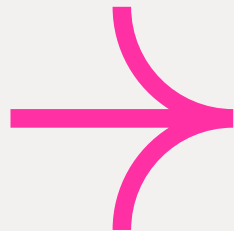


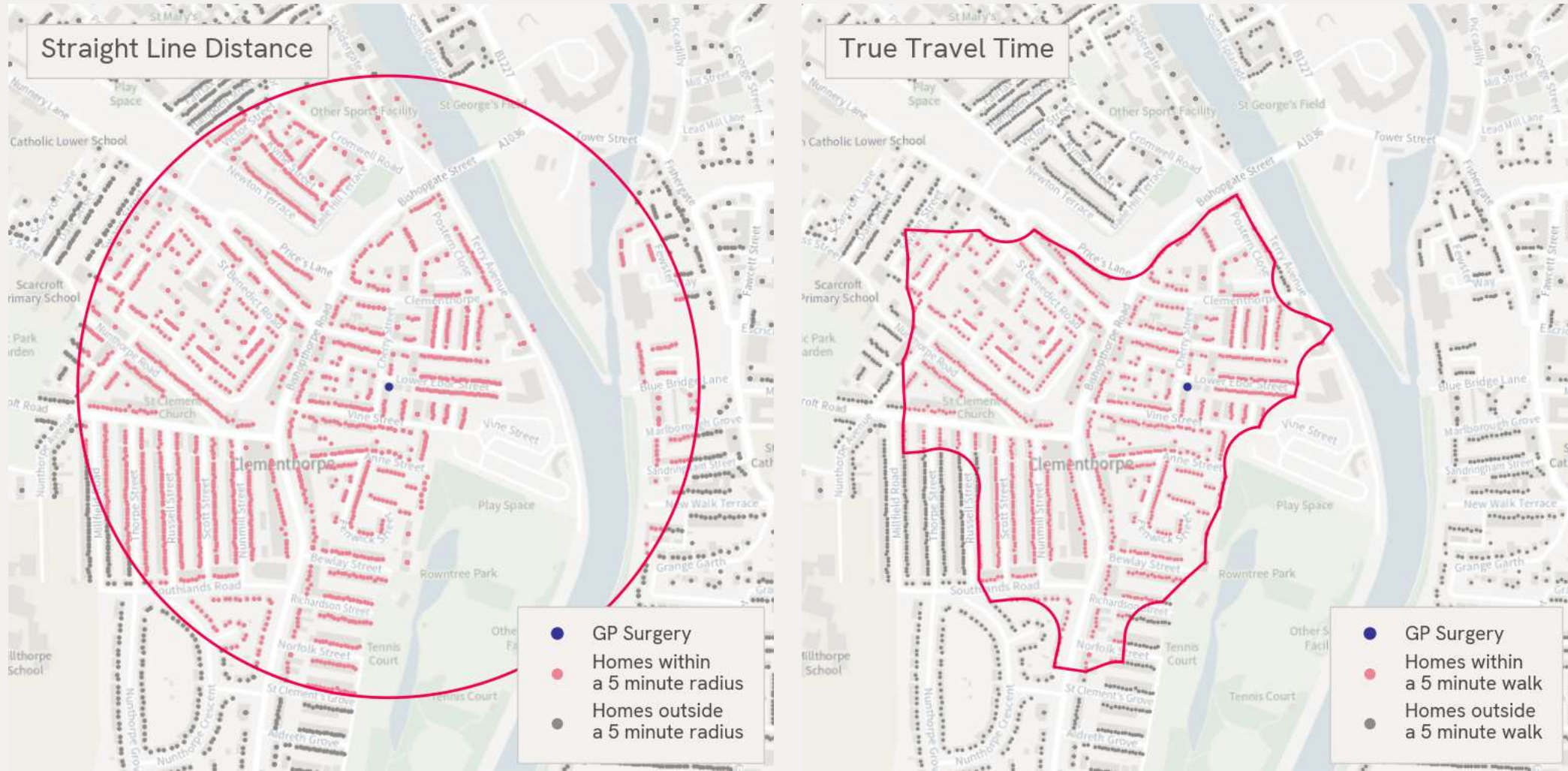
Supporting the National Health Service by democratizing travel time analysis

Rebecca Aspin - Data Scientist

rebecca.aspin@os.uk

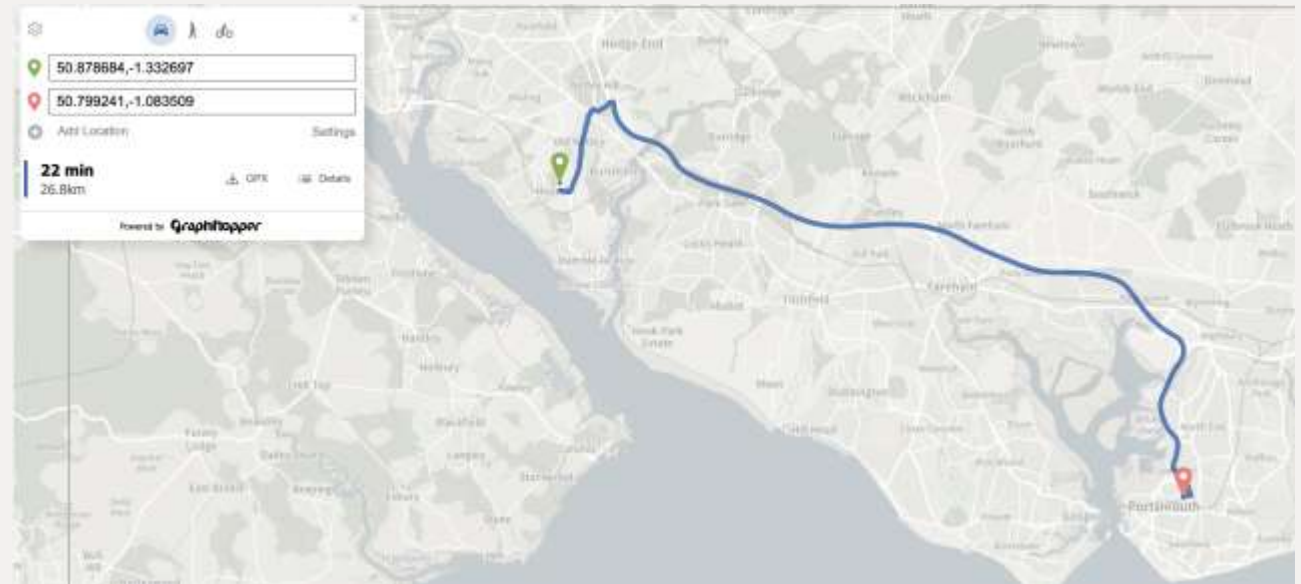


Travel Time Analysis is often oversimplified



Traditional routing analysis can be streamlined

| Start | End | Travel time | Geometry |
|----------------|----------------|-------------|----------|
| 1 Aspen Road | Daffodil GP | ? | ? |
| 1 Aspen Road | Crocus Surgery | ? | ? |
| 3 Birch Street | Daffodil GP | ? | ? |
| ... | ... | ... | ... |



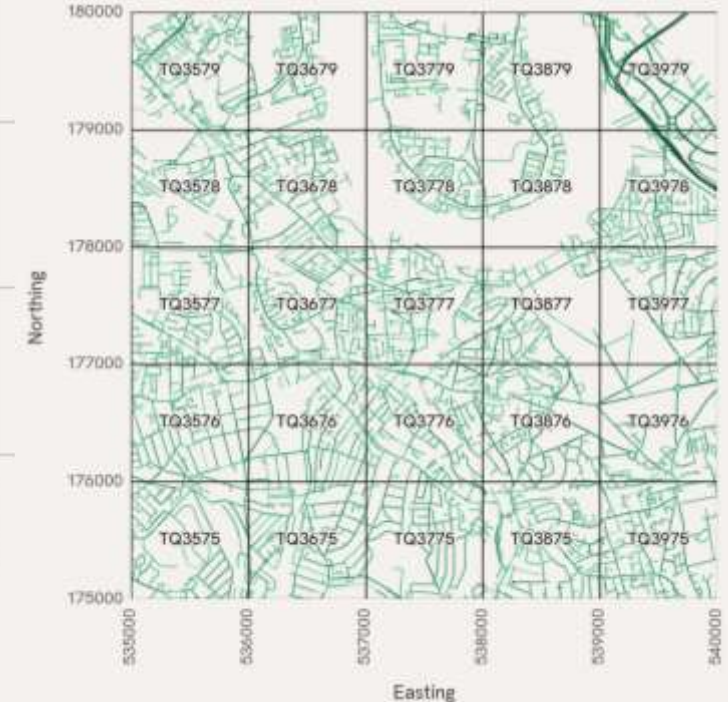
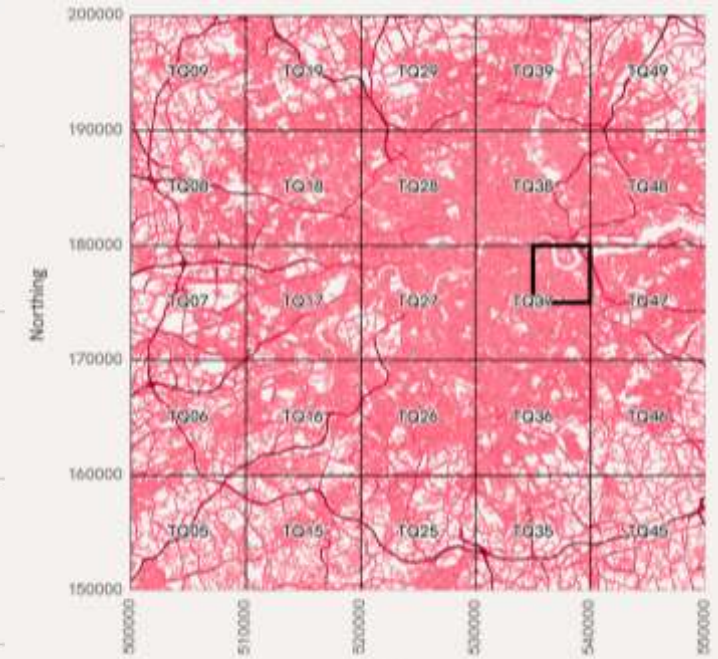
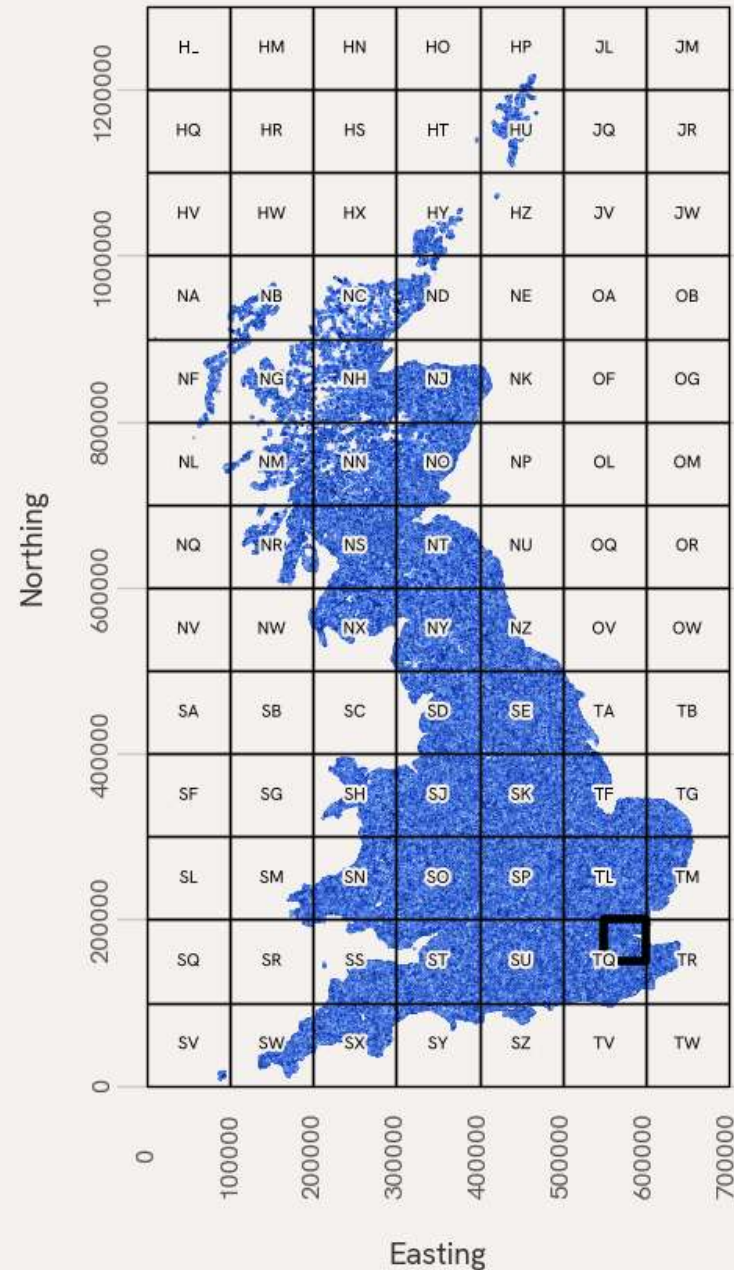
Traditional routing analysis can be streamlined

By providing a lookup matrix between pairs of reference geographies

| Start | End | Travel time | Geometry |
|----------------|----------------|-------------|----------|
| 1 Aspen Road | Daffodil GP | ? | ? |
| 1 Aspen Road | Crocus Surgery | ? | ? |
| 3 Birch Street | Daffodil GP | ? | ? |
| ... | ... | ... | ... |

| Start | End | Travel time |
|---------|---------|-------------|
| SO1 1AA | SO1 8YY | ? |
| SO1 1AA | SO1 9ZZ | ? |
| SO1 3CC | SO1 8YY | ? |
| ... | ... | ... |

We use the **British National Grid** as an interoperable GB-native reference geography, which is fixed spatially and temporally



Travel times are calculated using a custom version of the **graphhopper** routing library, optimized for Ordnance Survey's **Multi-Modal Routing Network (MRN)**



Travel times are calculated using a custom version of the **graphhopper** routing library, optimized for Ordnance Survey's **Multi-Modal Routing Network (MRN)**

```
protected double getSpeed(ReaderWay way, Boolean reverse) {
    double speed;
    double naismith_speed;
    double elevation = getElevation(way, reverse);
    double distance = getEdgeDistance(way);

    if (distance > 0.0) {
        naismith_speed = (distance)/(distance/MEAN_SPEED +
            elevation/600.0);
        if (naismith_speed > 0.05) {
            speed = naismith_speed;
        } else {
            speed = 0.05;
        }
    } else {
        speed = MEAN_SPEED;
    }
    return speed;
}
```

Using the travel time matrix

Once the data is indexed to the grid, performing travel time analysis for any number of use cases is as simple as a table join

| A^B_C start_id | A^B_C end_id | 1.2 time | 1.2 distance |
|------------------|----------------|----------|--------------|
| SU300102 | SU279088 | 38 | 3.181 |
| SU300102 | SU296080 | 31 | 2.598 |
| SU300102 | SU298130 | 49 | 4.11 |
| SU300102 | SU301106 | 13 | 1.089 |
| SU300102 | SU313076 | 47 | 3.917 |
| SU300102 | SU314085 | 36 | 3.022 |
| SU300102 | SU316077 | 50 | 4.175 |
| SU300105 | SU286082 | 38 | 3.011 |
| SU300105 | SU290127 | 41 | 3.39 |
| SU300105 | SU297086 | 26 | 2.156 |
| SU300105 | SU299149 | 60 | 4.986 |
| SU300105 | SU300065 | 54 | 4.515 |
| SU300105 | SU318137 | 55 | 4.619 |
| SU300105 | SU319125 | 47 | 3.877 |
| SU300105 | SU320078 | 59 | 4.888 |



| A^B_C station | A^B_C grid_id |
|-------------------------------------|-----------------|
| REDBRIDGE RAILWAY STATION | SU373135 |
| ASHURST RAILWAY STATION | SU334101 |
| EASTLEIGH RAILWAY STATION | SU457190 |
| SHOLING RAILWAY STATION | SU447109 |
| MILLBROOK RAILWAY STATION | SU398126 |
| SWAYTHLING RAILWAY STATION | SU439159 |
| WOOLSTON RAILWAY STATION | SU439112 |
| BITTERNE RAILWAY STATION | SU438133 |
| ST DENYS RAILWAY STATION | SU431138 |
| HEDGE END RAILWAY STATION | SU496149 |
| TOTTON RAILWAY STATION | SU364132 |
| SOUTHAMPTON AIRPORT PARKWAY STATION | SU448170 |
| SOUTHAMPTON CENTRAL RAILWAY STATION | SU412121 |

| A^B_C 100m_grid | A^B_C nearest_station | 1.2 time | 1.2 distance \uparrow |
|-------------------|---------------------------|----------|-------------------------|
| SU430139 | ST DENYS RAILWAY STATION | 4 | 0.36 |
| SU445110 | SHOLING RAILWAY STATION | 4 | 0.36 |
| SU456187 | EASTLEIGH RAILWAY STATION | 4 | 0.36 |
| SU439135 | BITTERNE RAILWAY STATION | 5 | 0.36 |
| SU437112 | WOOLSTON RAILWAY STATION | 5 | 0.361 |
| SU495147 | HEDGE END RAILWAY STATION | 4 | 0.361 |
| SU331101 | ASHURST RAILWAY STATION | 4 | 0.362 |
| SU366135 | TOTTON RAILWAY STATION | 4 | 0.363 |
| SU439115 | WOOLSTON RAILWAY STATION | 4 | 0.364 |
| SU435134 | BITTERNE RAILWAY STATION | 5 | 0.364 |
| SU437114 | WOOLSTON RAILWAY STATION | 5 | 0.367 |
| SU447107 | SHOLING RAILWAY STATION | 4 | 0.367 |
| SU432137 | ST DENYS RAILWAY STATION | 4 | 0.367 |
| SU455188 | EASTLEIGH RAILWAY STATION | 4 | 0.371 |
| SU430136 | ST DENYS RAILWAY STATION | 4 | 0.373 |

NHS England Application: Travel time to GP Surgeries and Pharmacies

