**Introduction:** This exercise focuses on identifying and mapping tectonic landforms on Bainbridge Island in Washington. This environment is fertile, leading to different appearances of geomorphic landforms on the surface. We will be using the Geomorphic Indicator Ranking System to map landforms indicative of active faulting and using this tool to assign a final fault confidence ranking for traces. Please refer to the Student GIR Table posted on the course website for the full defined list of geomorphic features included in the system and their justifications as fault indicators. Tutorials on using the GIR shapefile will be posted under the QGIS tutorial video link (http://activetectonics.asu.edu/mapping_active_faults/QGIS_videos/).


*Figure 1. Location of Bainbridge Island, WA.(Credit: Michelin)*

*Learning Goals – After completing the exercise you should have these skills:*

- Identify and map landforms of different preservation levels
- Use the Geomorphic Indicator Ranking System in QGIS to accurately map the location of the geomorphic features indicative of active faulting
- Relate the quantity and ranking of the features to a final fault confidence ranking

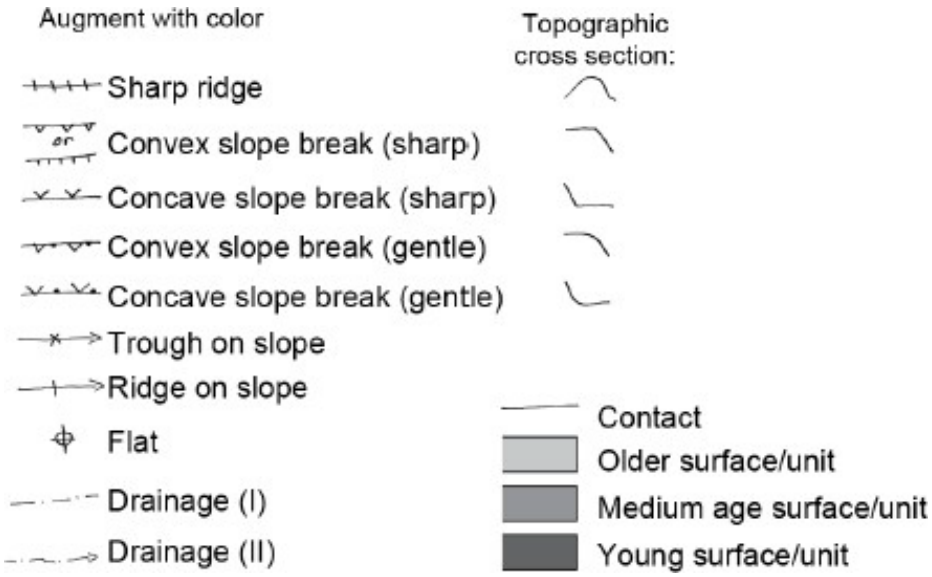
*100 points total*

**Instructions:**

1. Load the bainbridge_2015_dtm.tif product into QGIS. The digital terrain model is shared on the course website. It is also available from the Washington Department of Natural Resources lidar portal (https://lidarportal.dnr.wa.gov). (5 points)

2. Choose at least four GIS derivative products (multiple angle hillshade, slope shade, contour, etc.) to analyze the landscape and include screenshots. What products did you choose? What did each product best illuminate? Answer in a few sentences. (10 points)

3. Spend 30 minutes mapping the morphology of the area. Look for things like concave, convex, break in slope, etc. as shown in the below figure. This can be done in QGIS with shapefiles, Adobe Illustrator, PowerPoint, or printed/annotated by hand. Include a screenshot or photo (if by hand) and include an explanation if the symbology differs from below. (20 points).




4. Map the geomorphic landforms you see in this landscape. They can include those associated with faulting (beheaded drainage, landslides, etc.) or general morphology (drainages, ridges, etc.). You may use whatever symbology you prefer for these features but make sure it is consistent and include an explanation. This can be done in QGIS with shapefiles, Adobe Illustrator, PowerPoint, or printed/annotated by hand. Include a screenshot or photo (if by hand). (25 points)

5. Open the 'GIR_Shapefiles.zip' file found on the course website into QGIS and apply the style file for the 'GIR_Feature.shp' shapefile.

6. Map the point indicators using the Geomorphic Indicator Ranking System shapefile and Student GIR Table as reference. It is important to note that you should choose the feature name that you believe matches the type of faulting the feature resulted from (strike-slip, normal, reverse). This mapping assignment will be mapping a **reverse faulting** system. (10 points)

7. Based off the locations of the mapped GIR features, map the proposed location of the fault(s) using a red line shapefile. Include a screenshot (15 points).

8. Write a one-page summary: (15 points)
    a. The first paragraph: Description of the observed indicator features. Include descriptions of their proximity to the fault trace and interpretation about how the features formed on the landscape.
    b. The second paragraph: An interpretation on the relationship between the geomorphic features with their quantity to the strength of the fault location. Why are some features better indicators of active faulting than others?
    c. The third paragraph should include a discussion of the effect glaciation and vegetation has on the quality of mapping. What modifiers did you map? What effect does the level of preservation of the features have on your confidence level when mapping the landforms and faults?