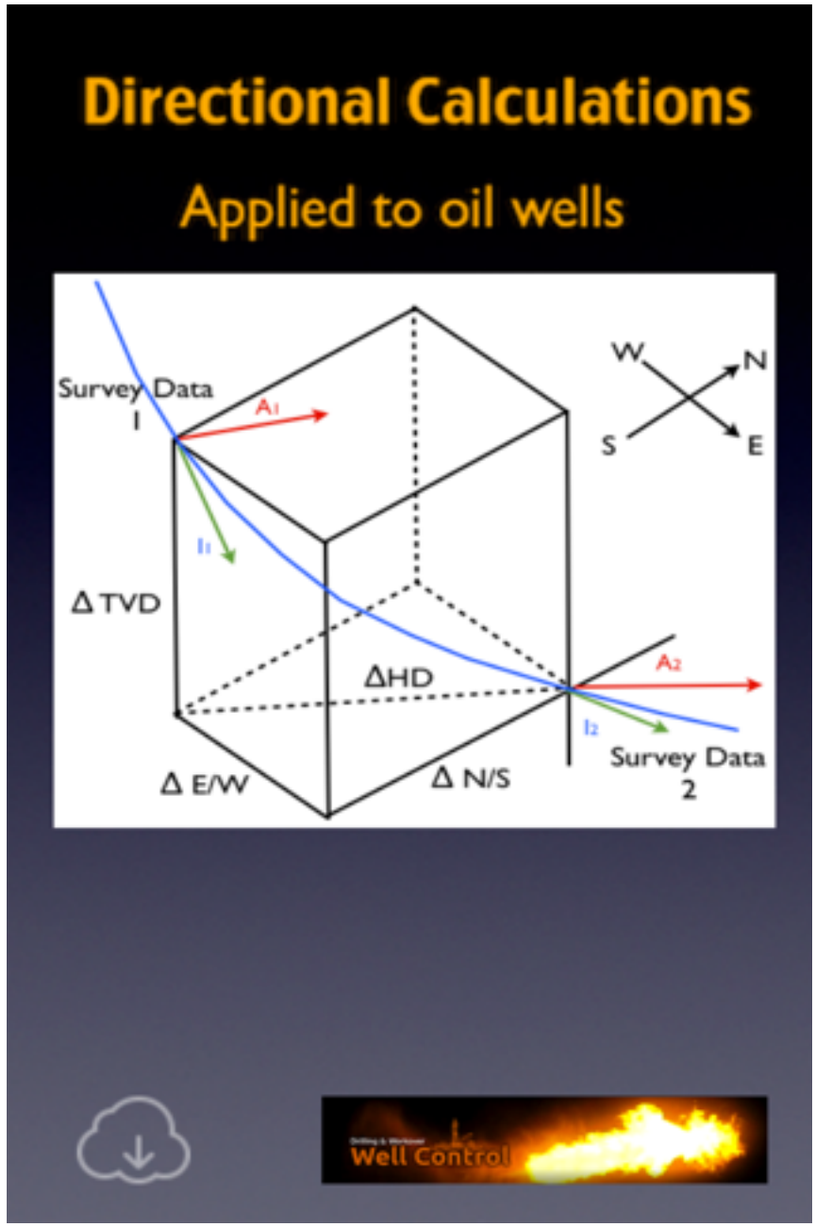
www.wellcontrol.com.br

Directional Calculations for iPhone and iPod touch



Disclaimer

Directional Terms

Infos on the App

2D Type I Well

2D Type II Well

2D Horizontal Well

Two between Stations

3D Section Calculations

Vertical Section

About

Available on the App Store

Version: 2.0

Directional Calculations

Disclaimer

These tools and materials are provided 'as is' without warranties of any kind, express or implied.

Please verify the tools provided by this application by yourself before you use them. Ensure you understand the impact of using these tools.

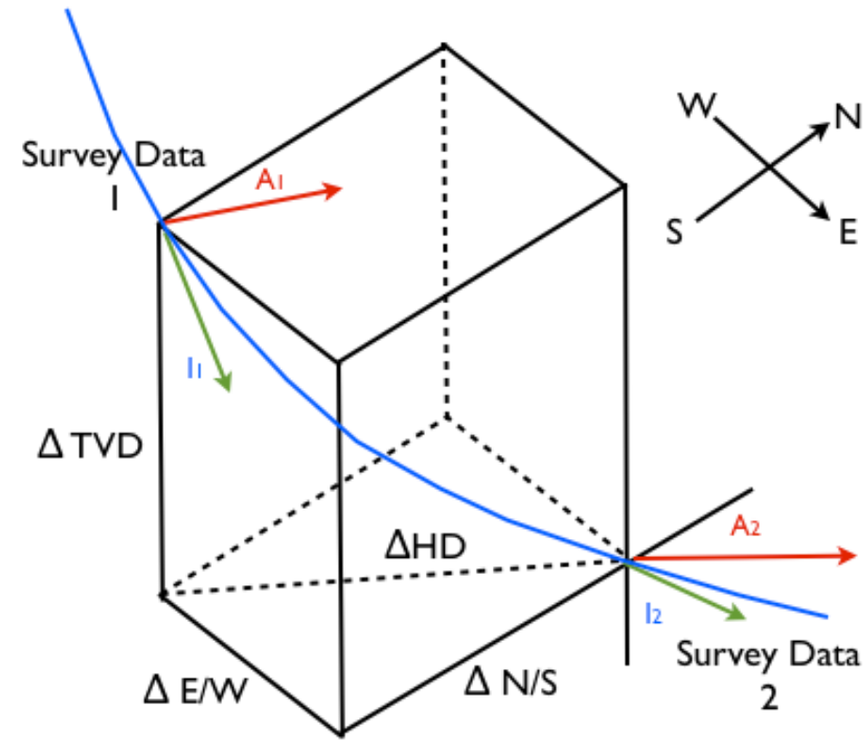
Any use you choose to make of these tools & materials is undertaken by you entirely at you own risk.

Note:

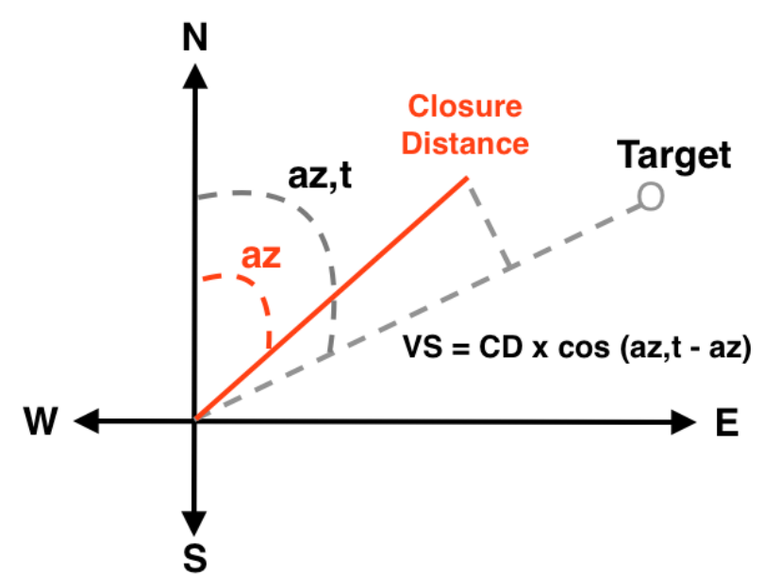
This app was created with an educational proposal to help students and teachers of drilling engineering and has no intention of replace the professional software provided by directional companies.
It is also an useful tool for other professionals in the oilfield, such as technicals and engineers.

Thanks

Directional Terms



KOP - Kick Off Point
BUR - Build Up Rate
DOR - Drop Off Rate
DLS - Dog leg Severity
RC - Radius of Curvature
INC - Inclination, Drift
TVD - True Vertical Depth
MD - Measured Depth
VS - Vertical Section
CL - Course Length = MD2 - MD1
N/S - North / South coordinate
E/W - East / West coordinate
TR - Turn Rate
HD - Horizontal Displacement
CD - Closure Distance (= HD)
AZI - Azimuth



Informations on the app

Version 2.0

Directional Calculations app provides useful tool to students, drillers, technicians, drilling engineers and other professionals of directional drilling.

- Calculates the survey parameters between two stations using the five methods (tangential, tangential balanced, minimum curvature, radius of curvature and average angle)
- Calcultes the parameters of the 2D wells (types I, II and horizontal)
- Calculates the 3D projections (changing of the inclination and azimuth between stations)
- Calculates the projection of the Horizontal Displacement (Closure Distance) on the target azimuth

Visit our website for other Oil & Gas app.

How To

Terms

iCloud:

- Enabled if iCloud available on device
- Auto saves to restore when open again.
- Shares the same data on devices (iPhone, iPod Touch and iPad)
- Tap on button to get data edited on the other device

2D Wells:

- Tap on titles to edit values (Kop, BUR,...)
- Edit parameters from Top to Bottom
- Touch and swipe to right for [< Back]

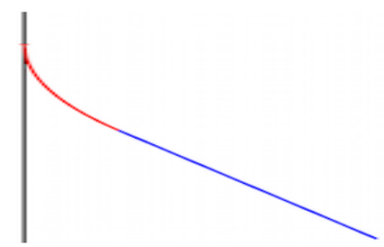
3D Section Calculations:

- First, Select a option to edit parameters: BUR/INC and TR/AZI.
- Check for informations on [info button).
- With the Minimum Curvature Method

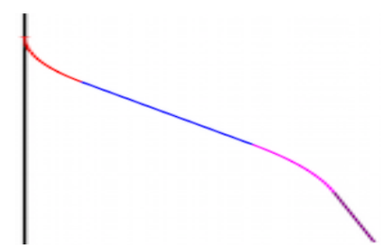
2D Wells

Use this tool to calculate wells without to change the azimuth. Use the templates for Well Type I, II and Horizontal.

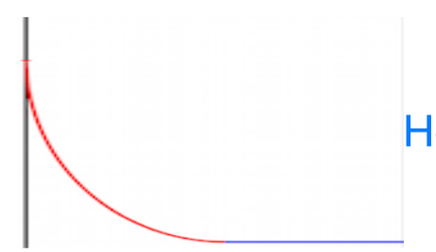
1. Select the Length Unit: Meter or Foot
2. Click on Well Type button on Main Menu
3. Edit parameters from top to bottom



Well Type I



Well Type II



Horizontal

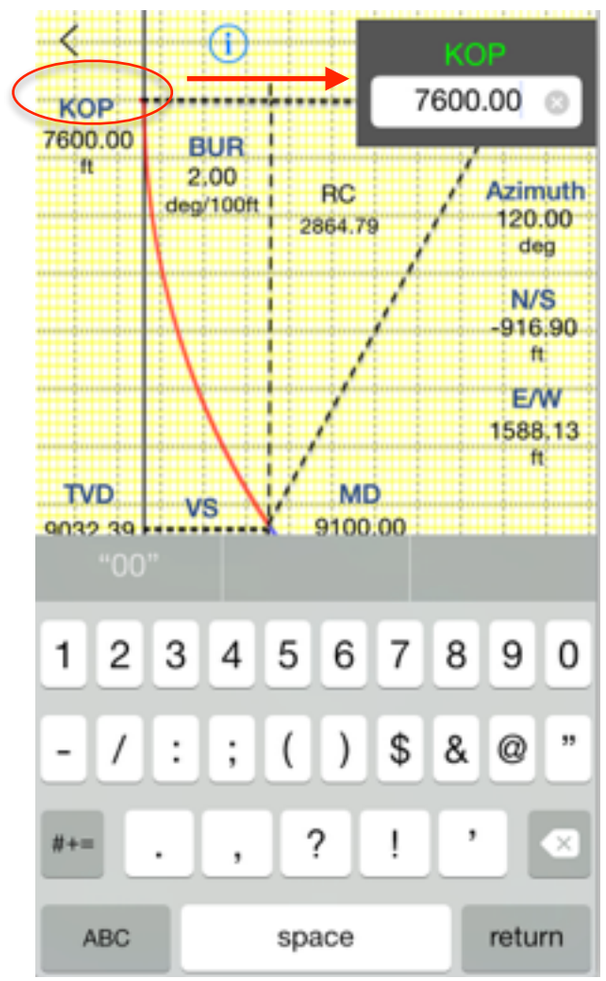
Well Type I - Build and Hold

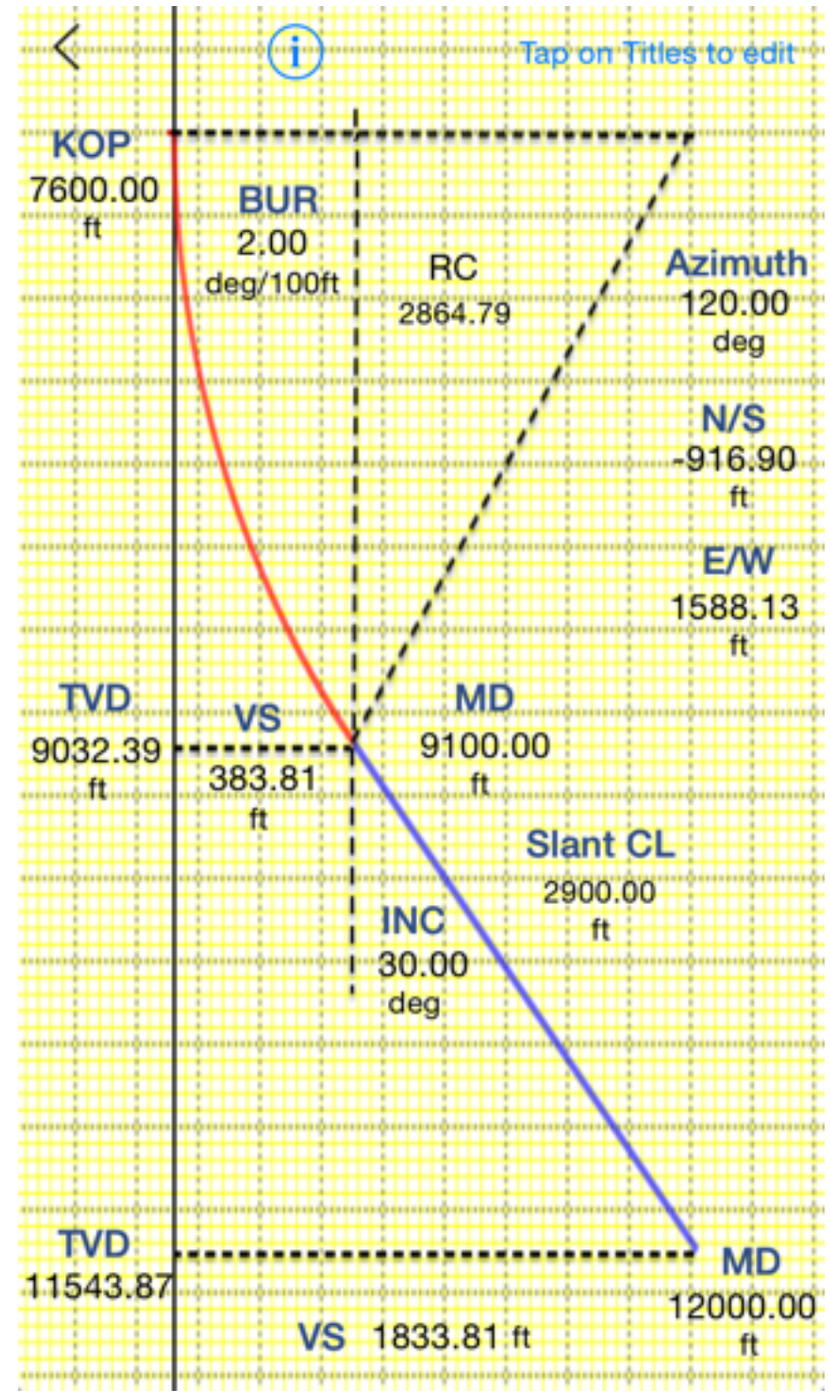
Example

1. Start a build up 2.0 deg/100ft at 7,600 ft
2. Stop build up to inclination = 30 deg
3. Hold until Target at 12,000 ft / 120 deg

1. Select Length Unit = FOOT
2. Set KOP = 7600
3. Set BUR = 2
4. Set INC = 30
5. Set Azimuth = 120
6. Set MD = 12000

Tap on titles to edit parameters



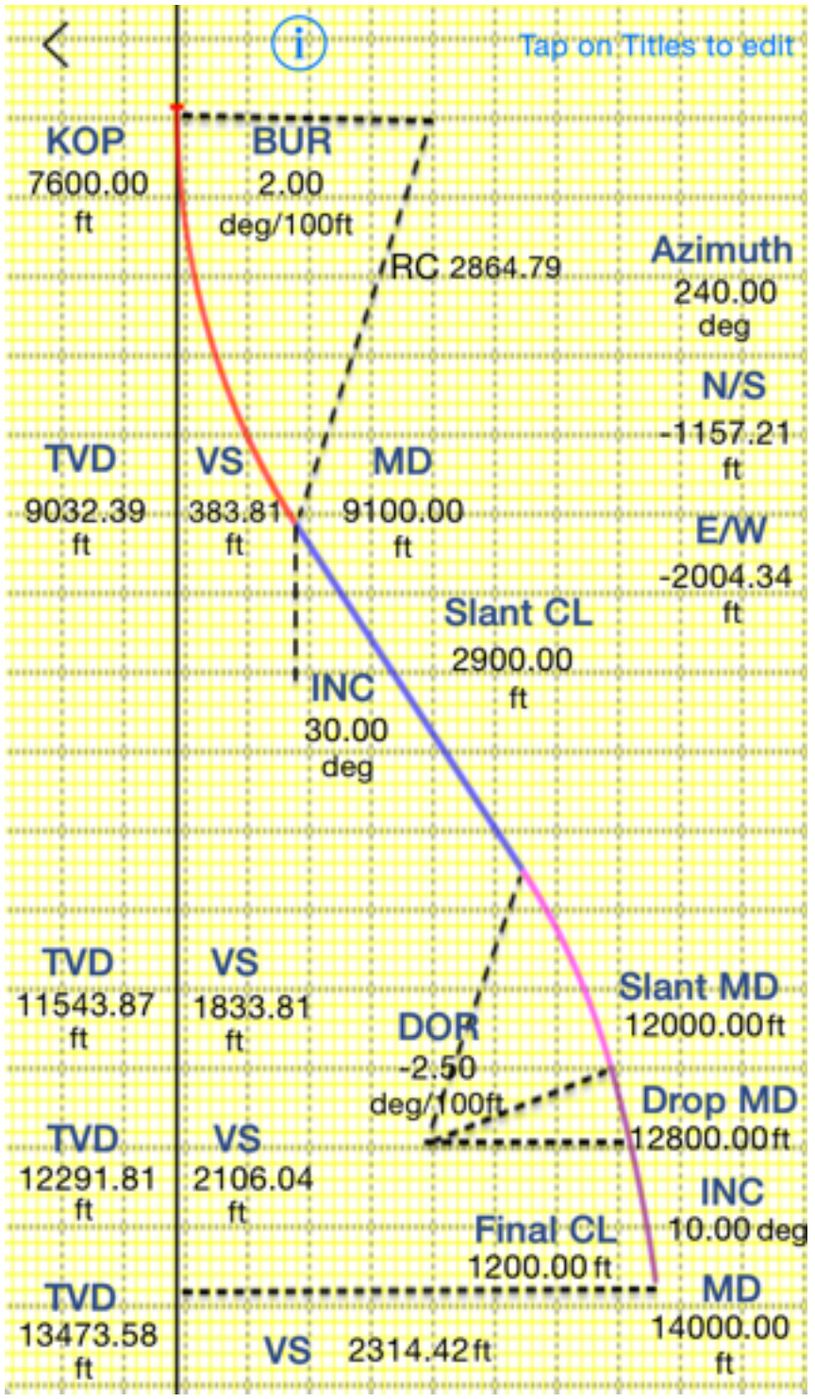


Well Type II - Build-Hold-Drop-Hold

Example

1. Start a build up 2.0 deg/100ft at 7,600 ft
2. Stop build up to inclination = 30 deg
3. Hold until 12,000 ft @ direction 240 deg
4. Drop inclination to 10 deg @ 2.5 deg/100 ft
5. Hold until Target at 14,000 ft

1. Select Length Unit = FOOT
2. Set KOP = 7600
3. Set BUR = 2
4. Set INC = 30
5. Set Slant MD = 12000
6. Set DOR = - 2.5
7. Set Final INC = 10
8. Set MD = 14000
9. Set Azimuth = 240



Horizontal Well

Example

1. Start a build up 3.0 deg/100ft at 7,600 ft
2. Stop build up to inclination = 90 deg
3. Hold until Target at 12,000 ft / 330 deg

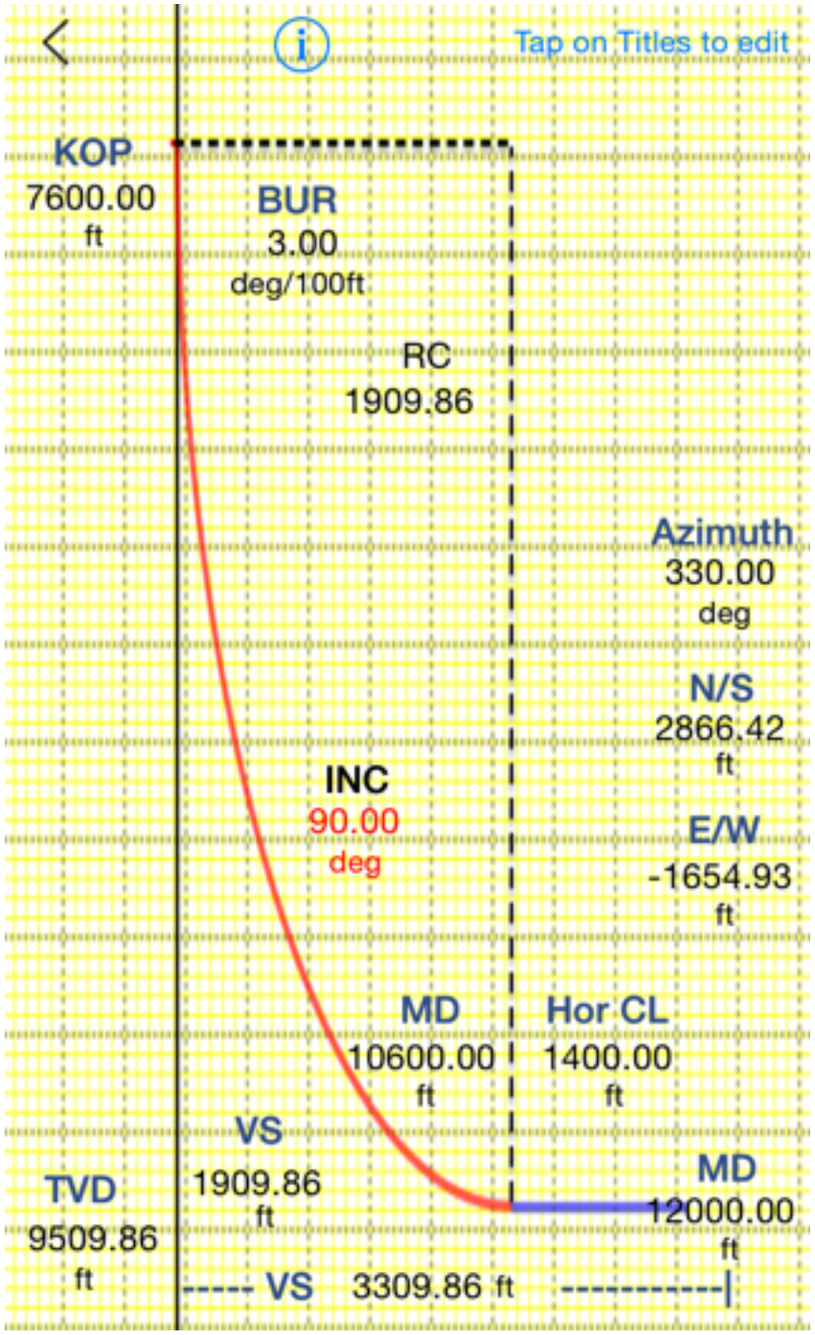
1. Select Length Unit = FOOT

2. Set KOP = 7600

3. Set BUR = 3

4. Set MD = 12000

5. Set Azimuth = 330



Calculations between two survey stations

1) TANGENTIAL:

Δ N/S = ΔMD x sin (I2) x cos (A2)
Δ E/W = ΔMD x sin (I2) x sin (A2)
Δ TVD = ΔMD x cos (I2)

DOG LEG SEVERITY (degree/100ft)
DLS= 100÷{MD x [sin(I1) x sin(I2) x (sin(A1) x sin(A2) + cos(A1) x cos(A2)) + (cos I1 x cos I2)]}

2) BALANCED TANGENTIAL:

Δ N/S = ΔMD/2 x [sin (I1) x cos (A1) + sin (I2) x cos (A2)]
Δ E/W = ΔMD/2 x [sin (I1) x sin (A1) + sin (I2) x sin (A2)]
Δ TVD = ΔMD/2 x [cos (I1) + cos (I2)]

3) MINIMUM CURVATURE:

Δ N/S = ΔMD/2 x [sin (I1) x cos (A1) + sin (I2) x cos (A2)] x RF
Δ E/W = ΔMD/2 x [sin (I1) x sin (A1) + sin (I2) x sin (A2)] x RF
Δ TVD = ΔMD/2 x [cos (I1) + cos (I2)] x RF

B = acos [cos(I2-I1) - (sin(I1) x sin(I2) x (1 - cos(A2 - A1))] (in radians)
RF = 2/B x tan(B/2)

4) RADIUS OF CURVATURE:

Δ N/S = [ΔMD x (cos(I1) - cos(I2)) x (sin(A2) - sin(A1))] / [(I2 - I1) x (A2 - A1)]
Δ E/W = [ΔMD x (cos(I1) - cos(I2)) x (cos(A1) - cos(A2))] / [(I2 - I1) x (A2 - A1)]
Δ TVD = ΔMD/2 x [sin(I2) - sin(I1)] / (I2 - I1)

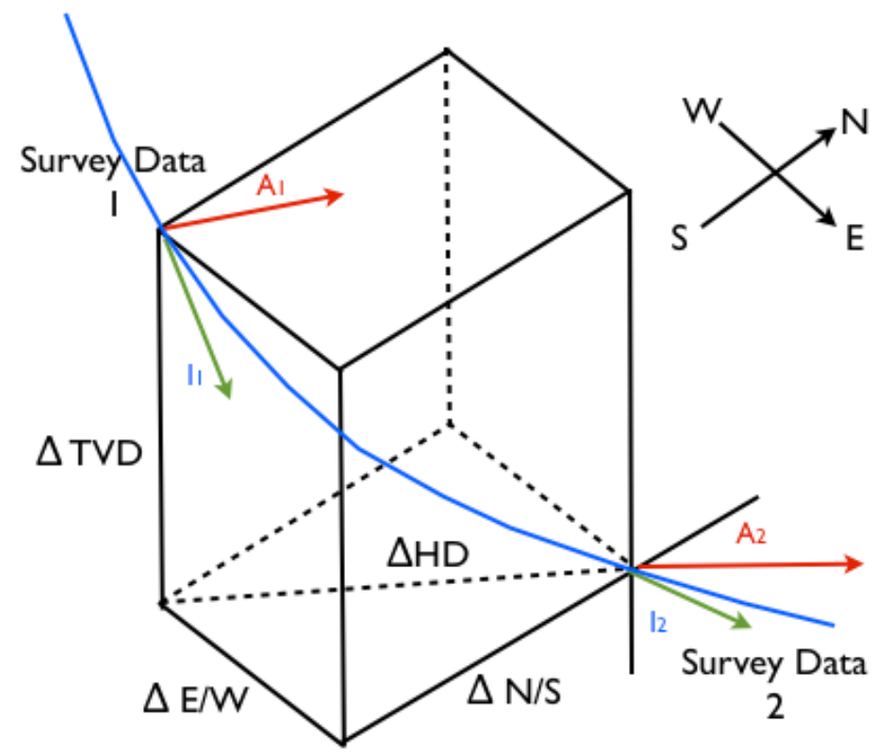
Angles in radians. A(deg) x PI / 180 => radian

DOG LEG SEVERITY (degree/100ft):

DLS = {acos [cos(I1) x cos(I2) + (sin(I1) x sin(I2) x cos(A2 - A1)]} x (100 ÷ MD)

5) ANGLE AVERAGING:

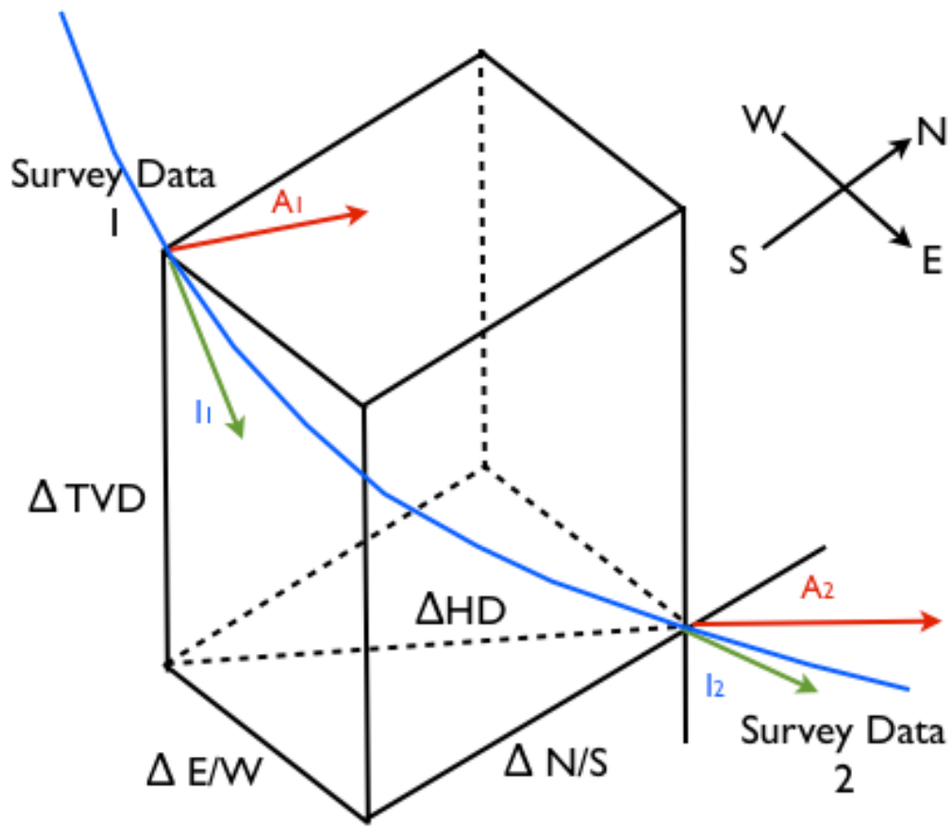
Δ N/S = ΔMD x sin((I1+I2)/2) x cos((A1+A2)/2)
Δ E/W = ΔMD x sin((I1+I2)/2) x sin((A1+A2)/2)
Δ TVD = ΔMD x cos((I1+I2)/2)



For All Methods:
ΔHD = Square Root [(Δ N/S)^2 + (Δ E/W)^2)]

Dog Leg Severity is calculated by method "Radius of Curvature" on methods 2, 3, 4 and 5.

Calculations between two survey stations



Between two Stations Terms

	# 1		# 2	
MD	7500		7600	ft
Inclination	10		13	deg
Azimuth	50		45	deg
Bearing	N 50.00 E		N 45.00 E	

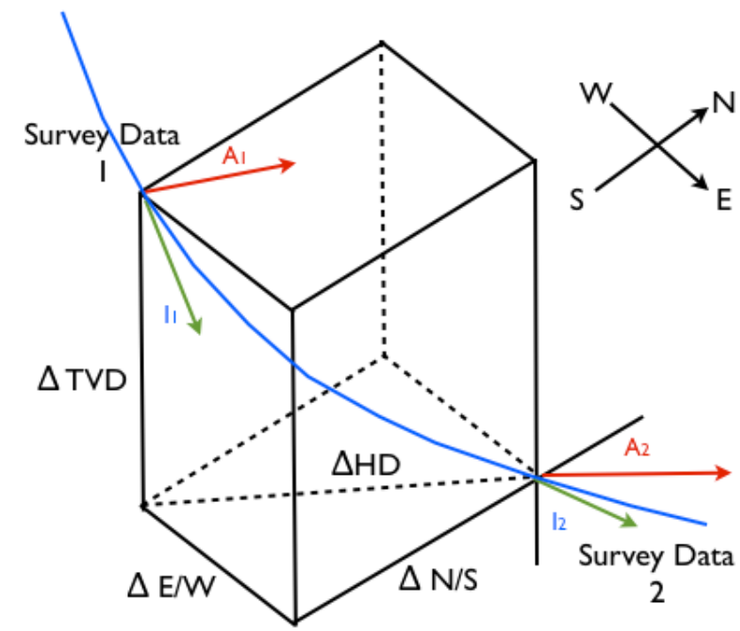
NW NE SW SE NW NE SW SE

CL, ft 100.00	ΔTVD ft	ΔHD ft	ΔN/S ft	ΔE/W ft
Tangential	97.44	22.50	15.91	15.91
Balanced Tangential	97.96	19.91	13.53	14.60
Minimum Curvature	97.98	19.92	13.54	14.61
Radius of Curvature	97.98	19.93	13.46	14.69
Average Angle	97.99	19.94	13.47	14.70

DLS	BUR	TR
3.16 (deg/100ft)	3.00 (deg/100ft)	-5.00 (deg/100ft)

3D Well Section Calculations

Parameters for example

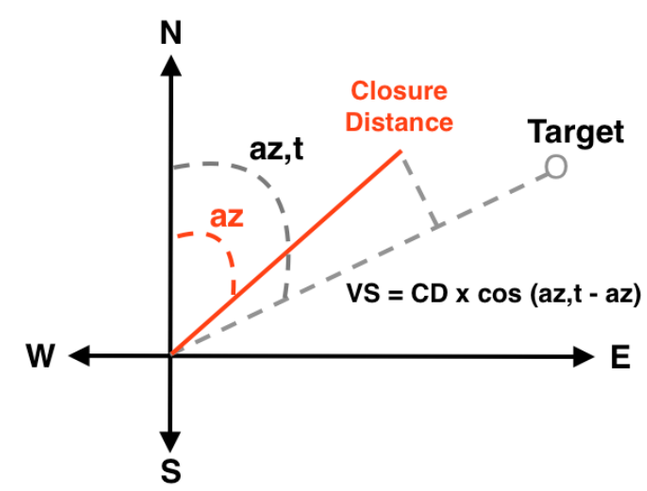


Set the Previous Parameters

1. MD = 6000 ft, TVD = 5906.26 ft
2. Inc = 0 deg, Azimuth = 26.00 deg
3. N/S = 698.88 ft, E/W = 340.87 ft

Set the 3D Well Section Parameters

1. Inc = 37 deg
2. Azimuth = 55 deg
3. DLS = 4 deg / 100 ft



Set the Target Azimuth to calculate the Vertical Section

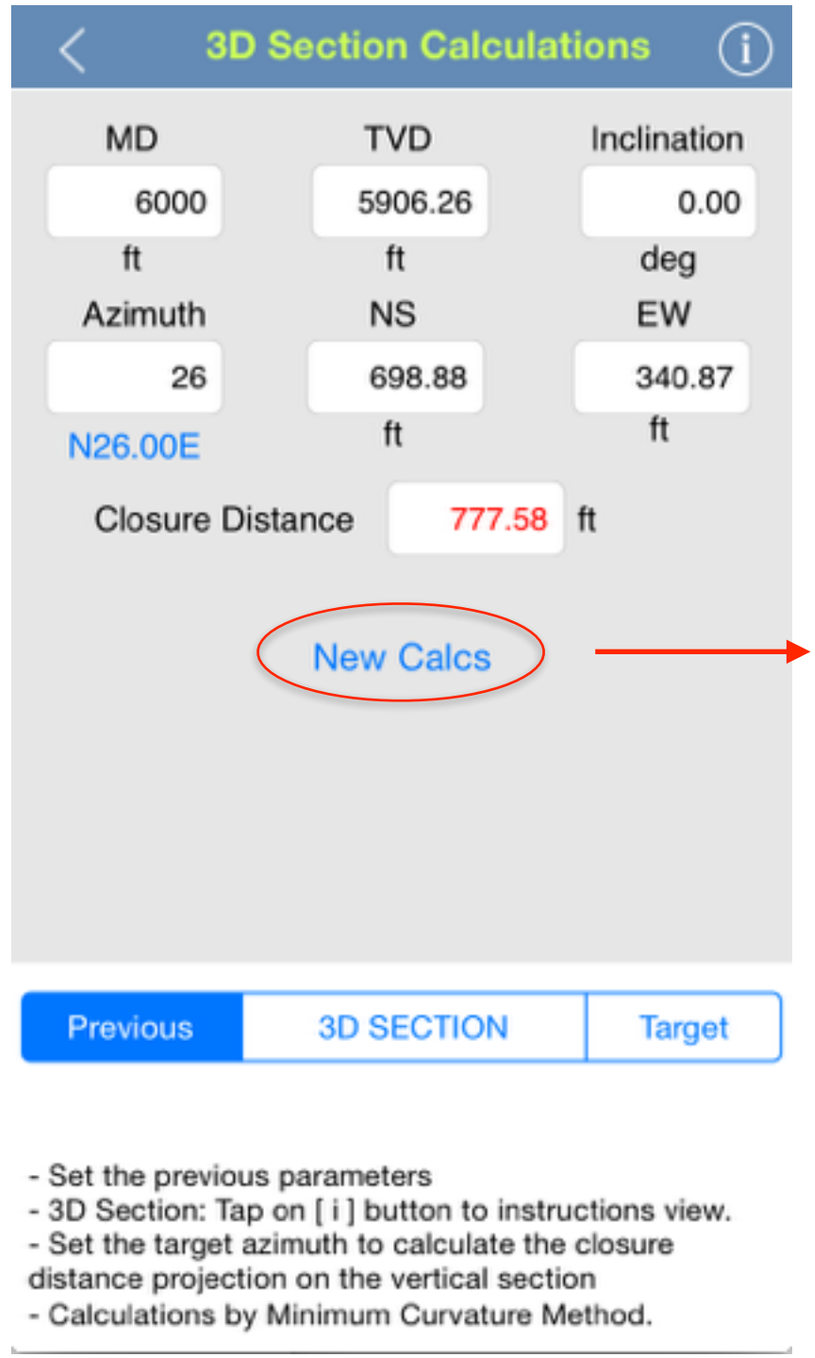
1. Set Target Azimuth = 0 deg

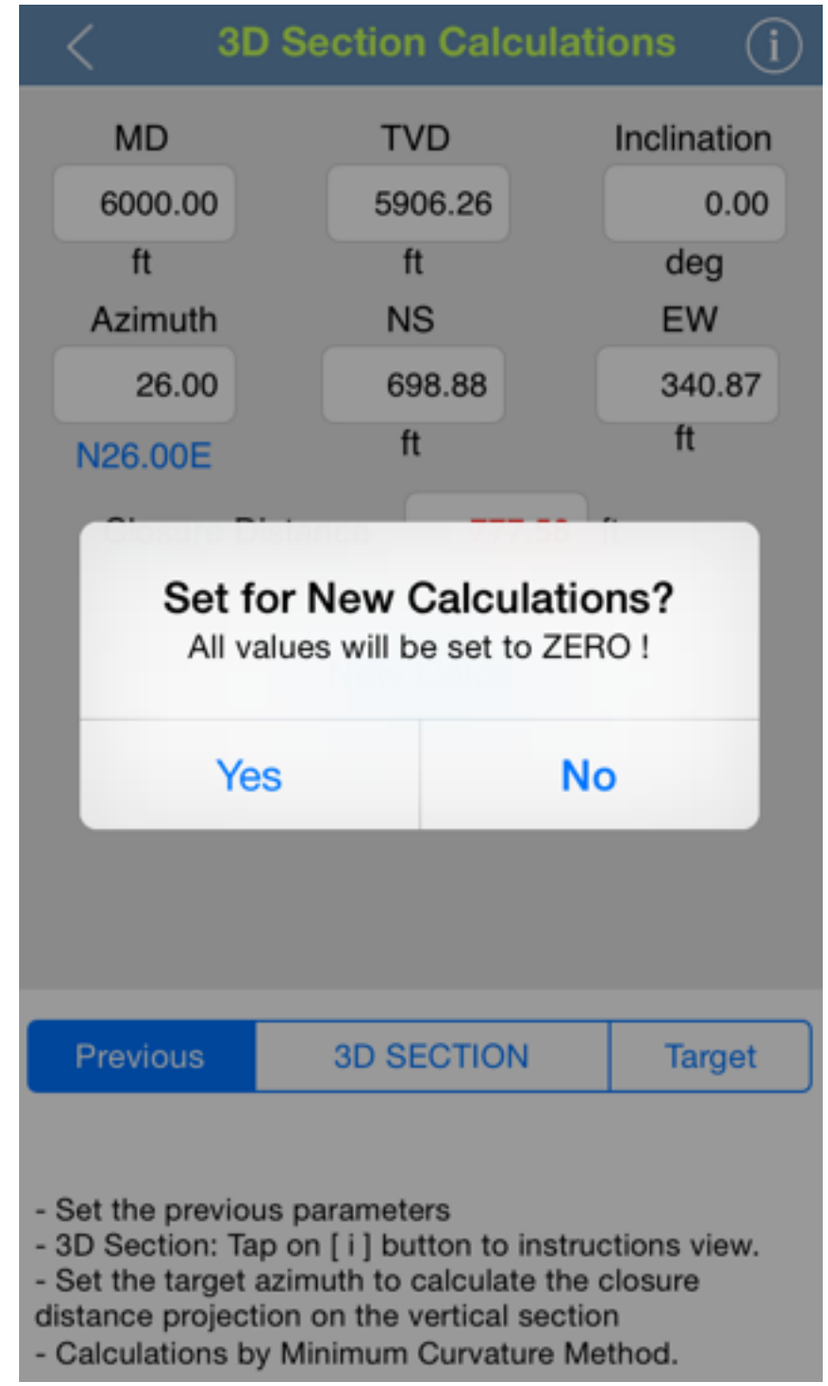
Minimum Curvature Method

3D Well Section Calculations

Set the Previous Parameters

1. MD = 6000 ft, TVD = 5906.26 ft
2. Inc = 0 deg, Azimuth = 26.00 deg
3. N/S = 698.88 ft, E/W = 340.87 ft





3D Well Section Calculations

Set the 3D Well Section Parameters

1. Inc = 37 deg
2. Azimuth = 55 deg
3. DLS = 4 deg / 100 ft

In this case, select options to set angles INC and AZI

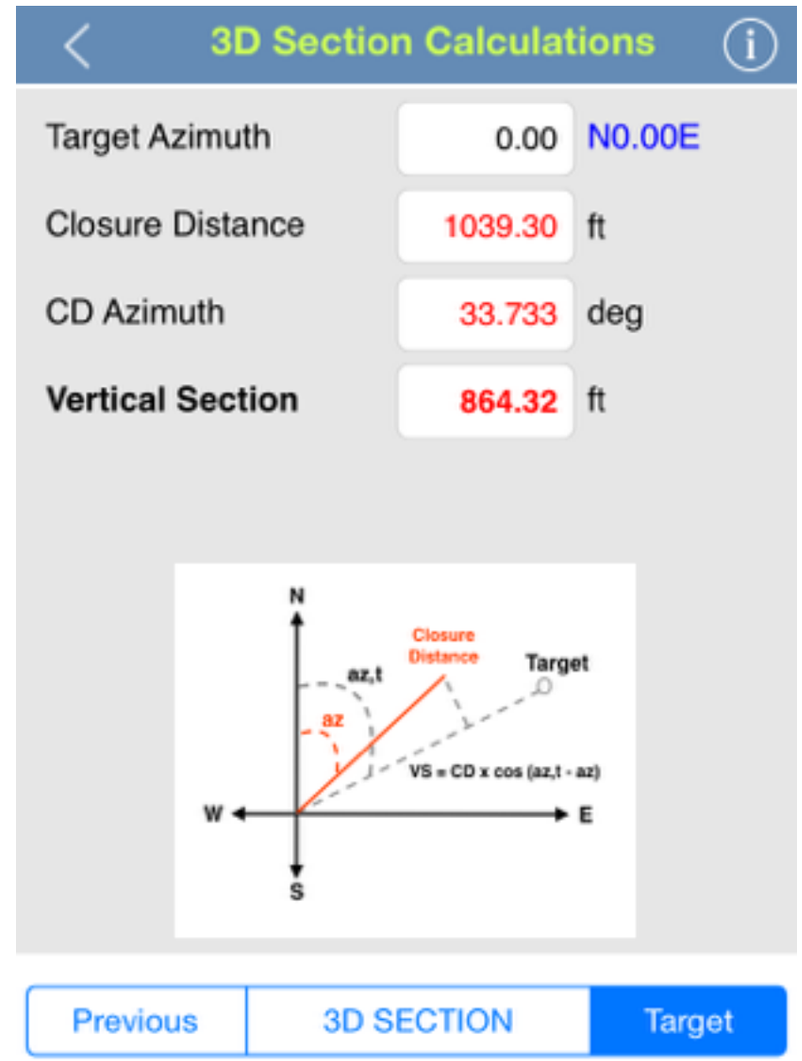
3D Well Section Calculations

Set the Target Azimuth to calculate the Vertical Section:

- Projection of the closure distance on the target azimuth

VS = CD x cos (az,target - az,cd)

1. Set Target Azimuth = 0 deg



- Set the previous parameters
- 3D Section: Tap on [i] button to instructions view.
- Set the target azimuth to calculate the closure distance projection on the vertical section
- Calculations by Minimum Curvature Method.

3D Well Section Calculations

Select an option

Calculation Tool - Help | Terms

Select an option:

Set BUR,MD -> INC | Set INC, MD -> BUR

1. Editing "BUR"
Gets value in "MD" -> Calculates "INC"

2. Editing "MD"
Gets value in "BUR" -> Calculates "INC"

3. Editing "INC"
Gets value in "BUR" -> Calculates "MD"

Calculation Tool - Help | Terms

Select an option:

Set BUR,MD -> INC | Set INC, MD -> BUR

1. Editing "INC"
Gets value in "MD" -> Calculates "BUR"

2. Editing "MD", "TVD", "N/S", "E/W"
Gets value in "INC" -> Calculates "BUR"

3. Editing "BUR"
Gets value in "INC" -> Calculates "MD"

Select an option

Set TR,MD -> AZI | Set AZI, MD -> TR

1. Editing "TR"
Gets value in "MD" -> Calculates "AZI"

2. Editing "MD"
Gets value in "TR" -> Calculates "AZI"

3. Editing "AZI"
Gets value in "TR" -> Calculates "MD"

Set TR,MD -> AZI | Set AZI, MD -> TR

1. Editing "AZI"
Gets value in "MD" -> Calculates "TR"

2. Editing "MD", "TVD", "N/S", "E/W"
Gets value in "AZI" -> Calculates "TR"

3. Editing "TR"
Gets value in "AZI" -> Calculates "MD"

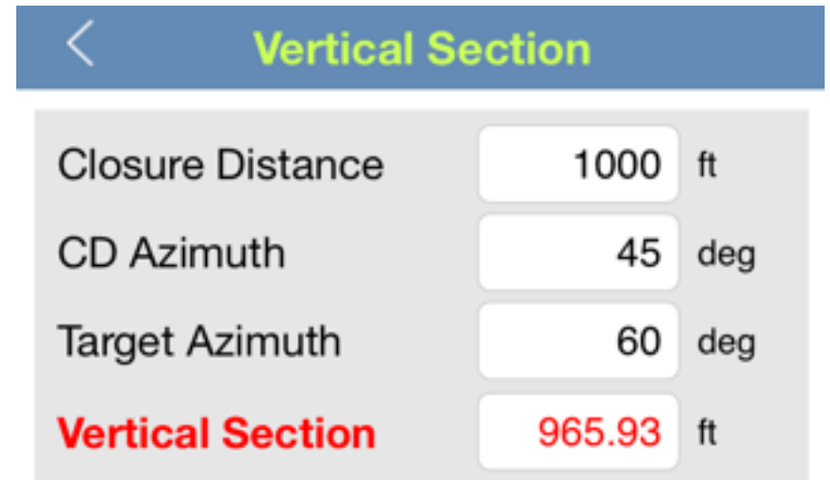
BUR -> Build Up Rate | TR -> Turn Rate
INC -> Inclination | AZI -> Azimuth
MD -> Measured Depth

BUR -> Build Up Rate | TR -> Turn Rate
INC -> Inclination | AZI -> Azimuth
MD -> Measured Depth

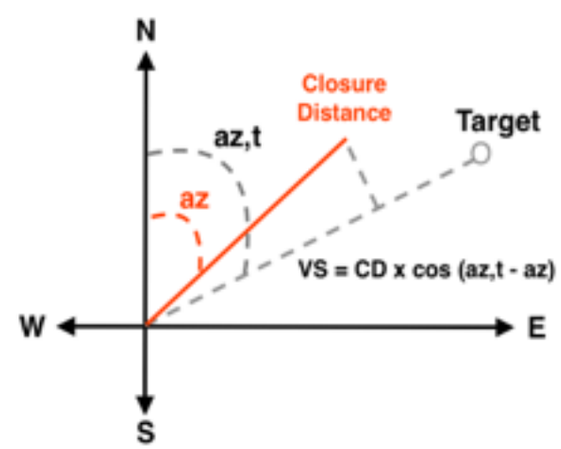
Vertical Section Calculations

Set the Target Azimuth to calculate the Vertical Section:

- Projection of the closure distance on the target azimuth



VS = CD x cos (az,target - az,cd)



About

This app was developed based on our experience. There is no comparison with any other software.

Our goal was to create a low-cost application with the help of experts to share with drilling engineers, technicians, drillers, students and teachers of drilling engineering.

There is no intention to replace the professional softwa-res.

You can contribute with suggestions for improvements, cor-recting the translation to english, reporting bugs and sprea-ding it to your friends.

Please visit our support url and see other applications for Oil & Gas for iPhone, iPod Touch, iPhone and Mac.

Contact

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Website

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Blog

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