

GIS9312-D1

3D Analysis in ArcGIS

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Date: April 19, 2016
Project Number: GISC-9312-D1

Dear Mrs. Janet Finlay,

RE: Submission: GISC9312-D1

Please accept this letter as a formal submission of Assignment one: GISC9312-D1– 3D Analysis in ArcGIS for Travis Vanos. The works were completed with ArcGIS, for the required deliverables.

The purpose of this assignment is to further analyze triangulated irregular network (TIN) surfaces and their three-dimensional properties with ArcView. Tasks include querying surface data calculating slope and aspect, visualizing terrain using hillshade, and creating contours from a TIN. Final maps can be found in Appendix I and Appendix II.

Following the assignment procedures, please find the required material attached. Should you have any questions regarding the enclosed documents, please contact Travis Vanos at your convenience at travis.vanos@gmail.com. I eagerly await your comments and suggestions.

Sincerely,



Travis Vanos
GIS/GM Candidate, Niagara College
T. V.

Enclosures: VanosTGISC-93012-D1 Report

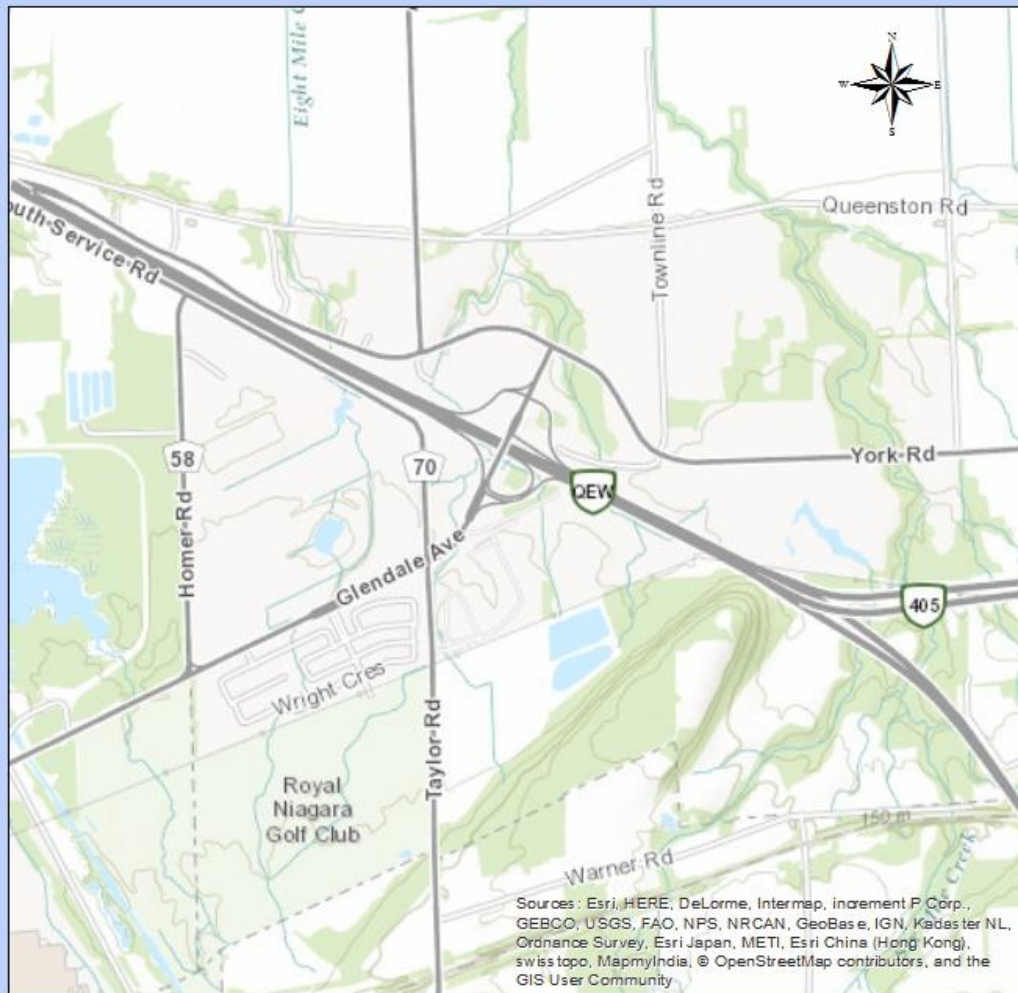
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PURPOSE

Starting with solely ArcInfo Coverage feature classes, a thorough analysis is undertaken with the created Triangulated Irregular Network (TIN) surfaces created for Slope, Hillshade and Line of Sight Analysis. As stated in the Terms of Reference for Deliverable one: GISC9312-D1 the following report will cover the analysis of three-dimensional data using ArcGIS. After the data has been prepared for analysis, the subsequent sections will cover surface data queries, TIN slope and aspect analysis, hillshade visualization and contours using the 3D Analyst extension of ArcGIS. A hillshade surface of the area of interest was created from the raster data. As discovered, most of the areas experiencing full shade are in the northwest side as the area exhibits high elevation. To determine the steep areas, the slope raster was “draped” on the TIN for 3D visualization. Finally, a three-dimensional surface was created using the Arc scene extension of 3D Analyst and can be used to “fly through” the scene observing different angles of the raster.

Study Area Niagara Escarpment - GISC9312-D1



0 280 560 1,120 1,680 2,240
Meters

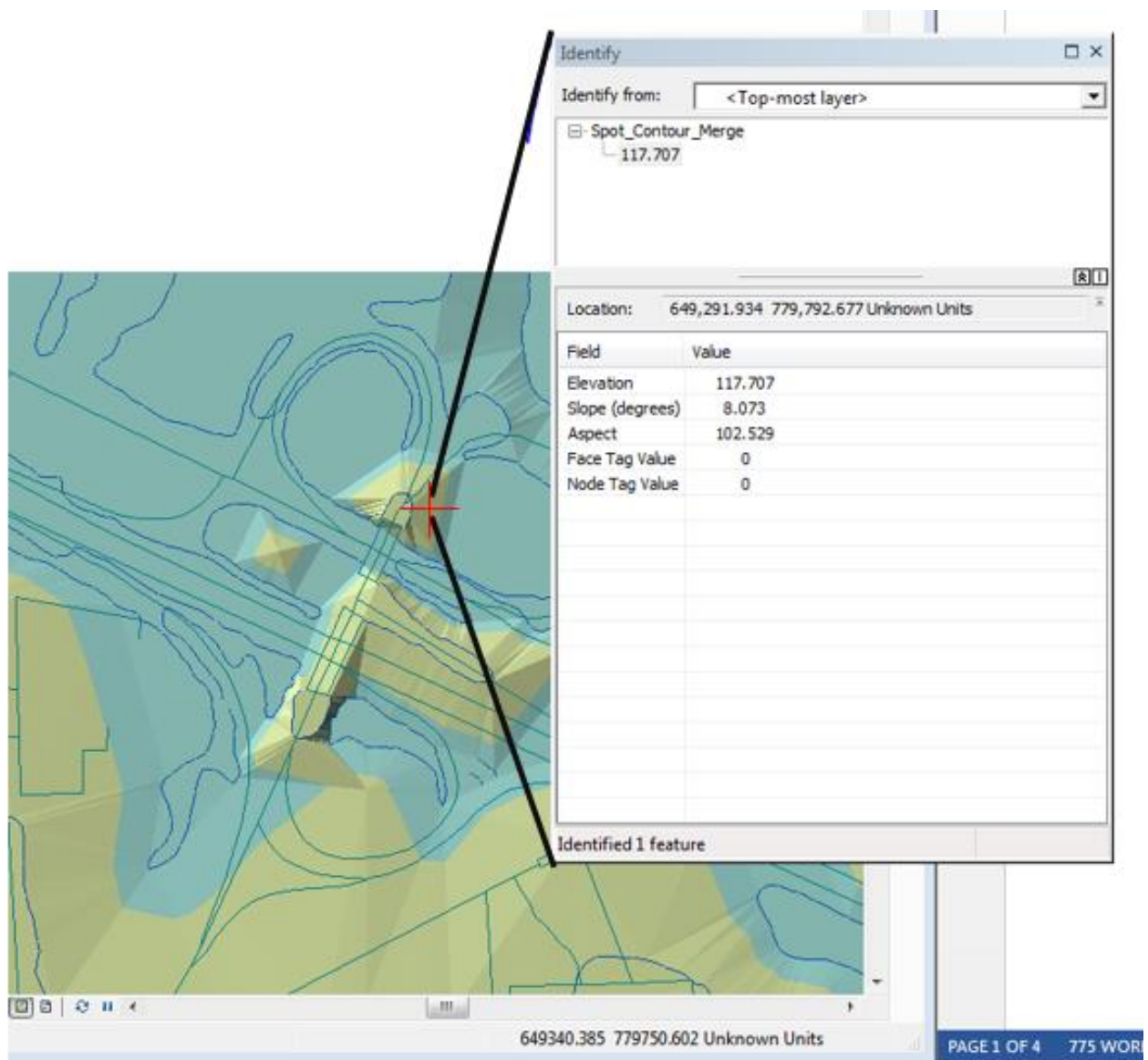
Projection: UTM NAD 1983 Zone 17N

Data: ESRI Topographic World Basemap
Equilibrium Consulting
Created by: Travis Vanos
Date: April 19, 2016
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FIGURE 1 STUDY AREA GLENDALE CAMPUS - NIAGARA ESCARPMENT FOR GISC9312-D1

WHAT IS THE SLOPE (IN DEGREES) AND THE ASPECT (ALSO IN DEGREES) OF THE EAST FACING SLOPE AT THE GLENDALE AVENUE INTERCHANGE OF THE QEW?

Once the feature classes were merged and the TIN was created it was converted to a Raster. After, it was possible to create the Slope and Aspect from the raster surface using the toolset available with 3D analyst extension. Though the Identify tool, it was possible to identify the slope value (in degrees) and the aspect value of the slope at the Glendale Avenue interchange. The slope value found was 8.073 degrees, and the aspect value found is 102.529 degrees.



WHAT DOES ASPECT MEAN? WHAT IS AN ASPECT OF ZERO DEGREES?

As ESRI defines, Aspect is “..the compass direction that a topographic slope faces, usually measured in degrees from north. Aspect can be generated from continuous elevation surfaces.” (ESRI, GIS). Aspect is the face in relation to north and, thus, 0° would mean the face is directly north-facing

WHAT RANGE OF SLOPES IS FOUND ON THE NIAGARA ESCARPMENT THAT FACES THE GLENDALE CAMPUS, IMMEDIATELY SOUTH OF THE CAMPUS (IN PERCENT – INCLUDE A GRAPHIC)?

After running the slope tool, it is found that the degree of slope range from 0.0° degrees and approximately 27° degrees right on the escarpment face. As seen in Figure 2, “A” shows the maximum degree on the escarpment face and B represents the lowest classification of 0 – 0.5°.

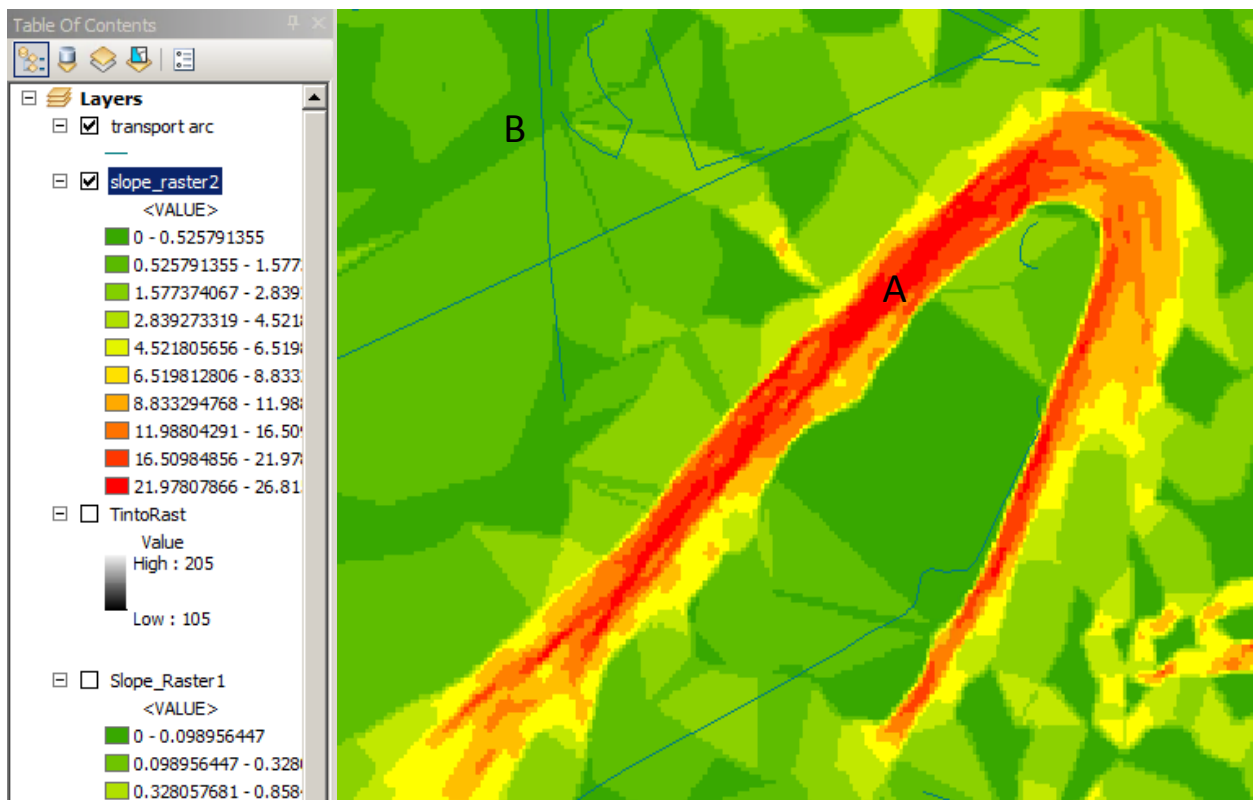



FIGURE 2 RANGE OF SLOPE DEGREES (10 JENKS)

... CREATE A LINE OF SIGHT THAT PROCEEDS (APPROXIMATELY) THROUGH THE GLENDALE CAMPUS. WHY CAN THE AREAS THAT ARE INDICATED AS NOT IN THE LINE OF SIGHT NOT BE SEEN? PROVIDE A GRAPHIC TO SUPPORT YOUR ANSWER

In ArcMap, with the 3D extension enabled, the **Create Line Of Sight** button  on the 3D Analyst toolbar was used to produce the line of sight from “standing” on the bluff as seen in Figure 3.

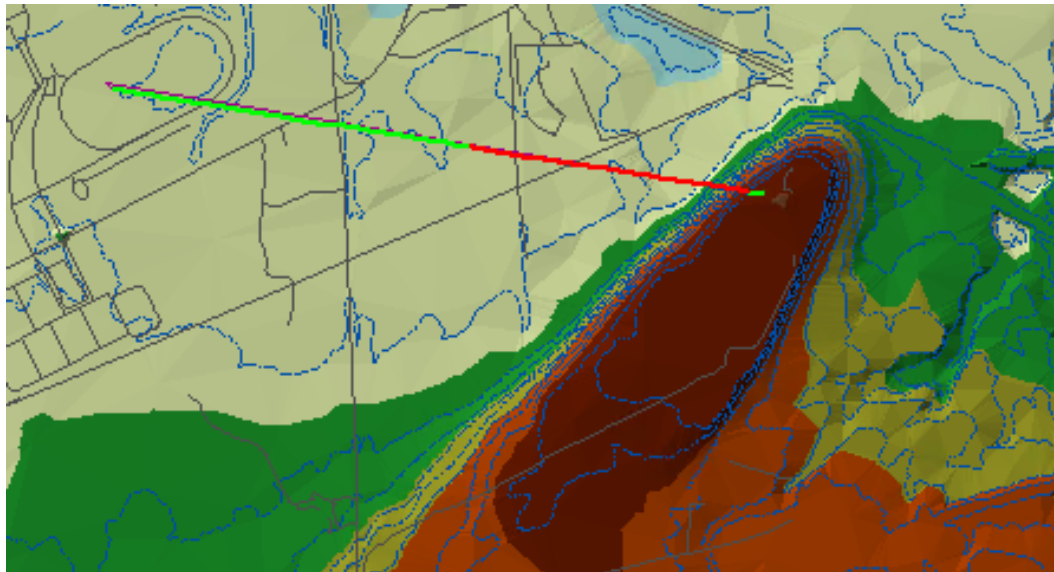


FIGURE 3 LINE OF SIGHT FROM BLUFF

It can also be plotted to show the height of the area of interest (Y axis) and distance (X axis) as seen in Figure 4.

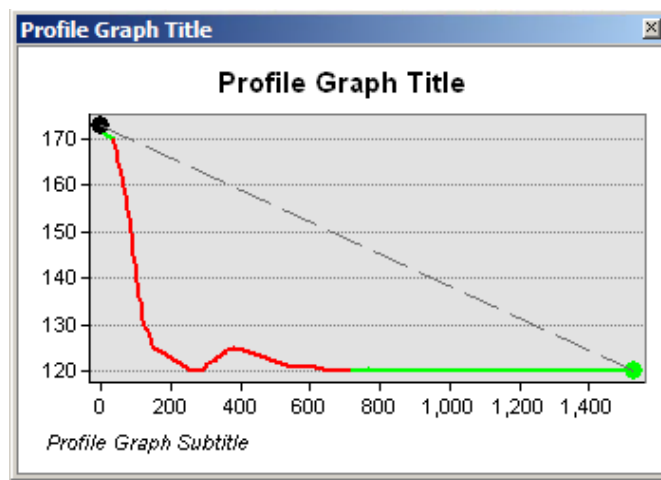


FIGURE 4 LINE OF SIGHT PROFILE GRAPH

CREATE A LINE OF SIGHT THAT PROCEEDS THROUGH THE QEW/GLENDALE HIGHWAY INTERCHANGE BERM. WHY CAN THE AREAS THAT ARE INDICATED AS NOT IN THE LINE OF SIGHT NOT BE SEEN? PROVIDE A GRAPHIC TO SUPPORT YOUR ANSWER.

The area in the line of sight intersecting the QEW Berm is not visible because they are hidden by the terrain located at the blue point as seen in Figure 5.

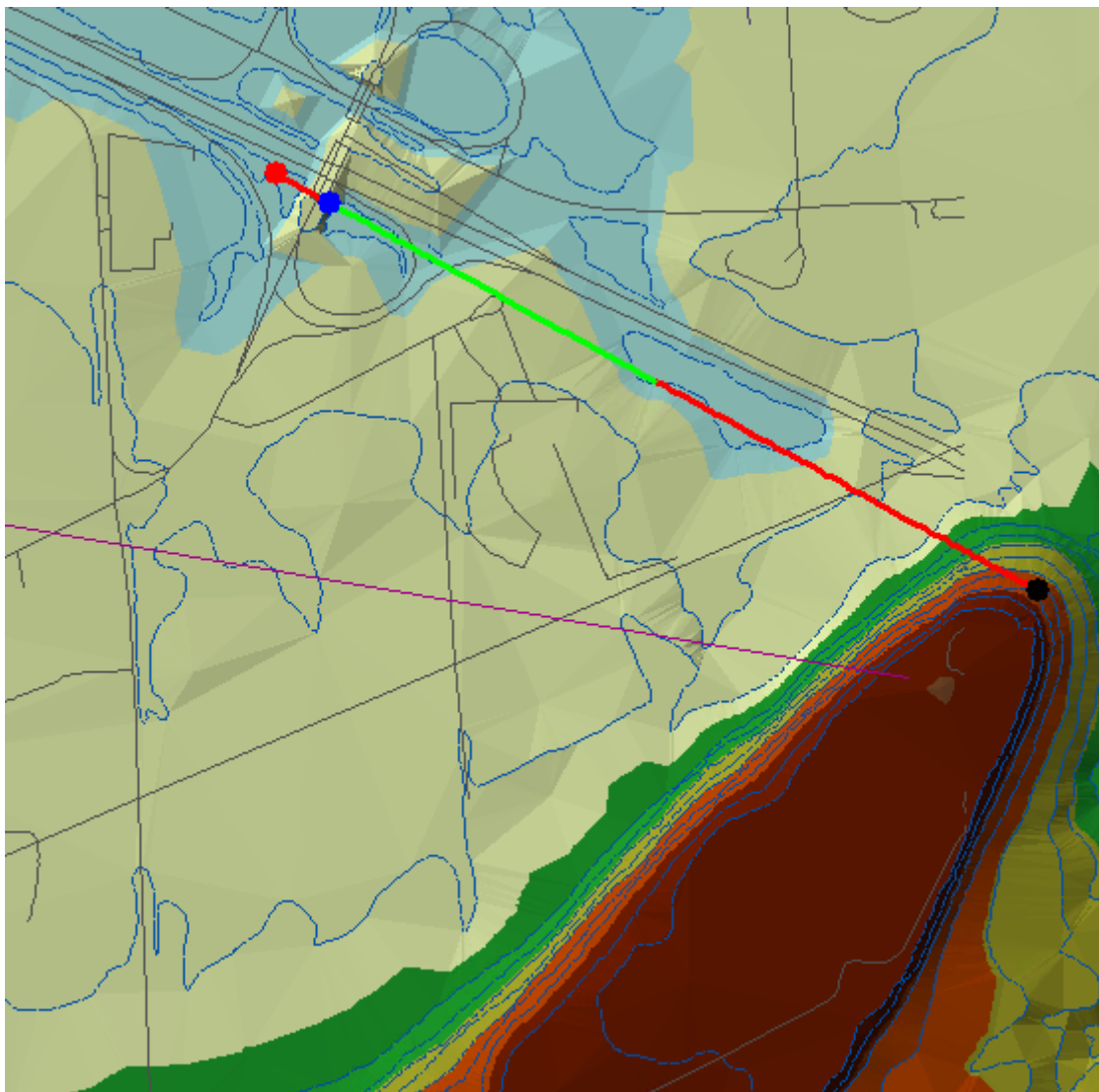


FIGURE 5 LINE OF SIGHT VIEWING QEW BERM

Again, looking the profile graph in Figure 6 of the line of sight reveals as the elevation of the ramp increases there is a point, around 950 meters where the viewer can no longer see beyond. This coincides with the generated TIN and could be used as validation that the elevation is accurate to a known area that would be not in the line of sight from the escarpment.

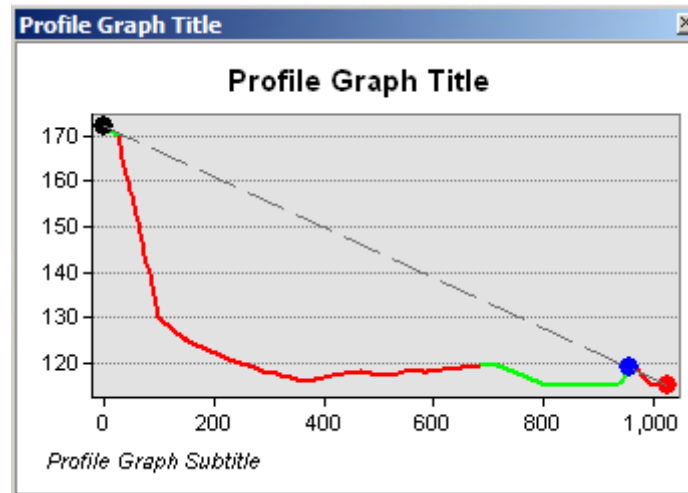


FIGURE 6 VIEW FROM ESCARPMENT TO QEW BERM

CREATE A HILLSHADE ANALYSIS FOR THE TWO OBM TILES YOU HAVE BEEN WORKING WITH. CREATE A LINE OF SIGHT THAT PROCEEDS THROUGH THE QEW/GLENDALE HIGHWAY INTERCHANGE BERM. WHY CAN THE AREAS THAT ARE INDICATED AS NOT IN THE LINE OF SIGHT NOT BE SEEN?

Firstly, the sun specs needed to be found for the date of March 21st, 2016 and the results can be found in Figure 7. It is determined the azimuth is **150.41°** and the elevation is **43.47°**.

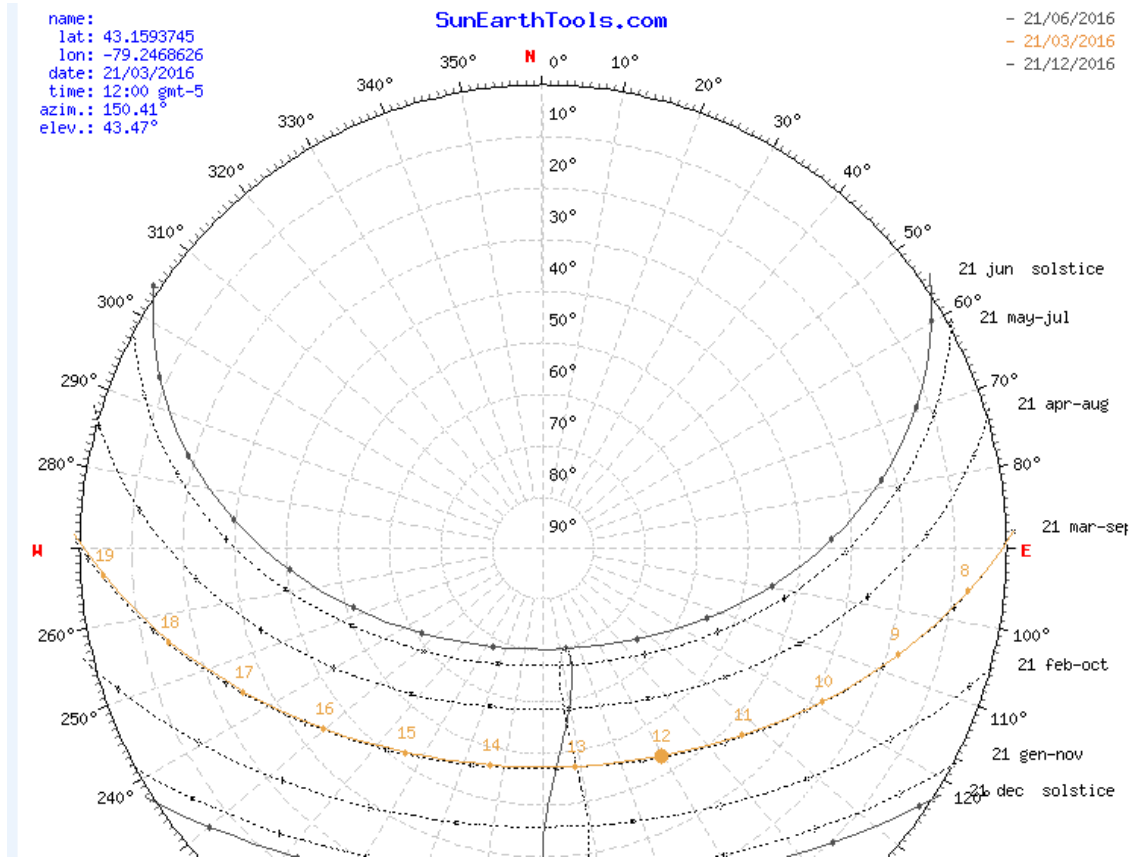


FIGURE 7 SUN SPECS AS GENERATED BY SUNEARTHTOOLS.COM

The hillshade tool was then used to generate the hillshade of the area of interest found in Figure 8.



FIGURE 8 CREATED HILLSHADE MODEL WITH 3D ANALYST

After the hillshade tool was used, it was laid on top of the created TIN with the 'Z' values for a 3D model. Seen in Figure 9 red areas show the extent that is fully shaded.

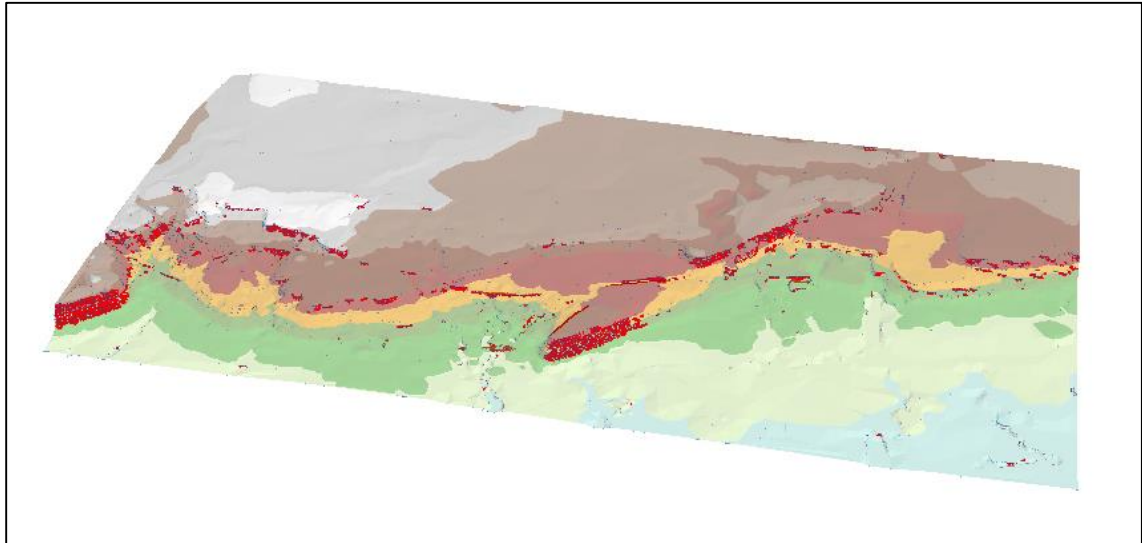


FIGURE 9 3D MODEL WITH HILL SHADE

CONCLUSION

The slope values of the study area are in the range from 0 to 27 degrees, and most exhibit a slope less than 10 ° of gradient. Most of the observable area is not shaded except for areas on the steep face of the Niagara Escarpment. Most of the slopes aspect is close to 0 or 360 ° meaning most are facing directly north or directly south. The hillshade created was an asset visualizing terrain, and it can be seen from the map in Appendix III that most of the slopes experiencing full shade are located at northwest sides of the terrain at high elevation.

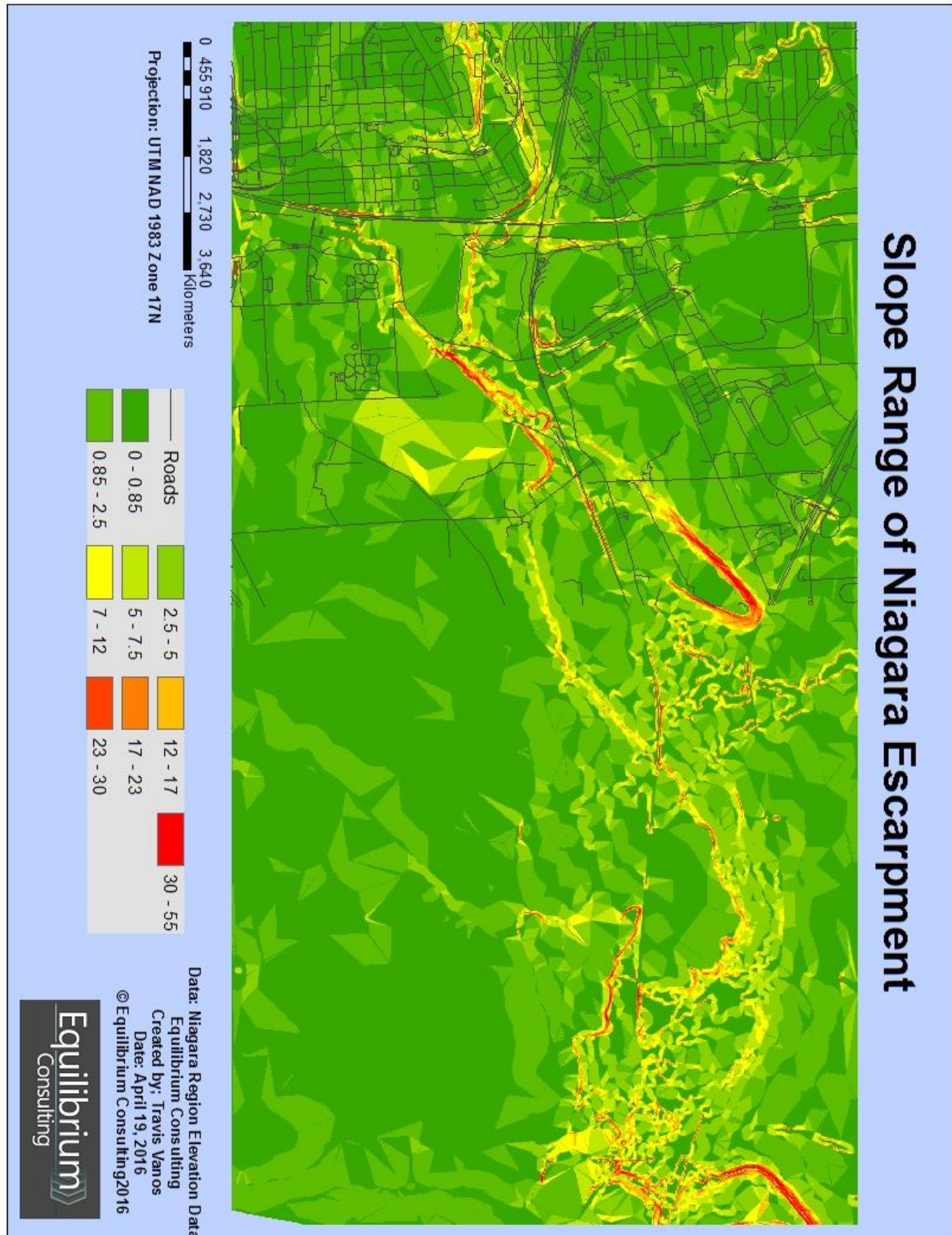
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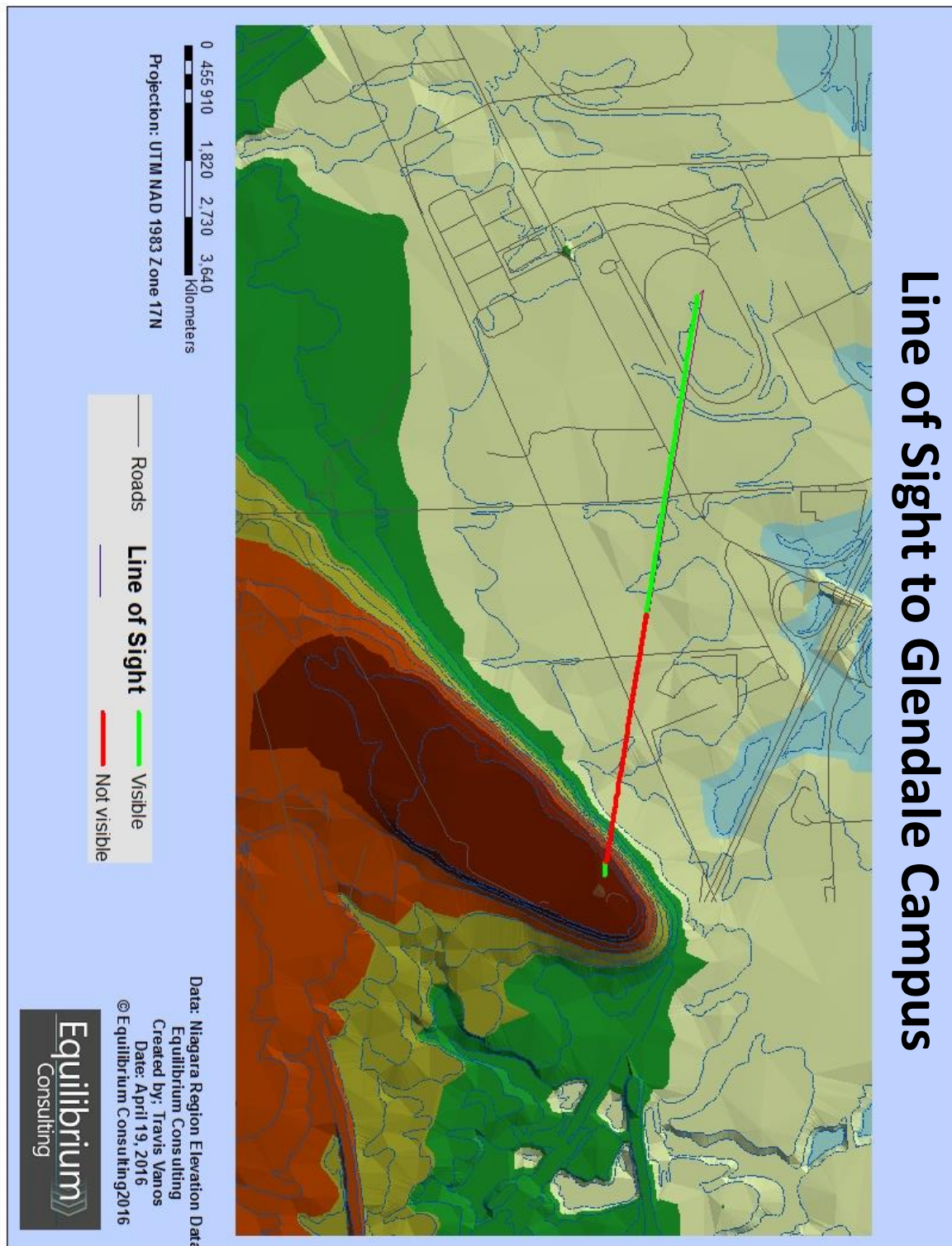
http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/Understanding_visibility_analysis

Finlay, J (2016) GISC9312-D1 – Geospatial Visualization Terms of Reference.

APPENDIX I



APPENDIX II



APPENDIX III

