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)

Define Survey Properties:



Select file to save readings:

S REC	5.1.C	٢
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Save As		
Name:	Survey1	
Folder:	None	•
Type:	TLC 3d Files	•
Location:	Main memory	•
	OK Ca	ancel
123 1 2 3 Tab Q W CAP a s Shift z 3 Ctl áü `	3 4 5 6 7 8 9 0 e r t y u i o d f g h j k 1 < c v b n m , . \ <i>Ej</i> Pockot PC	- = ♥ p [] ; · / ← ↑ ← → ▲
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S REC
🎢 TLC 3d Cap 🛛 🖪 🎢 ┥득 4:31 🚳
Instrument Settings:
Instrument Height: 1.50
Station Name: P0
Northing: 1,000.00
Easting: 1,000.00
Bearing (°) 0.00
Dimensions in m
Continue Back Cancel
🖉 Poskat PC

- Define instrument settings:
 - Height

- World coordinates (if available)
- Name

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Stations:		
Station Na	me:	
Northing:	Easting:	Elevation:
	Dimensions in m	
Range m	Azimuth (°)	Inclination (°)
+ Station	Get Obsv	Back
+Station Get	Obsv Back Ca Ø Poeket PC	ancel 🔤 🔺

- 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.



 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:

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Left Marker Range Azimuth Inclination (°) (°)	+ Range Azim (°)	uth Inclination) (°)
CONTINUE BACK CANCEL		KCANCEL
Continue Back Cancel	Continue Back Cancel	ot PC

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



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

Readings are automatically saved and tagged as shown:

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L	🎥 TLC 3d Cap 🛛 🖸 🎢 📢 4:53 🚫
L	Observation Readings
	Observation Type: CREST Point
1	
	Range Azimuth Inclination m (°) (°)
L	612.83 234.00 5.50
L	No. of Observations Stored: 1
L	SAVE
L	Save/Terminate Cancel
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Change type of reading as shown (only future readings are affected):

	·	
🎥 TLC 3d Cap) 🛛 🖸 🏹 📢	4:54 🚫
Observation	<u>Readings</u>	
Observation Type:	TOE Point CREST Point TOE Point FACE Point	
Range m 612.83	BOREHOLE Collar GEOMETRY Point LIFTER BOREHOLI OTHER 234.00 5.5	E Collar
No. of Observa	ations Stored:	1 ANCEL
Save/Terminal	te Cancel	
l	🖁 Poskat PC	

(a) REC
🎢 TLC 3d Cap 🛛 🖸 🎢 📢 4:54
Observation Readings
Observation TOE Point
3D SURVEY 🚯
Data saved to file \My Documents\Survey1.T3D 1 observations
61Z.83 Z34.UU 5.5U
No. of Observations Stored: 1
SAVE
Save/Terminate Cancel 🔤 🔺
🖉 Pooket PC

- 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

Edit Format View Help File \$FILESTART:newfile TLCPSION3D V100 client loc eng Profiling "Jenoptics Laser" 1,1001,1002,103 09-15-1998 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,"BHO" .47,9.5,20.83,"BH0" .47,9.8,20.97,"BH0" .47,9.8,21.11,"GE00" .46,9.9,21.58,"GE00" .46,10,21.34,"BH1" .46,9.8,21.66,"ВН1" .46,10,21.53,"ВН1" .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 Pilina .01 1.45,74,75,89,181,IST 2/20/2004 2:37:22 PM 1,612.8333333333333,234,5.50261146496815,5T1,7,5,6 612.8333333333333,234,5.50261146496815,BASE 612.833333333333,234,5.50261146496815,BASE 612.833333333333,234,5.50261146496815,BASE 612.833333333333,234,5.50261146496815,BASE 612.8333333333333,234,5.50261146496815,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 612.833333333333,234,5.50261146496815,FACE 612.833333333333,234,5.50261146496815,FACE 612.833333333333,234,5.50261146496815,FACE 612.833333333333,234,5.50261146496815,FACE 612.8333333333333,234,5.50261146496815,FACE 612.833333333333,234,5.50261146496815,FACE 612.8333333333333,234.5.50261146496815,FACE 612.833333333333,234,5.50261146496815,FACE 612.8333333333333,234,5.50261146496815,FACE 612.8333333333333,234.5.50261146496815,FACE 612.8333333333333.234.5.50261146496815.FACE \$END

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

Muckpile Survey - Traverse

Emulator	et PC 2003
1	it (15)
F.	2/ Pocket PC
	Survey Details: Survey Type: Muck Piling Client: Vibronics Location: Evansville Engineer: Luis Face Name: Data File: Wy Documents\MuckPile.txt
	CONTINUE CANCEL

• Define the default parameters for the survey

B Pock	et PC 2003 📃 🗖 🔀
Emulator	Help
	JI Pockel PC
Ę	Instrument Settings: Instrument Height: 1.50 Station Name: P0 Northing: 1,000.00 Easting: 1,000.00 Elevation: 100.00 Bearing (°): 0.00
	Dimensions in m

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

Emulator	Help		
1			
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+	🎊 TLC 3dCap	P 🛱	∢ € 8:22
	Stations:		
5	Station Nam Northing:	e: Easting:	Elevation:
	Di	mensions in m	
	Range m	Azimuth (°)	Inclination (°)
	+ Station	act ob.	Back
	+Station Get Ob	osv Back Ca	ncel 🖂 🔺
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- Ignore any back sights, it is not strictly necessary to reference the bearing of the instrument
- Press the "Get Obsv" button to continue..

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Observation F	<u>Readings</u>	
Observation Type:	BASE Point	
Target Heigh	n t: 0.0 n	n 🛛
Range (m)	Azim (°)	Inclin (°)
Northing:	Easting:	Elevation:
		m
No. of Observation	ns Stored:	10
SAVE		CANCEL
End Cancel		

• 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.

27	TLC 3d C	ар 💡	#‡ ◄€ 8::	23	
Ob	servatio	n Readings			
	bservatio Typ	on Foresign	HT Shot	-	
Τá	arget Hei	ight: 0.0	m		
Ra	ange (m)) Azim (°)) Inclin	ര	
6	612.83 234.00 5.50				
	Northing:	Easting:	Elevatio	on:	
1,49	93.51	641.45	160.27	m	
No.	of Observ	ations Stored:	11		
Terminate and Save Survey					
Τı	T <u>r</u> averse Instrument				
End	Cancel				

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

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<u>Obse</u>	rvation I	Readings		
Obse	ervation Type:	FORESIGH BASE Point	IT Shot 🗸	
larg	et Heigl	FORESIGH	IT Shot	
Rang	ge (m)		— <u> </u>	
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Nor	thing:	Easting:	Elevation:	
			m	I
No. of	Observatio	ns Stored:	10	I
				I
	AVE		CANCEL	I
	-			
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	🏂 тес	3d Cap		27
	Observ	ation Rea	<u>idings</u>	
	TLC3I	DCap		(
		Please s where y the inst FORESI	urvey the point you want to mov rument using th GHT type before	to /e e

proceedina

No. of Observations Stored:

SAVE

End Cancel

0

CANCEL

- 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





- 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.

- 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

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Survey Det	<u>ails:</u>	
Survey Type:	Bench Plan	•
Client:		
Location:		
Engineer:		
Face Name:		
Data File: \My	Documents\BenchP	lan1
CONTINUE	CAN	EL
Continue Canc	el	•
Ĺ	🚰 Poeket PC	

- 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:

N	Nicrosoft Excel - B	enchPlan1							
:2)	<u>File E</u> dit <u>V</u> iew	Insert Format 1	ools <u>D</u> ata <u>W</u> i	ndow <u>H</u> elp Ad	o <u>b</u> e PDF				
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2	Client								
4	Location								
5	Engineer								
6	Filename	\Storage Card\Be	enchPlan1 CSV						
7	Survey Type	Bench Plan							
8	Instrument Name	2 on on Filan							
9	Face Name								
10									
						Instrument			
					Instr	Station			
11	InstrumentHeight	Instr Northing	Instr Easting	Instr Elevation	Bearing	Name			
12	1.25	1000	1000.00	100	90.00	p1			
13	Survey Date	6/13/2004 11:30							
	Number of								
	Reference								
14	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	
20	004.00	340	5.07	0	307.99	1222.70	105.97	COLLAR	
29	004.00	340	5.07	0	307.99	1222.70	105.97	COLLAR	
30	004.50	340	5.67	0	307.99	1222.70	165.07	COLLAR	
32	654.50	340	5.07	0	307.99	1222.70	165.07	COLLAR	
32	654.50	240	5.07	0	307.99	1222.70	165.07	COLLAR	
33	004.50	540	10.0	0	301.99	1222.76	105.97	COLLAR	

TLC3dCAP Settings:

S REC	·
🎢 Settings	G Y ₁ ◀€ 4:54
<u>Settings</u>	
Instrument:	Impulse 200 🗸
Horizont Measuremen	al Compass 🔹
Units:	Metric 👻
Comm Port:	1 🔹
Comm Port Settings:	4800,N,8,1 ▼
ACCEPT	CANCEL
Cancel	- I
<u>a</u>	j Pooket PC
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- 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

	® Microsoft ActiveSync		
	<u>File Vi</u> ew <u>T</u> ools <u>H</u> elp		
	Sync Stop Emails Explore		
	Pocket_PC		
	Connected Synchronized		
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Download	Survey File to PC	L.
\My Docume	ents\Survey1.T3D	
Comm	Port: 1	-
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Download Cl	ose	2
Download Cl	ose	•
Download Cl	ose	
Download Cl	ose If Porkei PC	

Interface to Winprof/Winpile (cont)

Load data file on Winprof for 3D analysis



Contact Details:

