In [31]:

```python
import pandas as pd
import datetime
import matplotlib.pyplot as plt
import random
from matplotlib import cm
import numpy as np
import matplotlib.ticker as mtick
import seaborn as sns
import folium
```

In [32]:

```python
# Read Tables into a pandas DataFrame
df_table1 = pd.read_csv('calderdale-adult-learning-courses-autumn-2019-2.csv')
df_table2 = pd.read_csv('calderdale-adult-learning-courses-spring-and-summer-2020-1.csv')
```

In [33]:

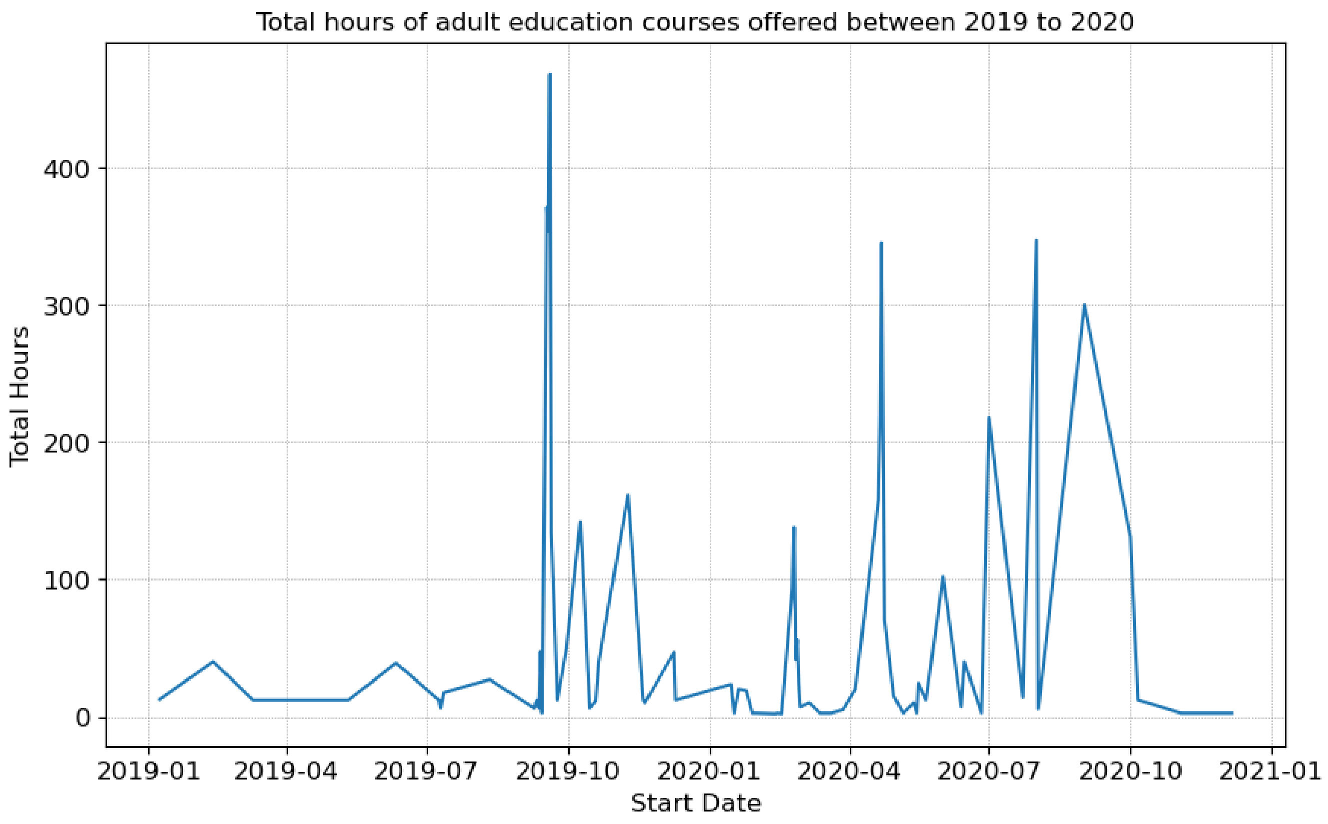
```python
# Data cleaning and transformation

#Convert the column to string format
df_table2['Start time'] = df_table2['Start time'].apply(lambda x: str(x))
df_table2['End time'] = df_table2['End time'].apply(lambda x: str(x))

# Convert the string to a datetime object and then format as string with time
df_table2['Start time'] = df_table2['Start time'].apply(lambda x: datetime.datetime.strptime(
df_table2['End time'] = df_table2['End time'].apply(lambda x: datetime.datetime.strptime(x, "

# remove special characters and define a dictionary of characters to be replaced and their re
special_chars = {'ï¿½','ï¿½-','�'}
df_table2['Full Fee'] = df_table2['Full Fee'].str.replace('special_chars', '')
df_table2['Full Fee'] = df_table2['Full Fee'].str.replace('�', '')
df_table2['Early Enrolment Fee'] = df_table2['Early Enrolment Fee'].str.replace('special_char
df_table2['Early Enrolment Fee'] = df_table2['Early Enrolment Fee'].str.replace('�', '')

# remove rows with no course codes
df_table2 = df_table2.drop(df_table2[df_table2['Course Code'] == 'Assessment required - pleas
df_table2 = df_table2.drop(df_table2[df_table2['Course Code'] == ' '].index)

#concatenate and replace NaN values in a specific column with 0
df_combined = pd.concat([df_table1, df_table2])
df_combined['Start Time'] = df_combined['Start Time'].fillna(0)
df_combined['End Time'] = df_combined['End Time'].fillna(0)
df_combined= df_combined.drop(df_combined[df_combined['Start Time'] == 'Various'].index)
df_combined= df_combined.drop(df_combined[df_combined['End Time'] == 'Various'].index)
df_combined['Start Date'] = pd.to_datetime(df_combined['Start Date'])

#Extract year and month from start time column
df_combined['Year'] = df_combined['Start Date'].dt.year
df_combined['Month'] = df_combined['Start Date'].dt.month_name()
df_combined['Start Time'] = df_combined.apply(lambda row: row['Start Time'] if row['Start Tim
df_combined['End Time'] = df_combined.apply(lambda row: row['End Time'] if row['End Time'] !=
df_combined = df_combined.drop(['Start time', 'End time'], axis=1)

#df_combined.to_csv('my_data.csv', index=False)
```

```
C:\Users\a4app\AppData\Local\Temp\ipykernel_3580\2376693445.py:32: UserWarning: Parsing dates
in DD/MM/YYYY format when dayfirst=False (the default) was specified. This may lead to incons
istently parsed dates! Specify a format to ensure consistent parsing.
  df_combined['Start Date'] = pd.to_datetime(df_combined['Start Date'])
```

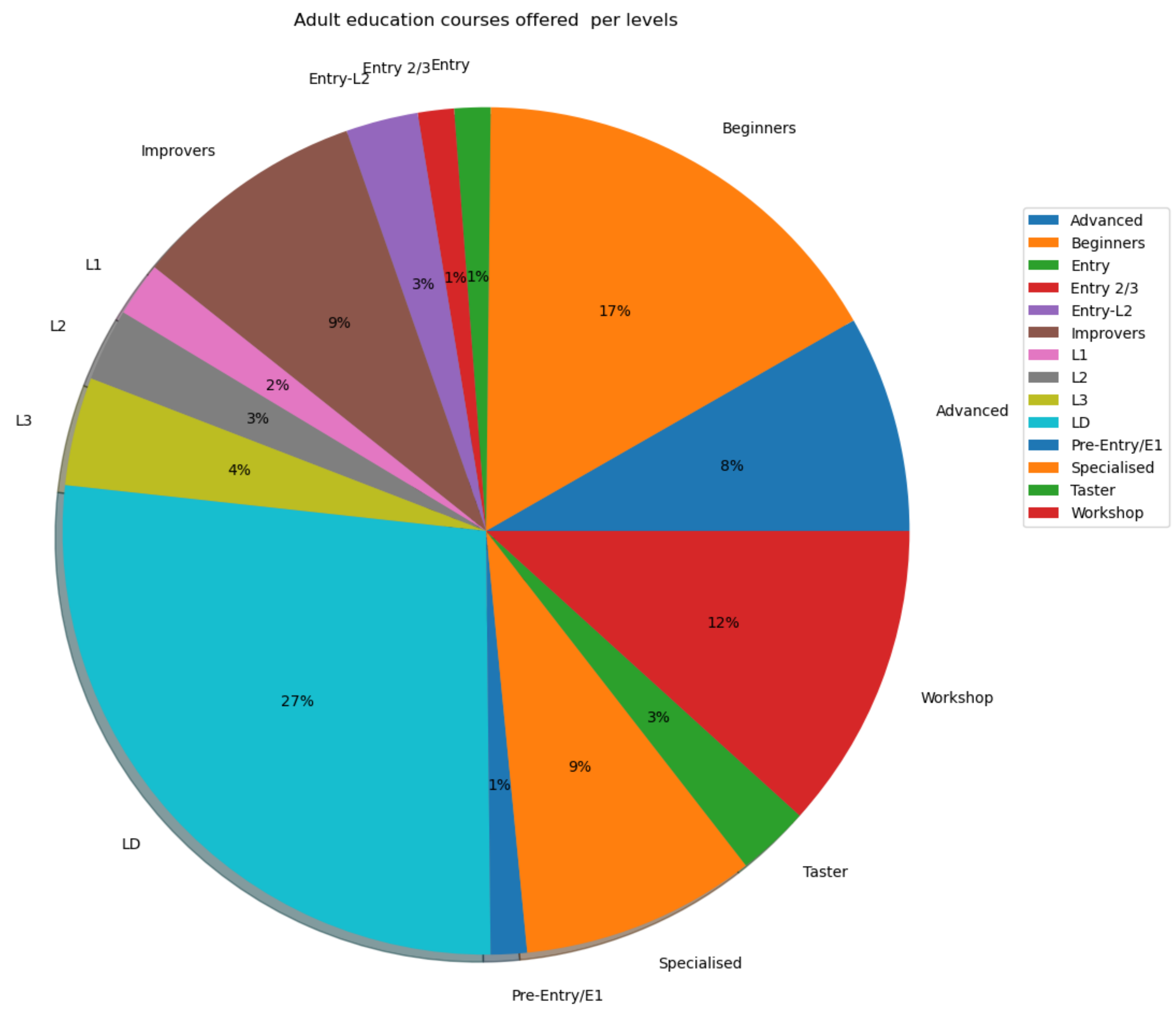
In [34]:

```python
# Line chart that display the course trend

enrollment = df_combined.groupby('Start Date')['Total Hours'].sum()

# Converion to Dataframe and Datetime format
enrollment_df = enrollment.to_frame()
enrollment_df=enrollment_df.sort_index()
```

```
enrollment_df.index = pd.to_datetime(enrollment_df.index)

# plot the enrollment over time as a line plot
fig = plt.figure(figsize=(10, 6))  # set the figure size
plt.grid(True, linestyle=':', linewidth=0.5, color='gray')
plt.plot(enrollment_df.index, enrollment_df['Total Hours'])
plt.xticks(fontsize=12)
plt.yticks(fontsize=12)
plt.title('Total hours of adult education courses offered between 2019 to 2020', fontsize=12)
plt.xlabel('Start Date', fontsize=12)
plt.ylabel('Total Hours', fontsize=12)
plt.show()
```

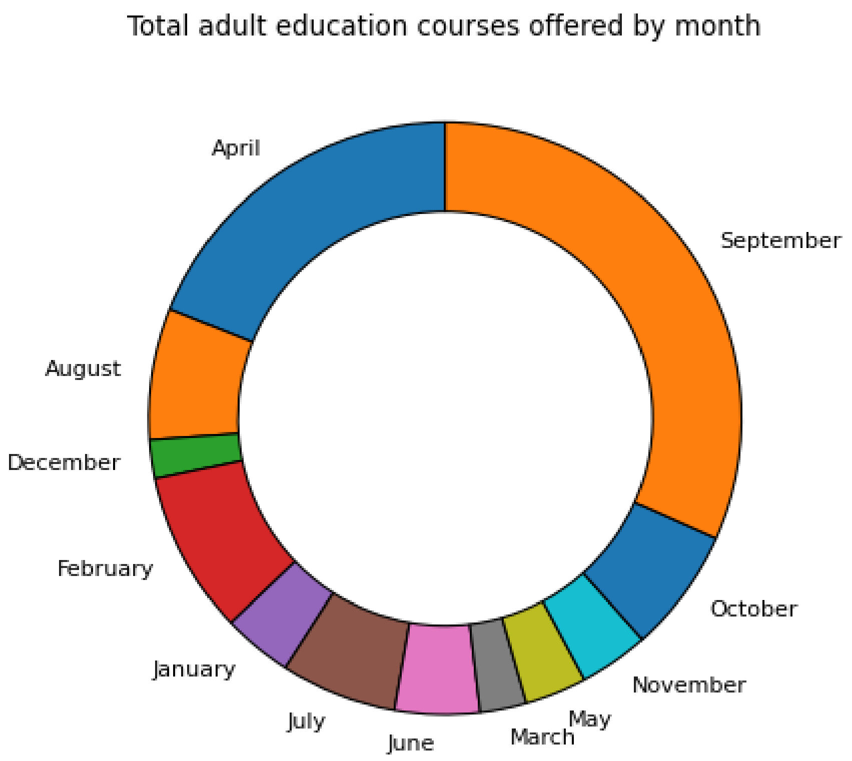


In [7]:
```
# Pie chart that displays the number of courses


# count the number of courses in each program area
Level1 = df_combined.groupby('Level')['Course Code'].nunique()

# create a pie chart
fig = plt.figure(figsize=(15, 8)) # set the figure size
ax=Level1.plot(kind='pie', legend=True,autopct='%1.0f%%',radius=1.6,shadow=True)
ax.legend(bbox_to_anchor=(1.3, 1), loc='upper left')
plt.title('Adult education courses offered  per levels', fontsize=12,  y=1.25)
plt.axis('off')
plt.show()
```

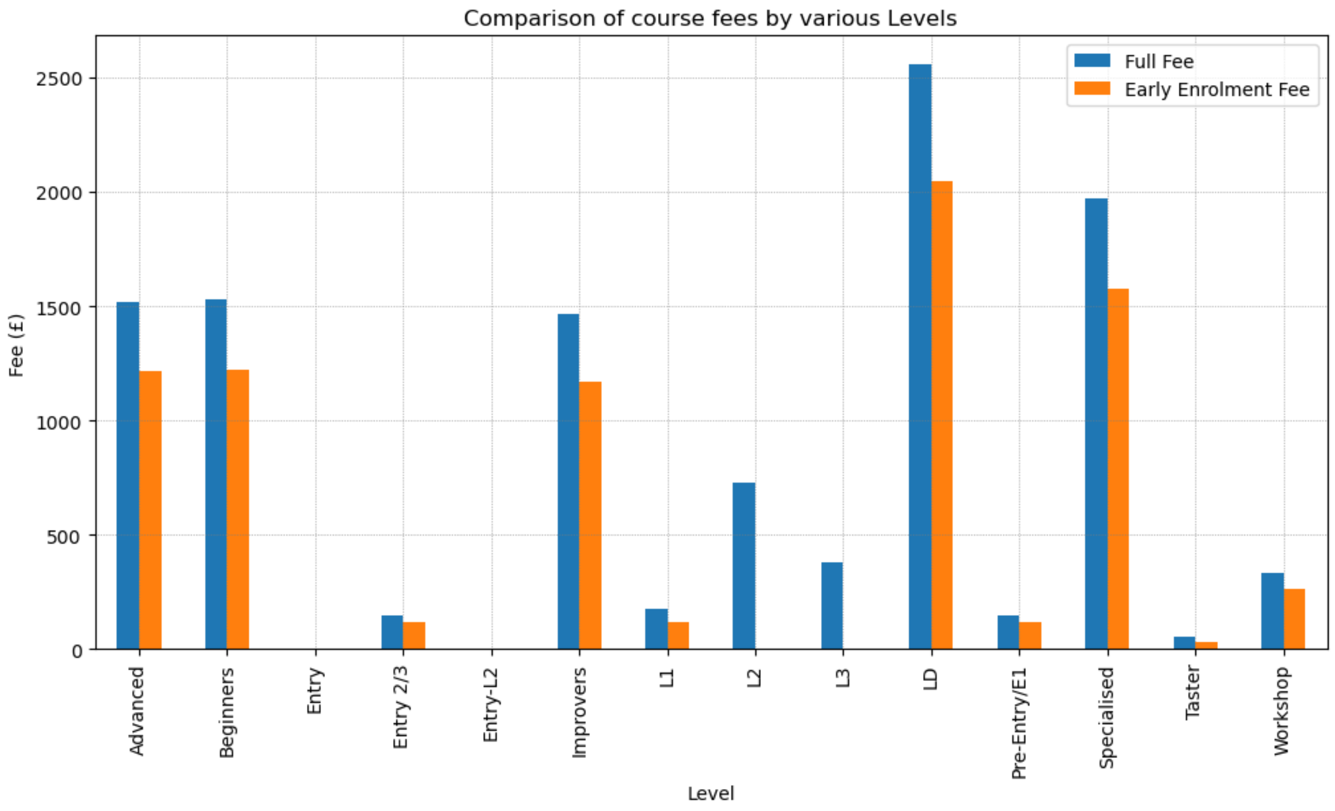


In [49]:
```
# Select the rows with the desired levels
selected_levels = ['Beginners', 'LD', 'Workshop']
selected_df = df_combined[df_combined['Level'].isin(selected_levels)]
selected_df['Full Fee'] = selected_df ['Full Fee'].str.replace('-', '')
selected_df = selected_df.drop(selected_df[selected_df ['Full Fee'] == ' '].index)
selected_df= selected_df.sort_values('Full Fee', ascending=False)

# Plot the results

# Group the courses by month and count the number of occurrences in each group
counts = df_combined.groupby(df_combined['Month'])['Course Code'].count()
counts = counts.sort_index()

fig, ax = plt.subplots(figsize=(10, 6),dpi=80)
counts.plot(kind='pie',wedgeprops = {"edgecolor" : "black",'width':0.3,
                        'antialiased': True}, startangle=90)
ax.set_xlabel('Month')
ax.set_ylabel('Count')
plt.title('Total adult education courses offered by month', fontsize=12,  y=1)
plt.axis('off')
plt.show()
```

```
C:\Users\a4app\AppData\Local\Temp\ipykernel_3580\86225514.py:5: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guid
e/indexing.html#returning-a-view-versus-a-copy
  selected_df['Full Fee'] = selected_df ['Full Fee'].str.replace('-', '')
```



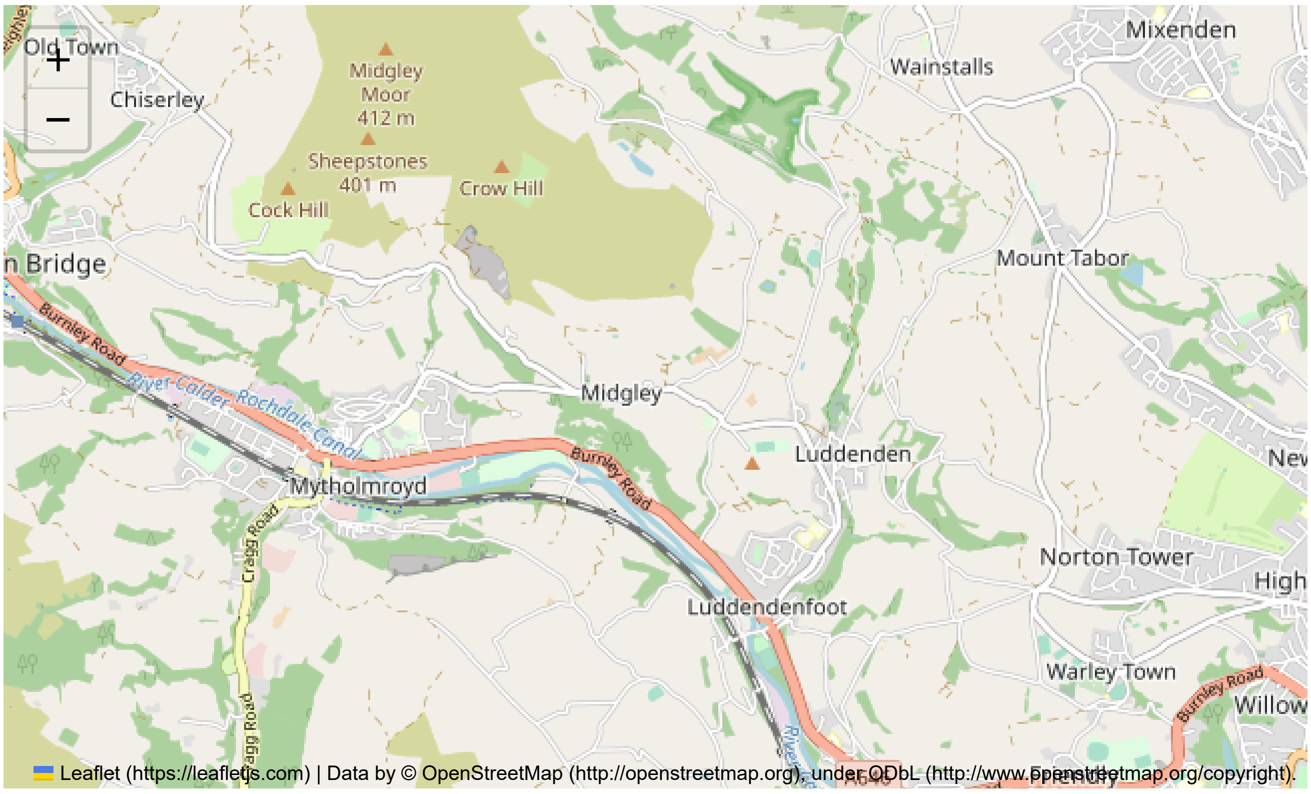
In [29]:
```python
# Filter the data for the year 2020
df_table3 = pd.read_csv('my_data.csv')
df_2020 = df_table3[df_table3['Year'] == 2020]

# Group the data by level and sum the full fee and early enrollment fee
grouped_df = df_2020.groupby('Level')[['Full Fee', 'Early Enrolment Fee']].sum()
ax = grouped_df.plot(kind='bar', figsize=(12,6))
ax.set_title('Comparison of course fees by various Levels')
ax.set_xlabel('Level')
ax.set_ylabel('Fee (£)')
plt.grid(True, linestyle=':', linewidth=0.5, color='gray')
plt.show()
```



In [23]:

```python
# Create a map centered on the average location of all courses
center_lat = df_table3['Latitude'].mean()
center_lon = df_table3['Longitude'].mean()
m = folium.Map(location=[center_lat, center_lon], zoom_start=10)

# Add a marker for each course location
for index, row in df_table3.iterrows():
    popup_text = f"{row['Course Code']}: {row['Description']}:{row['Postcode']}"
    folium.Marker(location=[row['Latitude'], row['Longitude']],
                  popup=popup_text).add_to(m)

# Display the map
m

#save the map in html
#m.save('course_map.html')
```

Out[23]:


Old Town
Chiserley
Midgley Moor 412 m
Sheepstones 401 m
Crow Hill
Cock Hill
Wainstalls
Mixenden
Mount Tabor
n Bridge
Burnley Road
River Calder
Rochdale Canal
Midgley
Luddenden
Mytholmroyd
Cragg Road
Norton Tower
Luddendenfoot
Warley Town
Willow
High
New
Leaflet (https://leafletjs.com) | Data by © OpenStreetMap (http://openstreetmap.org), under ODbL (http://www.openstreetmap.org/copyright).