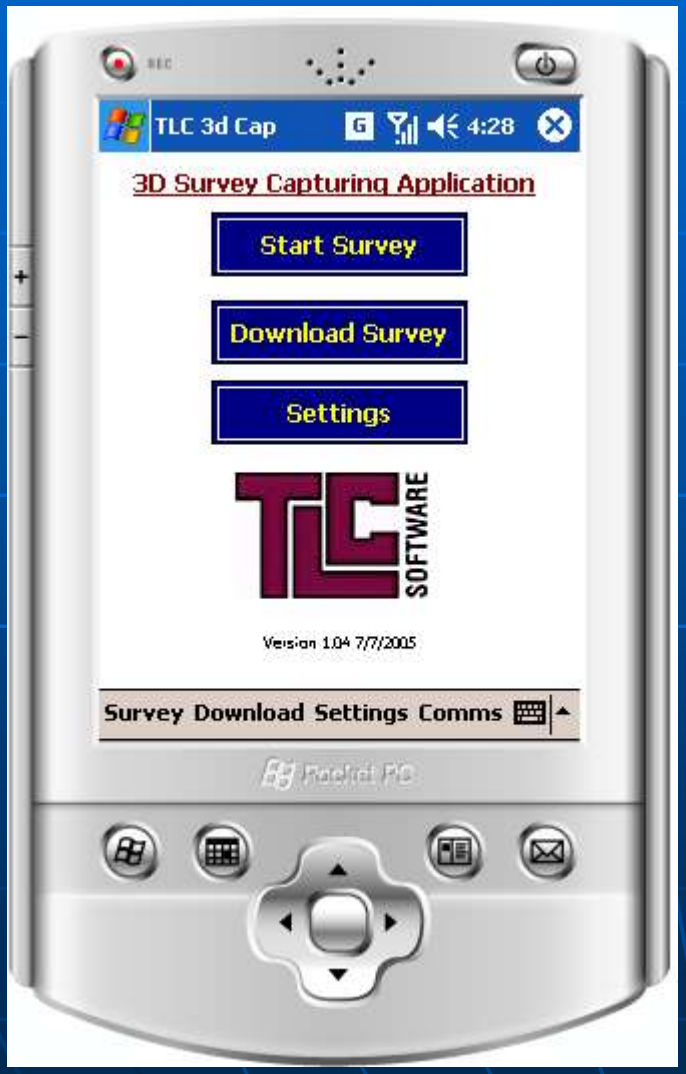
TLC 3D SURVEY CAPTURING SOFTWARE

Running on Pocket PC2003, Mobile 5 Devices
Windows CE Devices

TLC 3D CAP
Main Features



- Capture 3d Survey
  - Guide user throughout process
  - Collect all required information for 3d survey
- Interface to Winprof32
- Interface to a range of industry lasers
  - MDL Laser Ace 300, Quarryman II
  - Impulse 200, Autoscan
  - Laser Atlanta

Survey Modes…

- Three Methods are automated:
  - Profiling
  - Muck-pile survey
  - Bench Plan Survey

Generating a 3d Survey

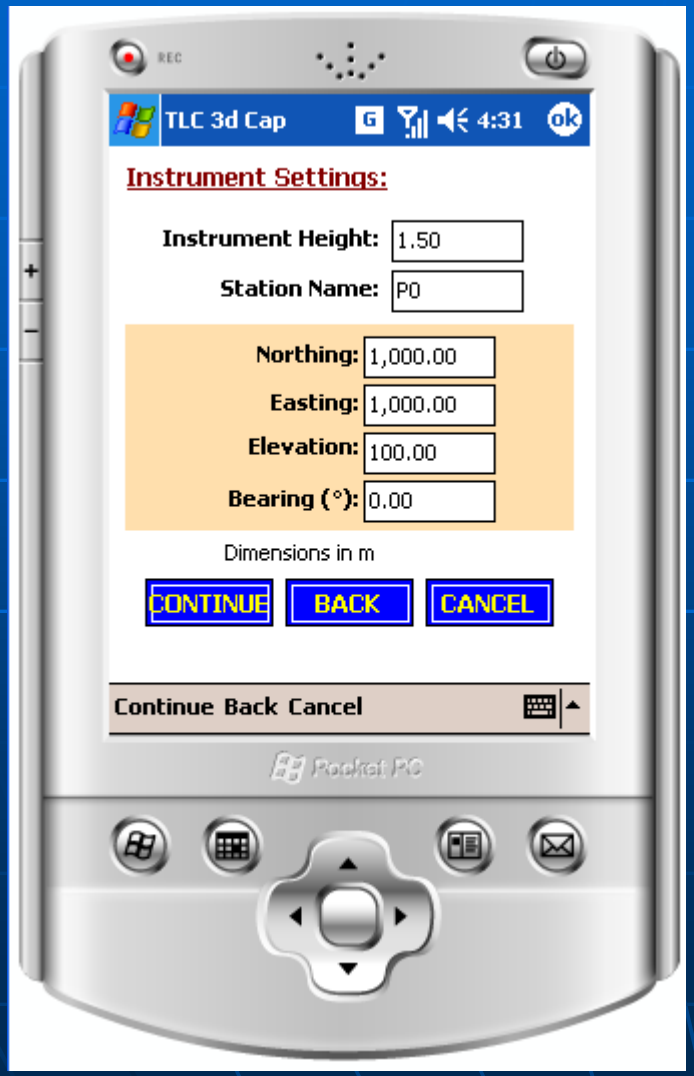
- Need to select the type of measurement
- Define where the laser instrument is located
- Define the coordinate system using known sights (required for muckpile measurements)

Generating A Survey (cont…)

Define Survey Properties:

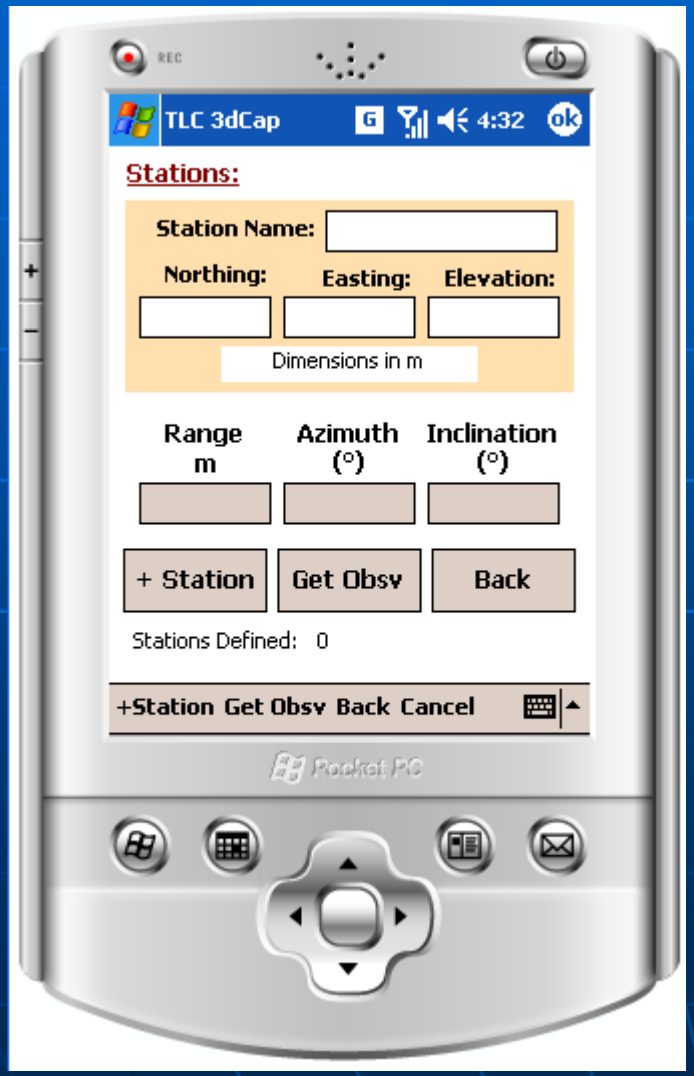
Select file to save readings:

Generating A Survey (cont…)



- Define instrument settings:
  - Height
  - World coordinates (if available)
  - Name

Generating A Survey (cont…)



- Define known stations (for world coordinate measurements)
- Up to 10 stations can be measured.
- For each station, the user can input:
  - World coordinates
  - Station ID

Resection method

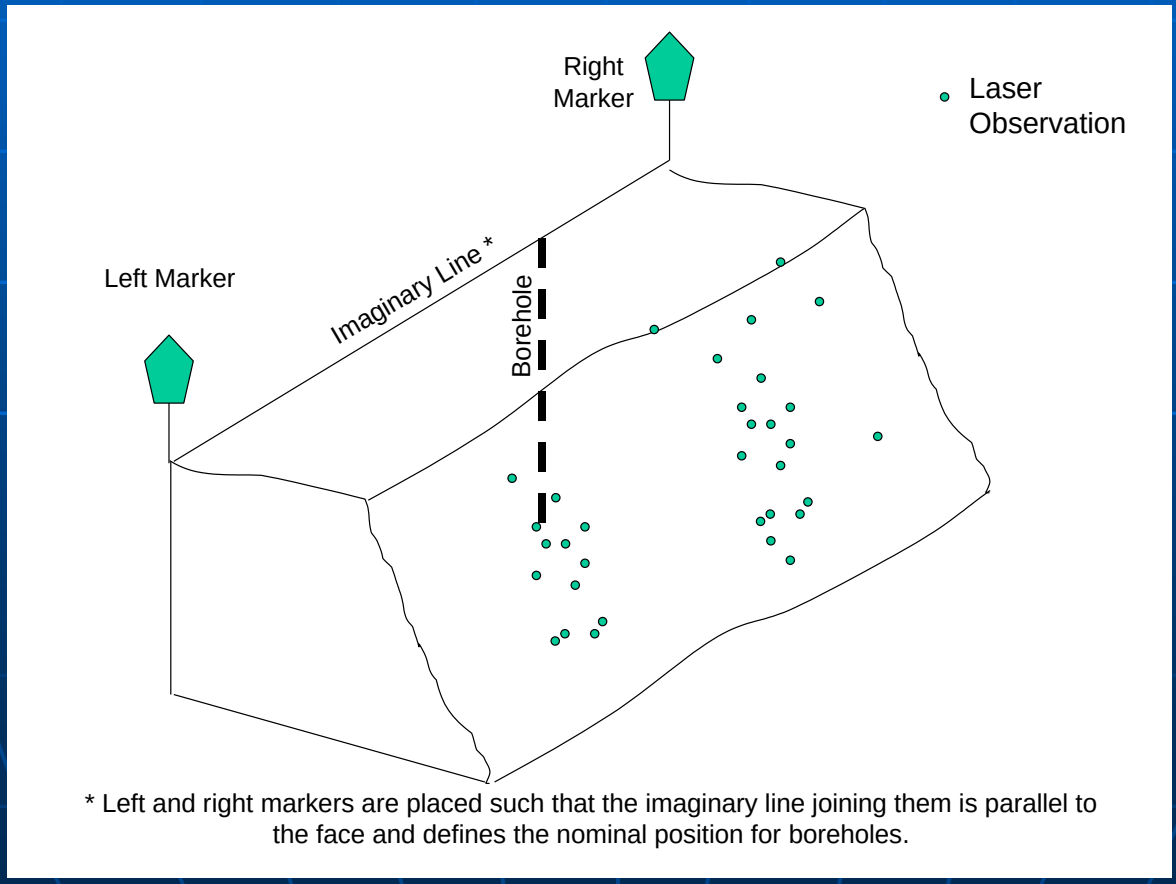
- 2 and 3 point resection algorithms supported.
- If the program detects that one or more stations have been measured, the following dialog appears:

Resection method (cont…)

- The result of the calculation is shown. If the user says nor or cancel, the original instrument coordinates are applied.
  - Note: The algorithm has been verified mathematically but not with real survey data.

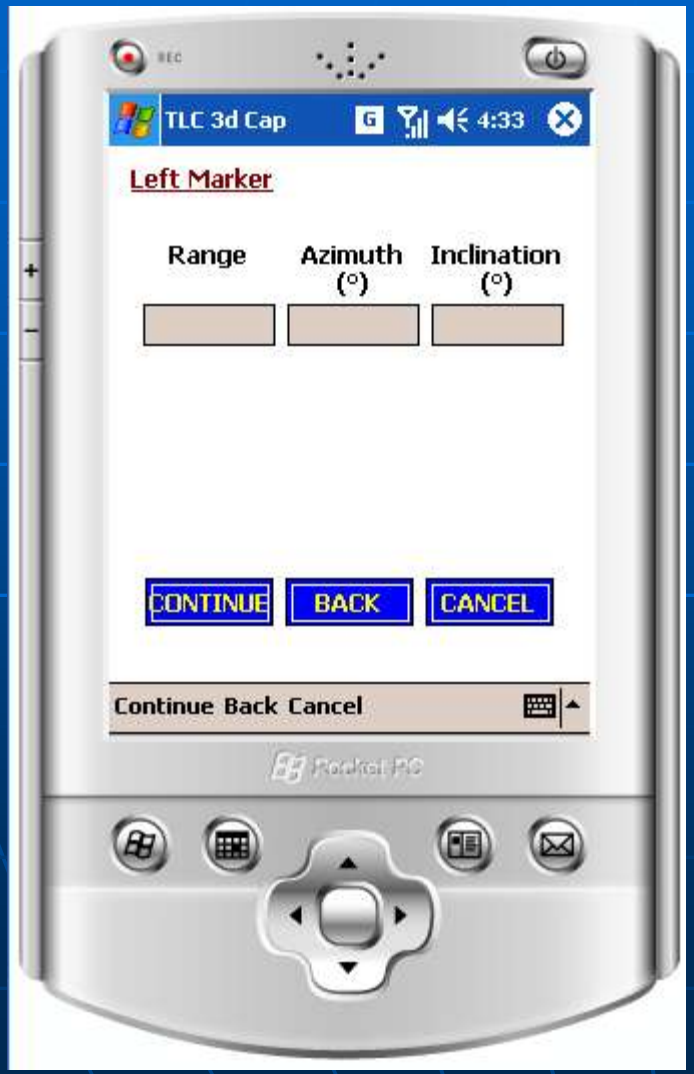
Generating A Survey (cont…)

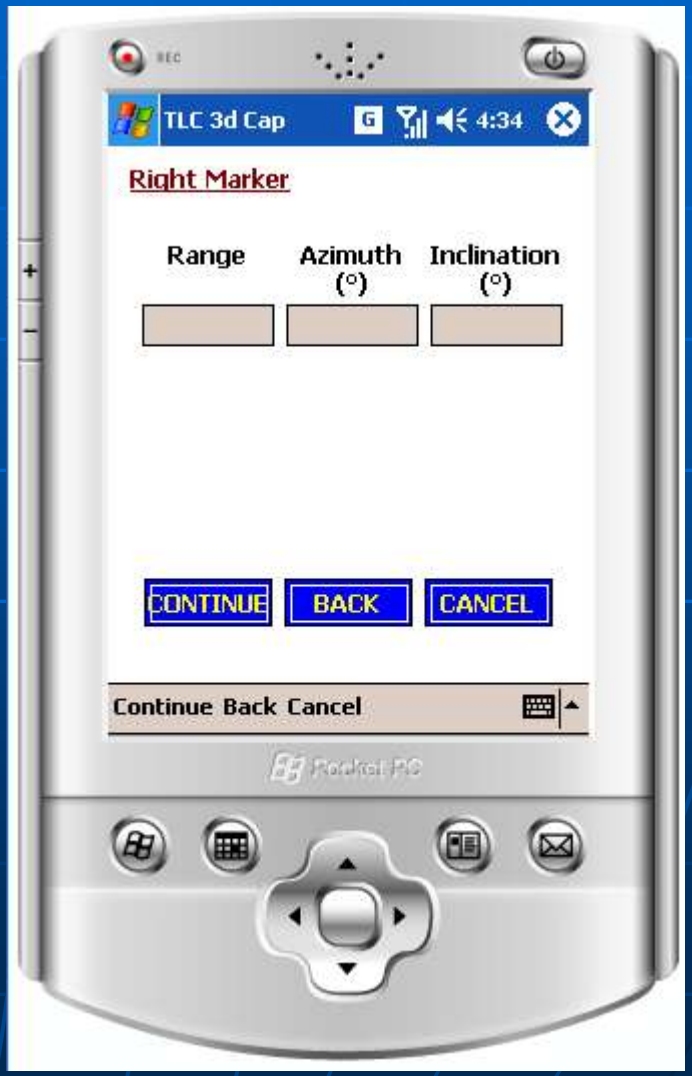
- Profiling for the purposes of determining borehole positions requires that a reference line is defined as shown:



Generating A Survey (cont…)

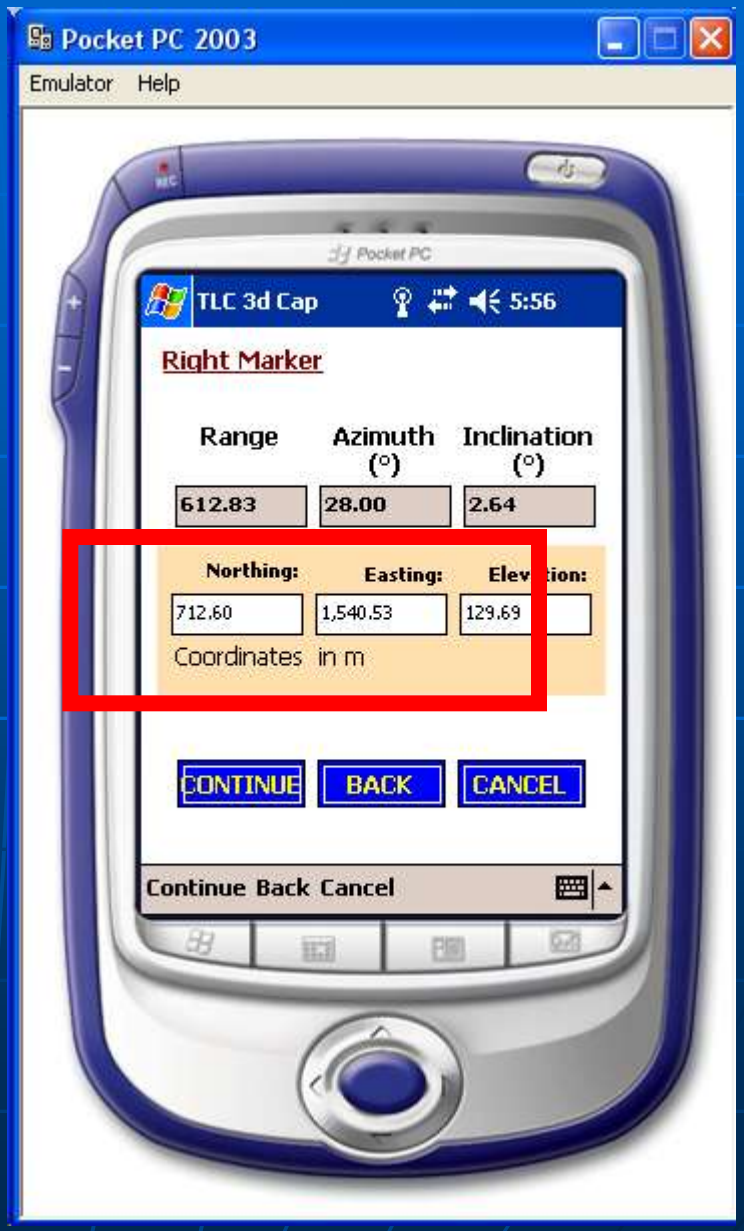
- Identify survey face by entering reference markers:





Generating A Survey (cont…)

- The left and right markers will show immediately the calculated real coordinates:

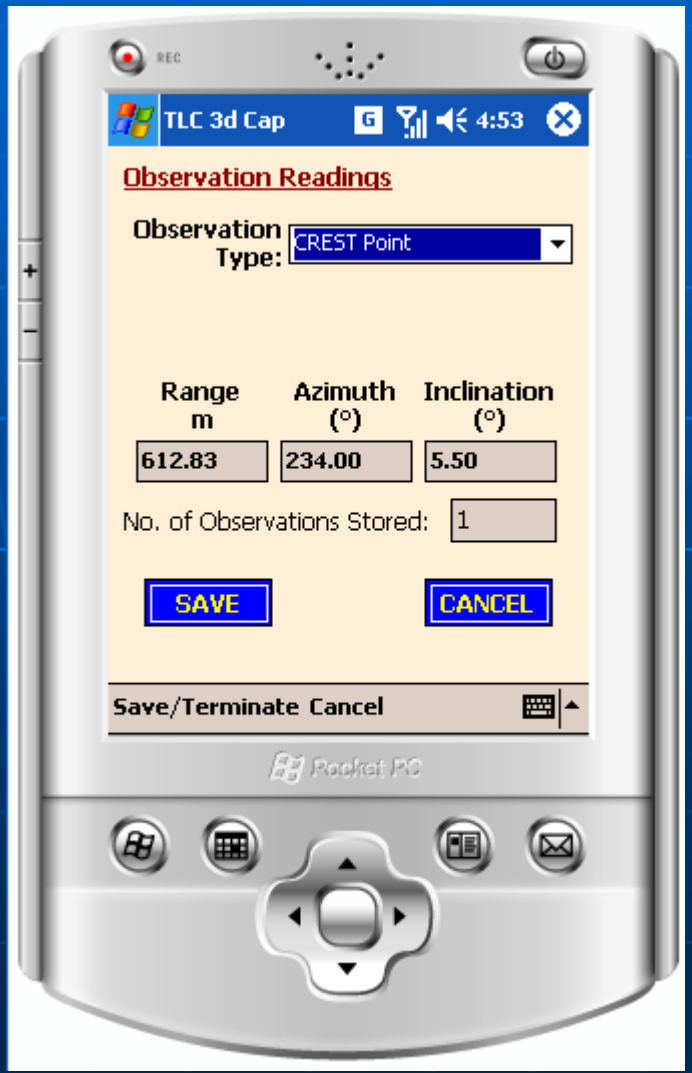


Generating A Survey (cont…)

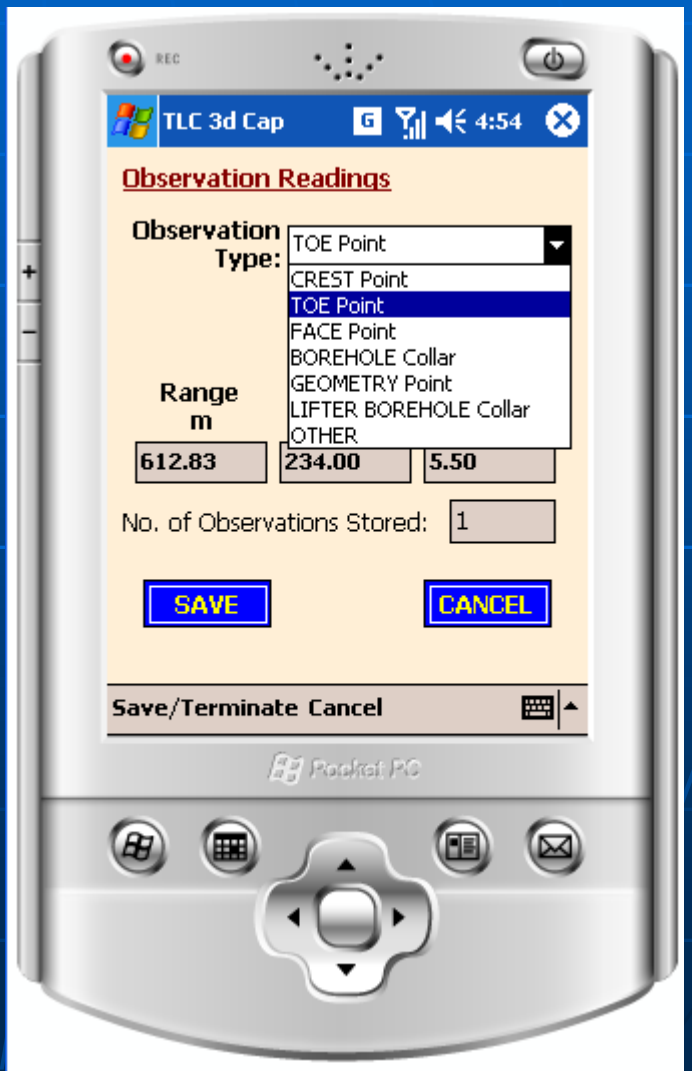
- Survey face
- Correct tagging of observation:
  - Crest
  - Toe
  - Face
  - Borehole collar
  - Geometry
  - Lifter hole collar

Generating A Survey (cont…)

Readings are automatically saved and tagged as shown:



Change type of reading as shown (only future readings are affected):



Generating A Survey (cont…)

- When survey is completed, press the SAVE button.
- The complete set of readings are stored in a text file which can be copied to a PC (using Active Sync) or downloaded directly to Winprof)

Profile Survey Generated File Example:

winp32newfile - Notepad

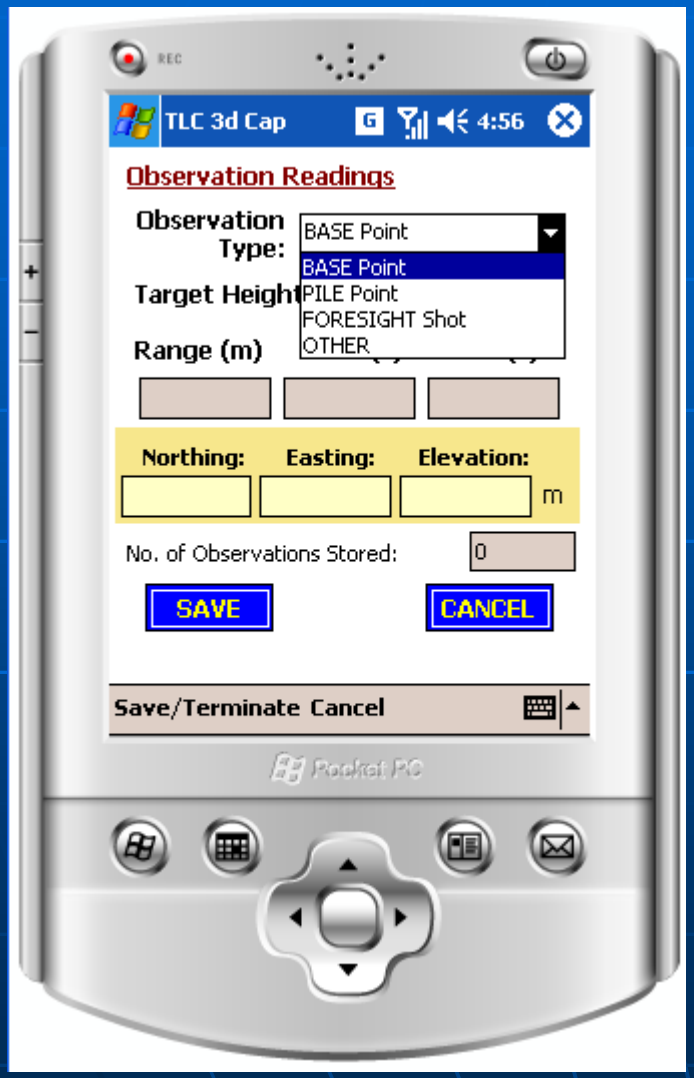
File Edit Format View Help

```
$FILESTART:newfile
TLCPSION3D V100
client
loc
eng
Profiling
"Jenoptics Laser"
1,1001,1002,103
09-15-1998
2
1,.05,332.3,-4.13,"s1",-123456,123456,987654.32
2,.04,332.4,-4.35,"bc",-123.45,654.32,.0123
.68,322.4,9.64,"LM"
.88,357.8,11.79,"RM"
.52,5.2,11.68,"CREST"
.52,5,11.59,"CREST"
.53,4.8,11.32,"CREST"
.6,.7,4.81,"CREST"
.6,.8,4.27,"TOE"
.6,.9,4.43,"TOE"
.55,4.1,11.02,"TOE"
.5,7.6,18.04,"TOE"
.47,9.5,21.04,"TOE"
.47,9.5,20.62,"BH0"
.47,9.5,20.83,"BH0"
.47,9.8,20.97,"BH0"
.47,9.8,21.11,"GEO0"
.46,9.9,21.58,"GEO0"
.46,10,21.34,"BH1"
.46,9.8,21.66,"BH1"
.46,10,21.53,"BH1"
.45,10.1,21.52,"LIFTER"
.46,9.9,21.48,"LIFTER"
.46,10.1,21.5,"FACE"
.62,334.9,1.78,"FACE"
.65,327.6,5.26,"FACE"
.65,345.5,11.42,"FACE"
.67,353.2,9.26,"FACE"
.67,359.9,9.67,"FACE"
.53,4.1,8.25,"FACE"
```

Muck Pile Survey

- A muck pile survey does not require that the user defines a reference line (hence no left or right markers are required)
- The muckpile is sometimes measured from different instrument locations and therefore it requires that the user locate back sights and fore sights

Muck Pile Survey



- Four different types of observations:
- BASE Points – determine the base of the pile
- PILE Points – readings on the pile
- FORESIGHT points – used to identify the next position for the instrument

Muckpile Generated File Example:

SurveyMuckPile - Notepad

File Edit Format View Help

```
$FILESTART:\My Documents\Survey1.T3D
TLCPDA3D(V100)
VIB
USA
LUIS
\My Documents\Survey1.T3D
Muck Piling
,01
1.45,74,75,89,181,IST
2/20/2004 2:37:22 PM
1
1,612.833333333333,234,5.50261146496815,ST1,7,5,6
612.833333333333,234,5.50261146496815,BASE
612.833333333333,234,5.50261146496815,BASE
612.833333333333,234,5.50261146496815,BASE
612.833333333333,234,5.50261146496815,BASE
612.833333333333,234,5.50261146496815,BASE
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612.833333333333,234,5.50261146496815,FACE
612.833333333333,234,5.50261146496815,FACE
612.833333333333,234,5.50261146496815,FACE
612.833333333333,234,5.50261146496815,FACE
612.833333333333,234,5.50261146496815,FACE
$END
```

- The muckpile file can be interpreted using the WINPILE application which calculates volumetric parameters

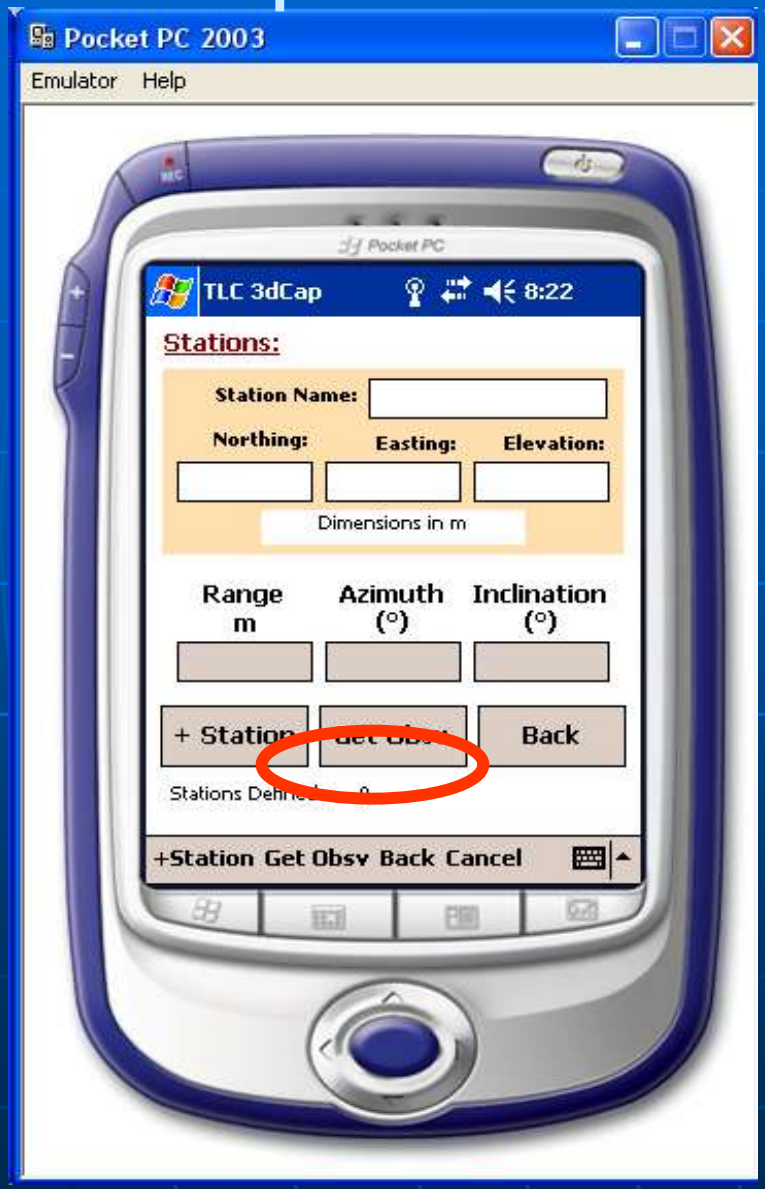
Muckpile Survey - Traverse

- Define the default parameters for the survey

Muckpile Survey (Cont…)

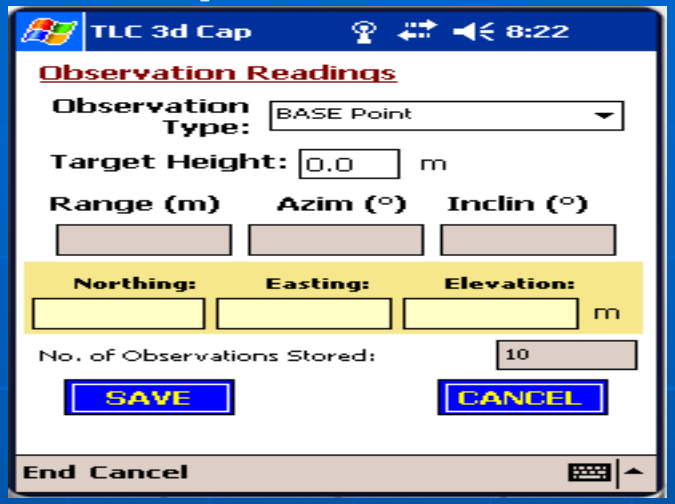
- Define the instrument coordinates using any convenient number, ie: 1000,1000,100

Muckpile Survey (Cont…)

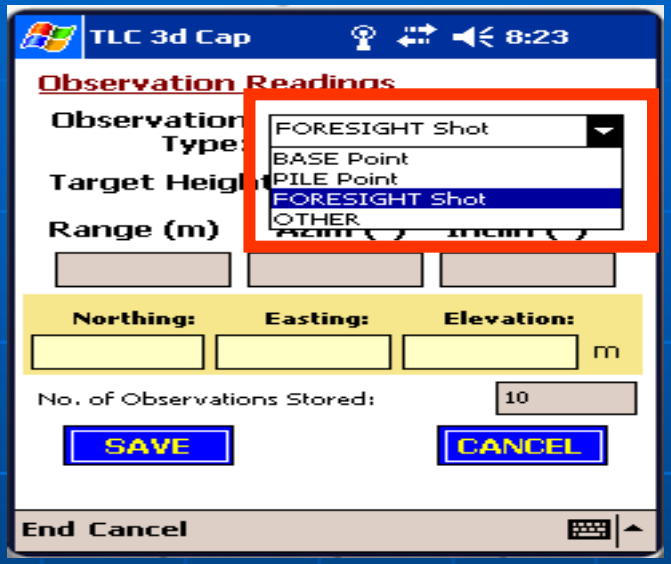


- Ignore any back sights, it is not strictly necessary to reference the bearing of the instrument
- Press the “Get Obsv” button to continue..

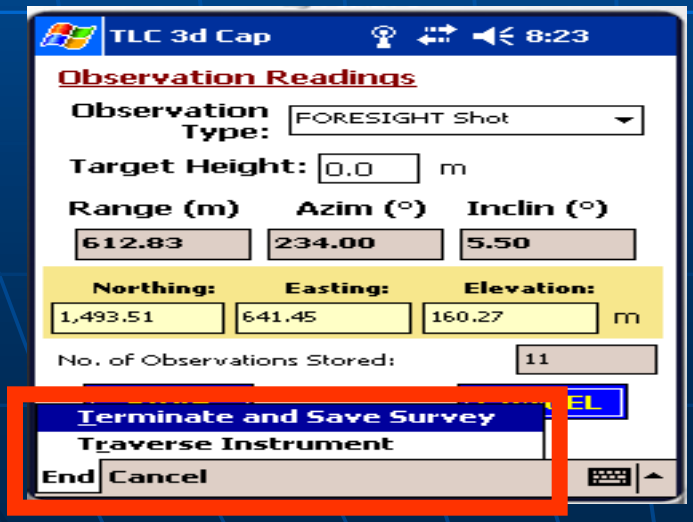
Muckpile Survey (Cont…)

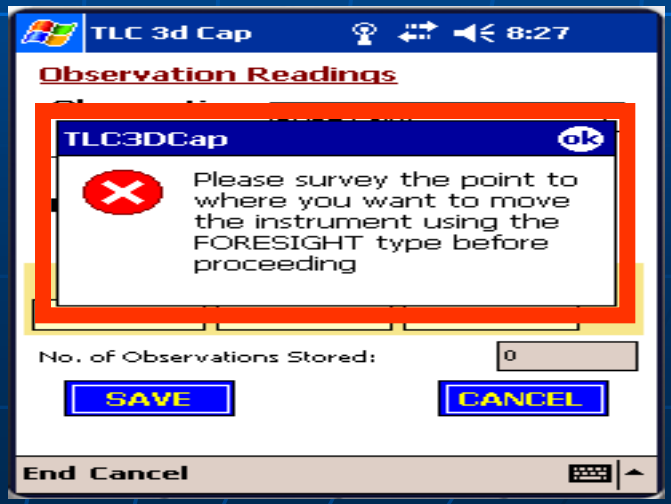


- Change the Observation type to Foresight as shown, and survey the point.



- After surveying the "Foresight" select the "Traverse Instrument" option from the "End" menu as shown. If no foresight observation was measured, an error dialog will be displayed.





Muckpile Survey (Cont…)

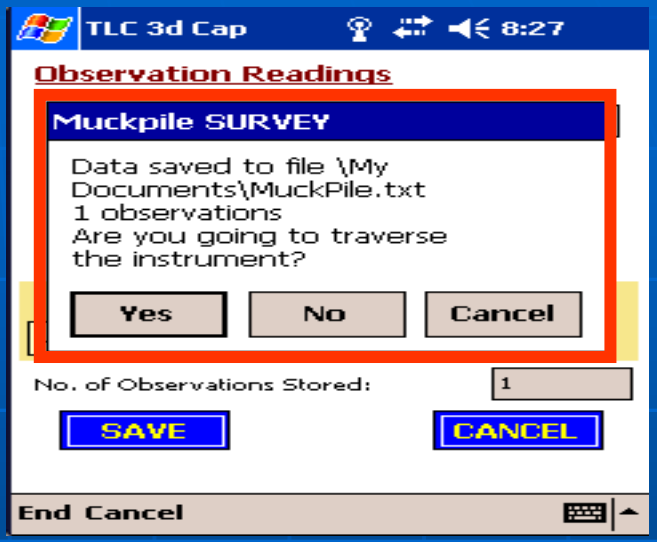
- When the traverse Instrument option is selected, the following screen is shown:

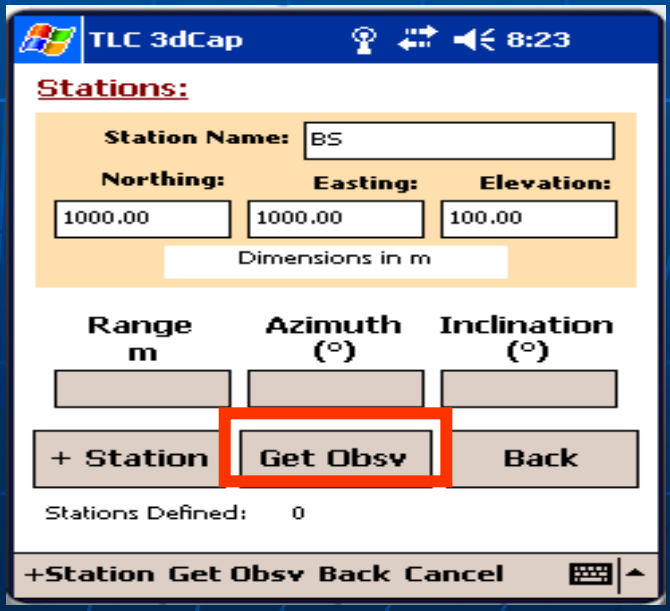
- The data captured up to that moment is saved in case there is any loss.

- If the user says yes, the following takes place automatically:
- The foresight coordinates are used as the new instrument settings.
- The current instrument coordinates are used as the coordinates for a new station "BS" (ie backsight station).
- The program automatically goes to the stations page, displays the "BS" coordinates and waits for user/laser input:

- Move the instrument to the "Foresight" position and survey the old setup position, now called "BS"

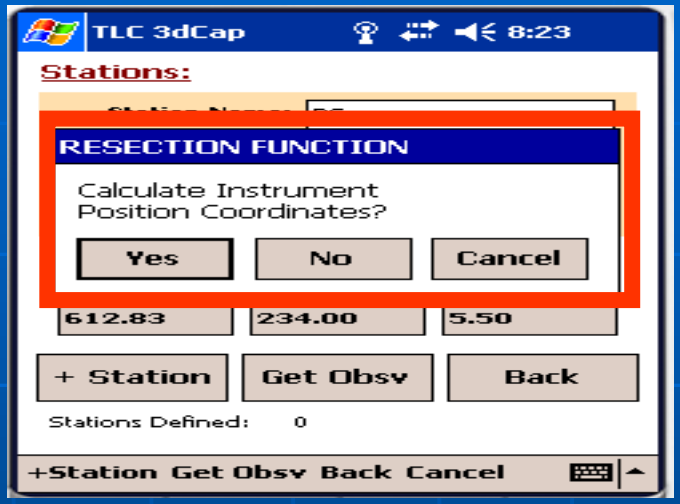
- Once the BS point is surveyed, press "Get Obsv" to continue

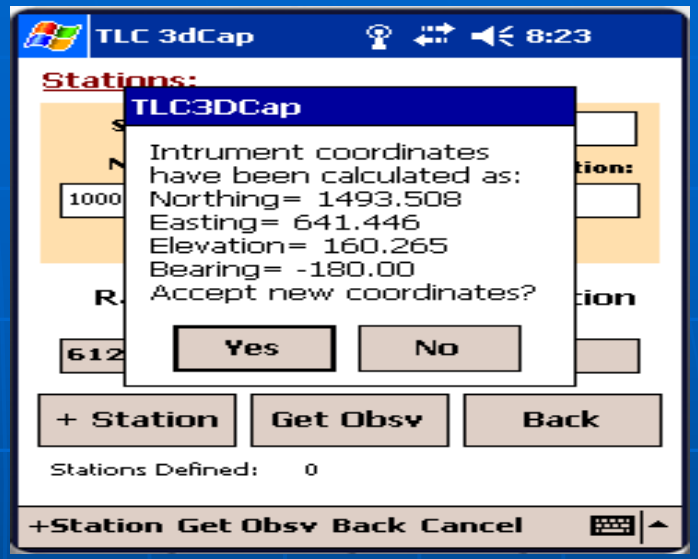




Muckpile Survey (Cont…)

- If the BS was surveyed, the following sequence of screens is displayed:

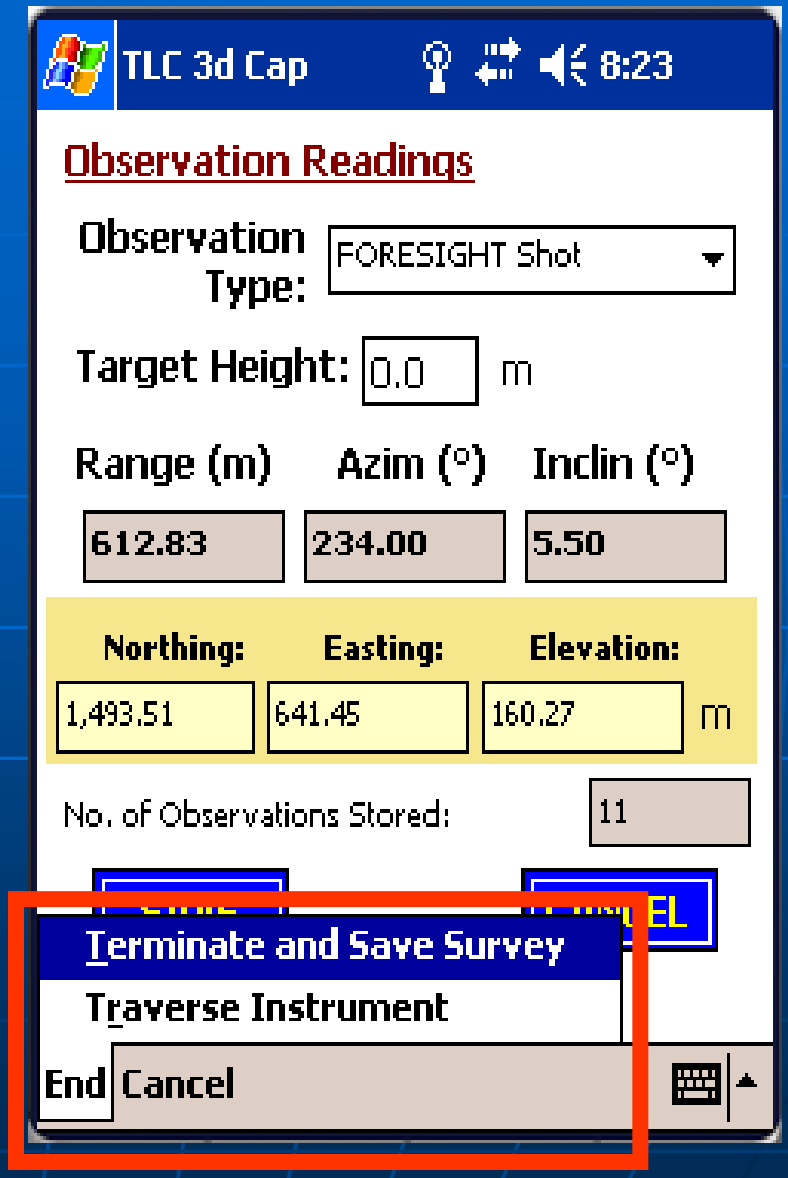




- The new instrument coordinates should show that the new instrument coordinates were actually the previous “foresight” coordinates. The “backsight was used to calculate a new bearing.
- The survey will now continue as before, with all data being stored in the same file. The sequence can be repeated many times.
- Note that by saving the traverse data all in the same file, the intermediate “foresight”, “backsight” and “instrument coordinates are not saved in the file. This means that although the file has horizontal angle, vertical angle and range data, it will not be possible to recalculate xyz data afterwards. For this to be the case, it will be necessary to change the data file structure to allow for multiple settings within the file.

Muckpile Survey (Cont…)

- After surveying the "Foresight" the user may select the "Terminate and Save Survey" option from the "End" menu as shown.
- The traverse method can still be used in this case – simply start a new survey and a new filename – you will see that the instrument settings will reflect the foresight coordinates, and the station dialog will display the BS coordinates.
- The difference with using this approach is that there will be multiple files for the complete survey.
- The advantage of doing the Traverse survey in this manner is that for each file, the coordinates may be recalculated from the raw laser data if necessary.



Bench Plan Measurements

- This survey is used to capture the positions of the borehole collars for a particular bench
- The borehole collar coordinates are calculated from the laser measurements and converted to a local XYZ or to a world XYZ coordinate system.
- The readings are saved in a comma delimited file

Bench Plan (cont…)

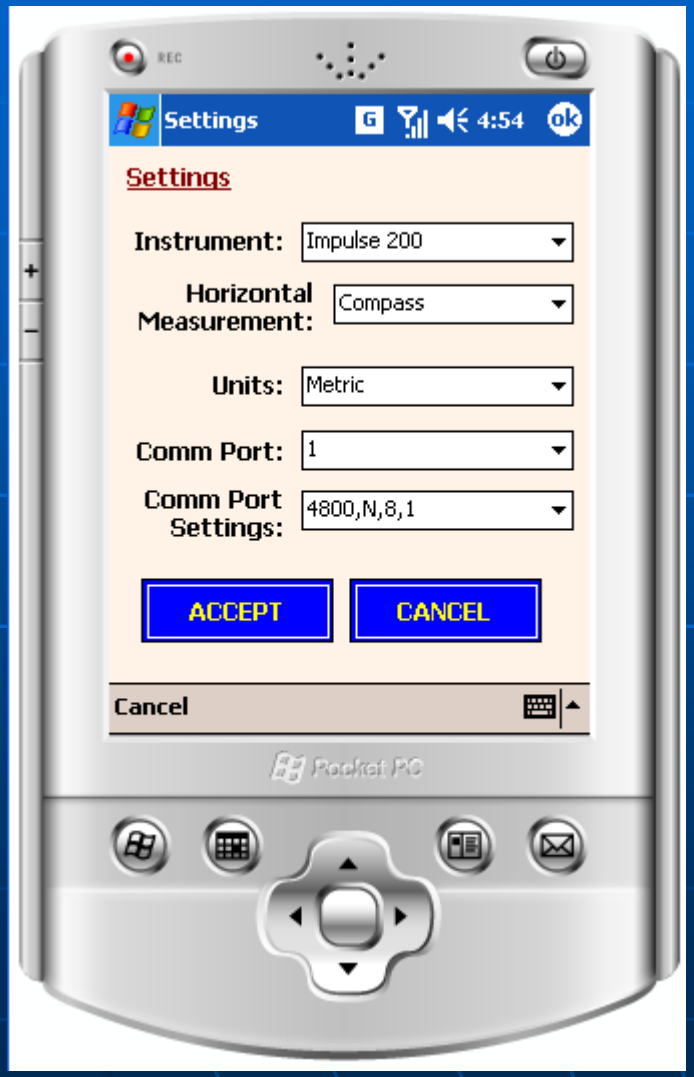
The user can define a target height for each borehole:

Example of file generated:

Microsoft Excel - BenchPlan1

	A	B	C	D	E	F	G	H
1	$FILESTART:\Storage Card\BenchPlan1.CSV							
2	TLCPDA3D(V110)							
3	Client							
4	Location							
5	Engineer							
6	Filename	\Storage Card\BenchPlan1.CSV						
7	Survey Type	Bench Plan						
8	Instrument Name							
9	Face Name							
10								
11	InstrumentHeight	Instr Northing	Instr Easting	Instr Elevation	Instr Bearing	Instrument Station Name		
12	1.25	1000	1000.00	100	90.00	p1		
13	Survey Date	6/13/2004 11:30						
14	Number of Reference Stations	0						
15	Range Distance	Horizontal Angle	Vertical Angle	Target Height	Northing	Easting	Elevation	Description
16	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
17	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
18	612.83	234	5.50	0	1358.55	1493.51	160.02	COLLAR
19	612.83	234	5.50	0	1358.55	1493.51	160.02	COLLAR
20	544.50	124	5.33	0	1303.16	550.54	151.84	COLLAR
21	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
22	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
23	612.83	234	5.50	0	1358.55	1493.51	160.02	COLLAR
24	544.50	124	5.33	0	1303.16	550.54	151.84	COLLAR
25	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
26	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
27	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
28	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
29	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
30	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
31	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
32	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR
33	654.50	340	5.67	0	387.99	1222.76	165.97	COLLAR

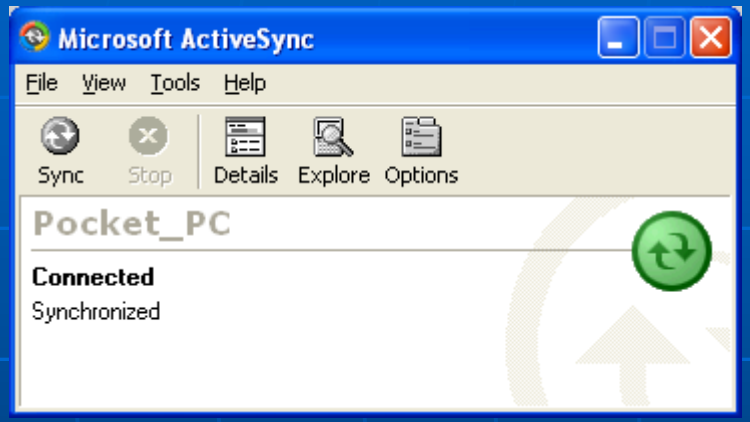
TLC3dCAP Settings:



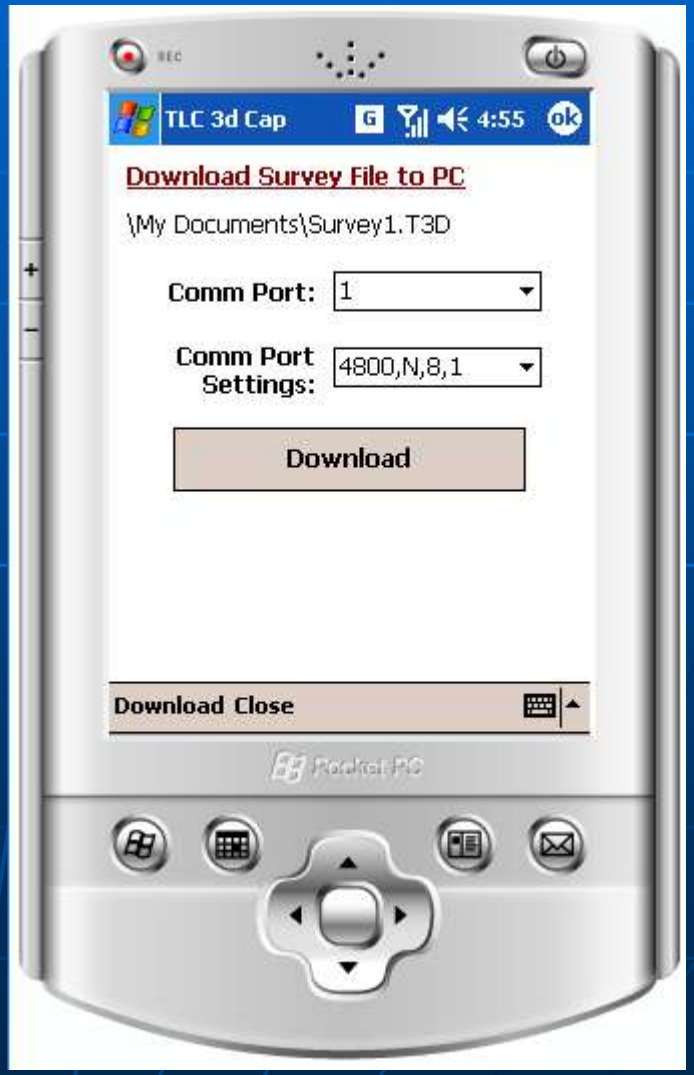
- Settings available:
- Instrument used
- Method of calculating horizontal angle (compass or encoder)
- System of units
- Communication settings:
  - Cable serial interface
  - Bluetooth serial port interface

Interface to Winprof/Winpile

- Data file transfer from PDA to PC
  - Using ActiveSync and Windows Explorer

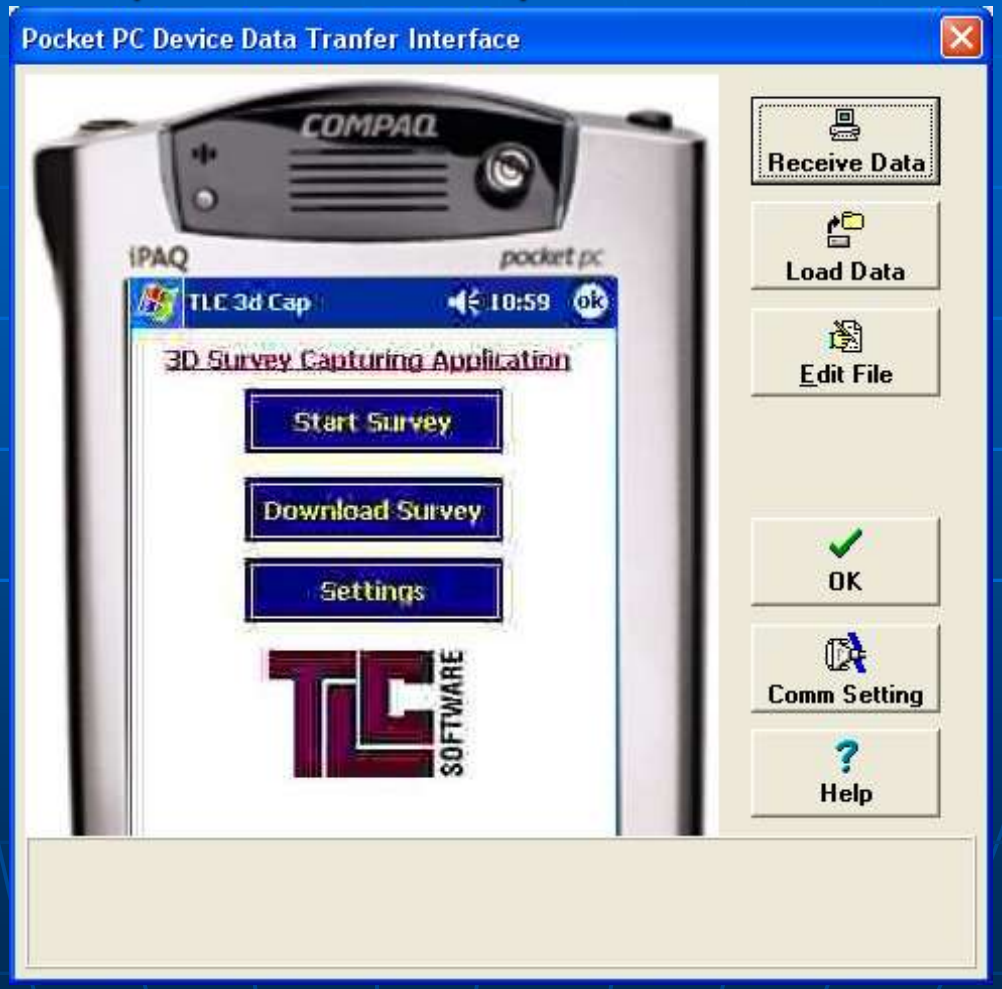


  - Via rs-232 download



Interface to Winprof/Winpile (cont)

- Load data file on Winprof for 3D analysis



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