View Shed Analysis

Plate II

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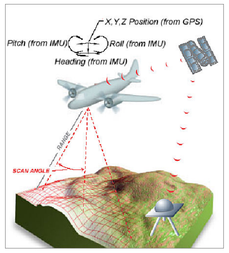
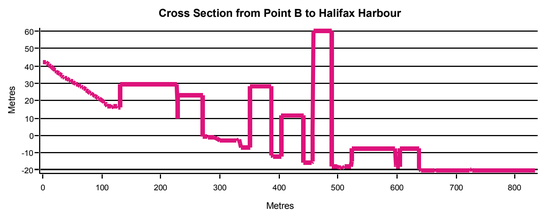
What is Lidar?

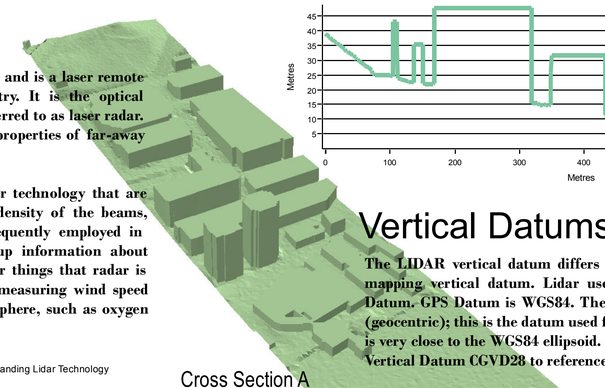
LiDAR is an acronym for light direction and ranging, and is a laser remote sensing technique used in both science and industry. It is the optical equivalent of the microwave radar, and so is often referred to as laser radar. LiDARs are used to precisely measure distances and properties of far-away objects.

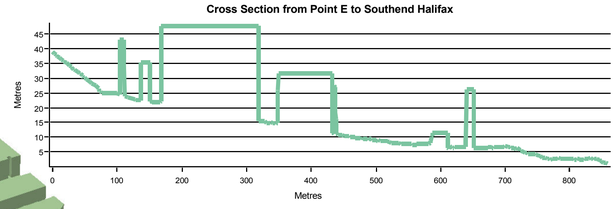
There are many applications of LiDAR / rangefinder technology that are used in both science and industry. Because of the density of the beams, combined with the short wavelength, LIDAR is frequently employed in studies of the atmosphere, as it is able to pick up information about atmospheric particles, clouds, rain, smoke, and other things that radar is incapable of registering. LIDAR is also capable of measuring wind speed and the density of various components of our atmosphere, such as oxygen and nitrogen.

Source: http://www.wisegeek.com/what-is-lidar.htm
Image: Brian Mayfield, CP, GISP, GLS, Timothy A. Blak, GS, PLS, CFM – Understanding Lidar Technology









Vertical Datums

The LIDAR vertical datum differs from the NS ETB MTM or UTM base mapping vertical datum. Lidar uses ellipsoid heights based on the GPS Datum. GPS Datum is WGS84. The origin is at the Earth's center of mass (geocentric); this is the datum used for the NAVSTAR GPS satellites. GRS80 is very close to the WGS84 ellipsoid. Nova Scotia uses the Canadian Geodetic Vertical Datum CGVD28 to reference MSL or Mean Sea Level.

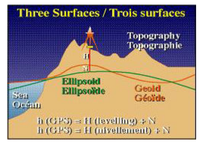
There are 3 reference surfaces use for Z-values:

1. Ellipsoid – Mathematical geometric model of the earth

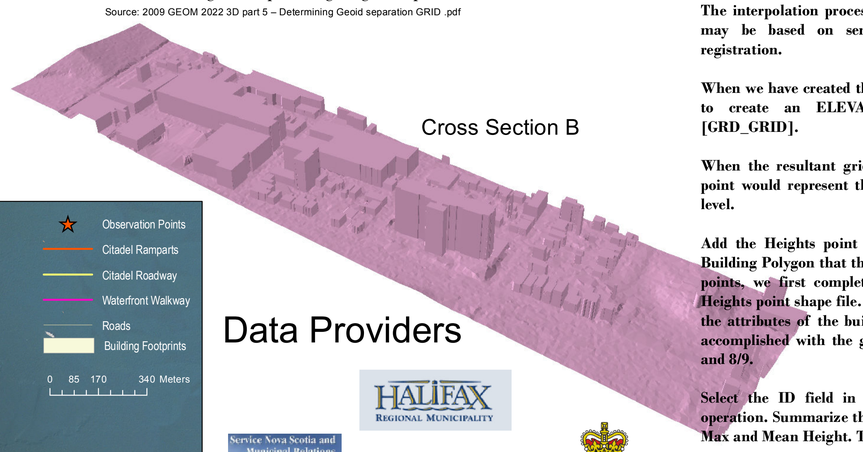
2. GEOID – Model based from the gravitational model – heights as if there were no land – sea level.

3. Topographic – a model based on 0-height being applied to MSL (Mean Sea Level) usually defined by the intersection of the GEOID and the ELLIPSOID

Formula: h = H + N
where: h = ellipsoid height
N = geoid separation
H = orthometric height
For GPS data, we normally obtain data in ellipsoid heights - h.
H = h – N
Or
orthometric height = ellipsoid height - geoid separation



Source: 2009 GEOM 2022 3D part 5 – Determining Geoid separation GRID .pdf



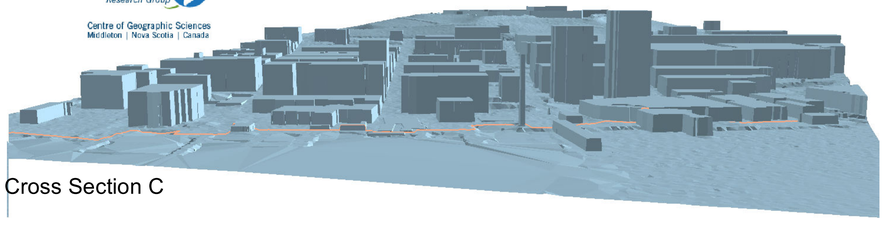
Data Providers

Service Nova Scotia and Municipal Relations
NOVA SCOTIA

HALIFAX
REGIONAL MUNICIPALITY

CANADA
HYDROGRAPHIC SERVICE-HYDROGRAPHIQUE

AGRG
Applied Geomatics Research Group
Centre of Geographic Sciences
Middleton | Nova Scotia | Canada



Viewsheds

The viewshed identifies the cells in an input raster that can be seen from one or more observation points or lines. Each cell in the output raster receives a value that indicates how many observation points can see the location. If you have only one observation point, each cell that can be seen from the observation point is given a value of 1. All cells that can't be seen from the observation point are given a value of 0.

The viewshed is useful when you want to know how visible objects might be—for example, you may need to know the answer to questions such as, From which locations on the landscape will the landfill be visible if it is placed in this location?, What will the view be like from this road?, or Would this be a good place for a communications tower?

Source: ESRI Help Desktop

Calculating Building Heights

To calculate base heights we need base height points within the building footprint. Currently these do not exist, as the LiDAR cannot "see" the base elevation of the building.

What we can do is use the Ground points to interpolate a ground based TIN, then DEM or GRID and then convert those grid cells to points using ArcToolBox Raster to Point.

The interpolation process will generalize some of the accuracy issues that may be based on sensor error, interpretation or building footprint registration.

When we have created the 2 DEM grids we could use the Raster Calculator to create an ELEVATION_DIF GRID. Basically [VEG_GRID] – [GRD_GRID].

When the resultant grid is converted to point with RasterToPoint, each point would represent the height from rooftop to the interpolated ground level.

Add the Heights point Attribute Table; the unique ID (RECNO) of the Building Polygon that the point is "INSIDE". Using the Building + Heights points, we first complete a "Spatial Join" on the attribute table of the Heights point shape file. The points that fall INSIDE each building can have the attributes of the building attached to each point. This function can be accomplished with the geoprocessing tools spatial join in both ArcView 3 and 8/9.

Select the ID field in the Spatial Join Table and use the Summarize operation. Summarize the building ID in the new Spatial Join table by Min, Max and Mean Height. This will create a new standalone Summary table.

Join the Table back to the Building polygon table by ID (recno) field. To make the JOIN permanent, use the Data | Export operation. You now have an "extrude" value for each building.

Source: 2009 GEOM 2022 3D part 6 - Determining Heights from Lidar .pdf