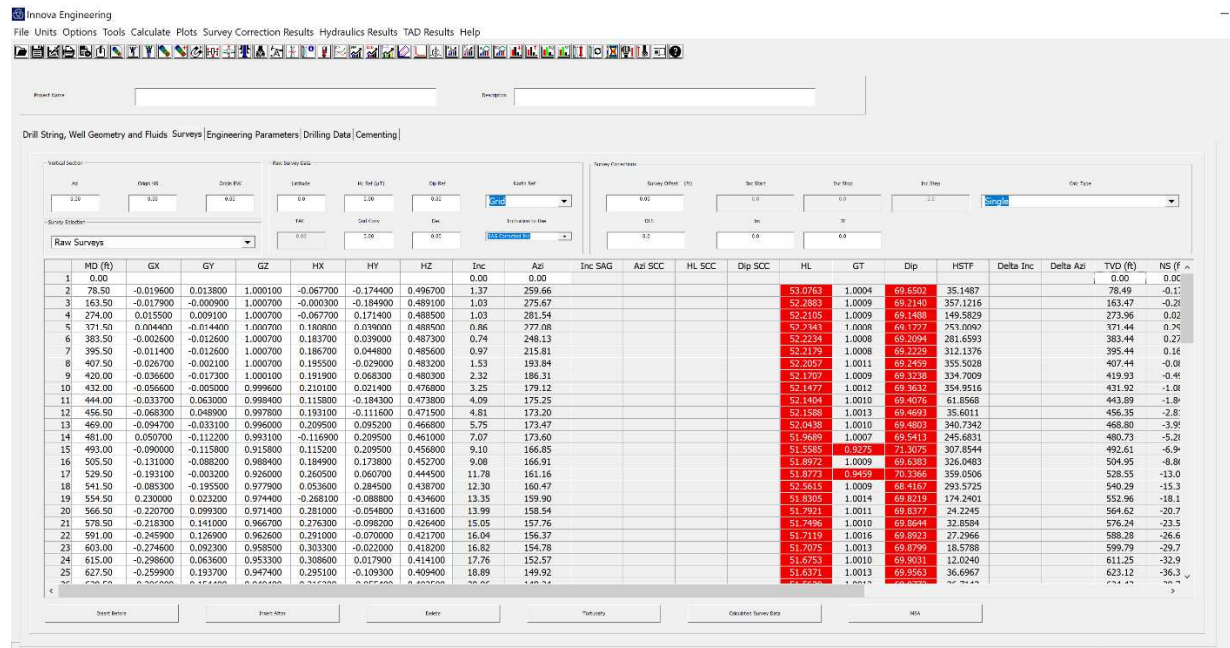
Units Options Tools Calculate Plots Survey Correction

- Mud
- Length
- Flow
- Pressure
- Weight
- Volume
- Diameter
- Temperature
- Magnetics**
 - Geolink / Tensor (mv) ✓
 - SSP / SUCOP (uT)
 - nT
 - nT no XY inversion

Survey Selection

The tie on is set in exactly the same way as regular surveys, however in this example the first line imported from the raw survey file has been assumed as the tie on line. In order to insert a tie on line, select row 1 and click the 'Insert Before' radio button.

Fill in the 'MD, Inc, Azi, TVD, NS, EW and VS' values as required for the tie-on line..



	MD (ft)	GX	GY	GZ	HX	HY	HZ	Inc	Azi	Inc SAG	Azi SCC	HL SCC	Dip SCC	HL	GT	Dip	HSTF	Delta Inc	Delta Azi	TVD (ft)	NS (ft)
1	0.00							0.00	0.00											0.00	0.00
2	78.50	-0.019600	0.013800	1.000100	-0.067700	-0.174400	0.496700	1.37	259.66					S2 0763	1.0004	69.6502	35.1487			78.49	-0.11
3	163.50	-0.017900	-0.000900	1.000700	-0.000300	-0.184900	0.489100	1.03	275.67					S2 2883	1.0009	69.7140	357.1216			163.47	-0.28
4	274.00	0.013500	0.009100	1.000700	-0.067700	0.171400	0.488500	1.03	281.54					S2 2105	1.0009	69.1488	149.5829			273.96	0.02
5	371.50	0.004400	-0.014400	1.000700	0.180800	0.039000	0.488500	0.86	277.08					S2 2341	1.0008	69.1777	263.0092			371.44	0.25
6	383.50	-0.002600	-0.012600	1.000700	0.183700	0.039000	0.487300	0.74	248.13					S2 2234	1.0008	69.2094	281.6593			383.44	0.27
7	395.50	-0.011400	-0.012600	1.000700	0.186700	0.044800	0.485600	0.97	215.81					S2 2179	1.0008	69.2229	312.1376			395.44	0.16
8	407.50	-0.028700	-0.002100	1.000700	0.195500	-0.029000	0.483200	1.53	199.84					S2 2057	1.0011	69.2493	335.5028			407.44	-0.04
9	420.00	-0.036600	-0.017300	1.000100	0.191900	0.068300	0.480300	2.32	186.31					S2 1767	1.0009	69.3338	334.7009			419.93	-0.46
10	432.00	-0.056600	-0.050000	0.999600	0.210100	0.021400	0.476800	3.25	179.12					S2 1477	1.0012	69.3632	354.9516			431.92	-1.08
11	444.00	-0.033700	0.063000	0.998400	0.115800	-0.184300	0.473800	4.09	175.25					S2 1404	1.0010	69.4676	61.8568			443.89	-1.89
12	456.50	-0.068300	0.048900	0.997800	0.183100	-0.111600	0.471500	4.81	173.20					S2 1358	1.0013	69.4693	35.6011			456.35	-2.8
13	469.00	-0.094700	-0.033100	0.996000	0.209500	0.095200	0.468600	5.75	173.47					S2 0438	1.0010	69.4803	340.7342			468.80	-3.9
14	481.00	0.050700	-0.112200	0.993100	-0.116900	0.209500	0.461000	7.07	173.60					S1 9689	1.0007	69.5413	245.6831			480.73	-5.21
15	493.00	-0.090000	-0.115800	0.915800	0.115200	0.209500	0.456800	9.10	166.85					S1 3585	0.9225	71.3675	307.8544			492.61	-6.9
16	505.50	-0.131000	-0.080200	0.988400	0.184900	0.172800	0.452700	9.08	166.91					S1 8972	1.0009	69.5383	326.0483			504.95	-8.84
17	529.50	-0.193100	-0.003200	0.926000	0.260500	0.060700	0.444500	11.78	161.16					S1 8773	0.9959	70.3368	359.0506			528.55	-13.0
18	541.50	-0.085300	-0.195500	0.977900	0.053600	0.284500	0.438700	12.30	160.47					S2 5615	1.0009	68.4167	293.5725			540.29	-15.3
19	554.50	0.230000	0.023200	0.974400	-0.268100	-0.088800	0.434600	13.35	159.90					S1 8305	1.0014	69.8219	174.2401			552.96	-18.1
20	566.50	-0.220700	0.099300	0.971400	0.281000	-0.054800	0.431600	13.99	158.54					S1 7921	1.0011	69.8377	24.2245			564.62	-20.7
21	578.50	-0.218300	0.141000	0.866700	0.276300	-0.098200	0.436400	15.05	157.76					S1 7486	1.0010	69.8494	32.8584			576.24	-21.5
22	591.00	-0.245900	0.126900	0.962600	0.291000	-0.070000	0.431700	16.04	156.37					S1 7119	1.0016	69.8923	27.2966			588.28	-26.6
23	603.00	-0.274600	0.092300	0.958500	0.303300	-0.022000	0.418200	16.82	154.78					S1 7075	1.0013	69.8799	18.5788			599.79	-29.7
24	615.00	-0.298600	0.063600	0.953300	0.308600	0.017900	0.414100	17.76	152.57					S1 6753	1.0010	69.9031	12.0240			611.25	-32.9
25	627.50	-0.259900	0.193700	0.947400	0.285100	-0.109300	0.409400	18.89	149.92					S1 6371	1.0013	69.9563	36.6967			623.12	-36.3

Save this project, as it can be used as the starting point for the BHA Analysis and SAG Example and the Short Collar Correction Example at a later date.