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CLE 1003 - SURVEYING

Fall Semester 2022-2023

School of Civil Engineering

J-COMPONENT PROJECT

"PREPARATION OF DIGITAL ELEVATION MODEL (DEM) AND CONTOUR MAP USING GOOGLE EARTH DATA IN QGIS SOFTWARE"

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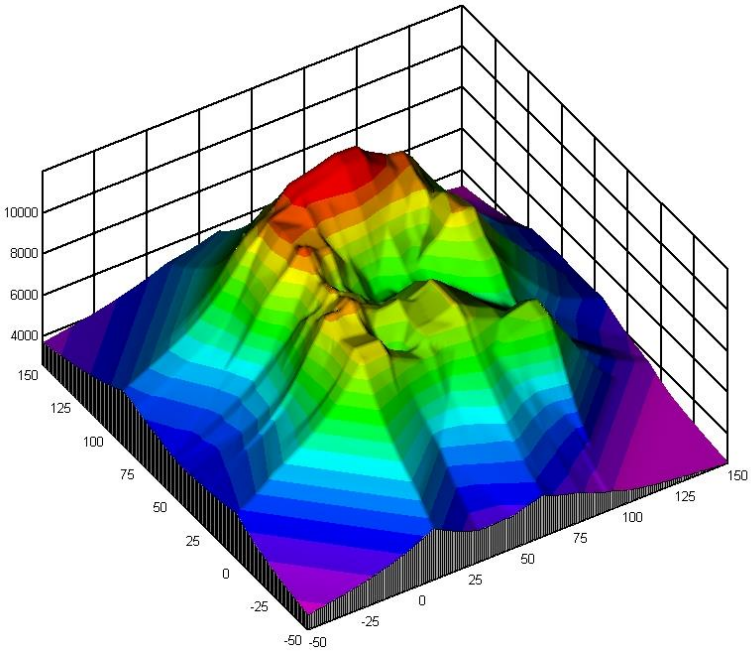
Table of Activities

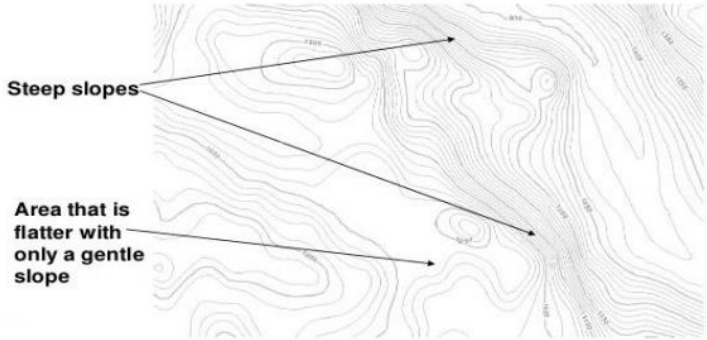
S.N.	Topic	Page no.
1	Introduction of Contouring	3
2	Characteristics of Contour	4
3	Uses of Contour Map	5
4	Procedure	5
5	The Google Earth Way	5
6	GPS Visualizer	6
7	QGIS	8

Contouring

Introduction

Contour is an imaginary line on the ground surface joining the points of equal elevation. It facilitates depiction of the terrain in a two dimensional plan or map. In other words contour is a line in which the ground surface is intersected by a level surface obtained by joining points of equal elevation. This line on the map represents a contour and is called contour line. Contouring is the Science of representing the vertical dimension of the terrain on a two dimensional map.





Contour Map

A map showing contour lines is known as contour map. A contour map gives an idea of the altitudes of the surface features as well as their relative position in plan serves the purpose of both, a plan and a section

Contour Line

A contour line is an imaginary outline of the terrain obtained by joining its points of equal elevation.

Contour interval

It is the vertical distance between any two consecutive contours. If a map includes contour lines of 101m, 100m, 99m, 98m and so on, the contour interval here is 1m.

The contour interval depends on

- The nature of the ground (i.e. whether flat or sleep)
- The scale of the map
- The purpose of the survey

Characteristics of Contour

The following point are consider which are as follows

- All points in a contour line have the same elevation
- Flat ground is indicated where the contours are widely separated and steep-slope where they run close together.
- A uniform slope is indicated when the contour lines are uniform spaced.
- A plane surface when they are straight parallel and equally spaced

Purpose of Contouring/Contour Map

Contour survey is carried out at the starting of any engineering project such as a road, railways, canal, Dam, building etc.

a) Contour maps are prepared in order to select the most economical or suitable site.
b) It helps to locate the alignment of a canal so that it should follow a ridge line.
c) It helps to mark the alignment of roads and railways so that the quantity of earthwork both in cutting and filling should be minimum.
d) It helps for getting information about the ground whether it is flat,undulating or mountainous.
e) It helps to find the capacity of a reservoir and volume of earthwork especially in a mountainous region.
f) It helps to trace out the given grade of a particular route.
g) It helps to locate the physical features of the ground such as a pond,depression, hill, steep or small slopes.

Uses of Contour Map

1. A Contour map furnishes information regarding the features of the ground, whether it is flat, undulating or mountainous.
2. From a contour map section may be easily drawn in any direction.
3. Indivisibility between two ground points plotted on map can be ascertained.
4. It enables an engineer to approximately select the most economical or suitable site for an engineering project such as a road, railway,canal or pipe line etc.
5. A route of a given grade can be traced on the map.
6. Catchment area and capacity of a reservoir may be determined from the contour map.
7. Contour map may be used to determine the quantities of the earth work

What is a grid?

A grid is a regular pattern of parallel lines intersecting at right angles and forming squares; it is used to identify precise positions. To help you locate your position accurately on the surface of the Earth (or map sheet), topographic maps have two kinds of referencing systems:

• universal transverse mercator (UTM) projection (easting/northing)

• geographic: degrees and minutes (longitude/latitude)

Procedure :

Using contours to represent the topography of a site is one of the easiest ways to understand the ground surface conditions. Unfortunately, finding reliable contour data is not always as easy to come by.

This article includes a summary of two different methods of sourcing contours and how they compare. The methods tested in this article include:

1. Google Earth + GPS Visualizer + QGIS ("The Google Earth Way")

Follow steps of contour map are mention below:

The Google Earth Way:

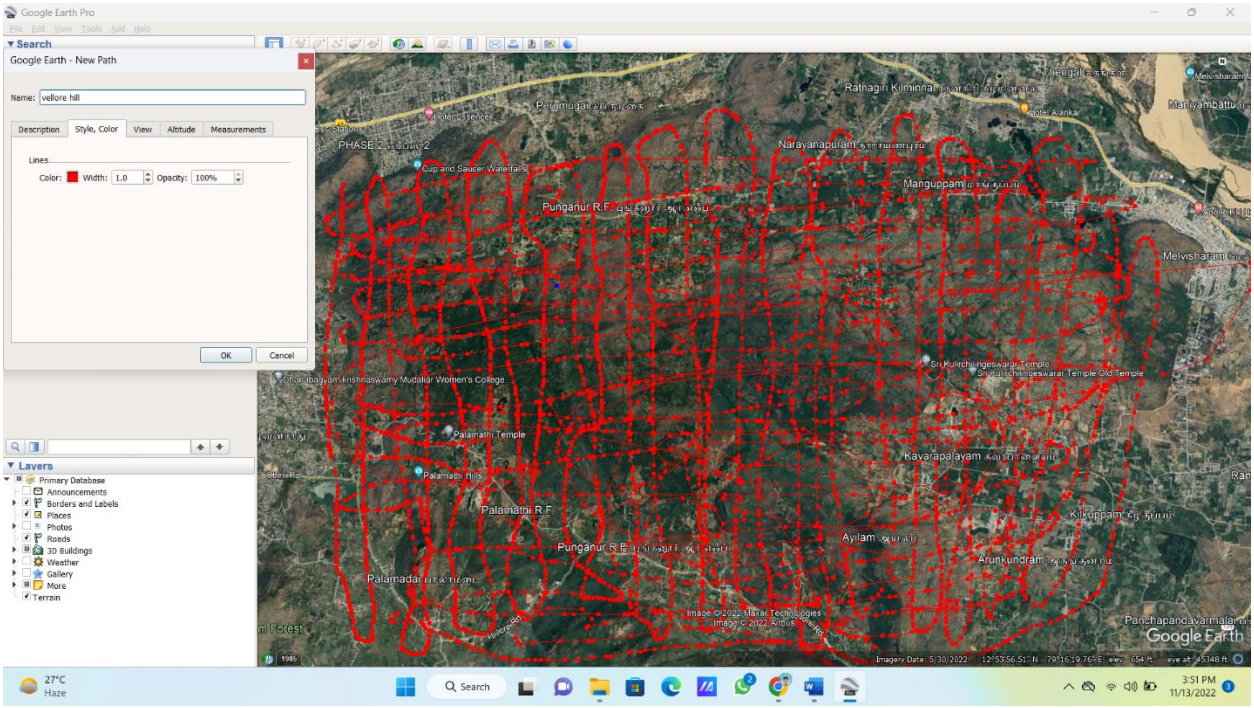
Google Earth is a computer program that renders a 3D representation of Earth based primarily on satellite imagery.

Part 1: Download Google Earth Pro and create points using the path tool

1. Google Earth Pro is free and can be downloaded by visiting their website (look for "Google Earth Pro on desktop."
2. Then I have choosen my place Vellore hill which is near from Vit campus,Vellore.

3. Navigate to your site in Google Earth, and then use the **Path** tool to draw (and create points) throughout your site.

4. Once you have fully covered your site with the path tool, click **ok**. Export your path by right clicking on the layer in the left menu and save the file in kmz format.



While scribbling all over our site may seem like a wild way to generate contours, for many it has become a simple hack to extract important information. The key to this approach is creating as many points as possible on the site, to capture detail in the contours, so try to have fun while making a big mess.

Part 2: Add elevations to the points created in GPS Visualizer

At this point, the points created in Google Earth only have horizontal coordinates (x and y), no elevation.

We are going to use GPS Visualizer to add elevation to the points that we've created.

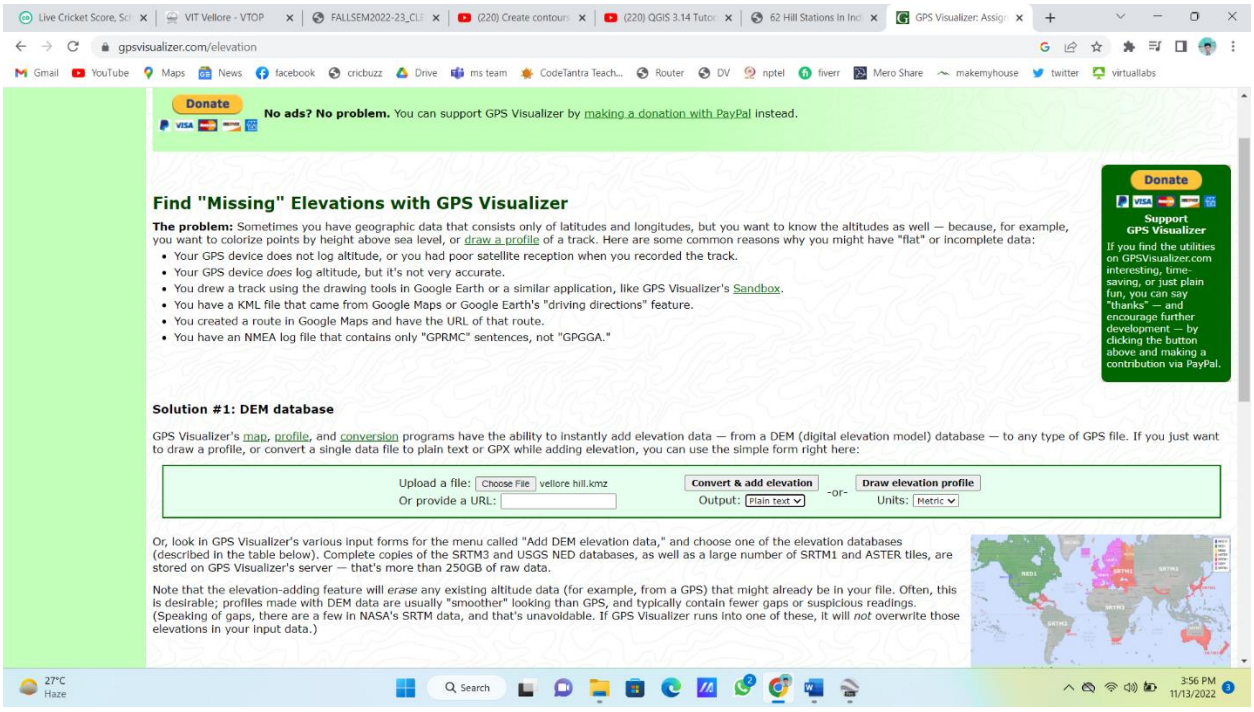
1. Click on **convert to GPX** and upload your kmz file.

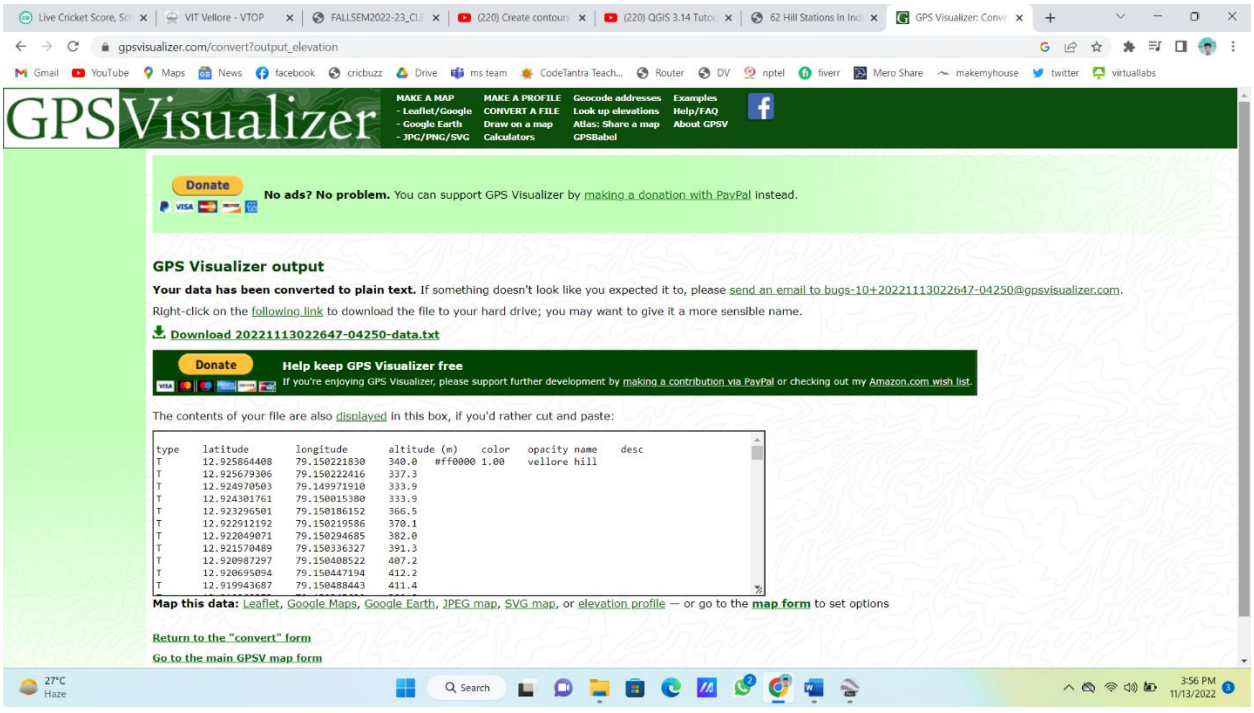
2. Open up the **Add DEM elevation data** drop-down menu. This menu includes seven different options as show below.

3. We can go ahead and select **best available source** so that, by default, the highest resolution elevation information will be added to your points.

4. Click on **Convert**

5. **Download** gpx file.





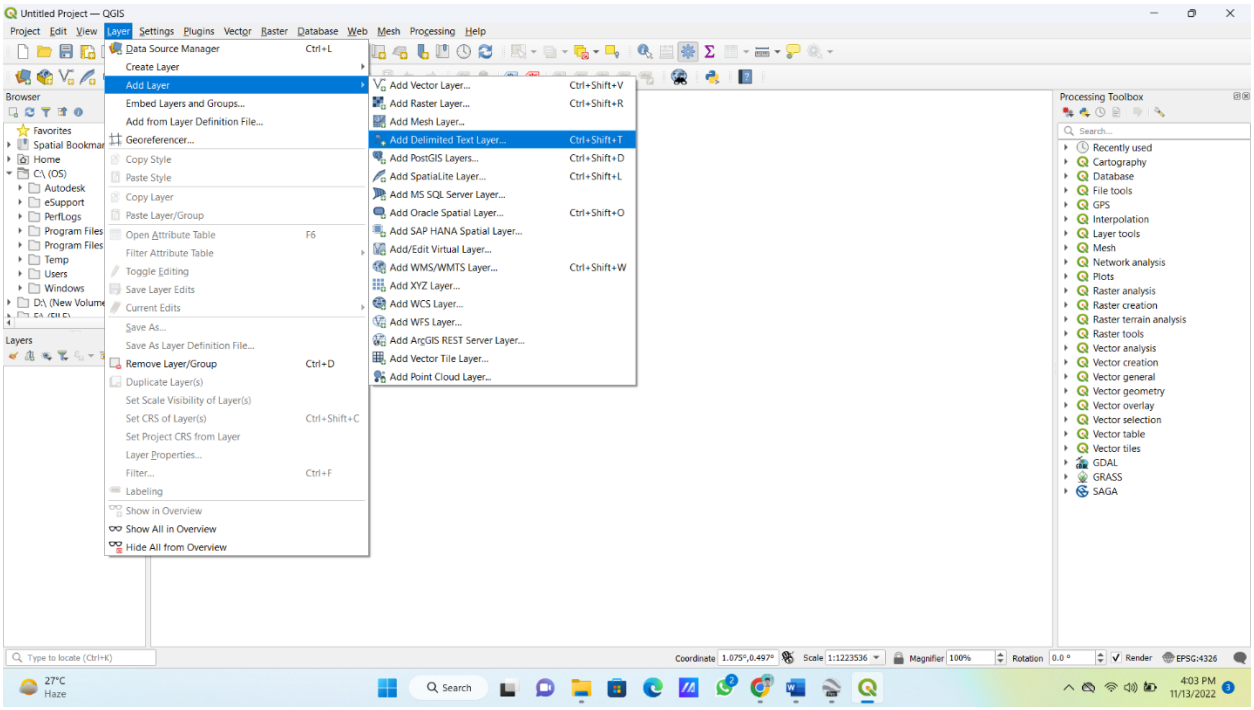
Part 3: Add elevations to the points created in QGIS

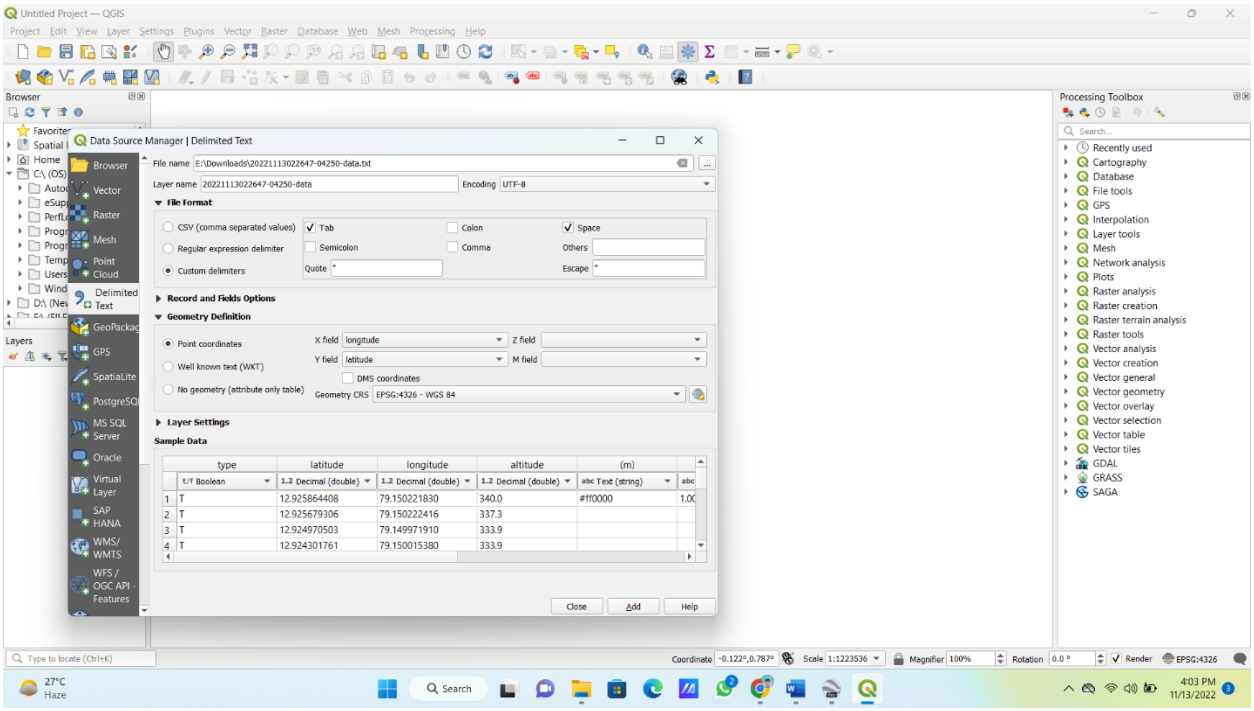
QGIS functions as geographic information system (GIS) software, allowing users to analyze and edit spatial information, in addition to composing and exporting graphical maps

At this point, you have a gpx file with coordinates – including the hoorizonal and vertical values.

The next step is to generate contours from the points. To do this, we will use QGIS, a free GIS software that you can download from their website. Once you have QGIS open, follow these steps:

1. Adding the gpx file to your project. In the top navigation bar, click on **Layer** > **Add Layer** > **Add Vector Layer,** select your file and then click **Add**





2. Select the layer called **"track_points"** or whatever layer has the greatest number of features in it (hint, these are your points). At this point, you should see all of the points created using Google Earth and GPS Visualizer on your screen.

3. Next, turn the points into contours. In the top navigation bar, click on **Vector** > **Contour.** Make the following parameter adjustments:

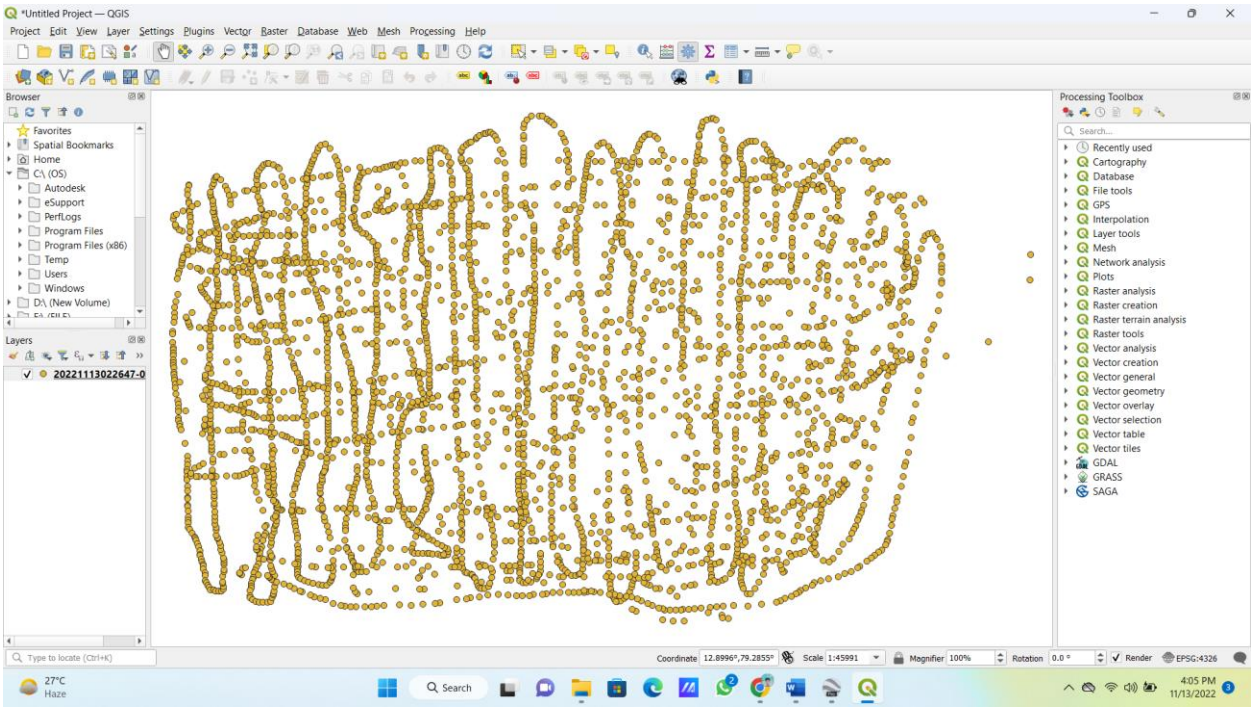
    1. **Data value** drop down needs to be set to elevation or "ele"

    2. **Method** drop down: Fixed contour interval

    3. **Interval:** Your choice, I selected 0.5 m

    4. **Number**: You will likely have to tweak this until you get the desired result.

4. Click **Add.** At this point, you should have your contours created which can be download in any format!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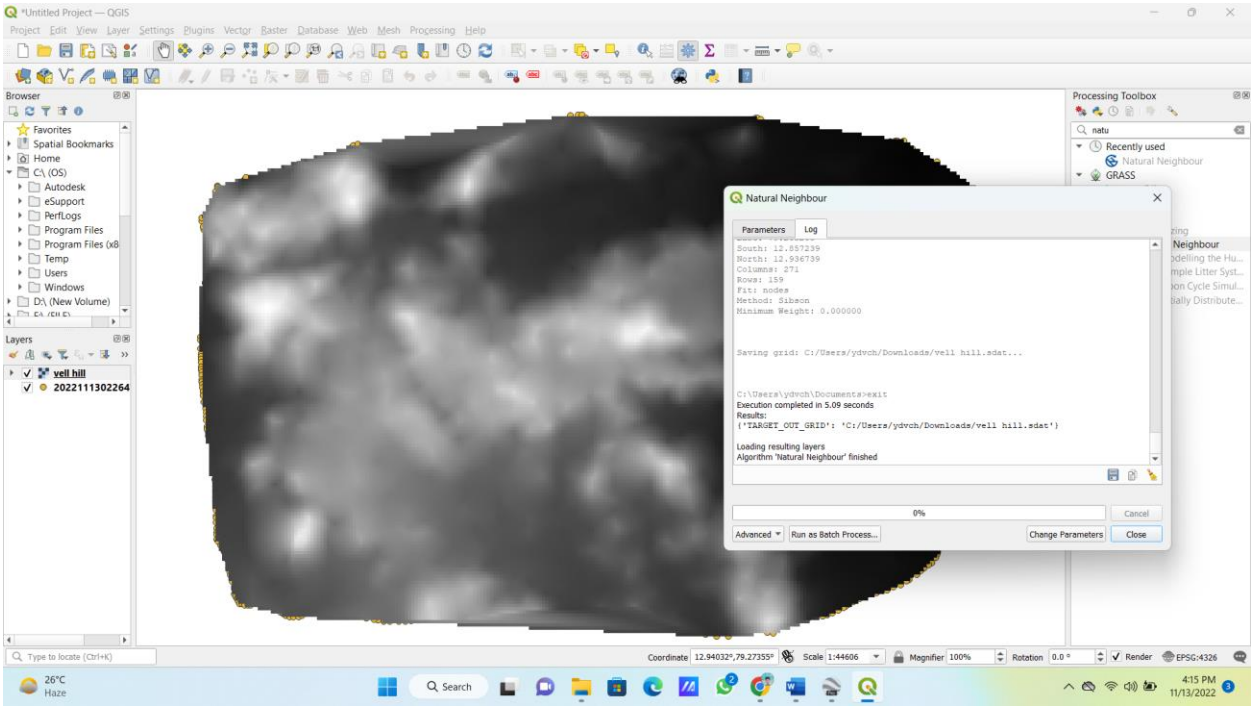
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North: 12.936739
Columns: 271
Rows: 159
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Method: Sibson
Minimum Weight: 0.000000
Saving grid: C:/Users/ydvch/Downloads/vell hill.sdat...
C:\Users\ydvch\Documents>exit
Execution completed in 5.09 seconds
Results:
{'TARGET_OUT_GRID': 'C:/Users/ydvch/Downloads/vell hill.sdat'}
Loading resulting layers
Algorithm 'Natural Neighbour' finished
0%
Cancel
Advanced
Run as Batch Process...
Change Parameters
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Coordinate 12.94032°,79.27355°
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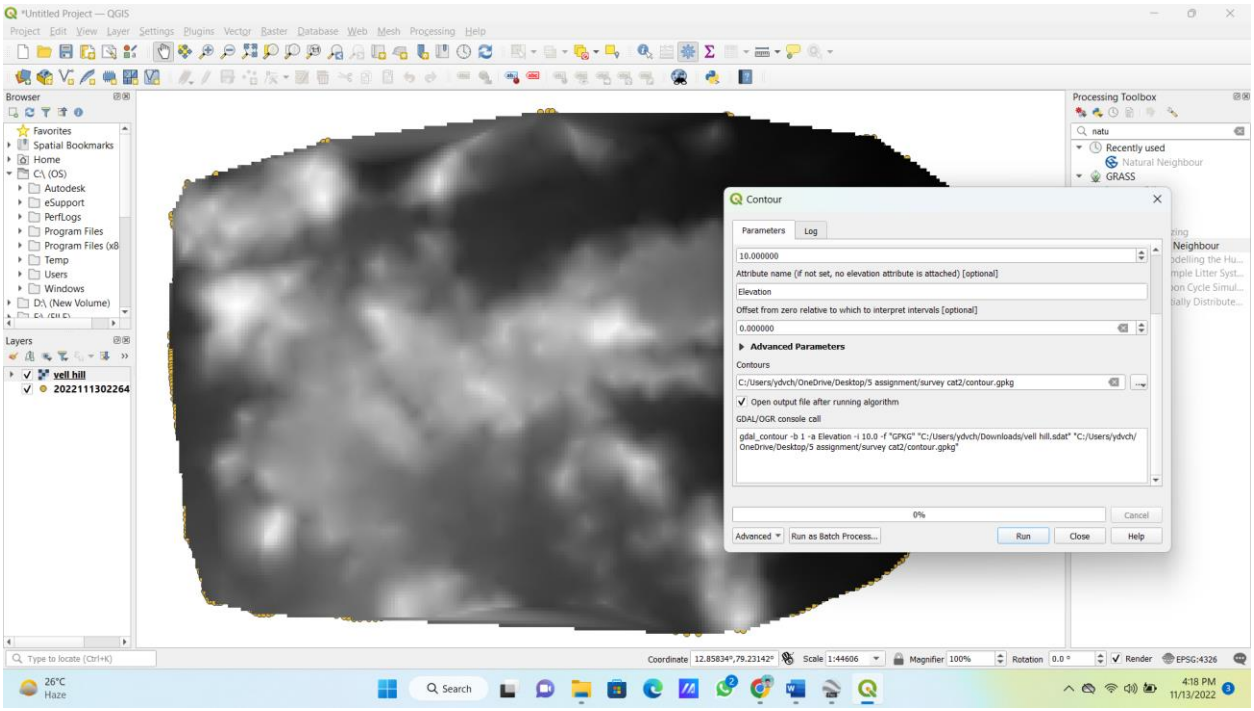
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Contour
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10.000000
Attribute name (if not set, no elevation attribute is attached) [optional]
Elevation
Offset from zero relative to which to interpret intervals [optional]
0.000000
Advanced Parameters
Contours
C:/Users/ydvch/OneDrive/Desktop/5 assignment/survey cat2/contour.gpkg
Open output file after running algorithm
GDAL/OGR console call
gdal_contour -b 1 -a Elevation -i 10.0 -f "GPKG" "C:/Users/ydvch/Downloads/vell hill.sdat" "C:/Users/ydvch/OneDrive/Desktop/5 assignment/survey cat2/contour.gpkg"
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Cancel
Advanced
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Run
Close
Help
Processing Toolbox
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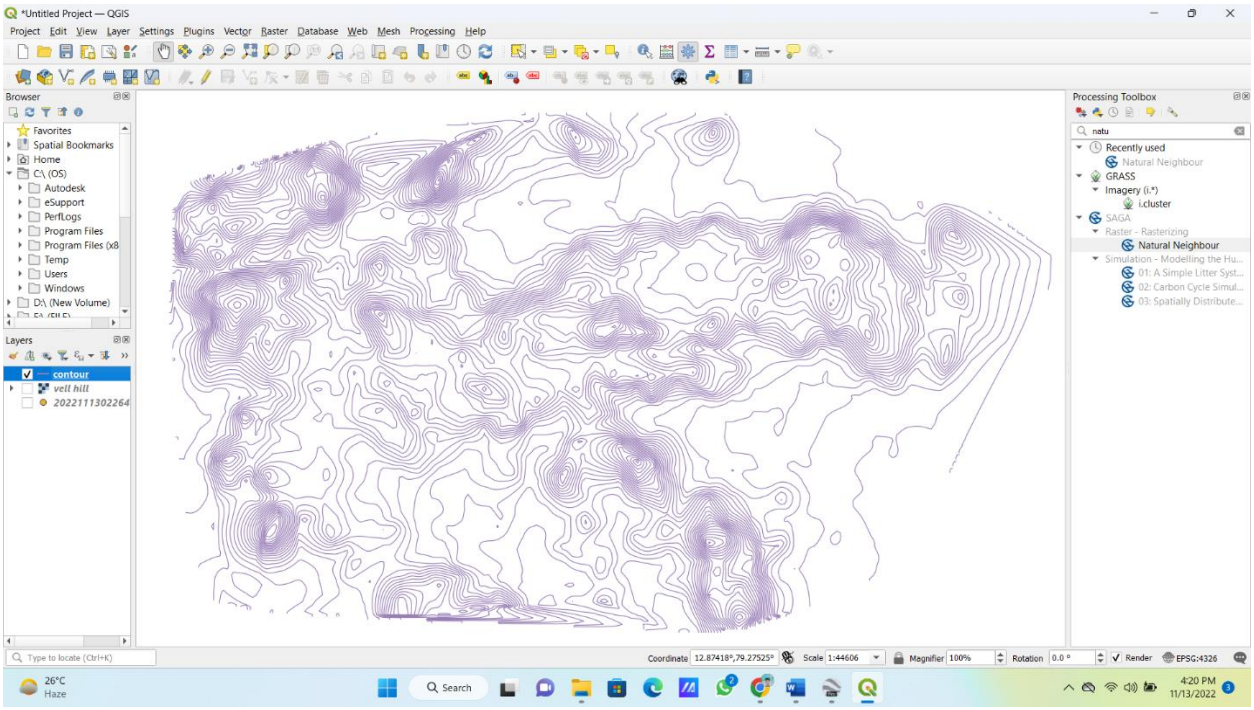
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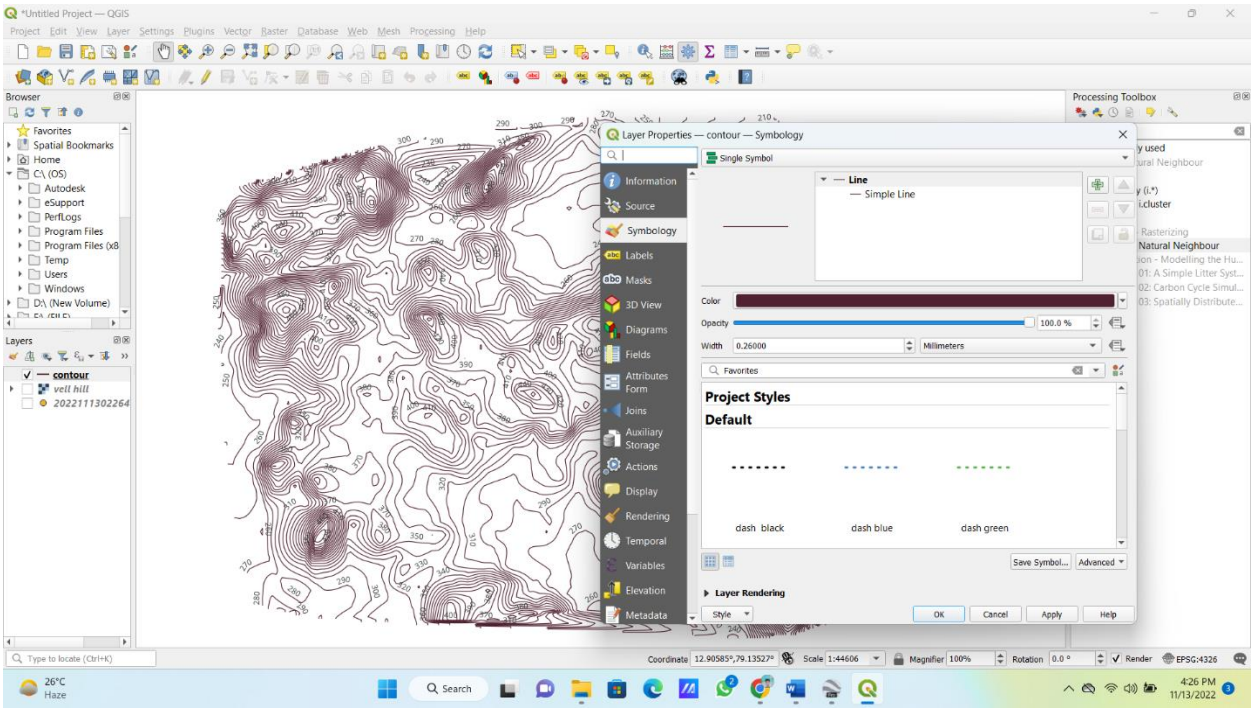
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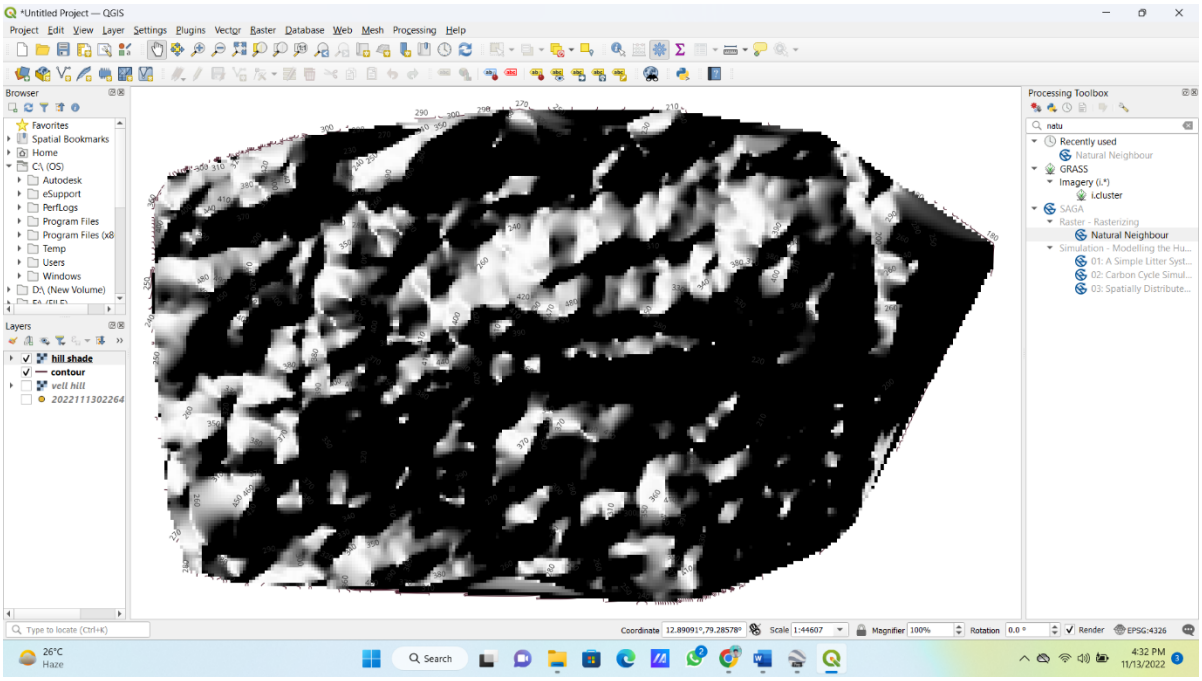
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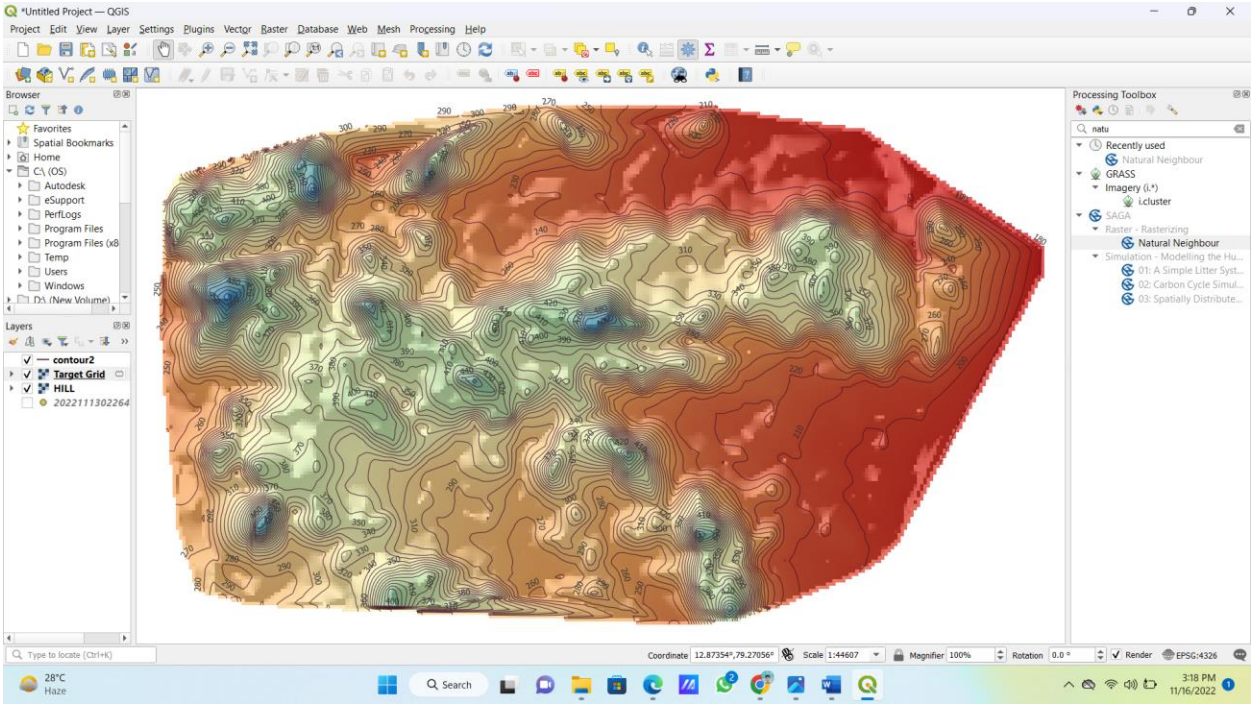
02: Carbon Cycle Simul...
03: Spatially Distribute...



Conclusion

This is the required Hill-Shade of given Elevation points. Hillshade is used to get better look at the Terrain. This is how we indirectly get the DEM, Contour maps and Hillshades of Mountain areas, rivers, lakes, hills, terrain, etc. where it is impossible & difficult to reach and do the survey, by using Google Earth Data and QGIS Software.

THE END