Mapping Fire and Emergency Medical Incidents in Kent, WA

Explanation of Methods Used to Produce Maps

First, I downloaded all the data and prepared the project environments for the geoprocessing tools. I set up processing parameters and limits, specifying workspace, output coordinates, processing extent and raster analysis. Then I modeled and contoured incident density. I did this by selecting kernel density from the geoprocessing tools, and creating an output called Inc_2016_000 grid. I repeated this for the other four density rasters. I modeled contours for all the rasters, which manually defined discrete contour intervals. I checked the values in Table 1 to check which values I needed to input for the interval values for the different rasters. This created outputs called Con_Inc 2016_110, with the final three digits varying between the different categories. Next I used the contour with barriers tool, creating contours for each category. Finally, I noticed that there were broken links in the project and I needed to repair them. I did this by clicking on the layers, navigating to its properties and then data source. I connected each category to the correct data source that it corresponded too, and clicked ok. This resulted in the link being repaired. I repeated this process for each category. To finish up, I deselected all the extra layers that did not need to be selected anymore for the assignment. I adjusted the transparency to 50% for the appropriate layers. Finally I exported each category as its own individual map in the form of a pdf.
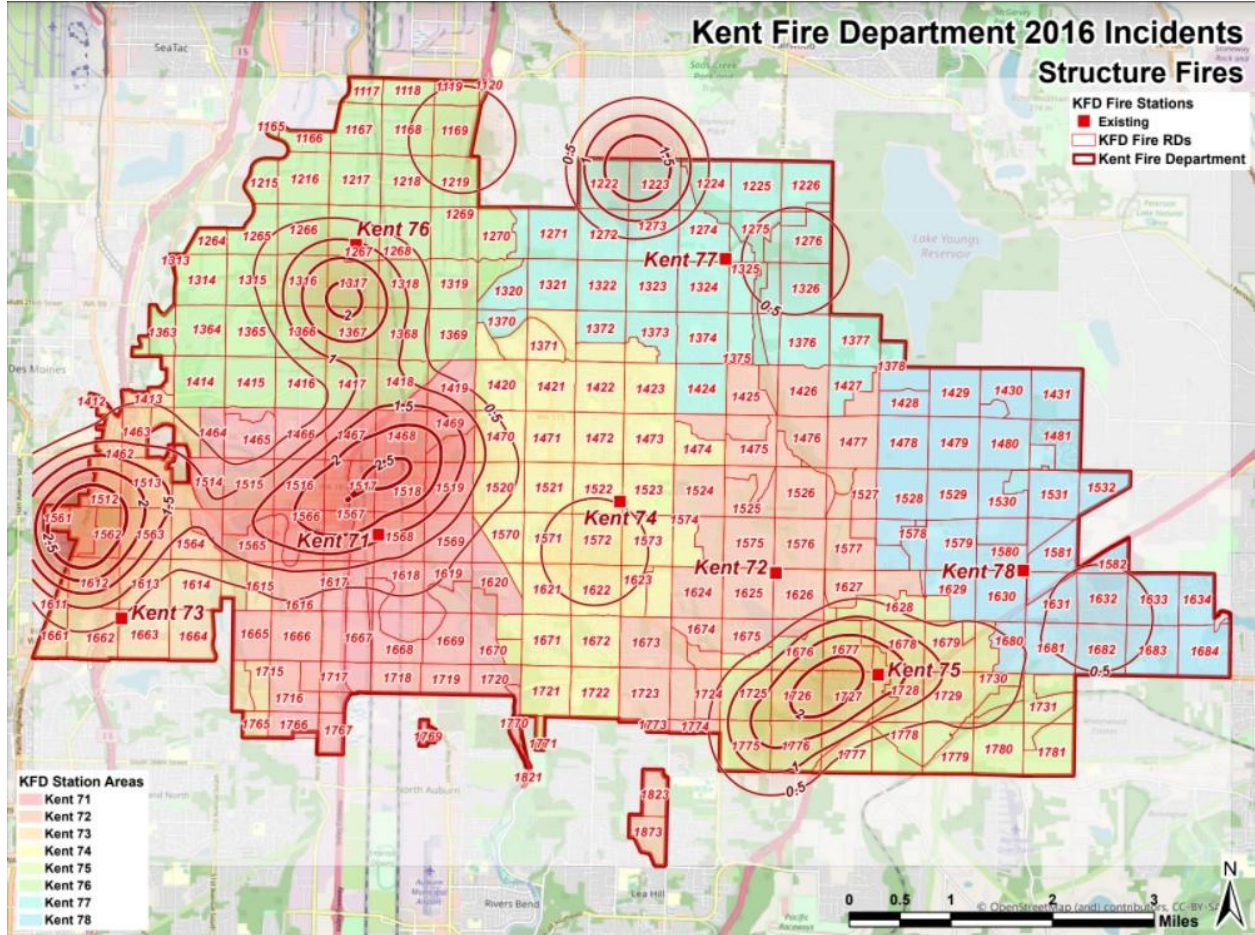
Five Maps: One For Each Incident Group
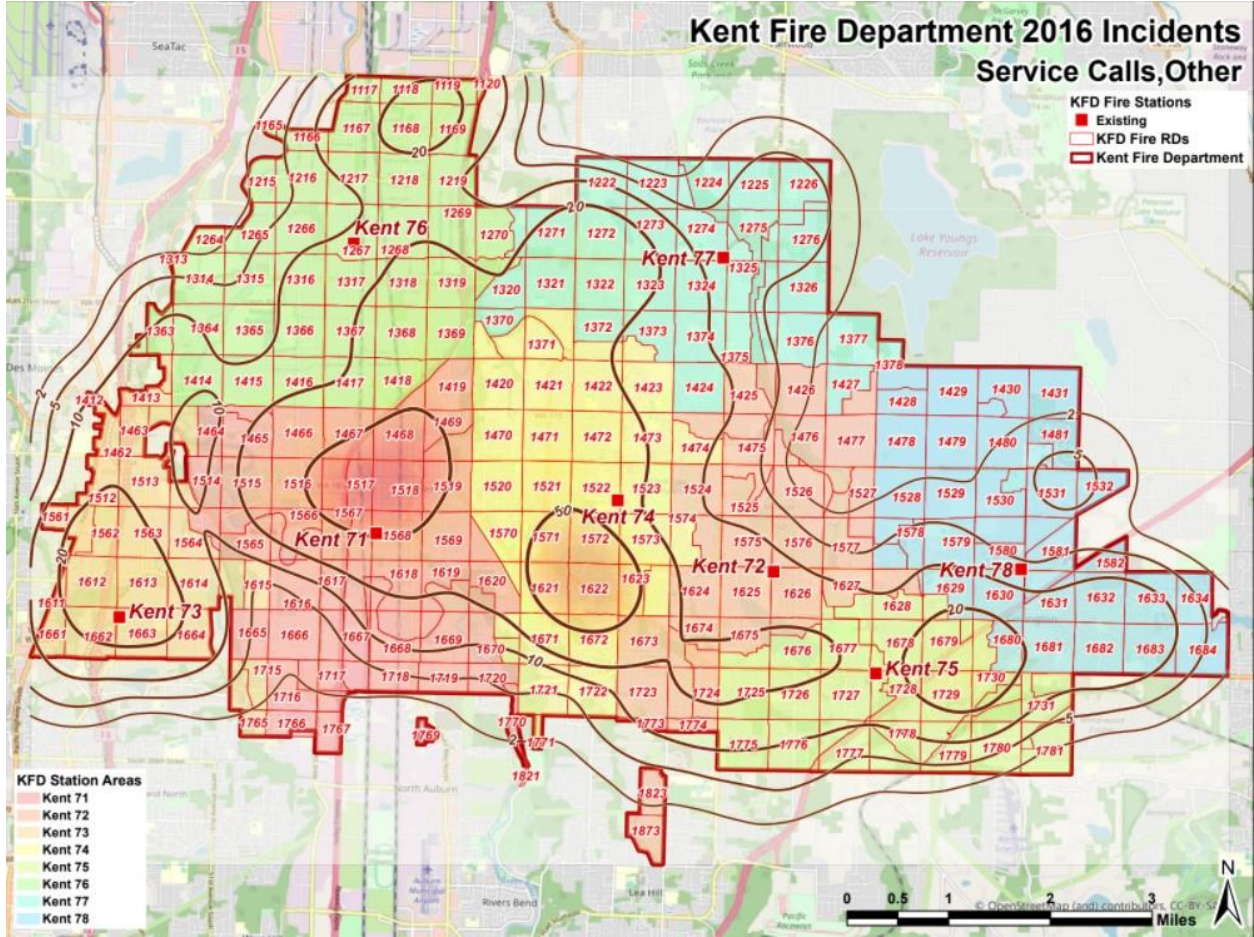
Map 1

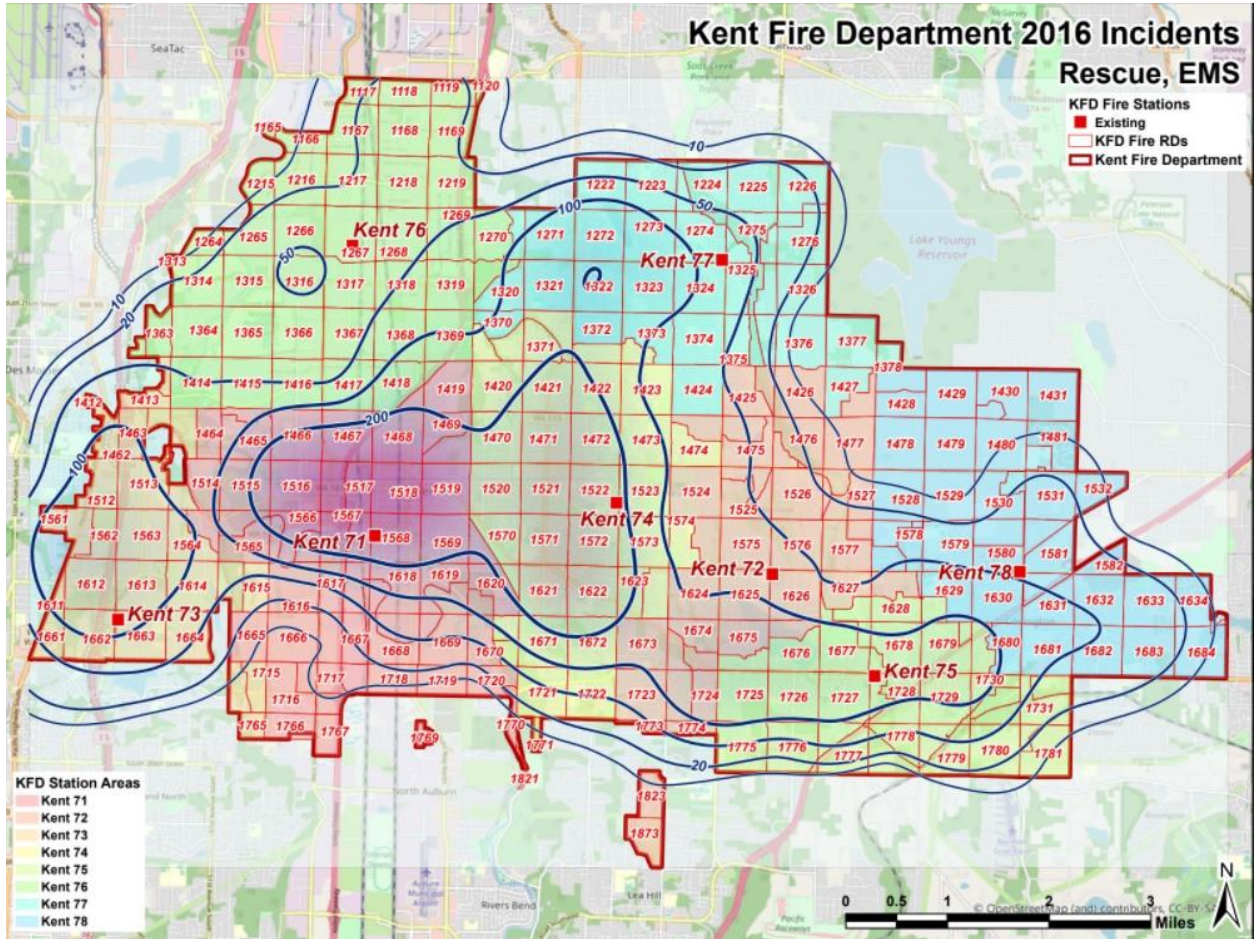Fire, Explosion, Hazmat.pdf
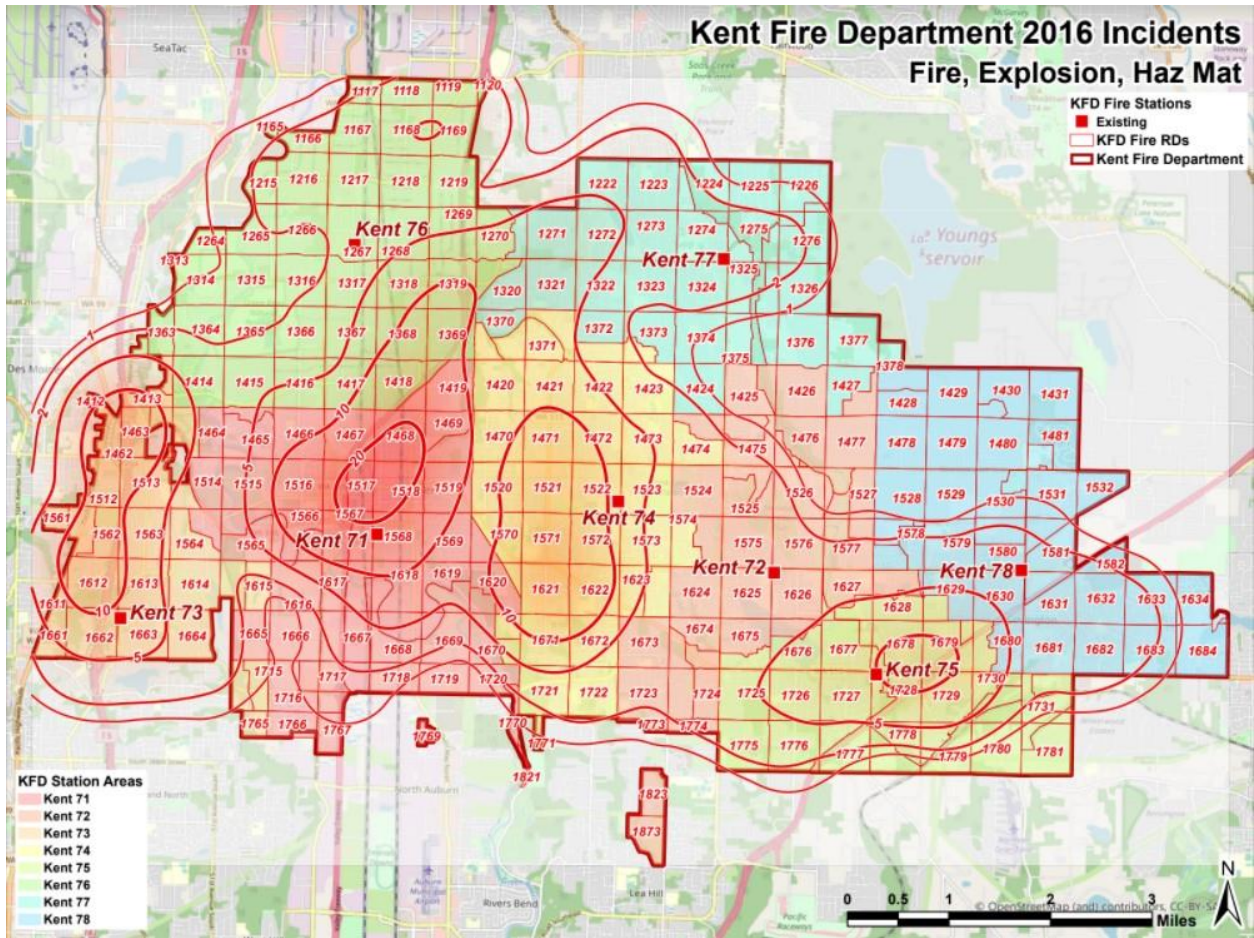
Map 2

Structure Fires.pdf

Map 3

Service Calls, Other.pdf

Map 4

Rescue, EMS.pdf

Map 5

All Responses.pdf

Kent Fire Department 2016 Incidents
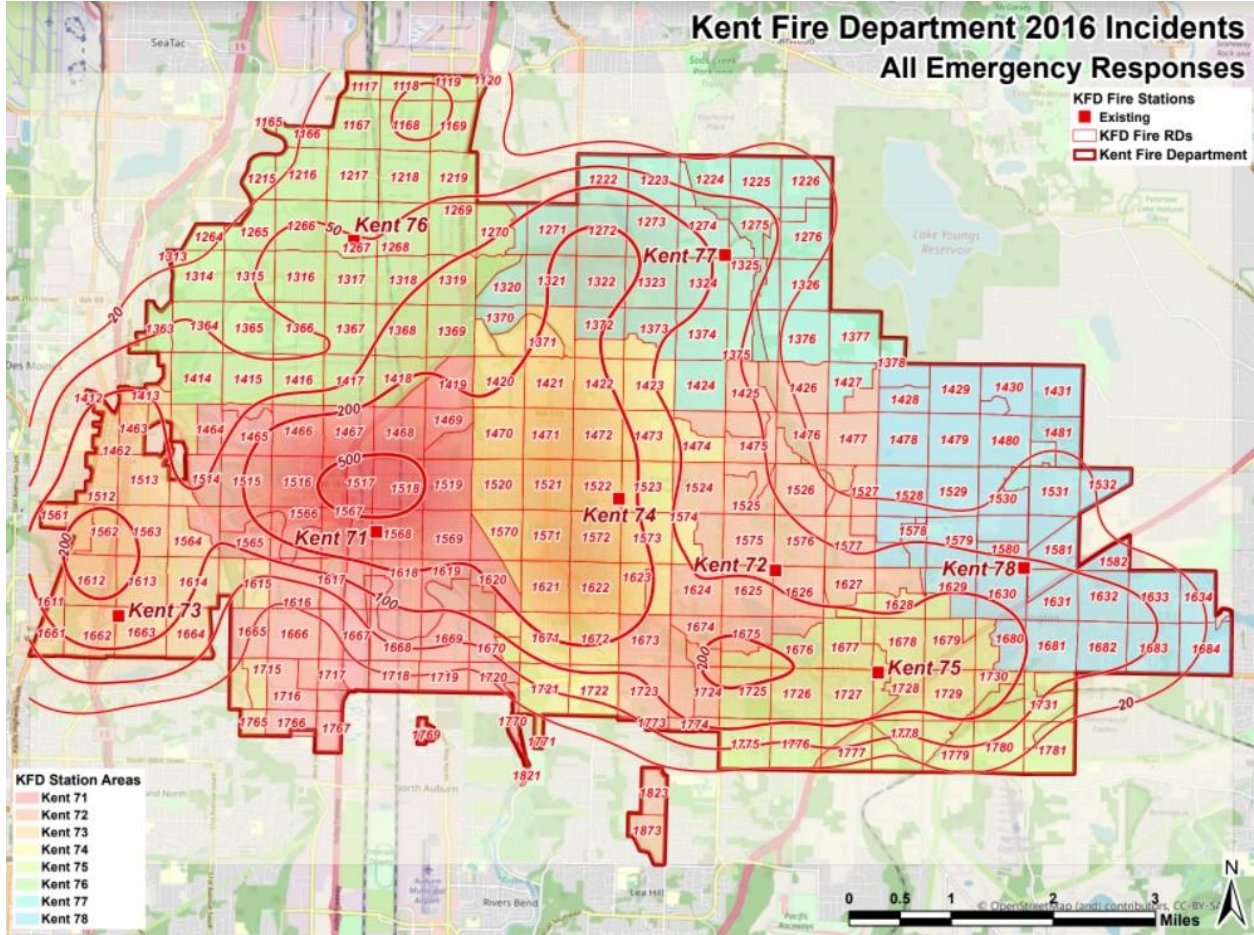All Emergency Responses

Commentary on Differences in Occurrence Across Kent for These Incident Types

The map that displays fires, explosions and haz mats suggests that a very large portion of the city is prone to these types of incidents. It seems that there is a slight trend in more of these incidents occurring in the southern half of Kent, with a concentration in either the center or the edge of the city. There is also a pattern of most of the edges of Kent being susceptible. However, for the most part there are a lot of areas in the city where these incidents have taken place.

The map showing structure fires displays more noticeable patterns. The midwestern part of the city is a prominent problem spot for this type of incident, and there are also many occurrences in the north and southeastern borders of Kent. These are the areas of the city where most of these incidents took place, but there is also a small region in the middle of the city where structure fires are more prone as well.

The map depicting service calls also shows that an extremely large component of the city is susceptible to this type of incident. The pattern starts on the edges and works its way closer to the center. There are two prominent clusters on the west and east of the southern half of the city, and a small cluster at the northernmost point and the eastern border. The very center of the city and a small part of the eastern border are the only areas in the entire city that are not susceptible to this type of incident.

The rescue and EMS map is slightly similar to previous maps in that occurrences for these incidents are very common across most of the city. The borders and the eastern part of the city are very prominent in this incident. However, a moderately large portion of the middle of the city and some of the regions north and west of that area are rather empty in terms of incidence occurrence. There is also a very small part of the east border that is clear as well.

For the map displaying emergency responses, we can see that the center of the city, as well as small parts of the western border and northern border, are clear for this type of incident. However, the majority of the city is covered in occurrences of this incident, event though it appears to be at a lesser volume than the fires, explosions and haz mats incidents and service calls incidents.

A common theme seems to eb that the center of the city has the lowest occurrence of incidents, and while there is a small part of the eastern and northern border that is sometimes low in incidents as well, the majority of the city is covered in high incident occurrences.

Explanation of the Effectiveness of Using Kernel Density Maps and Contour Intervals

It is important to note that during this exercise, we utilized the ArcGIS Spatial Analyst Kernel Density and Contour Intervals geoprocessing tools. This allowed us to model five different incident risk sets in the main region covered by the Kent Fire Department.

The contouring tool, specifically Contour by Barrier, creates contours from a raster surface. The incorporation of the barrier feature allowed us to independently create contours for either side of a barrier.

The kernel density uses a point or polyline feature using the kernel function to calculate a magnitude per unit area. This fits a surface that is smoothly tapered to each point or polyline.

Data Source and Reference

This exercise was developed by Mike Price, Entrada/ San Juan, Inc. and converted into an exercise for students. It was published in ArcUser in the summer of 2017.

Here is more information about the source: https://www.esri.com/about/newsroom/arcuser/modeling-incident-density-with-contours-in-arcgis-pro/

The data we used was part of a modeling incident folder. This contained a KFD folder, which stands for Kent Fire Department, and two subfolders. One is called GBDFiles, which is a WASP83NF folder holding geodatabase layers for Kent Fire Service Areas, and KFD_Pro, which holds the ArcGIS Pro project materials. For this lab, we used a synthetic subset of the KFD's emergency call records from the year 2016. It is a sample dataset that only represents a third of Kent's total responses for the year, and should not be used as a comprehensive indication of the department's response record. Rather, it is a starting point that works well for the purposes of this assignment. We categorized the incidents in Kent into five categories:

All Responses: NFIRS codes 100 to 999

Fire, Explosion, Haz Mat: NFIRS codes 100 to 299, 400-499

Structure Fires: Selected 100 series codes

Rescue, EMS: NFIRS codes 300 to 399

Service Calls, Other: NFIRS codes 500 to 999