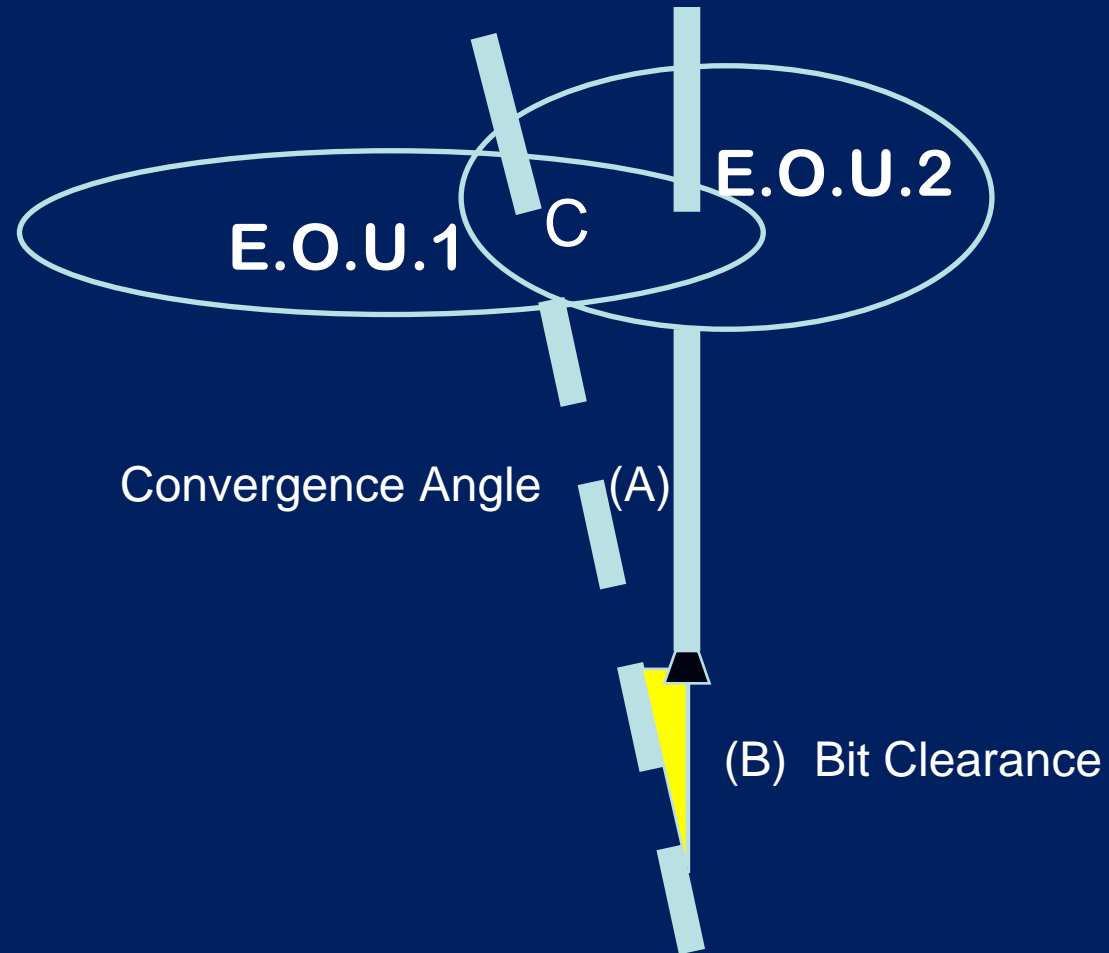


Preliminary Risk Estimate



$$\text{“Risk”} = P(C) \times [1 - P(\text{detection})]$$

30ppf casing weight

200nT BtotalDip interference threshold

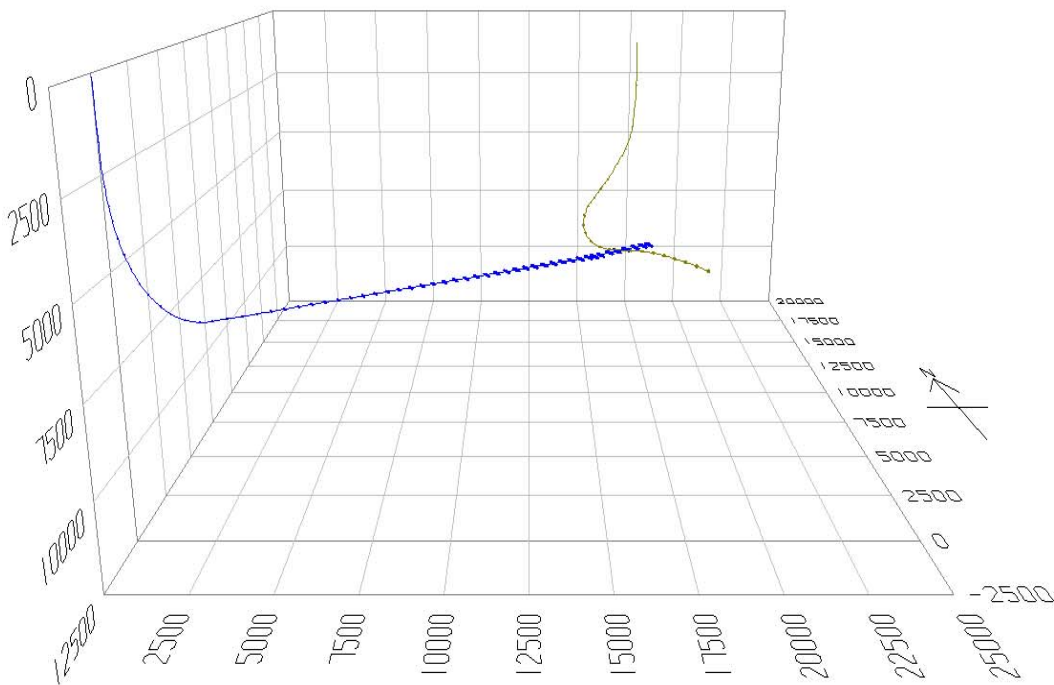
2m bit clearance before contact

* indicates MWD-ranging available w/o added shots

Check shots	Approach Angle (deg)					
	5	10	15	20	25	30
2.5m*	>95	>95	>95	95	89	79
5m*	>95	>95	>95	91	80	67
10	>95	94	87	71	50	34
15	>95	81	64	35	16	0
30	0	0	0	0	0	0



33/9-C-33/C-33 A



Significant improvement in detection with 30 degree approach (v 40deg)

Bit-to-Sensor distance (m):	10
Bit Clearance (m) :	2
Approach angle (deg) :	30
Casing Size (in) :	5.5
Casing Length (m):	10

MWD

Reference Field

Btotal (nT):	50588
Dip (deg):	72.2
Declination(deg):	-2.02
Hole Direction (deg):	55
Inclination (deg):	90
Shot spacing (m) :	2

MWD QC

Btotal alarm level (+nT) :	150
BtotalDip alarm (nT);	200
Approach Quadrant (1-4) :	2

Probability of Detection **0.68**

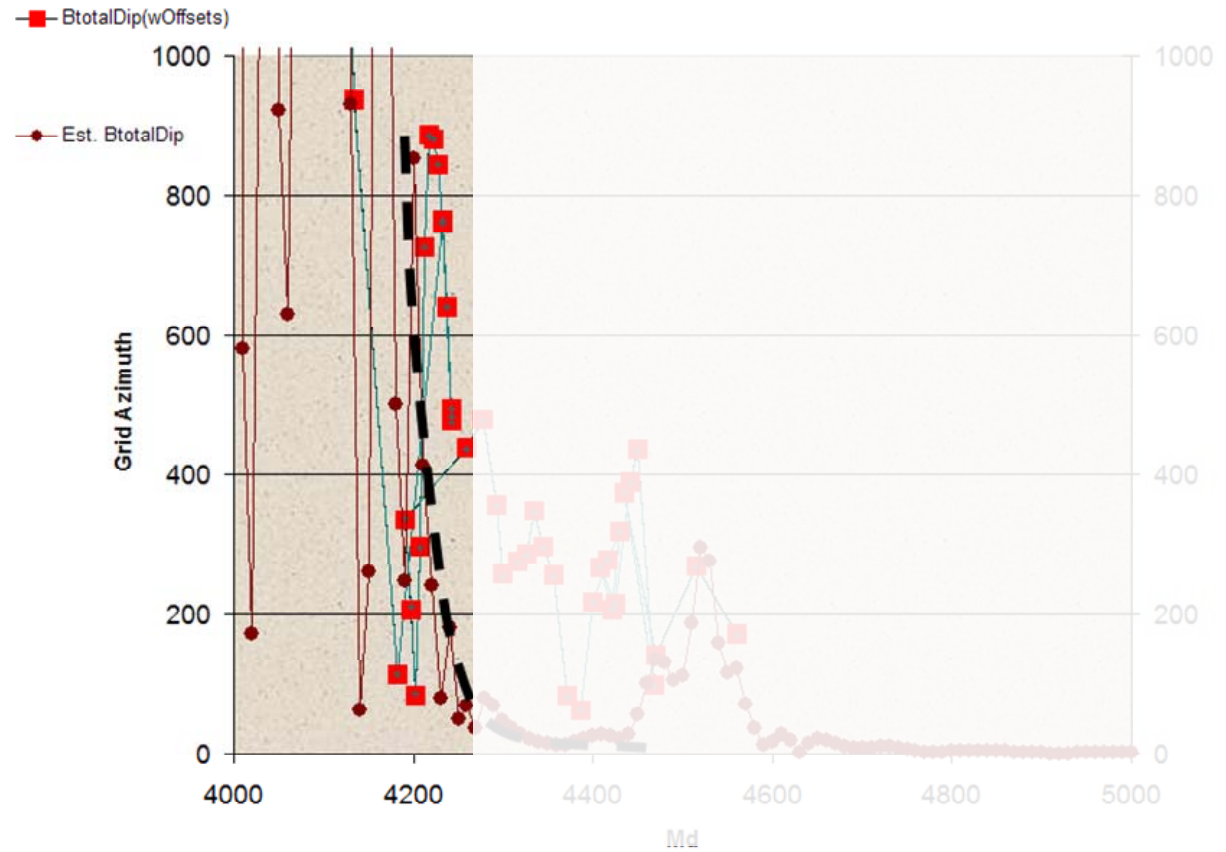
MagTraC

Probability of Detection: **0.89**

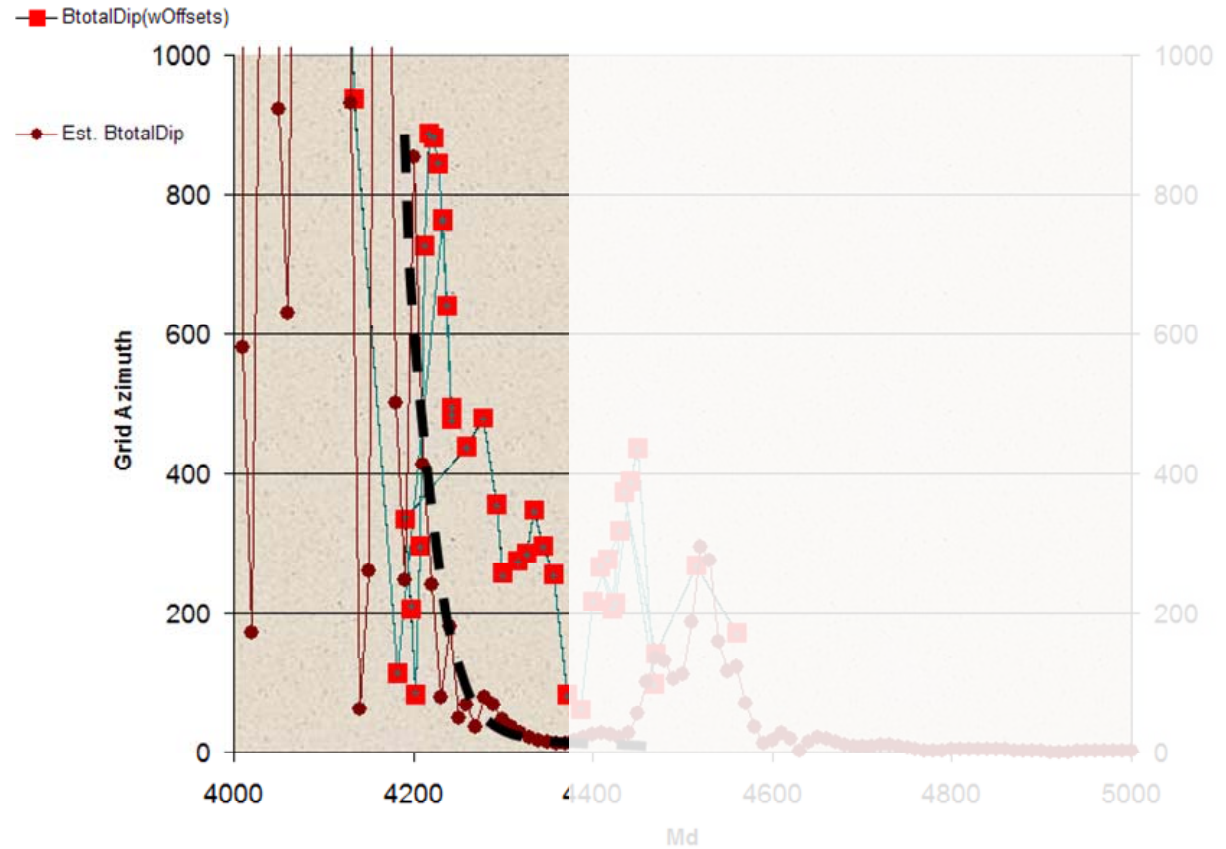
Assumed Sensor sensitivity (nT) 50

Notes

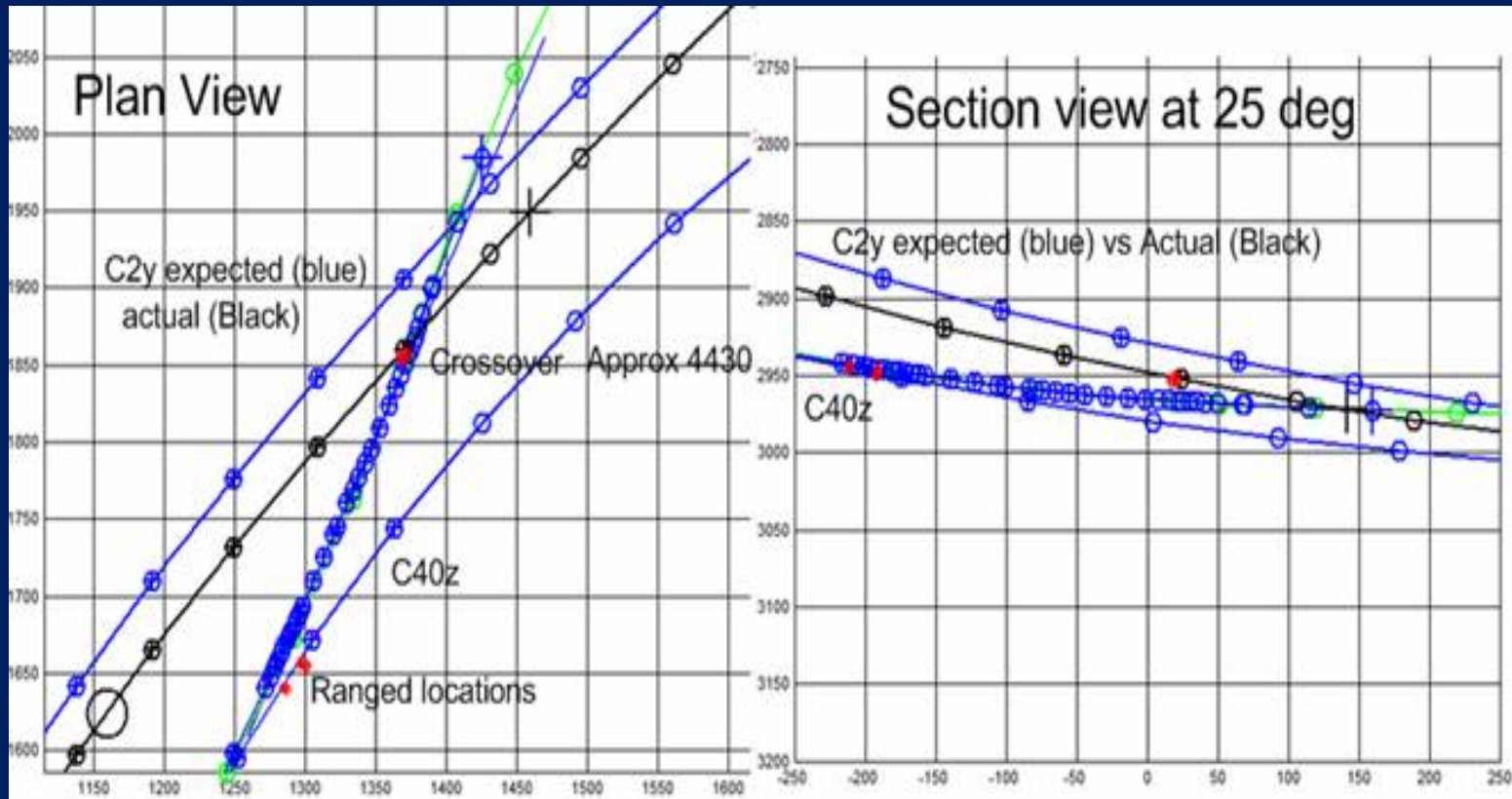
Monitor sidetrack from window

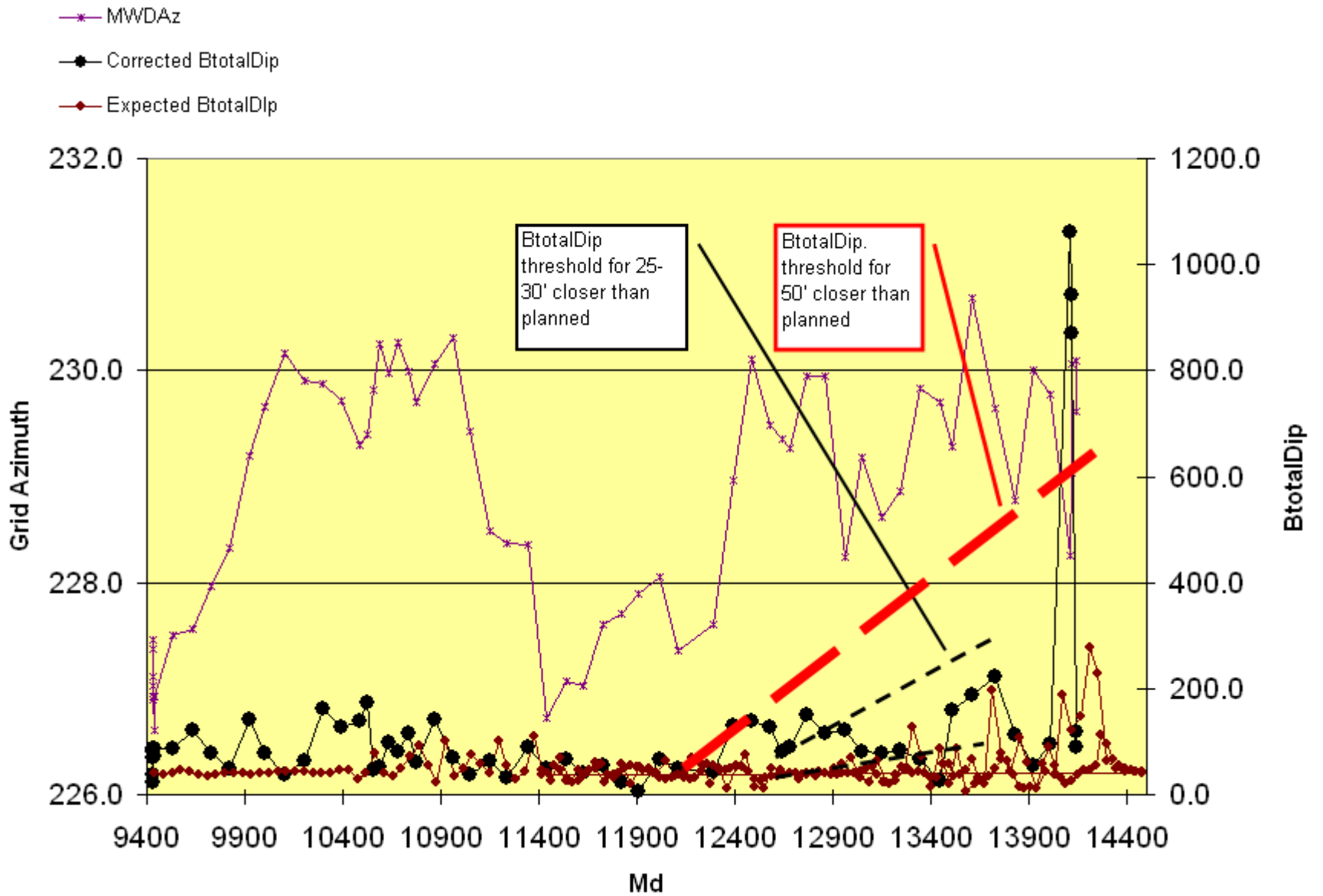


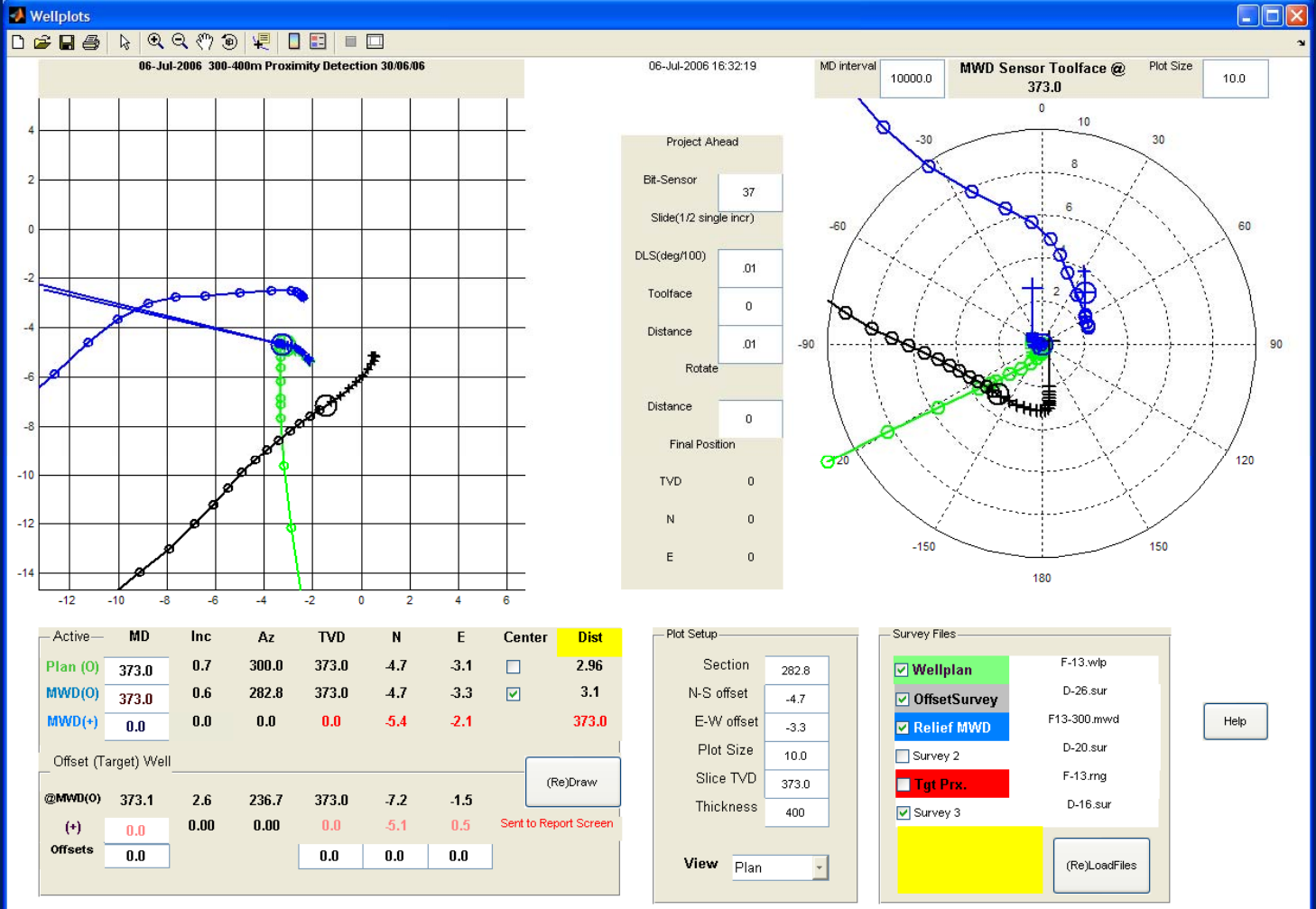
Detect out-of-design



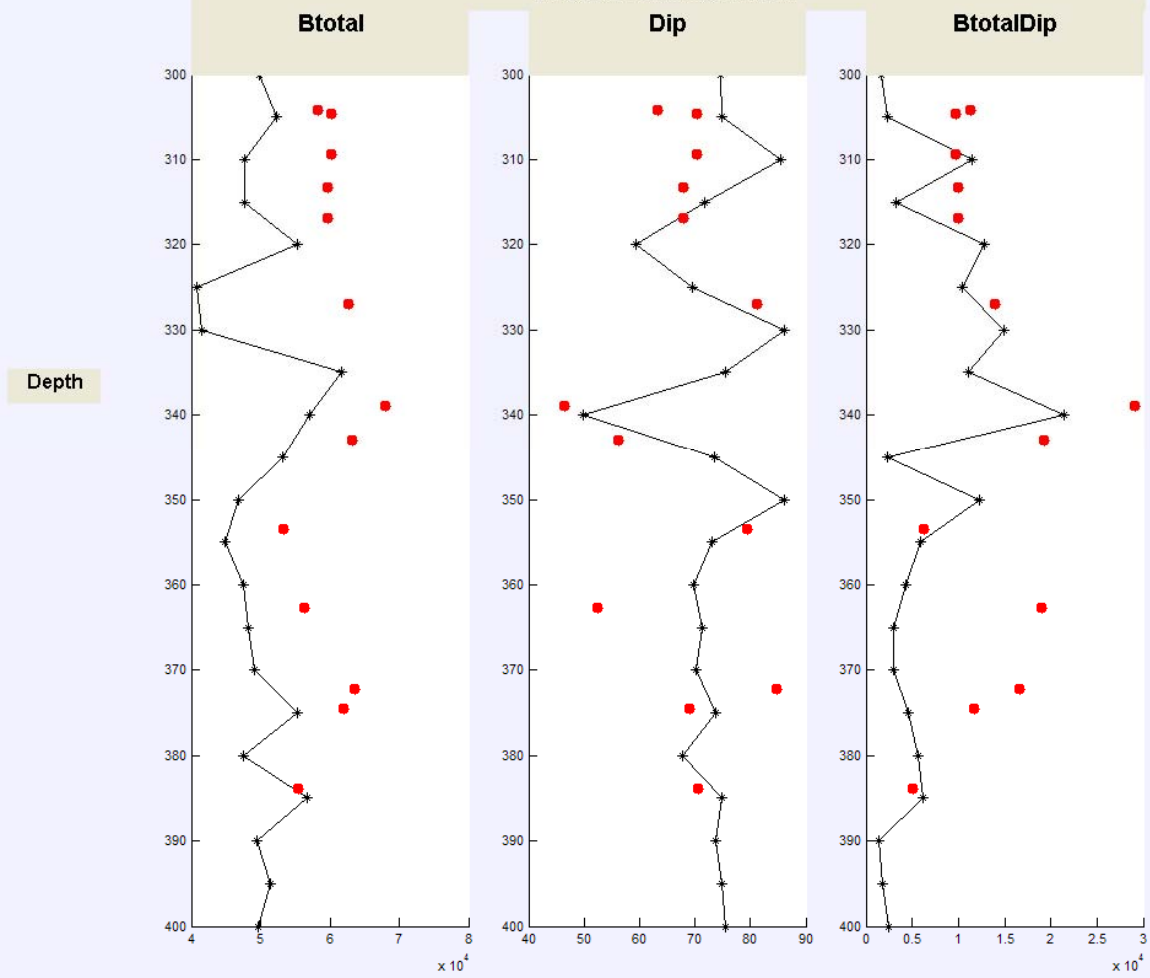
Offset wellbore re-positioned after safe "drill-by" with proximity detection







MagTraC Proximity Detector



Sim File
TotalF13.efd

Plot Interval

MD1	300
MD2	400

Est. x

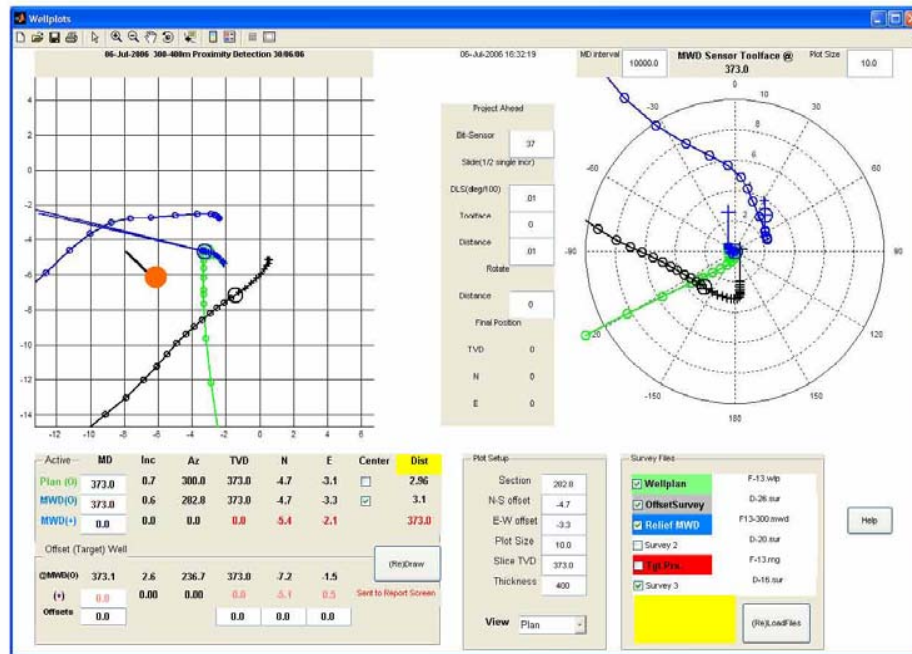
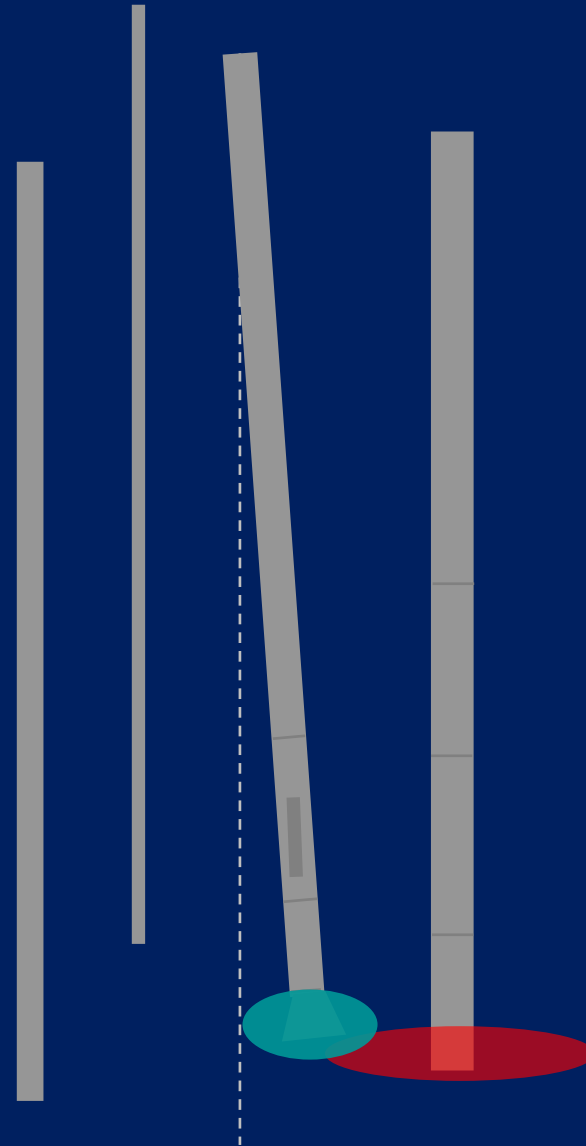


Figure 4

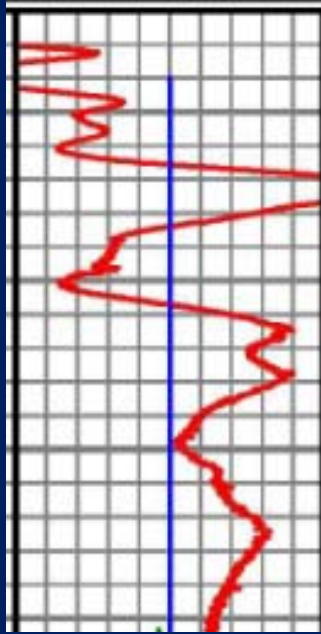
This estimated location is well within the planned survey ellipses of uncertainty and is only intended as an illustration.

Continuous MWD/gMWD monitoring in top hole section

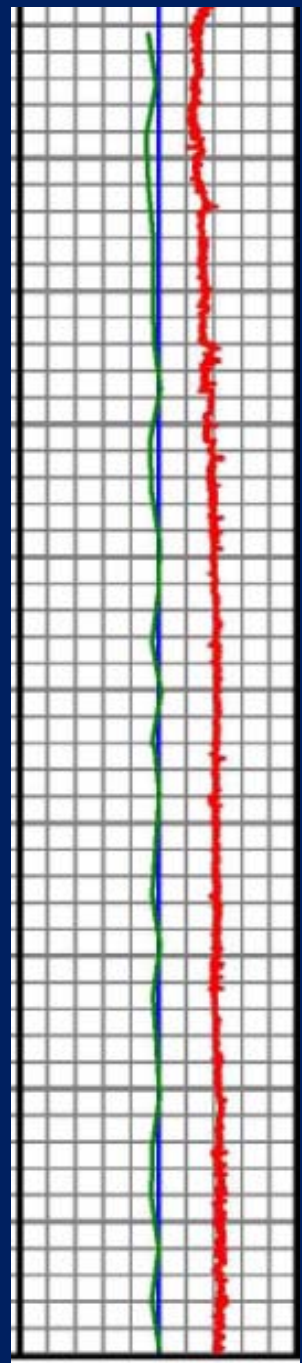
1. Continuous monitor total field interference in top hole section- compare with design.
2. Proximity to closest well is positively detected by MWD-ranging when gyro survey well-path or surveys are not as designed.
3. Decision to drill ahead or plug back based on known location of closest well



Log Continuous ETot (cETot)		
42565	Unit = nT	44565
Ref ETot		
43564	Unit = nT	43566
Magcomp - B Total		
42565	Unit = nT	44565



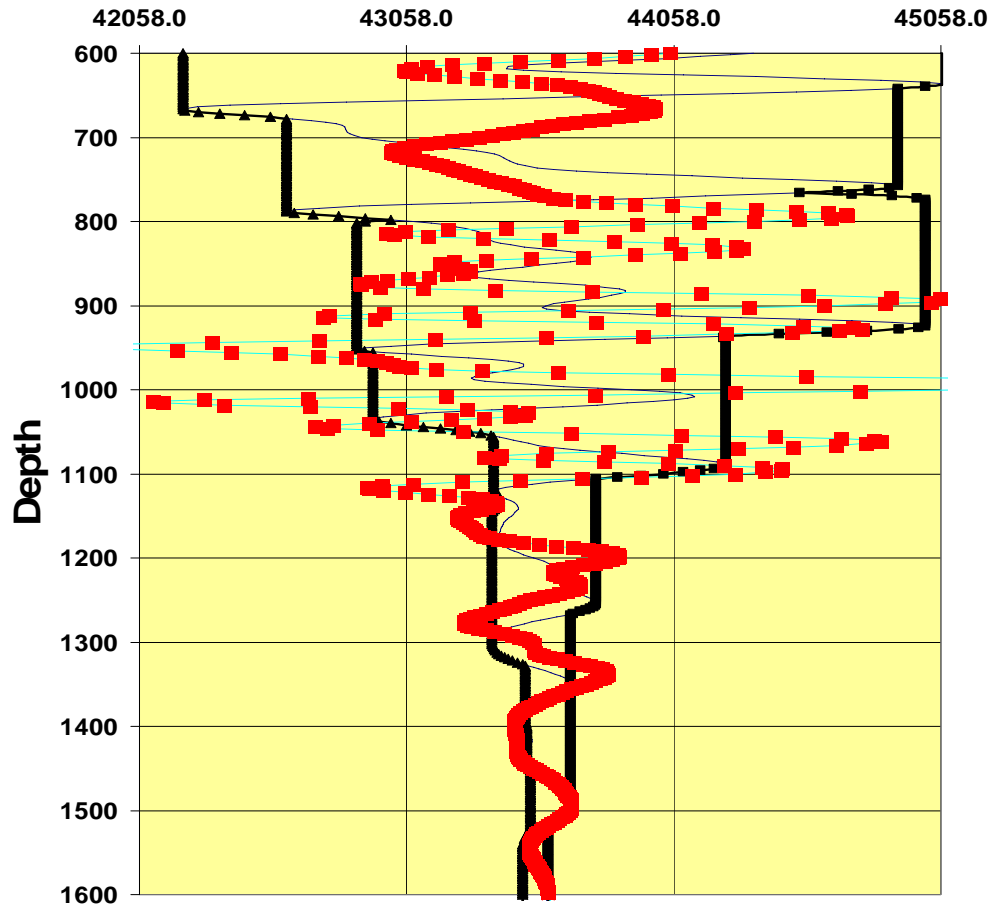
1500ft



4000ft

250 ft per division

as built and design continous Btotal



Reference

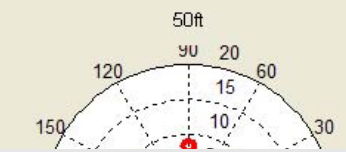
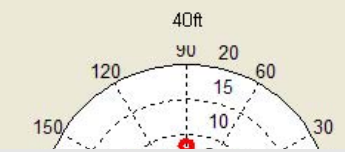
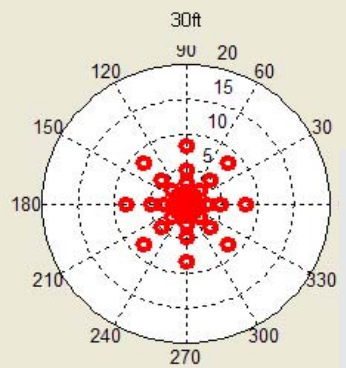
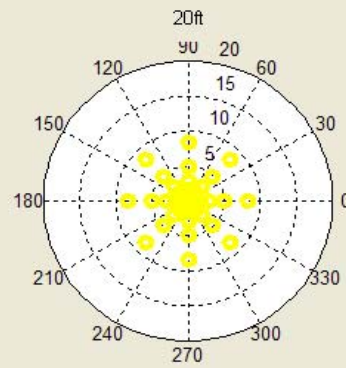
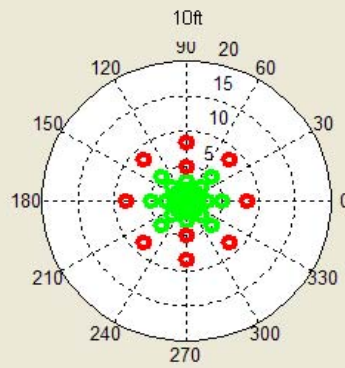
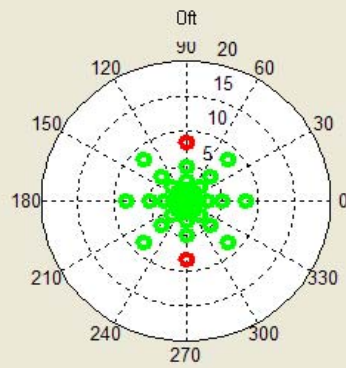
Btotal	50000
Dip	60
Dec	15

Tool Dir. 15

MWD Shot

Btotal	52000
Dip	61
Azimuth	15
Inclination	1
BHA Int	1000
Threshold	500

- 5" Casing
- 7" Casing
- 12" Casing



No casing of specified size c
Possible casing
Unable to determine

- Eventually 3-d graphics (of course)
- Specify casing size to detect
- Specify "noise" level
- Result is area where NO POSSIBLE CASING THIS SIZE (or larger) can be present

