# Workflows Assignment 3

## General / Tips

Setup ArcGIS Environment

Follow the steps outlined in the document Lab Fundamentals in LMS to set up your project environment.

File Save

Save your work often as ArcGIS is prone to crashing, especially when working with large files.

GEOM20013_A3_ Description

Refer to document GEOM20013_A3_Description for the description and assessment details for this assignment.

Remember to use the 'Search' function on the right of ArcMap interface to look for various tools mentioned in this document.

## Overview

VRA's Plans

The Victorian Rail Authority (VRA) has plans to create a new high-speed train line from Melbourne to Canberra. Upon a successful tender submission, the Victorian Rail Authority (VRA) has approved your geospatial consultancy to investigate the suitability of four potential rail alignments for their new highspeed rail carrying passengers from Melbourne to Sydney. The four proposed alignments cover only a subset (Figure 1) of the alignment with a majority of the design already being approved by the VRA with early works already in progress. Per the tender submission, proposed alignments are to be analysed on both practicality and economic viability.

Proposed Rail Alignment

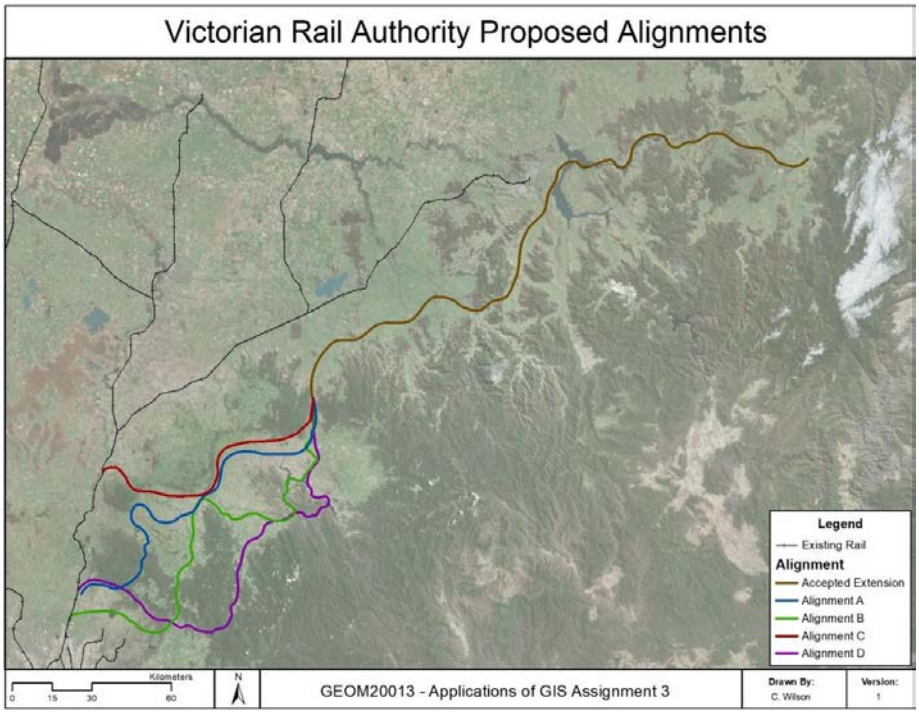



*Figure 1. The proposed rail alignment*

However...

The newly developed high-speed rail is the product of cutting-edge innovation which enables the rail to traverse through previously

unsuitable terrain. However, there are some known limitations to this technology which provides the need for this analysis. If the area covered by the alignment does not accommodate the technological constraints of the rail the VRA has both the technological and the permissions to alter the terrain but each alteration increases the overall cost of the project.

## Constraints

Limitations

The new high-speed rail does have a few design limitations for the terrain that the rail can safely traverse.

* With the added pressure to the track and the need to consider passenger comfort, the **new rail cannot be built on a slope steeper than 25 degrees**.

* To prevent damage to the rail and the added commercial risk of cancellations the **track cannot follow a path prone to flooding**.

This is not an exhaustive list of technological constraints for the technology. In order to further test their design for limitations, accompanying this analysis should be a literature review that discusses other potential factors that should be incorporated into determining the applicability or the constraints of determining a new rail alignment.

## Request for Information

Information Required

As this analysis is not an exhaustive multi-criteria analysis, the VRA requests that statistics about each line are provided along with visualisations to support further analyses.

The summary should include (but not limited to) the **total distance of each alignment**, the total **number of metres each alignment climbs (or falls)**, as well as the **number of unsuitable terrain obstacles each alignment encounters**. These factors will be used to derive an in-depth economic, environmental and social impact study.

The VRA requests that this information along with the analysis for this subject be provided in a comprehensive scientific report.

## Resources & Hints

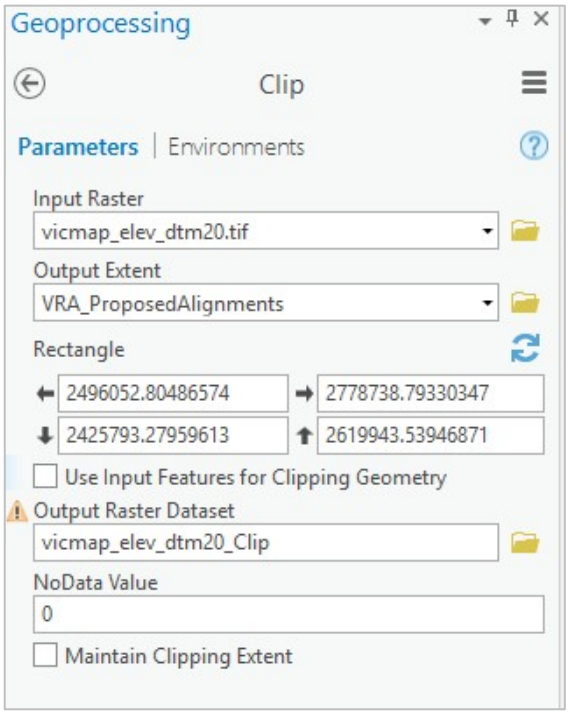
In order to help ensure that the analyses are conducted to the data standards set by the VRA, both a DEM of Victoria as well as a shapefile (VRA_ProposedAlignments) containing the proposed alignments has been provided.

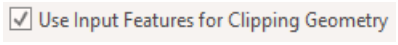
To access the tools, Click on the top Analysis tab > Click Tools > then there will be new pane on right hand side, search for tools or navigate the Toolboxes.

Clip

(Data Management)

This tool can be used to alter the size of a raster feature to the extents of another file. This is useful for reducing the computational complexity of further raster analyses and is essential in reducing processing times. Found under Data Management.

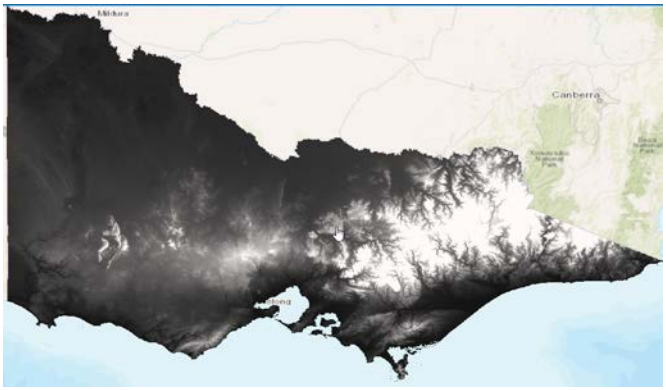



Check and then uncheck 

to make the raster the same shape as your AOI (area of interest).

Raster Functions

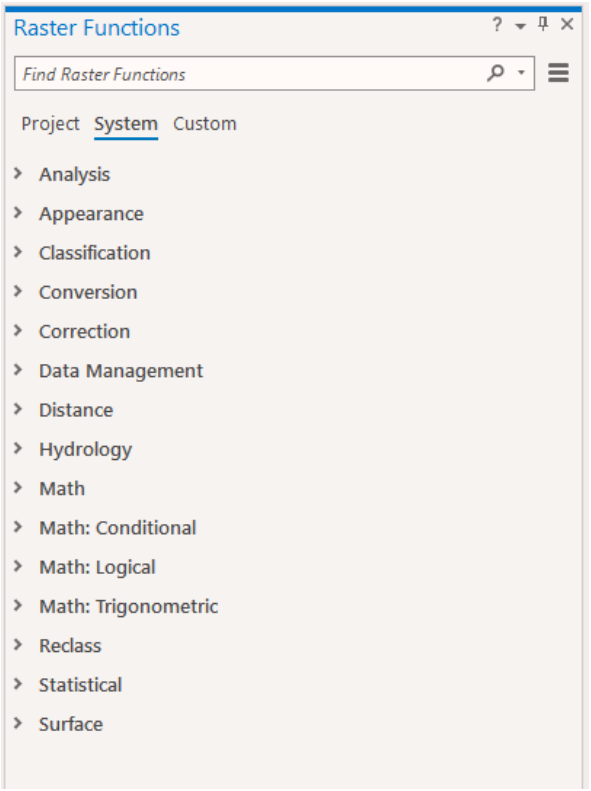
Most of the analysis conducted will be done on the Digital Elevation Model (DEM) proved, this is a raster dataset. Therefore, raster analysis functions will be used.




These can be accessed by clicking your DEM on the left-hand side > navigate to the **Imagery** tab in the top ribbon > click **Raster Functions**. These will now pop up in the right-hand pane.

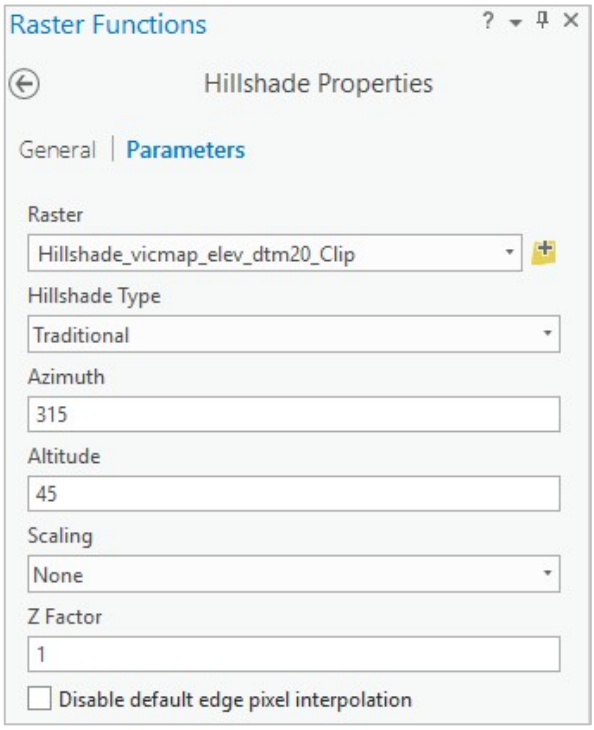
The tools under Raster Functions differ from using the tools found under Analysis top tab > Tools. As they don't make a new dataset each time you run them, it just performs analysis on the one raster dataset. This is quicker and saves on disk space.

You can search for a particular function or look in each of the categories, give them a go and see what results you get.



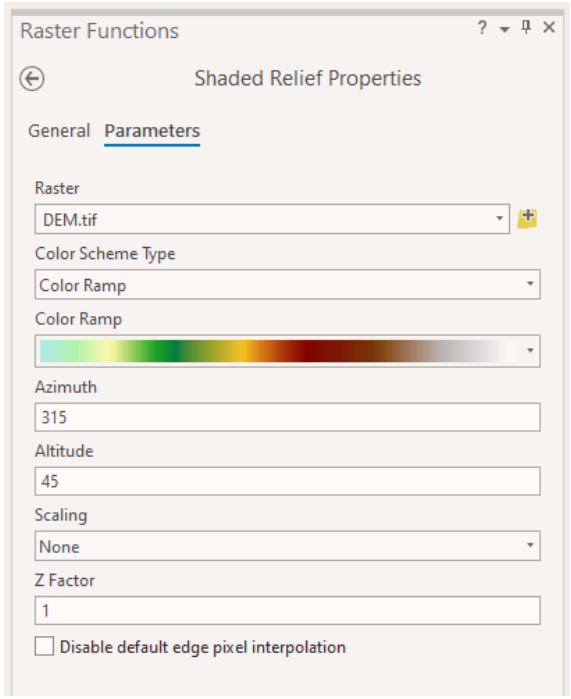

Hillshade

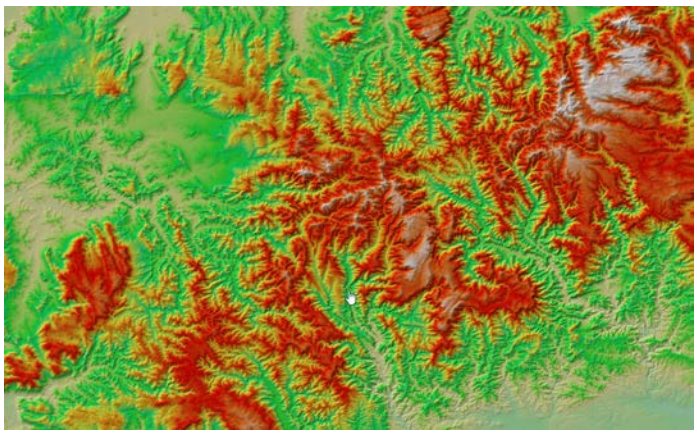
This is a tool run to improve visualisation and is often used in conjunction with other tools to help identify varying terrains and to support visual analyses. Found under Surface Section.




Shaded Relief

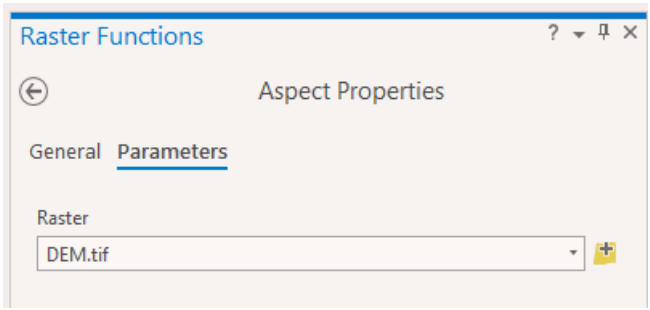
Although to better understand the terrain, the shaded relief tool also gives a different visual representation. Run this tool also on the DEM dataset.



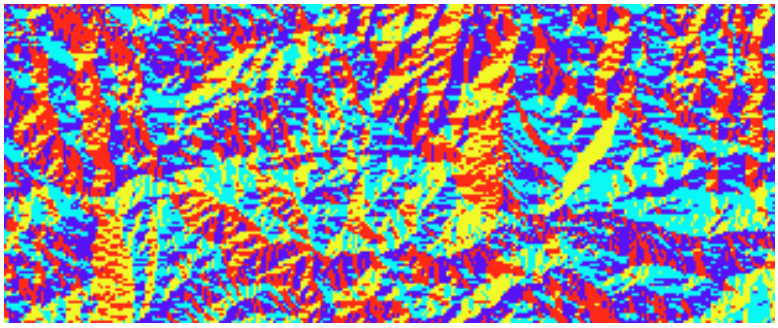
Aspect

This tool is used to determine which way a slope is facing. This is useful for catchment identification as well as a lot of aspect-dependent vegetation, weather and design analyses.



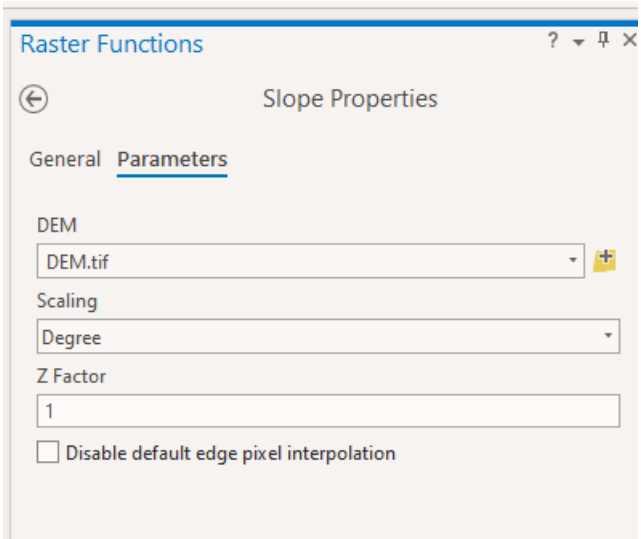

Change the symbology to Classify and equal interval of 4 to visualise the aspect.

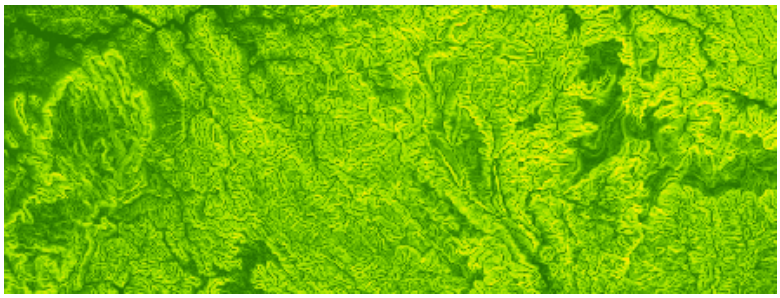
Change the colours for a



Slope

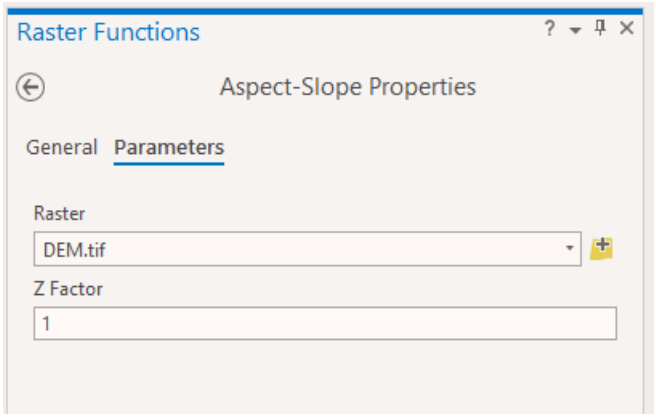
This tool is used to calculate the degree of the slope of each pixel. It is most often used in determining catchment and water flow information. This is an essential tool for the requested analysis as it can be used to identify all the areas with a slope larger than the prescribed limitation.

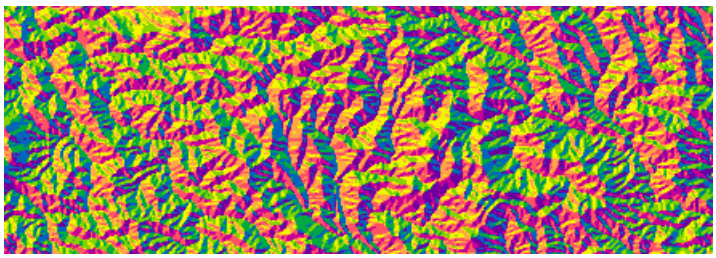


Aspect-Slope

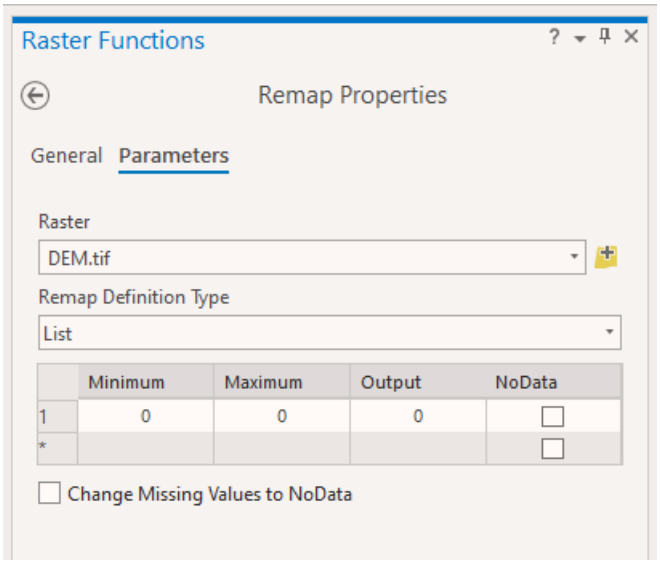
Tool to visualise the slope and Aspect of a raster



Reclassify

This tool reclassifies the values in each raster cell based on a manually prescribed categorisation. This will be very helpful for determining each of the 'obstacles' and the subsequent calculation of the number of obstacles that each alignment encounters. Found under Reclass.




Raster Calculator

This tool will not only be useful to this assessment but will be paramount to the final assignment. It allows you to perform mathematical expressions using the raster layers as a variable. For this assignment, it will be useful in combining raster datasets.

Found under math.

Choose which rasters you want in your equations and assign them variables (e.g. x and y).