Understanding and Plotting Cell Phone Information

Evan Weitz & Will Mattert
REASONS TO GATHER INFORMATION

What was said? - Content important (Drug cases, self-defense, conspiracy, etc..)

Mon, Aug 24, 9:11 PM
We met at 7-11 remember man
Lol
Not much dude wanna smoke so bad u have any green

Hey bro what's good wit ya
How much to lookin for
Was just saying whassup lol
Lol, Whassup. Chillin here. You got any hooks for sum blow
I actually do man. Lol
Can you get me an 8

too :) and it's a solid connect too u looking for a ball
Yah man. Hook a brotha up

OK I gotchu bro. They're all bagged up in .6 bags that cool
I just gotta swing thru my boys house. Its not stomped on either
REASONS TO GATHER INFORMATION

Who talked to who? - Links between witnesses (Bias, timing of events, conspiracy)
REASONS TO GATHER INFORMATION

Location?

Best Buy
Jay told the police in his second interview that Adnan showed him Hae's body in the trunk of her car here.
SOURCES OF INFORMATION
CELL PHONE

Information available:

- Call History
- Text Messages
- Photos
- Notes
- E-mails
- Social Messaging Applications
CELL PHONE

Visual Examination

Document with photographs

Forensic Analysis

Does not alter data

Deleted items can be recovered

Uses forensic software (Cellebrite, EnCase, etc.)

Different programs can retrieve different data
Phones often backed up to Computer

Computer may have information the phone does not.

iTunes for iPhone

Android files copied to hard drive
COMPUTER

Cloud backups

Websites

Check-ins

Social Media Posts

Photos
CARRIER RECORDS

Subscriber Info
  Name
  Billing Address

TracFones
  Point of sale
CELLULAR TECHNOLOGY

Limited Number of Frequencies

Area Split into Cells
## Tower Search Results!

**Alert!** 61 Towers (13 Registered, 48 Not Registered) found within 3.00 miles of 819 N 6th St, Milwaukee, WI 53203.

**Info!** The NEAREST Tower is .08 miles away and is owned by Milwaukee Radio Alliance.

**Alert!** One New Tower Application found within 3.00 miles of 819 N 6th St, Milwaukee, WI 53203.

<table>
<thead>
<tr>
<th>Tower Type</th>
<th>ID Num</th>
<th>Site Owner</th>
<th>Height</th>
<th>Dist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered</td>
<td></td>
<td>Milwaukee City Center, Llc</td>
<td>663 feet</td>
<td>.12 miles</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>Entercom Milwaukee, Llc</td>
<td>227 feet</td>
<td>.18 miles</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
<td>City Of Milwaukee</td>
<td>232 feet</td>
<td>.19 miles</td>
</tr>
<tr>
<td></td>
<td>(3)</td>
<td>Indusstar Digital Pcs, Inc, Dba = Indusstar</td>
<td>123 feet</td>
<td>.76 miles</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>Time Warner Cable Midwest Llc</td>
<td>282 feet</td>
<td>.83 miles</td>
</tr>
<tr>
<td></td>
<td>(5)</td>
<td>Sba Towers, Llc</td>
<td>158 feet</td>
<td>1.27 miles</td>
</tr>
<tr>
<td></td>
<td>(6)</td>
<td>Milwaukee, City Of</td>
<td>315 feet</td>
<td>1.65 miles</td>
</tr>
<tr>
<td></td>
<td>(7)</td>
<td>Wisconsin Bell Telephone Company</td>
<td>168 feet</td>
<td>1.66 miles</td>
</tr>
<tr>
<td></td>
<td>(8)</td>
<td>Milwaukee County Government</td>
<td>286 feet</td>
<td>2.66 miles</td>
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<tr>
<td></td>
<td>(9)</td>
<td>United States Cellular Corporation</td>
<td>70 feet</td>
<td>2.81 miles</td>
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<tr>
<td></td>
<td>(10)</td>
<td>Courier Communications Dba = Wnsv Radio</td>
<td>292 feet</td>
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<tr>
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<td>(11)</td>
<td>United States Cellular Corporation</td>
<td>120 feet</td>
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<tr>
<td></td>
<td>(12)</td>
<td>United States Cellular Corporation</td>
<td>120 feet</td>
<td>2.96 miles</td>
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<td>(1)</td>
<td>Kans Net Inc</td>
<td>278 feet</td>
<td>.12 miles</td>
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<td>(2)</td>
<td>Newaukee</td>
<td>784 feet</td>
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<td>(3)</td>
<td>County Of Milwaukee, Wisconsin</td>
<td>204 feet</td>
<td>.31 miles</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>Indus Inc</td>
<td>171 feet</td>
<td>.36 miles</td>
</tr>
<tr>
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<td>(5)</td>
<td>Indus Inc</td>
<td>199 feet</td>
<td>.42 miles</td>
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<tr>
<td></td>
<td>(6)</td>
<td>Blank</td>
<td>221 feet</td>
<td>.48 miles</td>
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<td>(7)</td>
<td>Milwaukee Public Schools</td>
<td>205 feet</td>
<td>.49 miles</td>
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<td></td>
<td>(8)</td>
<td>Nextel Communications</td>
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<td>.71 miles</td>
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<td></td>
<td>(9)</td>
<td>Warner Amex Cable Comms., Co. of Milwaukee</td>
<td>225 feet</td>
<td>.76 miles</td>
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<tr>
<td></td>
<td>(10)</td>
<td>Milwaukee School Of Engineering</td>
<td>202 feet</td>
<td>.77 miles</td>
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</table>
Alert! 36 Towers (16 Registered, 20 Not Registered) found within 4.00 miles of 1025 Clark St, Stevens Point, WI 54481.

Info! The NEAREST Tower is .06 miles away and is owned by Wisconsin Bell Telephone Company.

Ok! No Applications for Future Towers detected as of 11/11/15.

<table>
<thead>
<tr>
<th>Tower Type</th>
<th>ID Num</th>
<th>Site Owner</th>
<th>Height</th>
<th>Dist</th>
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<tbody>
<tr>
<td>Registered</td>
<td>(1)</td>
<td>Wisconsin Bell Telephone Company</td>
<td>180 feet</td>
<td>.06 miles</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
<td>University Of Wisconsin - Stevens Point</td>
<td>131 feet</td>
<td>.88 miles</td>
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<td></td>
<td>(3)</td>
<td>St. Michaels Hospital Of Stevens Point, Wi</td>
<td>121 feet</td>
<td>1.12 miles</td>
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<td></td>
<td>(4)</td>
<td>Americus Communications Inc Dba = Webt</td>
<td>402 feet</td>
<td>1.18 miles</td>
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<tr>
<td></td>
<td>(5)</td>
<td>Sentry Insurance</td>
<td>151 feet</td>
<td>1.41 miles</td>
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<td></td>
<td>(6)</td>
<td>Stevens Point Police Dept</td>
<td>180 feet</td>
<td>1.44 miles</td>
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<tr>
<td></td>
<td>(7)</td>
<td>United States Cellular Corporation</td>
<td>167 feet</td>
<td>1.75 miles</td>
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<td></td>
<td>(8)</td>
<td>Lake Mobility Llc</td>
<td>128 feet</td>
<td>1.97 miles</td>
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<tr>
<td></td>
<td>(9)</td>
<td>Charter Cable Partners, Llc</td>
<td>348 feet</td>
<td>1.98 miles</td>
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<td></td>
<td>(10)</td>
<td>Sba Monarch Towers ll, Llc</td>
<td>168 feet</td>
<td>2.33 miles</td>
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<tr>
<td></td>
<td>(11)</td>
<td>Warden, Jack D Dba = Wardens Communications Service</td>
<td>350 feet</td>
<td>2.57 miles</td>
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<td>(12)</td>
<td>Night Tower Holdings, Llc</td>
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<td>2.63 miles</td>
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<tr>
<td></td>
<td>(13)</td>
<td>United States Cellular Corporation</td>
<td>295 feet</td>
<td>3.00 miles</td>
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<tr>
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<td>(14)</td>
<td>Spectrasite Communications, Llc Through American Towers, Llc</td>
<td>138 feet</td>
<td>3.37 miles</td>
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<tr>
<td></td>
<td>(15)</td>
<td>Ccatt Llc</td>
<td>130 feet</td>
<td>3.41 miles</td>
</tr>
<tr>
<td></td>
<td>(16)</td>
<td>United States Cellular Corporation</td>
<td>131 feet</td>
<td>3.90 miles</td>
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</table>

Not Registered

<table>
<thead>
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<th>Site Owner</th>
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</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Sba Towers Inc</td>
<td>180 feet</td>
<td>.33 miles</td>
</tr>
<tr>
<td>(2)</td>
<td>Canadian National Railroad</td>
<td>120 feet</td>
<td>.87 miles</td>
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<tr>
<td>(3)</td>
<td>Verizon Wireless Personal Communications Lp</td>
<td>65 feet</td>
<td>1.05 miles</td>
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<tr>
<td>(4)</td>
<td>Blank</td>
<td>230 feet</td>
<td>1.15 miles</td>
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<td>(5)</td>
<td>Blank</td>
<td>120 feet</td>
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<td>(6)</td>
<td>Skipko Broadcasting Company</td>
<td>351 feet</td>
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<td>Blank</td>
<td>146 feet</td>
<td>1.70 miles</td>
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<td>(8)</td>
<td>Nsightel Wireless Llc</td>
<td>110 feet</td>
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</tr>
<tr>
<td>(9)</td>
<td>Us Cellular Corporation - Wi</td>
<td>170 feet</td>
<td>1.82 miles</td>
</tr>
</tbody>
</table>
Tower Search Results!

Alert! 3 Towers (2 Registered, 1 Not Registered) found within 4.00 miles of 101 N Ogden Rd, Peshtigo, WI 54157.

Info! The NEAREST Tower is 1.27 miles away and is owned by State Of Wi-educational Comm. Board.

Ok! No Applications for Future Towers detected as of 11/11/15.

<table>
<thead>
<tr>
<th>Tower Type</th>
<th>ID Num</th>
<th>Site Owner</th>
<th>Height</th>
<th>Dist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered</td>
<td>(1)</td>
<td>Vspec Inc/Global Supply Chain</td>
<td>569 ft</td>
<td>1.62 miles</td>
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<tr>
<td></td>
<td>(2)</td>
<td>Spectrusite Communications, Llc Through American Towers, Llc</td>
<td>254 ft</td>
<td>3.02 miles</td>
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<tr>
<td>Not Registered</td>
<td>(1)</td>
<td>State Of Wi-educational Comm. Board</td>
<td>205 ft</td>
<td>1.27 miles</td>
</tr>
<tr>
<td>Future</td>
<td></td>
<td>(No Towers Detected)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.antennasearch.com
TOWER TYPES

ADDING ANTENNA SECTORS TO ADD CAPACITY

OMNI DIRECTIONAL
Minimal capacity

TRI-SECTOR
3x capacity

SIX SECTOR
6x capacity
TOWER ORIENTATION

Azimuth
Degrees from due north

Beam Width
Width of sector in degrees
Usually 120 for 3 sector towers

Amplitude
Power or Range of signal

Location: [Longitude, Latitude]
NORTEL VS. LUCENT

Nortel

Sectors (1, 2, 3)

Lucent

Sectors (2, 3, 4)
CONNECTING TO TOWER

Phone searches for strongest signal

Not always closest tower

- Tower traffic
- Environmental factors
  - Vegetation
  - Water
  - Buildings
TRIANGULATION

MUST BE REAL TIME

CANNOT BE DONE FROM HISTORICAL DATA
INTERPRETING CALL DETAIL RECORDS
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>O</th>
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<tbody>
<tr>
<td><strong>Customer PTN</strong></td>
<td><strong>Date</strong></td>
<td><strong>Call Initiation Time</strong></td>
<td><strong>Duration (sec)</strong></td>
<td><strong>Type</strong></td>
<td><strong>Forwarded</strong></td>
<td><strong>911</strong></td>
<td><strong>Called PTN</strong></td>
<td><strong>Calling PTN</strong></td>
<td><strong>Received Cell Site</strong></td>
<td><strong>Terminating Cell Site</strong></td>
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<tr>
<td>(414) 215-6212</td>
<td>28-Feb-10</td>
<td>12:19:49 AM</td>
<td>23</td>
<td>Inbound</td>
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<td>(414) 215-6212</td>
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<td>(414) 215-6212</td>
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<td></td>
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<tr>
<td>(414) 215-6212</td>
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<td></td>
</tr>
</tbody>
</table>
HOW TO PLOT CELL TOWER DATA
Go to Google Drive and Select “Shared with me”
You should have a shared folder for Cell Tower Mapping.
Right Click the folder and select “Add to My Drive”
Select "Move"
Open this Folder and locate the folder you moved.
You should see this, one folder and 3 files
Do NOT ever alter, or delete this file!
Double Click this file
You should see this
Do not make any changes to this file!
Select "View live form"
A new window should open that looks like this
Now we get into the meat and potatoes of things

There are two different ways that cell companies set up their towers

**AT&T**

They provide coverage for sector used for the call. They do not have standard cell sectors

**Verizon/US Cellular/Sprint**

They tend to use standard cell sector layout
Verizon/ US Cellular/ Sprint standard layout

It will either be sector 1 or Alpha. The center of the sector is 0 degrees. Each sector is 120 degrees. You must verify that the tower is a standard layout with sector 1/Alpha to the north. This is the most common and true 95% of the time.
AT&T Towers

Their towers very. The center of the sectors are different as are the width. We will practice with both using our mapping form.
This is our AT&T example

<table>
<thead>
<tr>
<th>Item</th>
<th>Conn. Date</th>
<th>Conn. Time (UTC)</th>
<th>Seizure Time</th>
<th>ET</th>
<th>Originating Number</th>
<th>Terminating Number</th>
<th>IMEI</th>
<th>IMSI</th>
<th>CT</th>
<th>Feature</th>
<th>Cell Location</th>
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<tbody>
<tr>
<td>86</td>
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<td>0:28</td>
<td>0:08</td>
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<td>MO</td>
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<td>[30110,20213,-89.34108:43.25642:250:85.0]</td>
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<tr>
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<td>1:00</td>
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The crime happened at 11:30 AM.

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Pay attention to the Time Zone. AT&T use UTC

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</table>
16:30 UTC is 11:30 AM for this time of the year.
AT&T provides the cell tower data in the record.

<table>
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</table>
Information from this line - Write this down

[30110/20313:-89.34108:43.25642:250:85.0]

Cell Tower Latitude
Information from this line - Write this down

[30110/20313: -89.34108: 43.25642: 250: 85.0]

Cell Tower Longitude
Information from this line - Write this down

[30110/20313: -89.34108: 43.25642: 250: 85.0]

Center of the cell tower sector
Information from this line - Write this down

Sector Beam Width

[30110/20313:-89.34108:43.25642:250:85.0]
Information from this line - Write this down

[30110/20313] -89.34108:43.25642:250:85.0

Cell Tower Identifier
Figuring out the degrees of the sector

The sector center is 250 and it is 85 degrees wide, or 42.5 degrees on either side of 250. The edges of the sector are at 207.5 and 292.5

Does anyone not understand this?
Back to our Google Form

Cell Tower Mapping

* Required

What is the title of your cell tower?

20313

What is the latitude of your cell tower? *

43.25642

What is the longitude of your cell tower? *

-89.34108

What is the range of your cell tower in meters? *

If unknown use 5000 meters.

5000

What is the title of your case file? *

John Smith 15CF100

Submit
Input the title of the cell tower - the tower ID

Cell Tower Mapping

What is the title of your cell tower?
20313

What is the latitude of your cell tower? *
43.25642

What is the longitude of your cell tower? *
-89.34108

What is the range of your cell tower in meters? *
If unknown use 5000 meters.
5000

What is the title of your case file? *
John Smith 15CF100
Input the latitude of the cell tower

Cell Tower Mapping

What is the title of your cell tower?
20313

What is the latitude of your cell tower? *
43.25642

What is the longitude of your cell tower? *
-89.34108

What is the range of your cell tower in meters? *
if unknown use 5000 meters
5000

What is the title of your case file? *
John Smith 15CF100

Submit
Input the longitude of the cell tower
Input the range of the cell tower
And the title of your case file

Cell Tower Mapping

What is the title of your cell tower?
20313

What is the latitude of your cell tower? *
43.25642

What is the longitude of your cell tower? *
-89.34108

What is the range of your cell tower in meters? *
If unknown use 5000 meters.
5000

What is the title of your case file? *
John Smith 15CF1001
Cell Tower Mapping

* Required

What is the title of your cell tower?

20313

What is the latitude of your cell tower? *

43.25642

What is the longitude of your cell tower? *

-89.34108

What is the range of your cell tower in meters? *

If unknown use 5000 meters.

5000

What is the title of your case file? *

John Smith 15CF100

Submit
Plotting the ends - *For AT&T we only need points A&B

For point C, just enter the latitude and longitude for the cell tower location. Very important.
Finding points A & B - click the hyperlink

Using the distance and bearing calculator, determine point A. What is the latitude of this point?

http://www.geomidpoint.com/destination/

What is the longitude of point A?

Using the distance and bearing calculator, determine point B. What is the latitude of this point?

http://www.geomidpoint.com/destination/

What is the longitude of point B?

Using the distance and bearing calculator, determine point C. What is the latitude of this point?

http://www.geomidpoint.com/destination/

What is the longitude of point C?
It opens up a new webpage

Bearing and Distance Calculator

Finds the destination point given a starting point, bearing and distance. The points can be viewed on a Google map. Uses the WGS84 ellipsoid for greater worldwide accuracy.

Search for place:  
Find it

Starting point:
Latitude: 43.26642  Longitude: -89.34108

Bearing (0-360): 207.5  Distance:  

© miles  © km

Calculate  Clear

Earth model: WGS84 ellipsoid

Destination point:

See it on map
(Courtesy of Google Maps)

Calculator features

You can enter a latitude and longitude directly or use the handy 'Search for place' feature—a fast search of millions of cities, towns and other places worldwide. See Help for more information.

By default, the calculator uses the WGS84 ellipsoid to find the geodetic position of the destination point, which is used by GPS devices because it provides a good approximation for the shape of the earth. Eleven other commonly used reference ellipsoids are also provided as well as a user defined ellipsoid and a spherical earth model. Calculations are made using Vincenty's formula for direct azimuth and distance which yields a high degree of accuracy for the ellipsoid models.
Input the starting lat/long, AKA the cell tower center.
Input the bearing (we determined this earlier) and range.
Make sure you select kilometers!
Then click “Calculate”
It will calculate “Point A” for you

Bearing and Distance Calculator

Finds the destination point given a starting point, bearing and distance. The points can be viewed on a Google map. Uses the WGS84 ellipsoid for greater worldwide accuracy.

Search for place: Find it

Starting point:
Latitude: 43.25642  Longitude: 89.34108
Bearing (0.360): 207.5  Distance: 5

Calculate  Clear  Earth model: WGS84 ellipsoid

Destination point:
Latitude: 43.12.569 N  43.21649604
Longitude: 89.22.10W  -89.36945886
Final bearing: 207.28.50  207.4803619
Back bearing: 27.28.50  27.48053619

Calculator features

You can enter a latitude and longitude directly or use the handy ‘Search for place’ feature—a fast search of millions of cities, towns and other places worldwide. See Help for more information.

By default, the calculator uses the WGS84 ellipsoid to find the geodetic position of the destination point, which is used by GPS devices because it provides a good approximation for the shape of the earth. Eleven other commonly used reference ellipsoids are also provided as well as a user defined ellipsoid and a spherical earth model. Calculations are made using Vincenty’s formula for direct azimuth and distance which yields a high degree of accuracy for the ellipsoid models.
Latitude - write this down

Bearing and Distance Calculator

Find the destination point given a starting point, bearing and distance. The points can be viewed on a Google map. Uses the WGS84 ellipsoid for greater worldwide accuracy.

Search for place: Find it

Starting point:
Latitude: 43.25642, Longitude: 89.34108

Bearing: 207.5, Distance: 5

Calculate, Clear

Destination point:
Latitude: 43°12′59.5″N 43°21′46.0″E
Longitude: 89°22′10″W - 89°36′49.5″W

Final bearing: 207°28′50″ - 207°48′36″

Back bearing: 27°28′50″ - 27°48′50″

Courtesy of Google Maps

Calculator features

You can enter a latitude and longitude directly or use the handy ‘Search for place’ feature - a fast search of millions of cities, towns and other places worldwide. See Help for more information.

By default, the calculator uses the WGS84 ellipsoid to find the geodetic position of the destination point, which is used by GPS devices because it provides a good approximation for the shape of the earth. Eleven other commonly used reference ellipsoids are also provided as well as a user defined ellipsoid and a spherical earth model. Calculations are made using Vincenty’s formula for direct azimuth and distance which yields a high degree of accuracy for the ellipsoid models.
Longitude - write this down
Change the bearing to 292.5 and hit calculate again.
This is point B - Write down the lat/long for point B.
Input the information into the Google Form

Using the distance and bearing calculator, determine point A. What is the latitude of this point?*
http://www.geomidpoint.com/destination/
43.21649604

What is the longitude of point A?*
-89.36949386

Using the distance and bearing calculator, determine point B. What is the latitude of this point?*
http://www.geomidpoint.com/destination/
43.27362865

What is the longitude of point B?*
-89.39758441

Using the distance and bearing calculator, determine point C. What is the latitude of this point?*
http://www.geomidpoint.com/destination/
43.25642

What is the longitude of point C?*
-89.34108
Don’t forget, point C is the original cell location for AT&T.
Using the distance and bearing calculator, determine point A. What is the latitude of this point?

http://www.geomidpoint.com/destination/
43.21649604

What is the longitude of point A?
-89.36949386

Using the distance and bearing calculator, determine point B. What is the latitude of this point?

http://www.geomidpoint.com/destination/
43.27362865

What is the longitude of point B?
-89.39798441

Using the distance and bearing calculator, determine point C. What is the latitude of this point?

http://www.geomidpoint.com/destination/
43.25642

What is the longitude of point C?
-89.34188

Continue >>
Determining Lat/Long of a specific location

Open up Google Maps in a new window
Right click the location you need the lat/long for
Select “What’s here?”
A box will open up at the bottom with your lat/long.
Write down these numbers for our examples home/ali
bi location
Do the same for the scene of the crime
Input all of this information in the Google Form
Cell Tower Mapping

Plotting Locations

What is the latitude of the crime scene? *
43.2481847

What is the longitude of the crime scene? *
-89.3348895

What is the latitude of the alibi location? *
43.254883

What is the longitude of the alibi location? *
-89.345267

Submit

Never submit passwords through Google Forms.
You will see this
You will get an email from Celltowermapping.

Your file has been successfully generated from this form with Form Publisher.

John Smith 15CF100 2

Open in Google Docs
Select “Open in Google Docs”
```html
<!DOCTYPE html>
<html>
<head>
    <meta name="viewport" content="initial-scale=1.0, user-scalable=yes"/>
    <style type="text/css">
        html { height: 100% }
        body { height: 100%; margin: 0; padding: 0; }
        #map_canvas { height: 100%; }
    </style>
</head>
<body>
    <script type="text/javascript" src="http://maps.googleapis.com/maps/api/js?sensor=false"></script>
    <script type="text/javascript">
        function initialize() {
            var latlng = new google.maps.LatLng(43.25642, -89.34108);
            var myOptions = {
                zoom: 12,
                center: latlng,
                mapTypeId: google.maps.MapTypeId.ROADMAP
            }
            var map = new google.maps.Map(document.getElementById("map_canvas"), myOptions);
            var flightPlanCellTower = [
                new google.maps.LatLng(43.25642, -89.34108),
                new google.maps.LatLng(43.21649004, -89.36649386),
                new google.maps.LatLng(43.25642, -89.34108)
            ]
        }
    </script>
</body>
</html>
```
In the lower left corner a file will be downloaded
Select the file by left clicking on it

```javascript
function initialize() {
    var latlng = new google.maps.LatLng(43.25642, -89.34108);
    var myOptions = {
        zoom: 12,
        center: latlng,
        mapTypeId: google.maps.MapTypeId.ROADMAP
    }
    var map = new google.maps.Map(document.getElementById("map_canvas"), myOptions);

    var flightPlanCellTower = [
        new google.maps.LatLng(43.25642, -89.34108),
        new google.maps.LatLng(43.21649604, -89.36949386),
        new google.maps.LatLng(43.25642, -89.34108),
        new google.maps.LatLng(43.27362865, -89.39798441),
        new google.maps.LatLng(43.25642, -89.34108),
        new google.maps.LatLng(43.25642, -89.34108)
    ];
    var flightPath = new google.maps.Polyline({
        path: flightPlanCellTower,
        strokeColor: "#000000",
        strokeOpacity: 1.0,
```
A new window will open with Notepad that looks like

```html
<!DOCTYPE html>
<html>
  <head>
    <meta name="viewport" content="initial-scale=1.0, user-scalable=yes" />
    <style type="text/css">
      html { height: 100%; }
      body { height: 100%; margin: 0; padding: 0 }
      #map_canvas { height: 100% }
    </style>
    <script type="text/javascript" src="http://maps.googleapis.com/maps/api/js?sensor=false"></script>
  </head>
  <script type="text/javascript">
    function initialize()
    {
      var latlng = new google.maps.LatLng(43.23642, -89.34108);
      var myOptions = {
        zoom: 12,
        center: latlng,
        mapTypeId: google.maps.MapTypeIds.ROADMAP
      }
      var map = new google.maps.Map(document.getElementById("map_canvas"), myOptions);

      var flightPlanelower = [
        new google.maps.LatLng(43.23642, -89.34108),
        new google.maps.LatLng(43.25642, -89.34108),
        new google.maps.LatLng(43.23642, -89.34108)
      ];
      var flightpath = new google.maps.Polyline({
        path: flightPlanelower,
        strokeColor: "#000000",
        strokeOpacity: 1.0,
        strokeWeight: 2
      });

      flightpath.setmap(map);

      var marker = new google.maps.Marker({
        position: new google.maps.LatLng(43.2481847, -89.3348885)
      });
    }
  </script>
</html>
```
Select File - “Save As…”
Add `.html` to the end of the filename and select save.
Right Click the saved file - Open with - Google Chrome
Magic - A new window should open with your map!
You can zoom in on the map and move it around

Turn on satellite

If you turn on “Satellite” and zoom all the way in you can see the actual cell tower
For Verizon, US Cellular and Sprint

Exact same process

When you get to plotting the cell tower, you put information for point A, B, & C

When using the bearing and distance calculator, the bearing will always be 60, 180 & 300

Again, you pick the distance for the strength of your cell towers range
LIMITATIONS

Actual cell coverage doesn’t follow a nice neat model.

Easier to exclude than to include
FUTURE CONSIDERATIONS

Stingrays

GPS Data

Google location history
Any Questions?