GIS and future resource modelling

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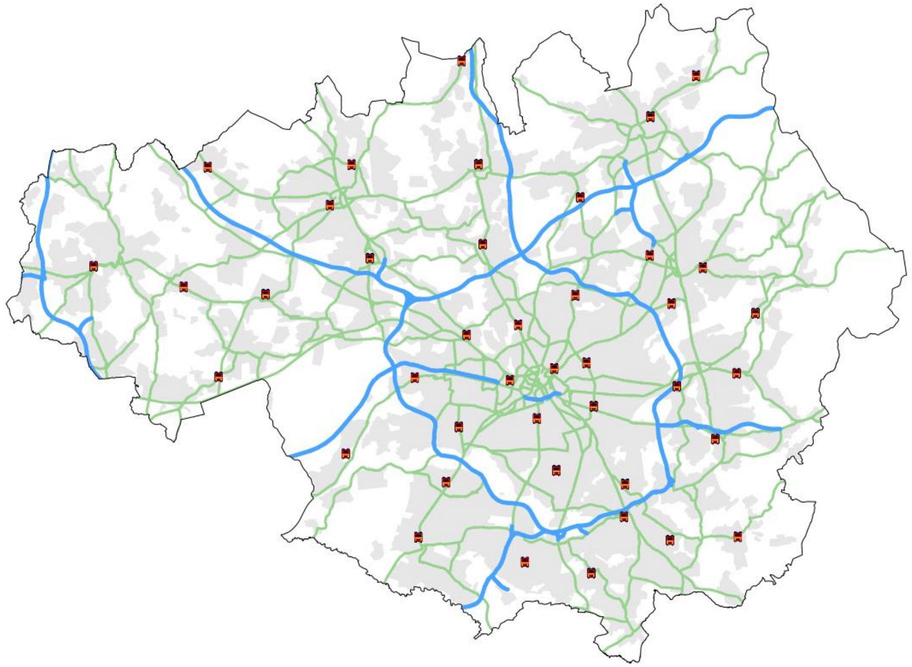
GREATER MANCHESTER FIRE AND RESCUE SERVICE

Introduction to GMFRS

Greater Manchester
- 496 square miles
- 2.8 million people

What we have now
- 41 Stations
- 56 Fire Engines
- 32 Special Appliances
- 1291 Firefighters

What we do (2016)
- 64,900 emergency calls
- 35,500 incidents
    - 12,600 fires
    - 8,500 special service (road traffic collisions, flooding, technical rescue, cardiac arrests)
- 65,000 mobilisations
- National and international resilience (USAR/ISAR)
- Cardiac Arrests and GMP incidents
- 35,000 Safe and Well visits



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Current situation

Currently need to save approx. £14.79m over the next four years. Most of this will come through changing shift patterns/crewing.

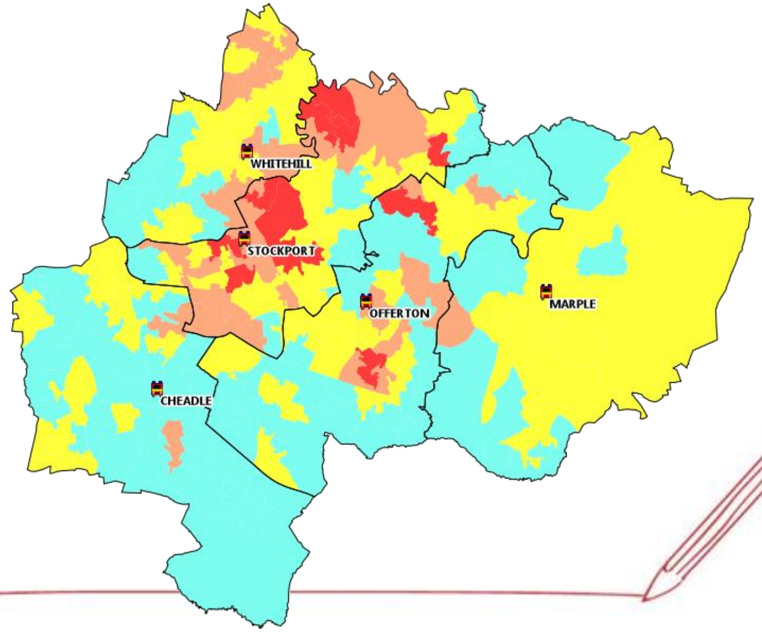
However this presentation will concentrate on:

- Station relocation
    - Stockport / Whitehill
    - Manchester Central
- Standby Moves

Stockport and Whitehill

Stockport is generally a medium to low risk borough, however in Stockport station area we have long-standing areas of high risk and high incident numbers.

Additionally our response times to the Brinnington area is always above our average – consequence of the road and motorway network.



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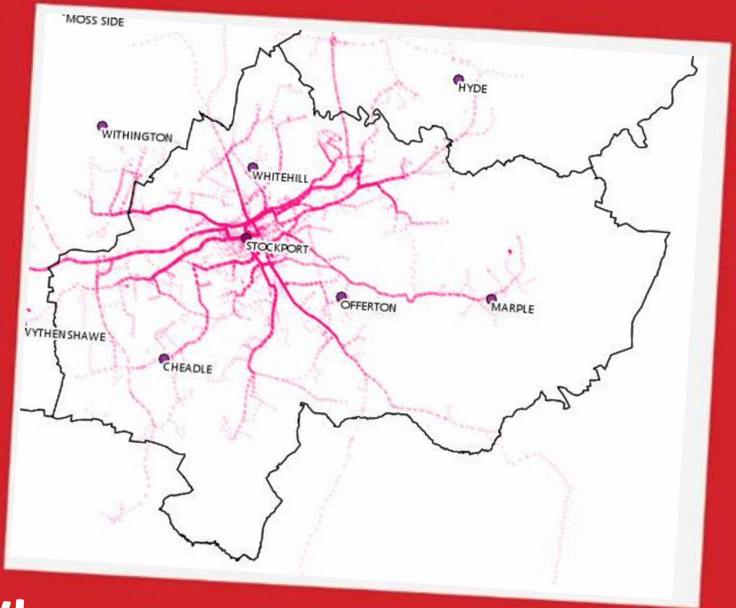
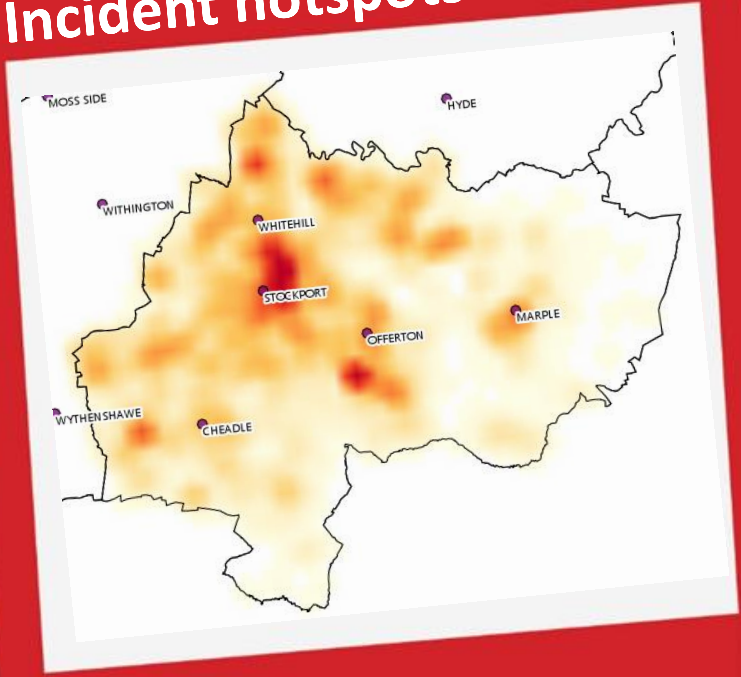
Stockport information – where to locate a station

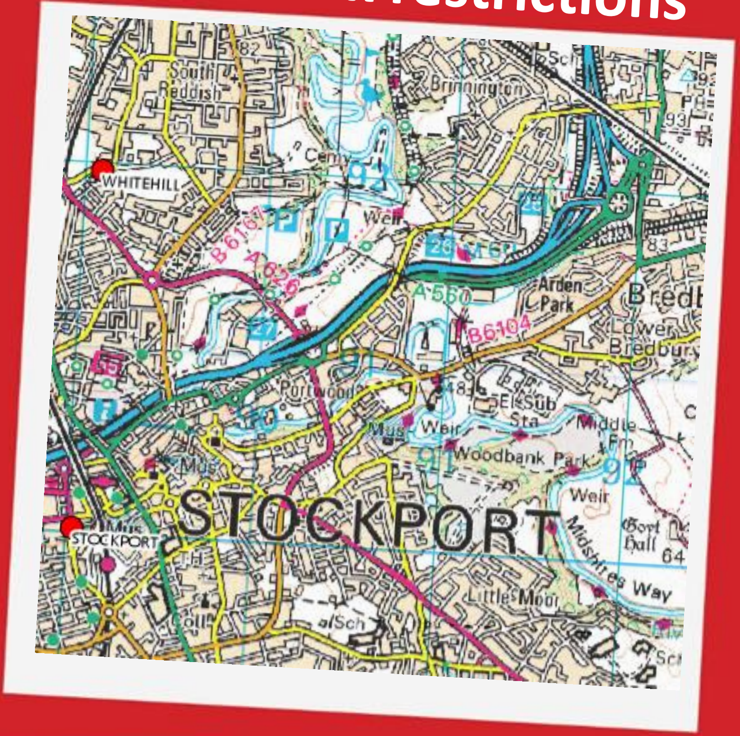


Where does the pump travel?

Incident hotspots



Road network restrictions



To decide on some possible locations, looked at the road network, mobilisations, incidents, potential areas of land that might be free.

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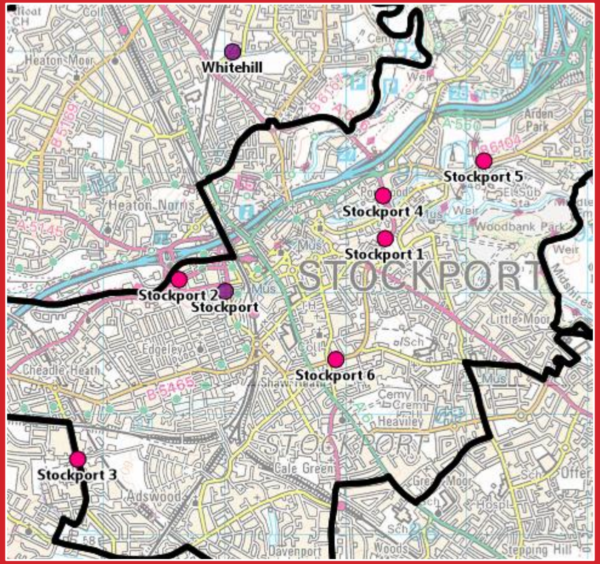
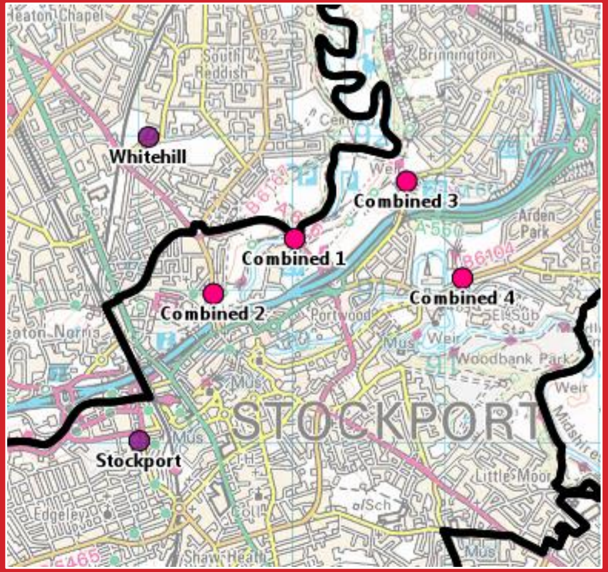
Potential locations



Potential new Stockport locations.

Potential new Combined station locations.



Created a new Route Cost Database with potential new stations as bases

Created new appliance sets, one with each of the new stations replacing Stockport/and Whitehill where appropriate.

Run the turnout model using each new appliance set using batch functionality.

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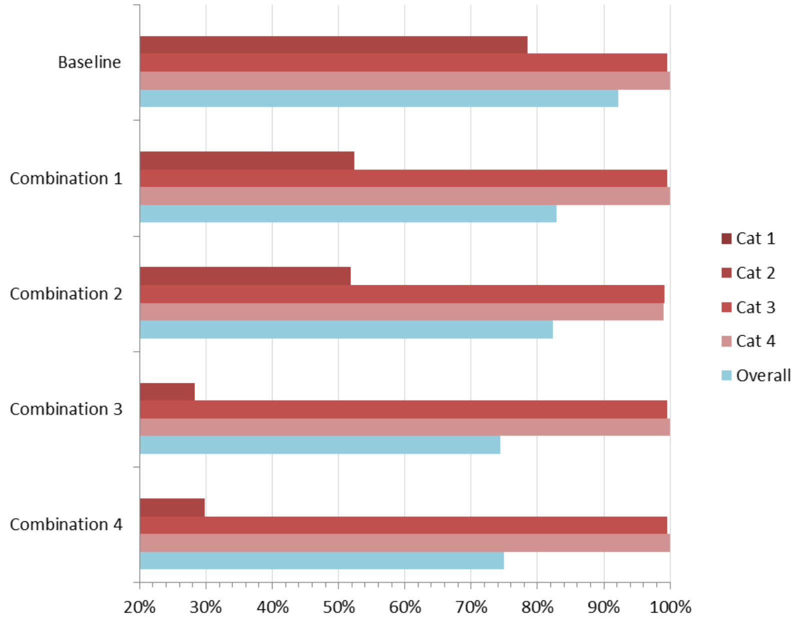
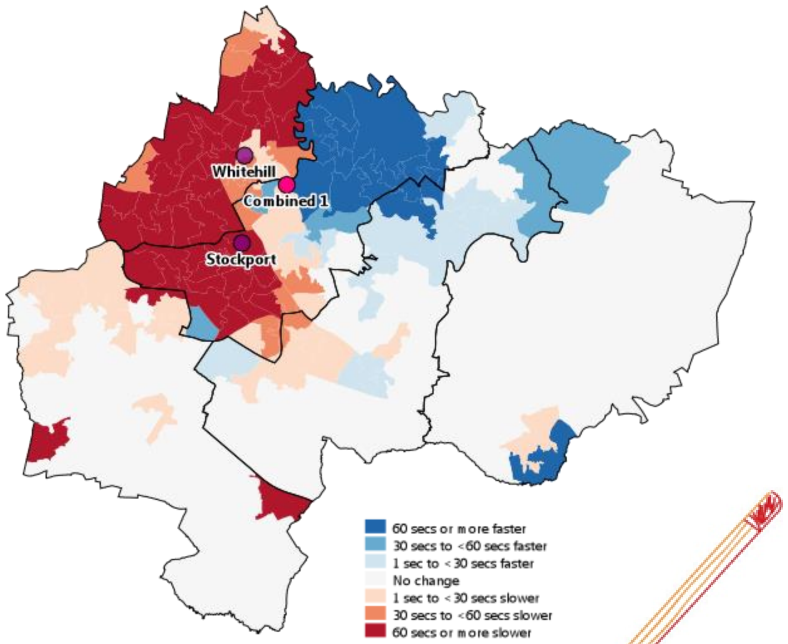
Stockport results

After results had been exported, compared each option against the basecase.

Examples below are the change in response performance in Stockport borough and the time difference by LSOA across Stockport borough.

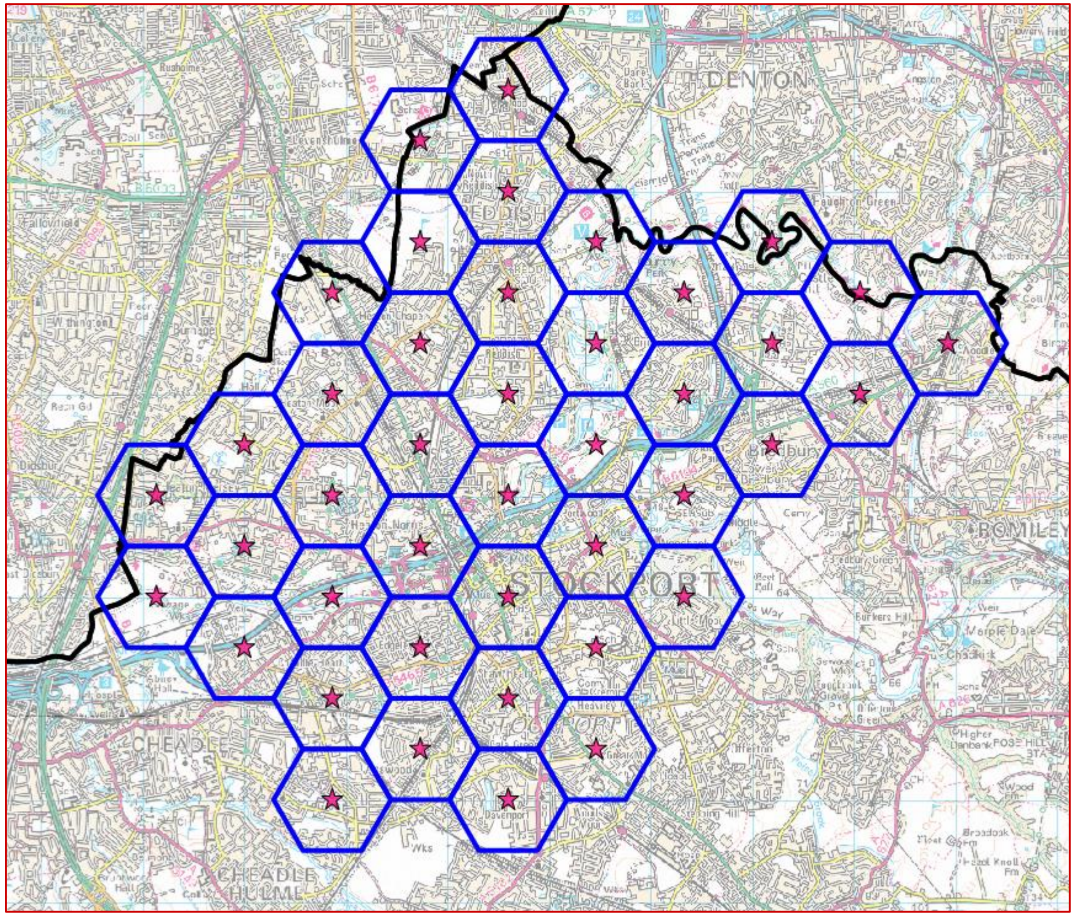




Where else?

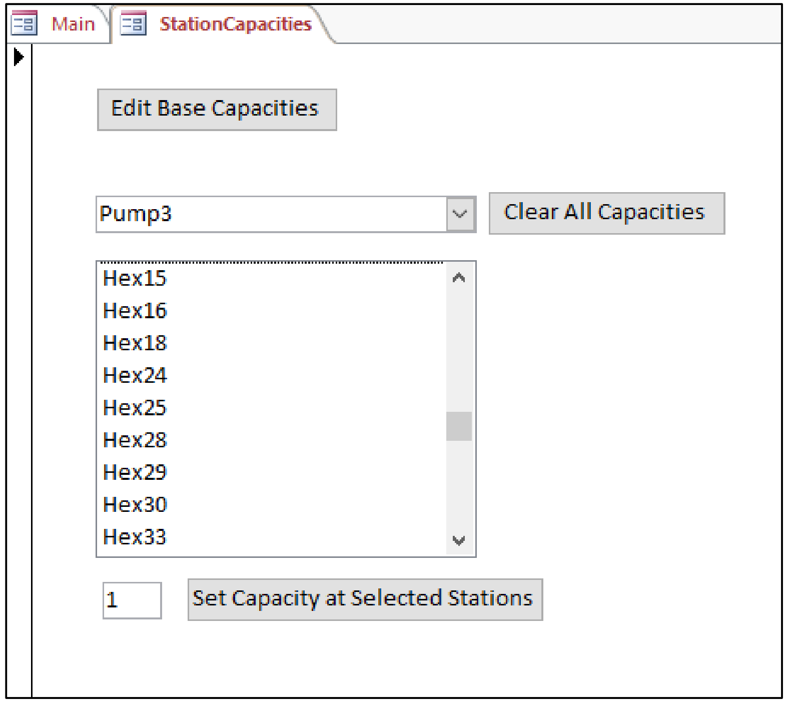
Less scientific method –

- Created a hexagon grid and a ‘station’ in the middle of each one.
- Snapped the point to the nearest main road.
- Full coverage of both Whitehill and Stockport station area
- Created new RCDB with the 42 extra stations.

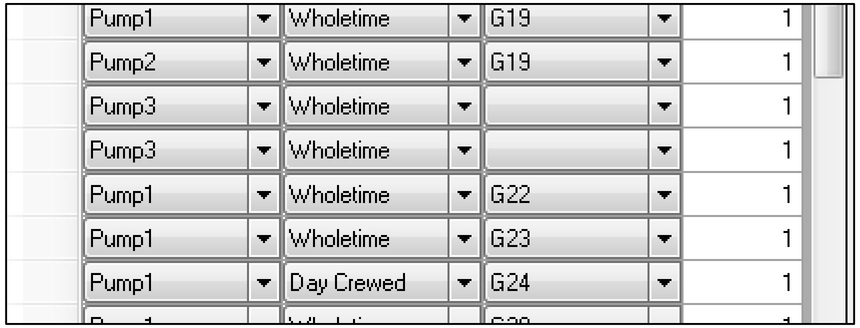


WLM floating resources

- Decided to let the WLM decide which of the new ‘Hex’ stations would be a good location.
- Created a new pump type just to differentiate it, and set the Base Capabilities (in MS Access) so that one could be located in any ‘’Hex’ station.
- In Map Modeller, removed the pumps from Stockport and Whitehill and left the station blank so that WLM could allocate the resource to the best location.
- Run ‘Predict’ and in the first attempt the two appliances were not used at all! This was because all the demand could be satisfied without the use of these two pumps.



Setting station capacity



Pump1	Wholetime	G19	1
Pump2	Wholetime	G19	1
Pump3	Wholetime		1
Pump3	Wholetime		1
Pump1	Wholetime	G22	1
Pump1	Wholetime	G23	1
Pump1	Day Crewed	G24	1

Creating floating pumps in WLM

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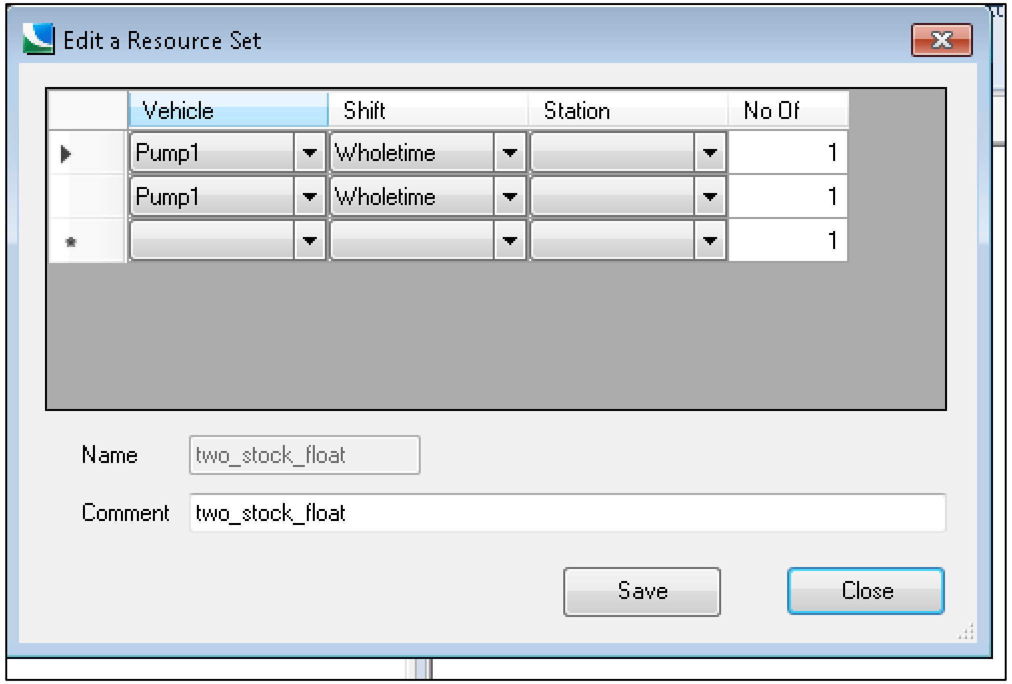
WLM floating resources

- Created a dummy scenario by filtering the incidents to just those in Stockport borough and having just the two floating resources on the run.
- Predict works by allocating a resource every hour and the results show this split by day and hour of the day.
- Summed this data up for the entire week, chose the top four options and repeated modelling as before.
- Two best locations were similar to the best Combined location from previous modelling (reassuring!)



Creating floating pumps in WLM using dummy scenario

	Hex5	Hex50	Hex51	Hex52	Hex53	Hex54	Hex55	Hex1	Hex58	Hex44	Hex6
Hour	Hex5	Hex50	Hex51	Hex52	Hex53	Hex54	Hex55	Hex1	Hex58	Hex44	Hex6
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	2	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	1	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	1
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	1	0	0	0	0
11	0	0	0	0	0	2	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	1	0

Results from Predict. Shows how many pumps were allocated to that station split by hour and day.

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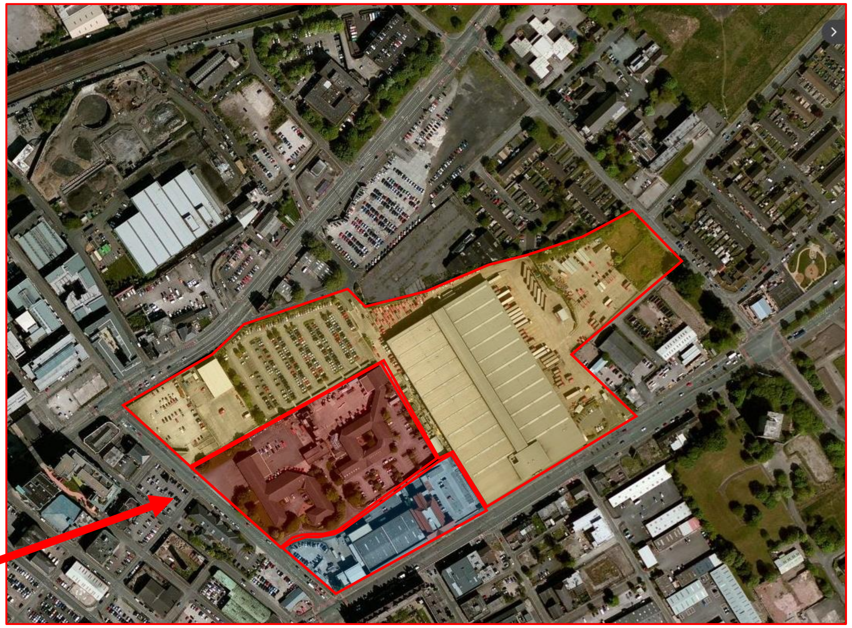
Manchester Central

New Cross regeneration zone.

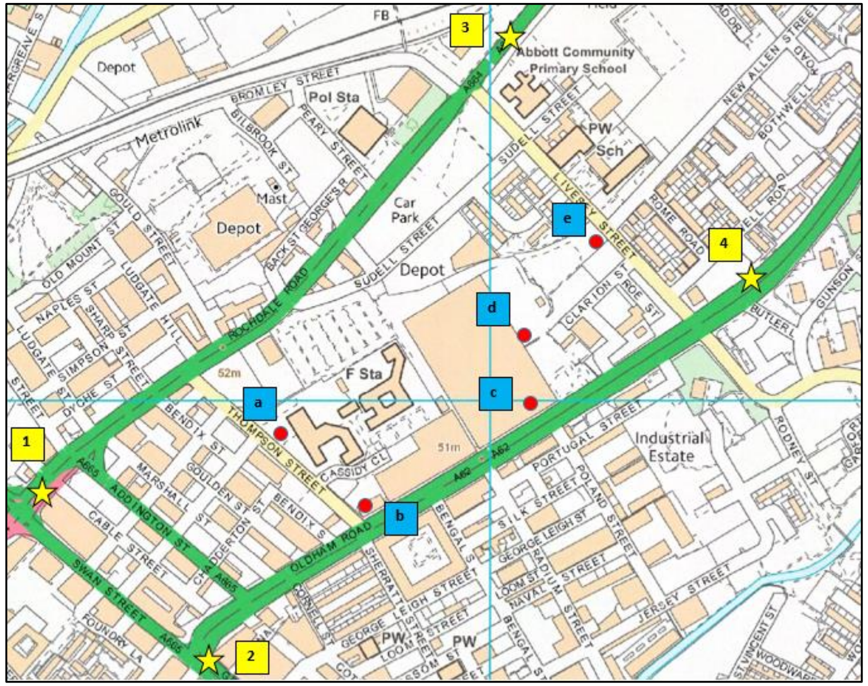


Manchester Central station and Training and Development Centre are in the red area.

- Manchester Central and TDC are just outside the city centre.
- Falls within one of Manchester City Council’s regeneration zones – New Cross.
- New training site due to open in Bury in 2017.
- Need a fire station to remain in this location.

Manchester Central – On Site Relocation

- A potential option is that Manchester Central can remain within that same block but not necessarily in the exact same location, depending on developer plans.



- Used the routing tools in Cadcorp to measure the time difference between the current location A and the other possible exits, to the four starred points.
- The routing used the roadspeeds which have previously been calculated using AVLS tool.
- Location C which is currently the Post Office was the second best option after A.

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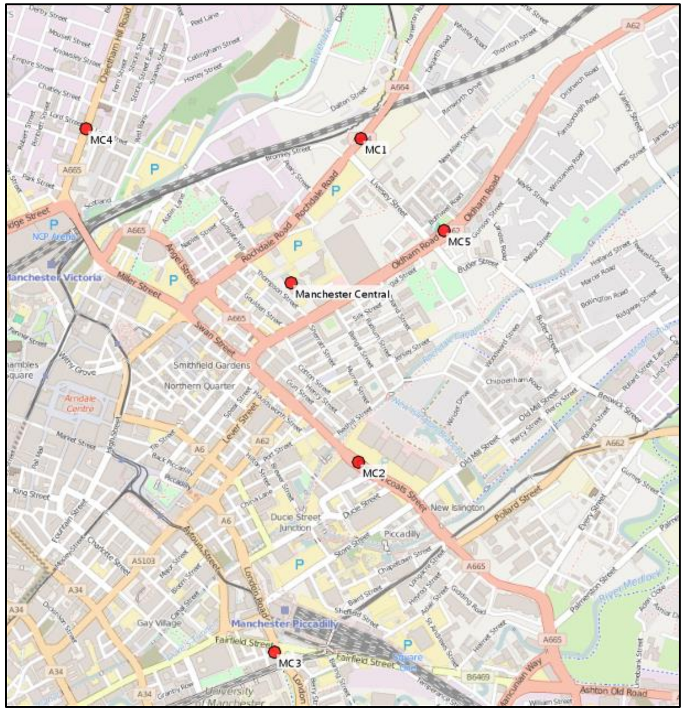
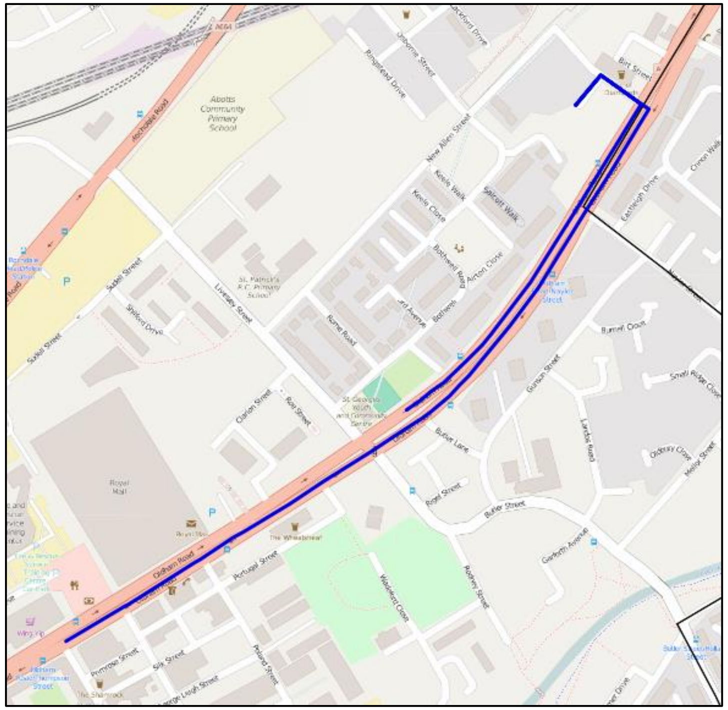
Manchester Central – different location



Potential Manchester Central locations

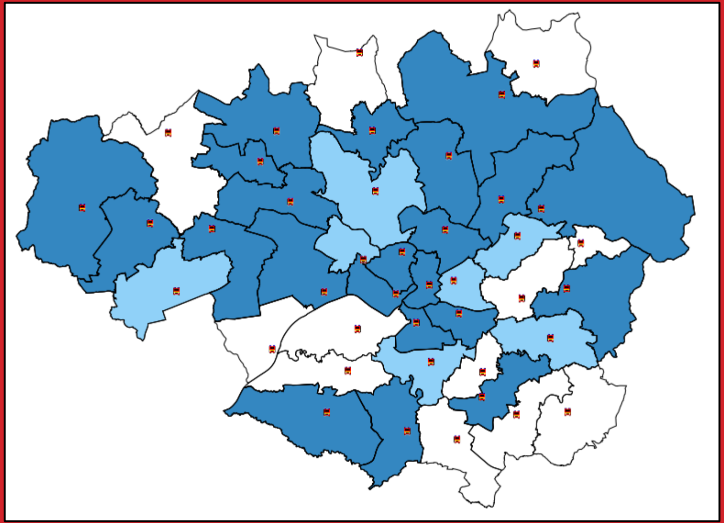


Road network issues!

- Also did a similar exercise to the one in Stockport to create potential new locations and run models in a similar fashion.
- Surprised by results for MC5, which is also on Oldham Road.
- Used Measure Route to determine where the pump was going. From the created location it could only turn left and then turn back on itself further along – hence longer response times than expected.

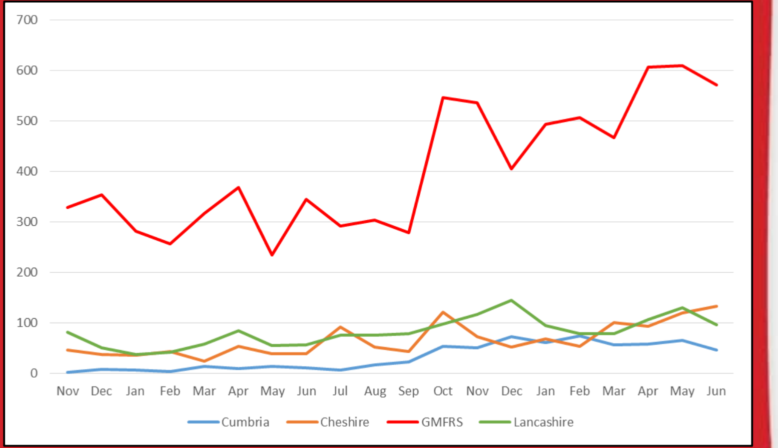
Standby Moves

We currently have 29 key stations – which are also used by NWFC to mobilise standby appliances. The aim is to have all the key stations (blue) covered at all times.



GMFRS key stations

Number of standby moves at NWFC



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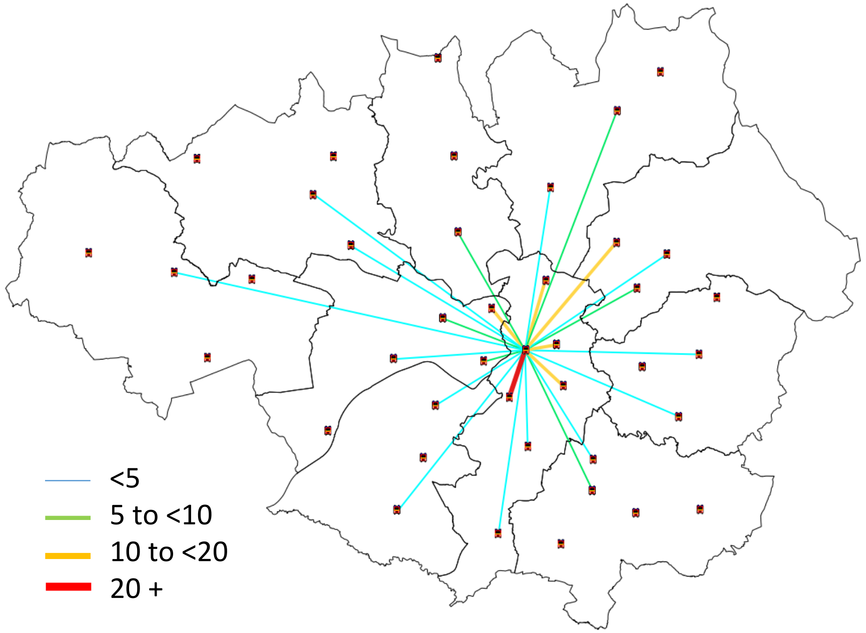
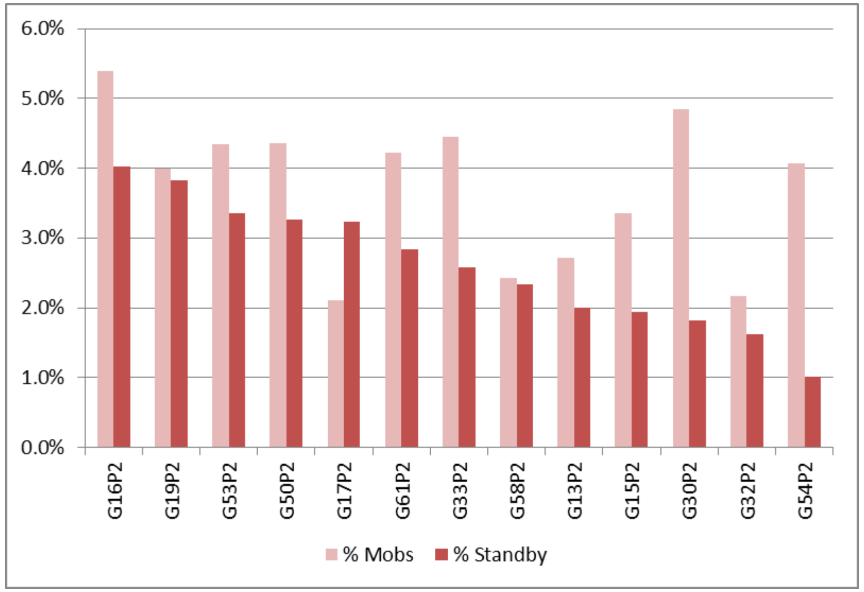
Standby Moves - Issues



- Using routing tools we calculated the total distance travelled by each pump. Most standby moves are not further than five miles however are very frequent.

- The map shows where Man Central P2 travels to – often short distances, but sometimes nearly 15 miles away.

- The table shows the % utilisation for incidents and standbys. Some 2nd pumps travel more to and from standbys than incidents.



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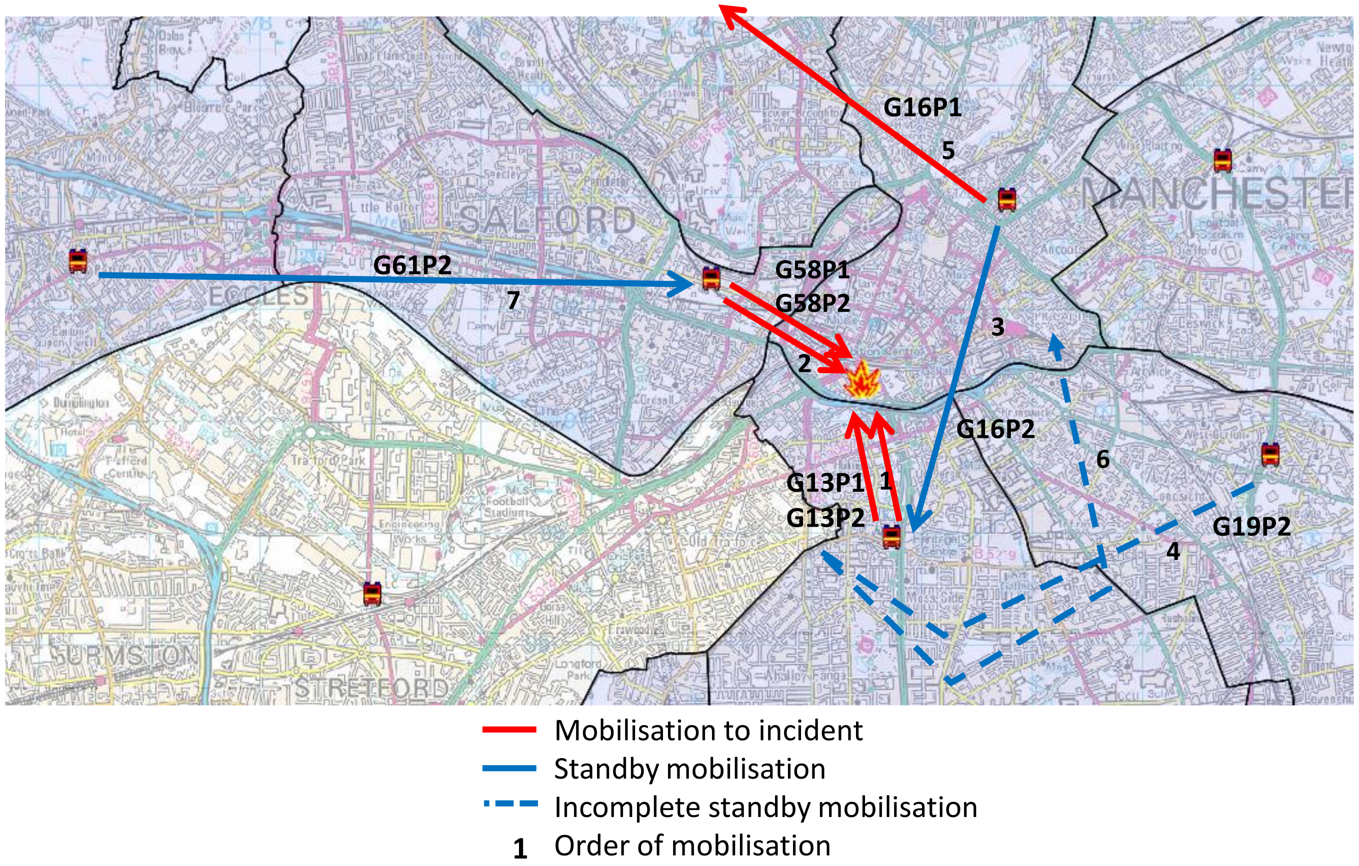
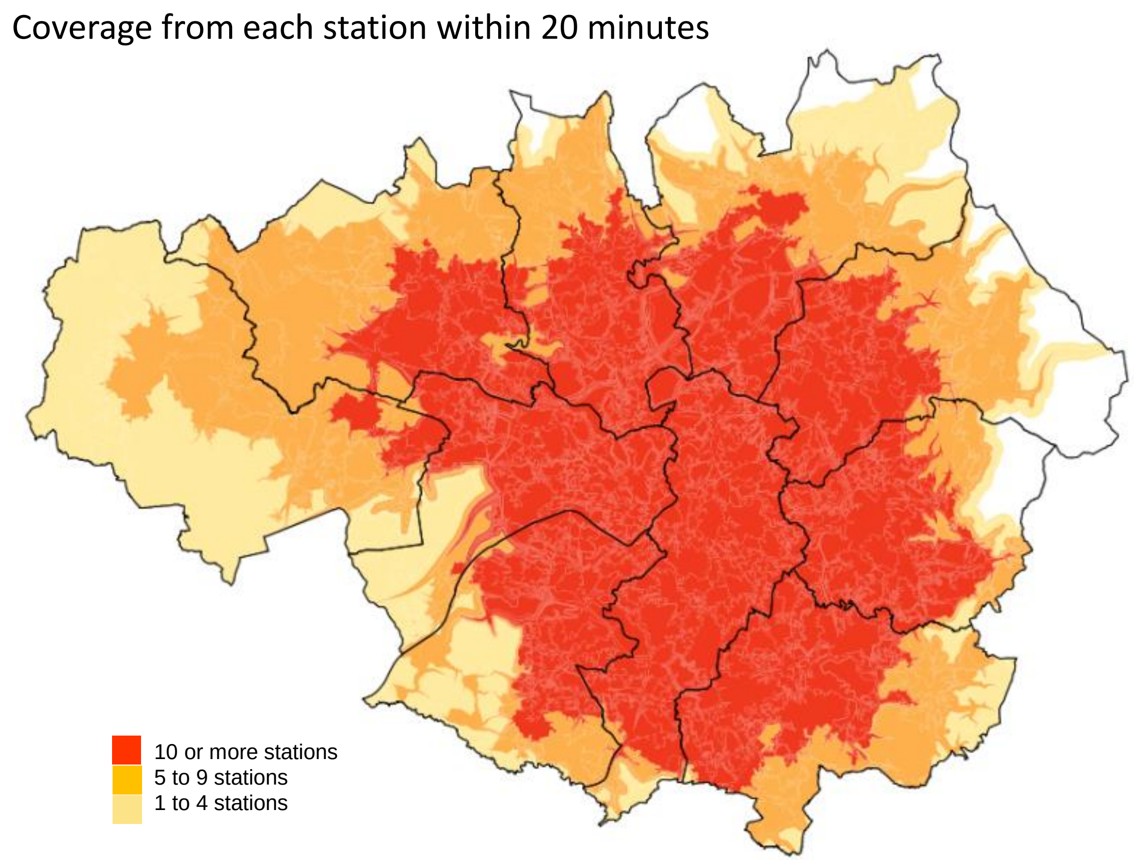
Standby Example

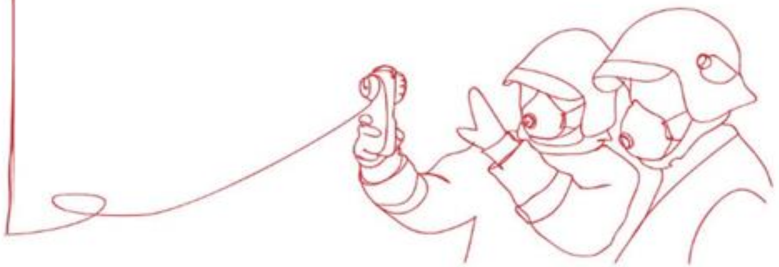


Created a geographical timeline for some incidents to show how pumps were crossing paths to provide cover and how many standbys can occur for single incidents.

GMFRS Coverage

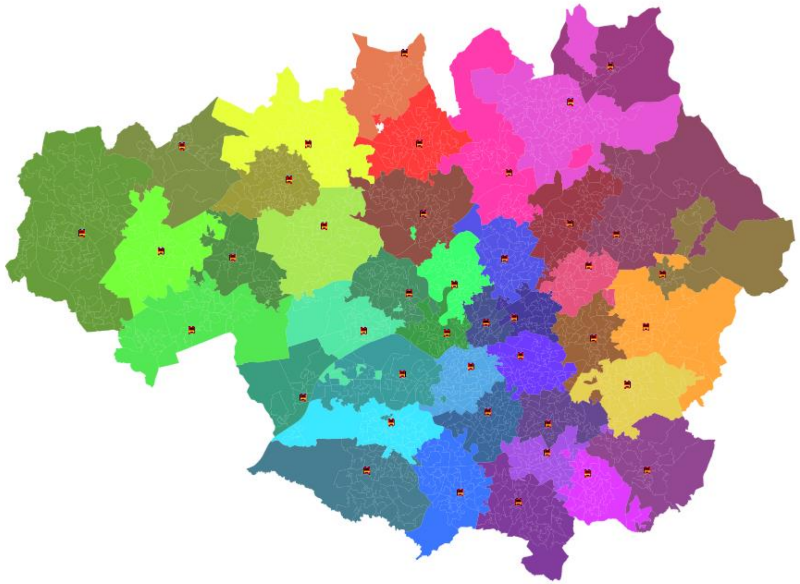


- Each station has an isochrone created between one and 30 minutes.
- The overlap between all 20 minute isochrones was calculated to show the amount of overlap between stations in Greater Manchester.

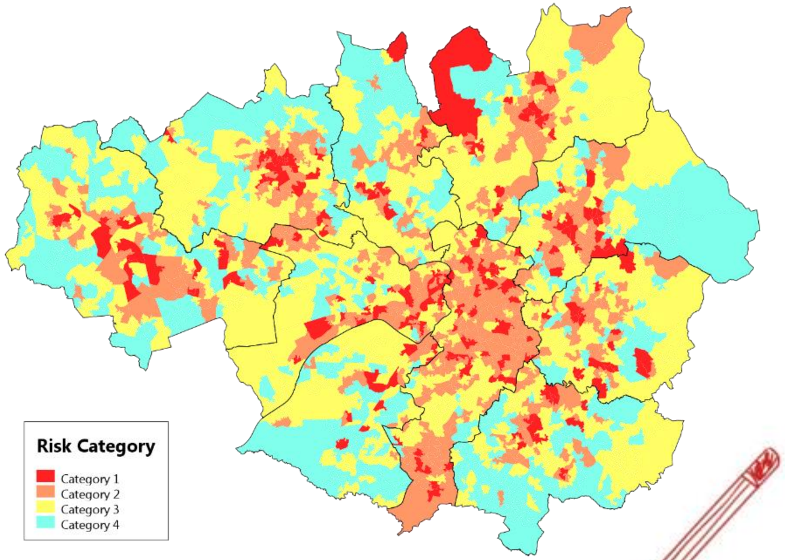


Creating Standby Zones

Decided to create larger standby zones rather than have many smaller station areas.



Risk model underpins a lot at GMFRS so used to group station areas.



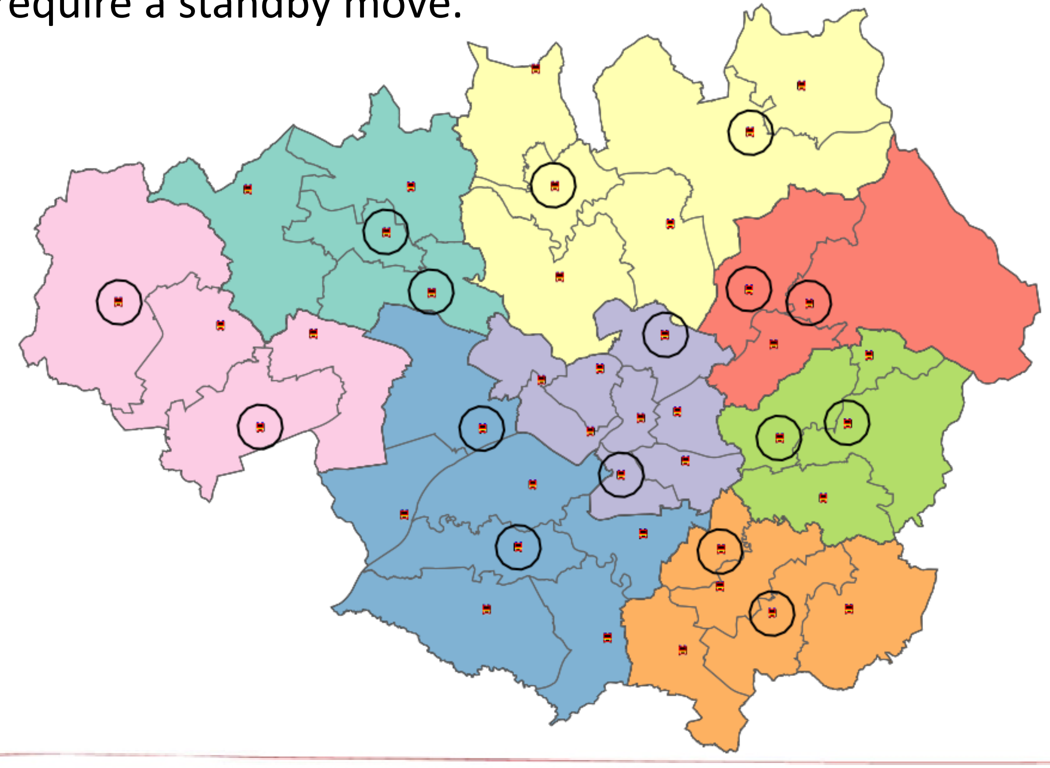
Which station's pump is mobilised most to each LSOA. Different pattern to current station areas.

Info Used

- Where pumps travel
- Incidents
- Road network
- Station coverage
- Risk model
- Historical standby moves

Proposed Standby Zones

Proposed standby zones. Each one will require two pumps to be available at all times.
The circled stations are those which should be mobilised to should the zone still require a standby move.

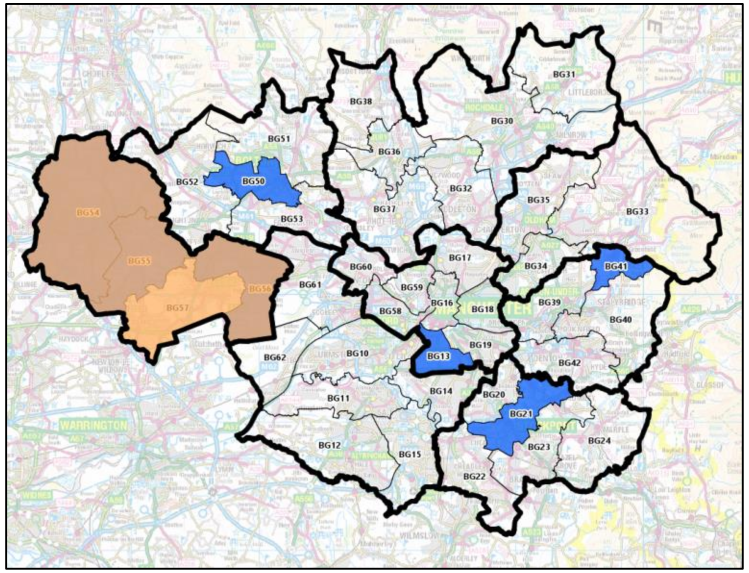


These stations were determined using isochrones to provide greatest geographical coverage within each zone.

Standby Moves Testing

A desktop exercise using simultaneous activity calculations was undertaken initially so show that standby moves should reduce by over 90%.

The zones have been added into NWFC mobilising system. Two rounds of testing have been undertaken and the system is working as planned.



Prototype coverage map

What Next?

- Final approval by CLT
- Implementation in live system at NWFC
- Guidance written for CR operatives and GMFRS staff
- NWFC Coverage Map amended (on the big screen in control room)

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Any Questions? ☺