

## Assignment 4: Vector Analysis

(60 Points, 6 Points Each, 3 Points for answers and 3 Points for explanations)

Data available under Resources>UK Data.

The provided [uk\\_data.gpkg](#) GeoPackage contains a variety of data layers for the United Kingdom, including the following that you will use in this assignment:

**uk\_bound:** boundary of entire United Kingdom

**countries\_bound:** boundaries of England, Wales, Scotland, and Northern Ireland

**district\_bound:** all districts in the United Kingdom

**geo\_bedrock:** bedrock geology

**geo\_surficial:** surficial geology

**geo\_faults:** fault lines

**geo\_dykes:** geologic dykes

**airports:** major airports

**places:** major cities

**roads:** major roads

**railroads:** major railroads

The geology data are from the British Geological Survey. The political boundaries are from the United Kingdom Data Service. All other layers are from Natural Earth.

\*There are some geometric issues with the geology data that will cause some tools to fail. To prevent this issue, you need to set “Invalid features filtering” to “skip (ignore) features with invalid geometries.” This is available here: Settings > Options > General.

### Questions

Use vector geoprocessing, analysis, and query tools to answer the following questions. There are generally multiple ways to find each answer. For each question, provide your answer (**3 Points**) and a brief description of how you obtained it (**3 Points**).

1. How many districts (**district\_bound**) have at least some of their extent within 50 kilometers of London (**town\_polys**)? **107, Selected polygon for London, buffered polygon by 50 km, used select by location to find all districts that intersect the buffer.**
2. How many **districts** have all their land area within 50 kilometers of **London**? **81, same as above accept select by location using within as opposed to intersect.**

3. How many **districts** have their centroid within 50 kilometers of **London**? **92, calculate centroid for each district, select by location using 50 km buffer.**
4. Which district (**district\_bound**) has the longest length of mapped railroads (**railroads**)? (Hint: The “Sum Line Lengths” tool failed for me and will not work in this instance. So, you will need to complete this task using vector overlay and other common vector analysis methods). **Highland, interested railroads and districts. Dissolved on common district name field, calculated area for railroads intersected with and dissolved to the district boundaries.**
5. Which **district** has the largest density of mapped **railroads**? **Hammersmith and Fulham, joined the dissolve result to the districts then calculated the density by dividing the railroad length by the district area.**
6. What is the latitude of the most northern extent of the United Kingdom (**uk\_bound**)? **~60.7, calculated rectangular extent of feature, extracted vertices of rectangle, converted to geographic coordinate system, calculated geometric fields.**
7. How many separate polygons make up the United Kingdom extent as represented in the **uk\_bound** data layer? **2,927, multipart to singlepart to break entire geometry into separate pieces.**
8. What is the radius in kilometers of the smallest circle that would completely encompass the United Kingdom (**uk\_bound**)? **~636 km, calculated minimal bounding geometry of boundary and obtained radius for the table.**
9. Is London (**town\_polys**) within the extent of a convex hull calculated for all of the geologic dykes (**geo\_dykes**) mapped in the United Kingdom? **No, dissolved all dykes to a single feature, calculated convex hull for dissolved feature, see if London is in this extent.**
10. How many dykes (**geo\_dykes**) have their centroid within the extent of Scotland (**countries\_bound**)? **2750, calculate centroids from dyke polygons, count points in polygons by country.**

## Deliverables

- Answers and explanations for the 10 questions.