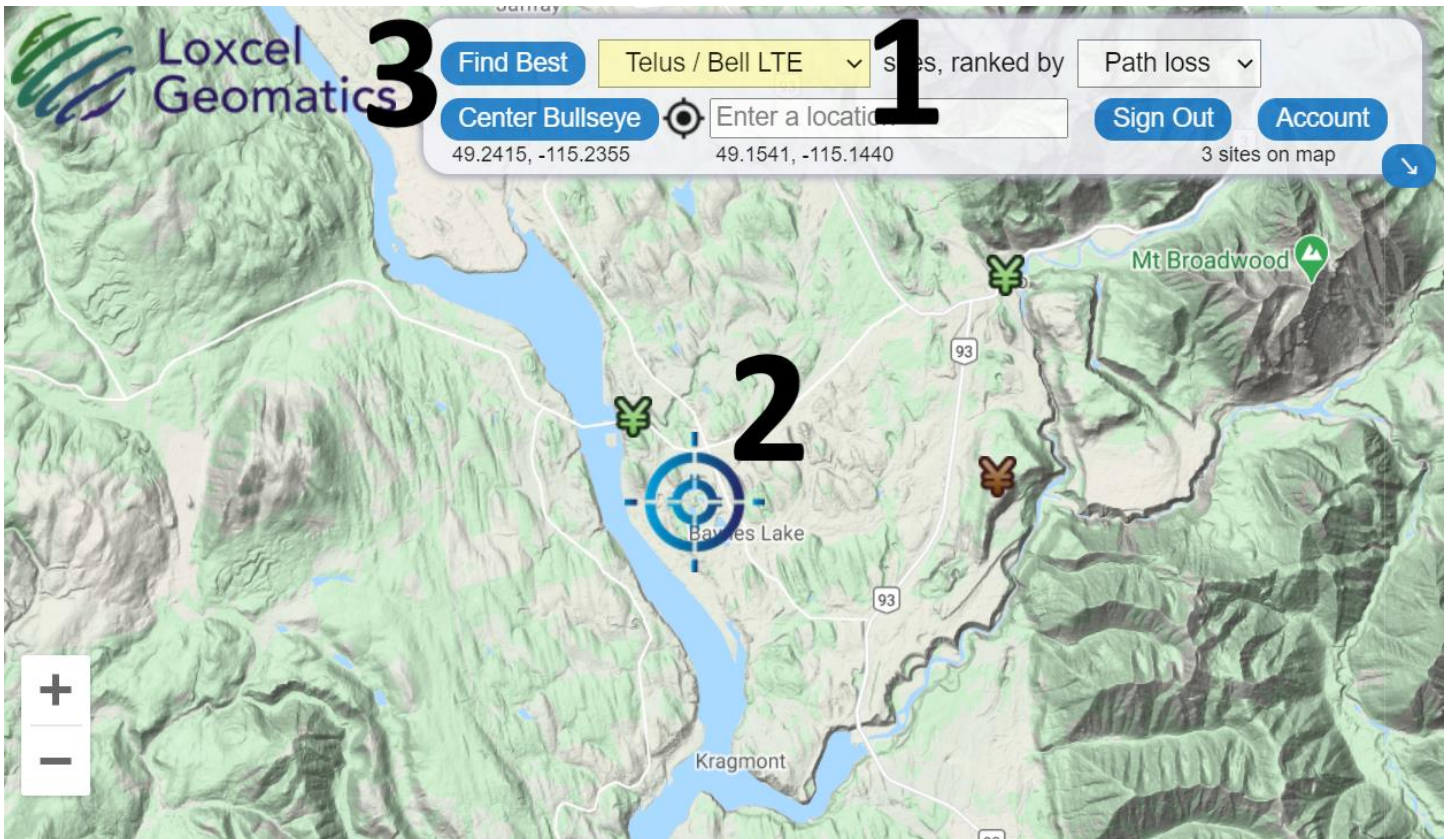


Introduction to Loxcel Cellular Services (Canada)

Loxcel Cellular Services can help you connect a mobile signal booster or Internet of Things (IoT) device to a cellular network. This short guide explains how to find the best cellular sites, generate a PDF site survey and interpret its results.

To begin, visit loxcel.com/celltower from your web browser and sign in with your email address and password. Once signed in, you will see blue buttons, drop-down controls and a map covered with cellular site icons:



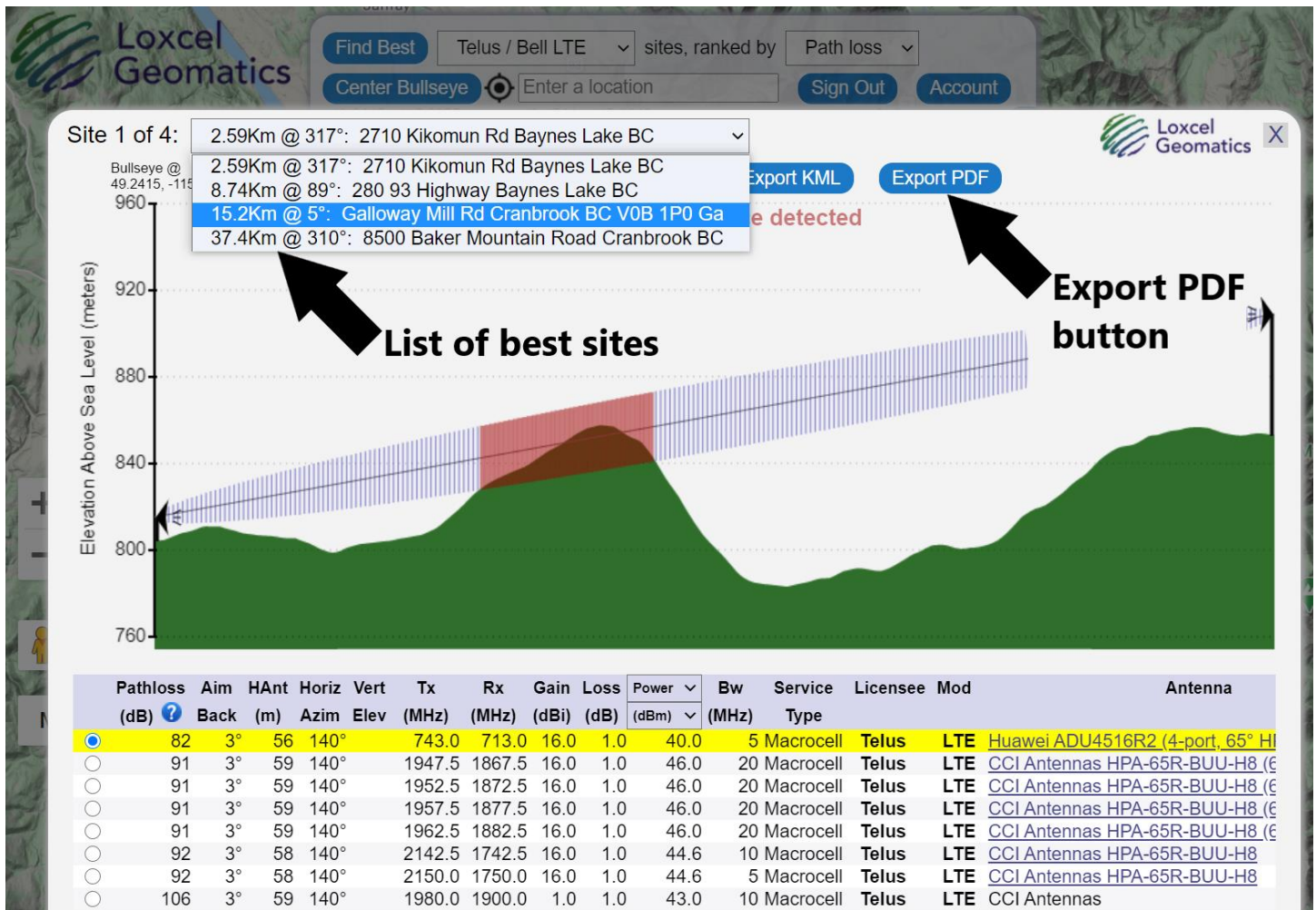
Perform these three steps to find the best cellular sites:

STEP 1: Choose a filter to select the type of cellular sites to find. Filters include carriers (Rogers, Telus, Bell, Freedom, Videotron, SaskTel, Eastlink, Tbaytel, Xplornet, ...), frequency bands (700MHz, 850MHz, 1.9GHz, ...), 5G, etc.

STEP 2: Move the map to where you need cellular coverage. Then drag the bullseye over your exact location. (Click *Center Bullseye* if you don't see the bullseye.)

STEP 3: Click *Find Best* to start your search.

Loxcel Cellular Services searches outwards from the bullseye for sites that match the filter. It ignores sites completely obscured by terrain (hills, mountain peaks, etc.) and returns a list of best sites ordered by their estimated path loss:



Loxcel Cellular Services found 4 *Telus / Bell LTE* sites, 2.59 to 37.4 km from the bullseye. Sites with the lowest path loss are listed at the top.

Can a more distant site be a better site? Yes! Although site #1, *2710 Kikomun Rd Baynes Lake BC*, is one-third the distance of site #2, *280 93 Highway Baynes Lake BC*, the terrain intersects its Fresnel zone, affecting signal quality.

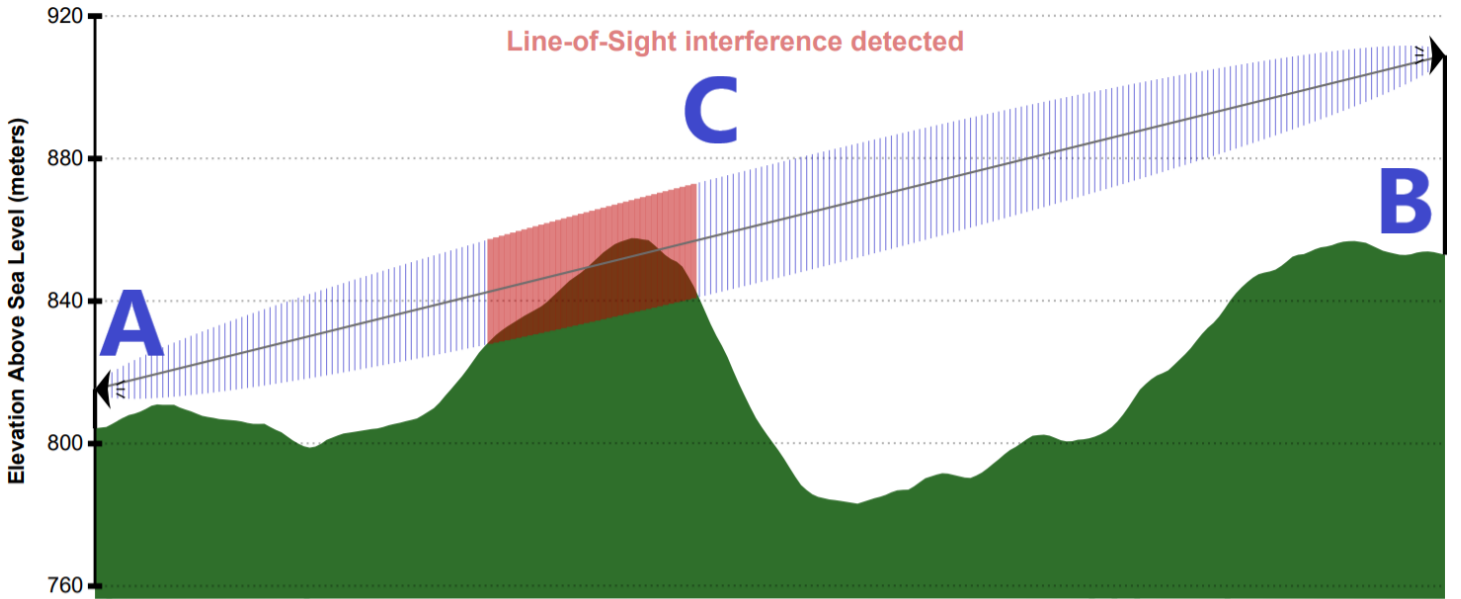
Cellular coverage depends much more on terrain interference, antenna gain, radio power and transmit frequency than distance.

Loxcel Cellular Services considers all of these factors to deliver more accurate results.

Click *Export PDF* to download a PDF color copy of the site survey. The PDFs on the next two pages are of site #1 with terrain interference and site #2 with no terrain interference:

Telus site: 2710 Kikomun Rd Baynes Lake BC

Site is 2.59 km away bearing 317° elevated* 2°, 100% Fresnel



Bullseye @ 49.2415, -115.2355

Antenna: 11 m

Horiz Aim Back: 3°

Path Loss: 83.3 dB = 98.1 dB (free space) + -15.8 dB (horiz) + 1.0 dB (vert)

* Vertical scale exaggerated to show topographic relief.

This report is the property of Loxcel Geomatics, and is generated for Kevin Macdonald, Loxcel Geomatics (kmac@loxcel.com)

Report generated from data supplied by Telus to ISED, current as of the date shown below.

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Telus Site @ 49.2585, -115.2600

HAnt: 56 m

Transmit: 743.0 MHz

Receive: 713.0 MHz

Horiz Azim: 140°

Vert Elev: Unknown

Gain: 16.0 dBi

Line Loss: 1.0 dB

Radio Power: 40.0 dBm

Bandwidth: 5.0 MHz

Service Type: Macrocell



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Label	Description
A	Your location, as represented by the bullseye on the map
B	Cellular site selected from the list of best sites
C	Fresnel zone highlights areas of interference in red; line-of-sight cuts through its middle. A message above says (from best to worst) <i>No signal interference detected</i> , <i>Fresnel interference detected</i> or <i>Line-of-Sight interference detected</i> . Terrain is colored green for land and blue for water and curved to represent the earth's curvature
D	Information about your location: 1. Antenna Height above ground (11 m): you can change this value 2. Horizontal Aim Back (3°): how far off-center your location is from the center of the directional cellular antenna at B. Lower aim back is better 3. Path Loss (83.3 dB): estimated signal loss from B to A. Lower path loss is better (e.g. 90 is better than 110 and much better than 130). Considers transmit frequency, distance, and approximate antenna losses. Does not consider losses due to Fresnel zone interference

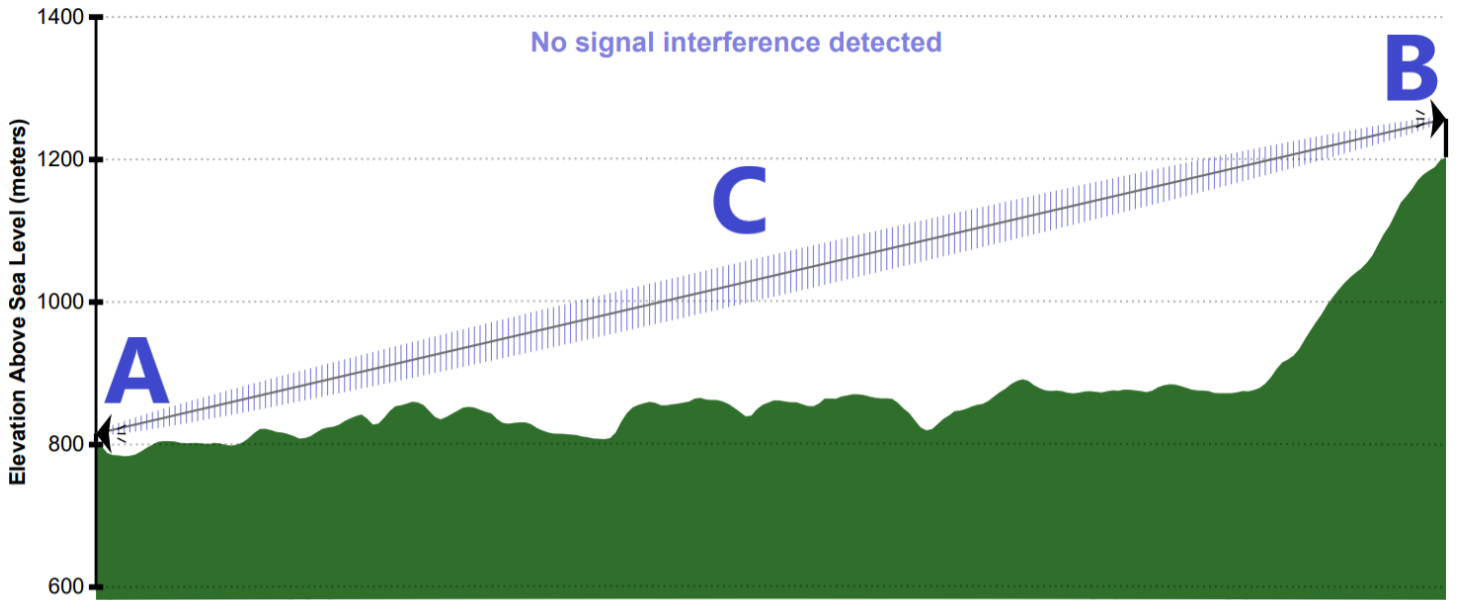
E

Information about cellular site:

1. Antenna Height above ground (56 m)
2. Transmit Frequency (743.0 MHz): lower frequency transmits better
3. Receive Frequency (713.0 MHz): not important
4. Horizontal Azimuth (140°): antenna horizontal direction. 0° aims north, 90° aims east, etc.
5. Vertical Elevation (Unknown): antenna vertical direction. 0° aims at horizon, 5° aims downwards
6. Antenna Gain (16.0 dBi): captured in path loss calculations
7. Line Loss (1.0 dB): signal loss through cabling, from radio to antenna
8. Radio Power (40.0 dBm): output power from radio (dBm = decibel milliwatts)
9. Transmit Bandwidth (5.0 MHz): 5 MHz is good for IoT; 40 MHz is excellent for wireless broadband
10. Service Type (Macrocell):
 - a. *Macrocell* = traditional cell tower, building rooftop, etc. Taller tower can reach 20+ km away
 - b. *Metrocell* = antenna mounted less than 8m above ground. 1 km² neighborhood coverage only

Telus site: 280 93 Highway Baynes Lake BC

Site is 8.74 km away bearing 89° elevated* 3°, 100% Fresnel



Bullseye @ 49.2415, -115.2355

Antenna: 11 m

Horiz Aim Back: 9°

Path Loss: 93.2 dB = 108.7 dB (free space) + -16.5 dB (horiz) + 1.0 dB (vert)

* Vertical scale exaggerated to show topographic relief.

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Telus Site @ 49.2428, -115.1151

HAnt: 54 m

Transmit: 743.0 MHz

Receive: 713.0 MHz

Horiz Azim: 260°

Vert Elev: Unknown

Gain: 17.0 dBi

Line Loss: 1.0 dB

Radio Power: 40.0 dBm

Bandwidth: 5.0 MHz

Service Type: Macrocell

