

Innovation in Winter Service



Russell Martin

Highway Maintenance Manager

Leeds City Council
Highways and Transportation





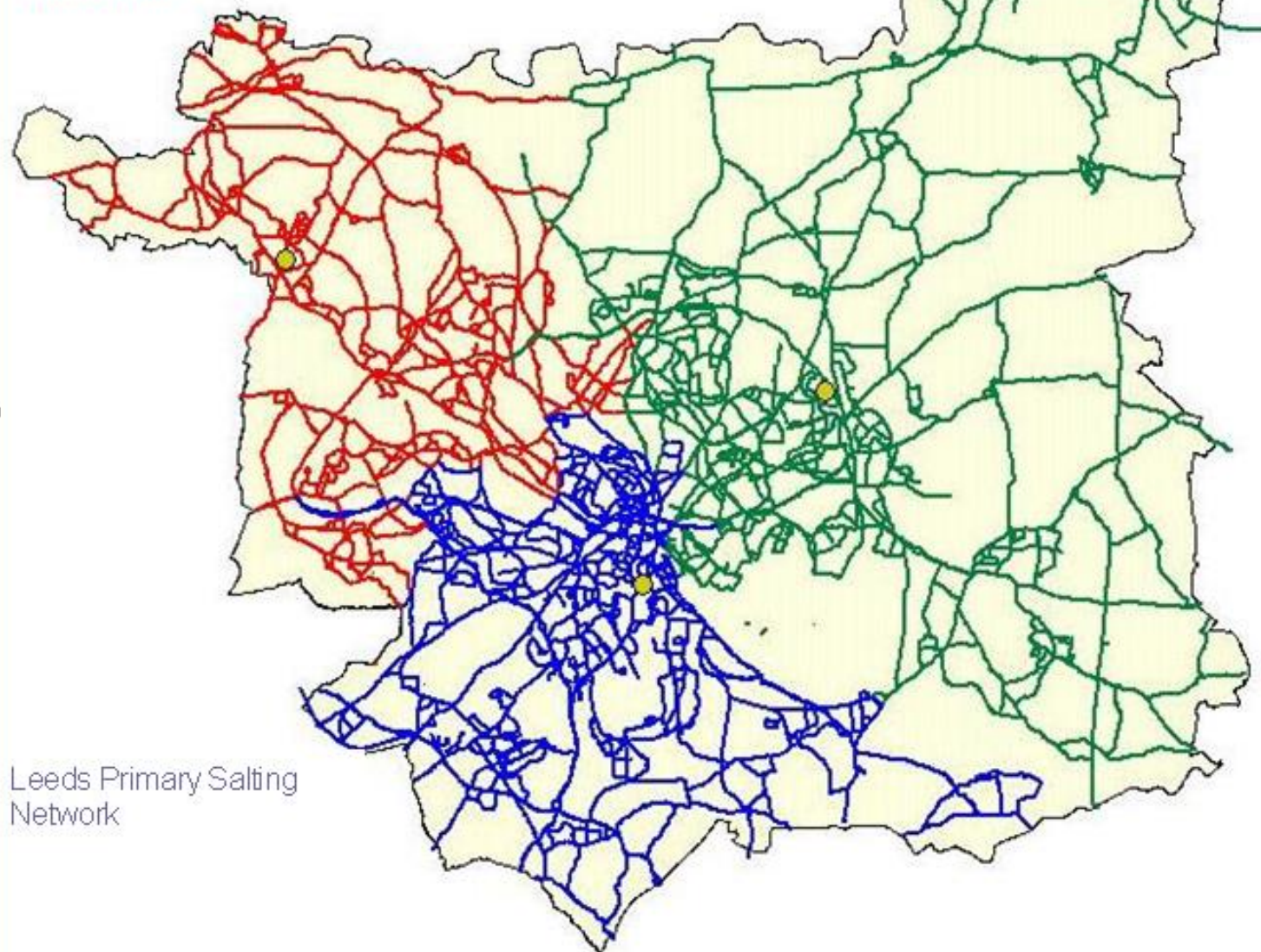
Statistics

- £21 Billion Economy
- Third largest city in the UK
- Population: 800,000 (plus)
- 26 Million Visitors per year
- 3,000 Km of road
- 5,500 Km of footway
- 146,000 gullies
- 92,000 street lights

Pottery Fields Routes

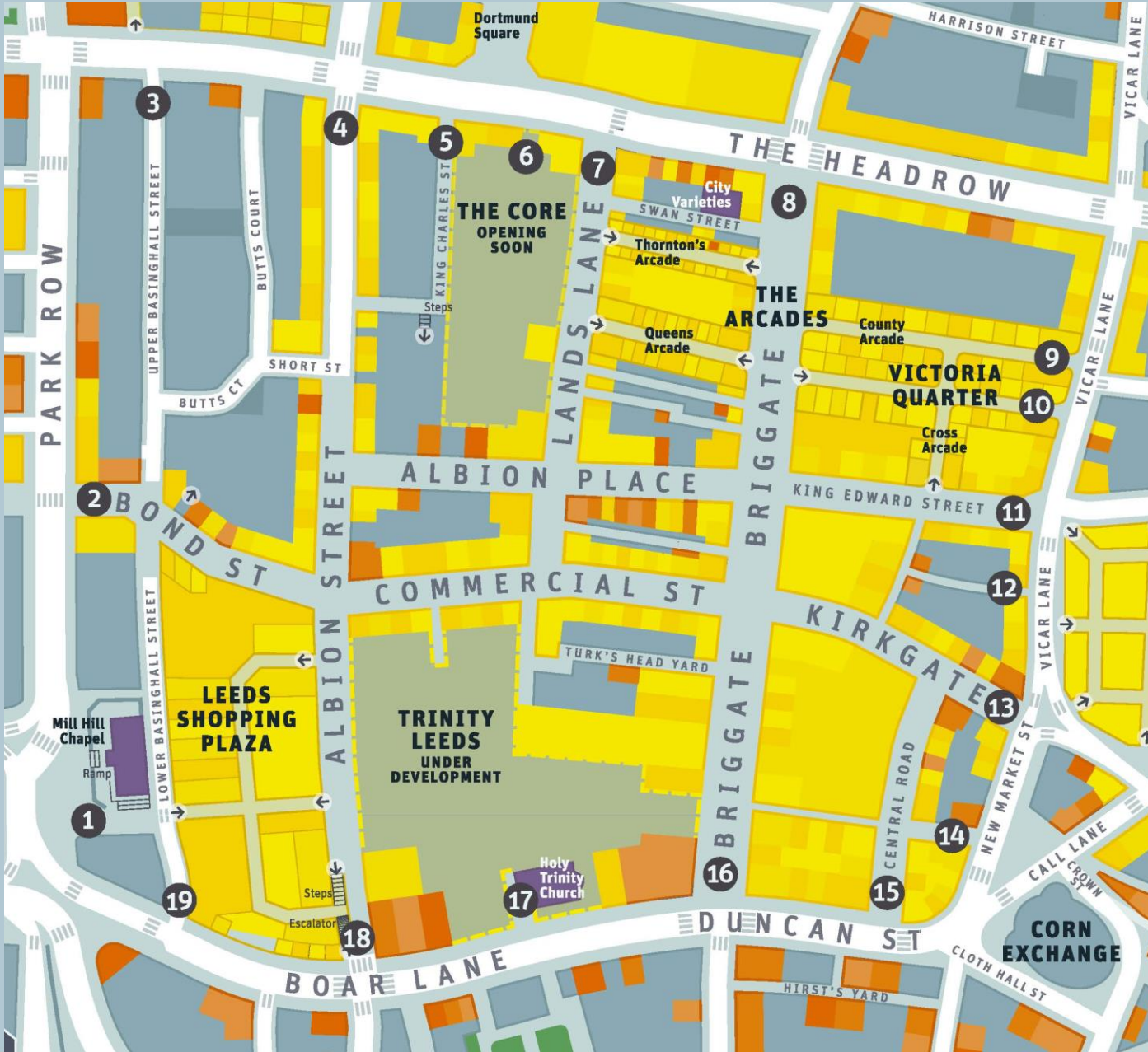
Seacroft Routes

Henshaw Routes



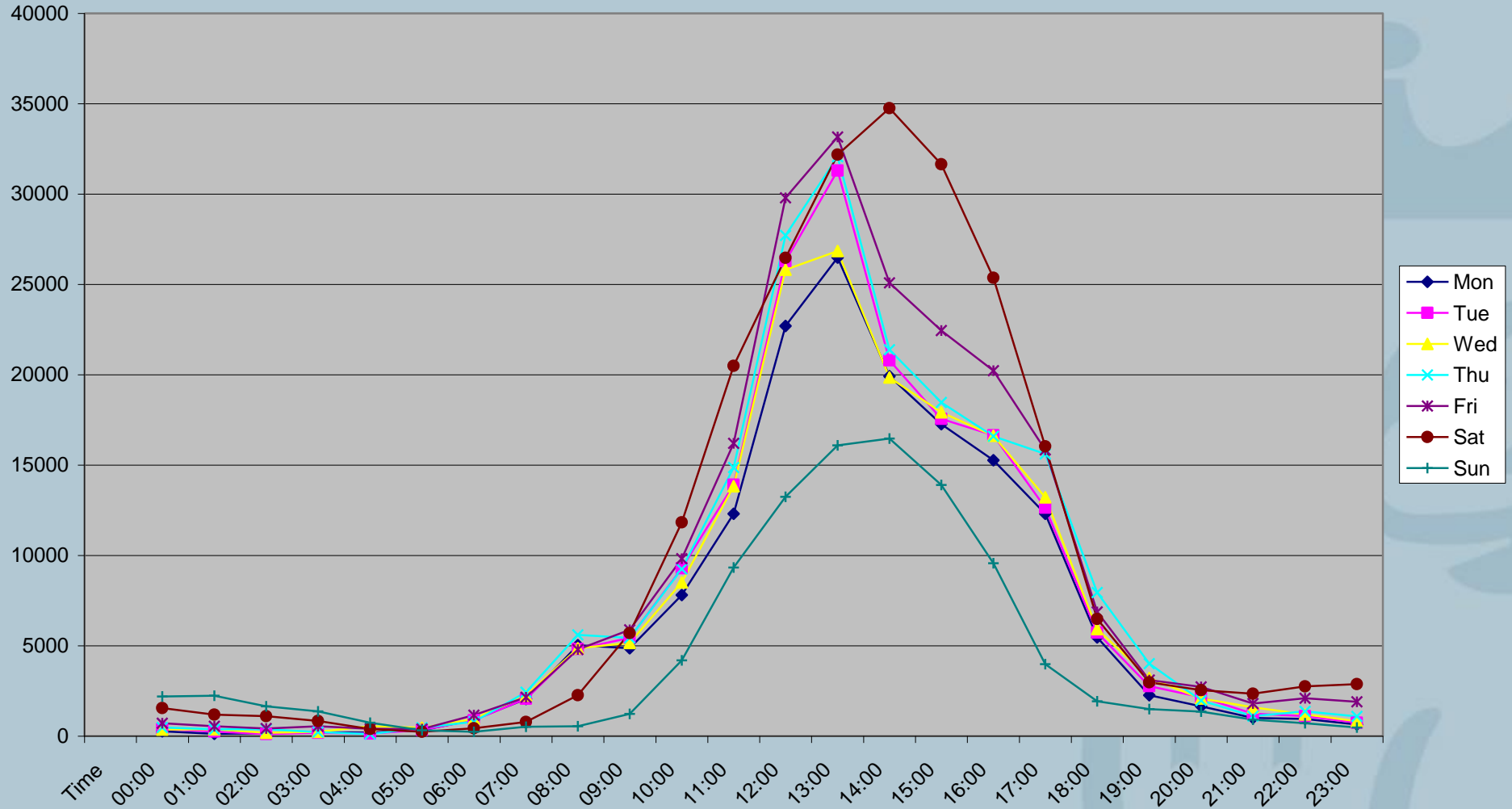
Leeds Primary Salting Network

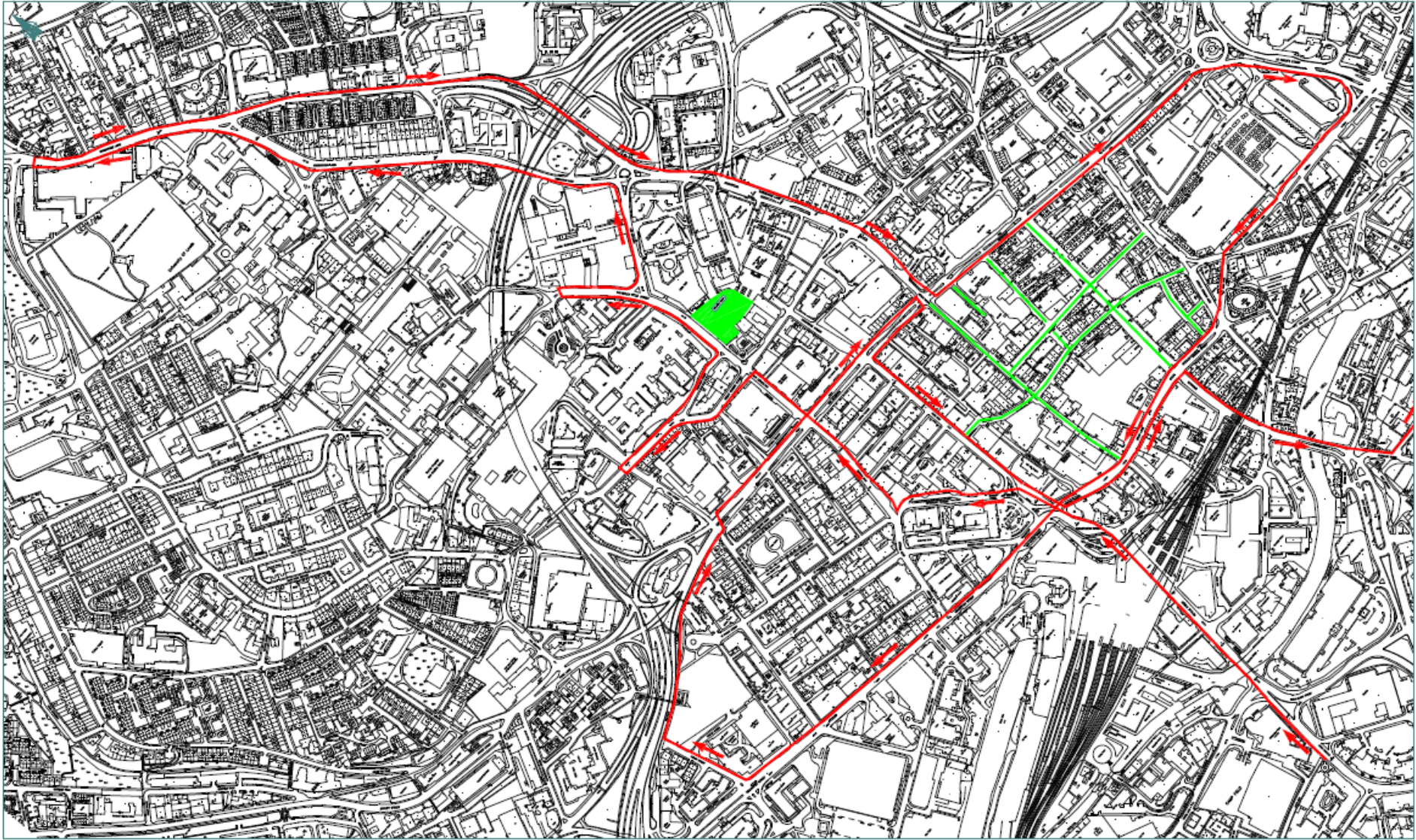
City Centre Pedestrian Cordon



- 1 BY MILL HILL CHAPEL
- 2 BOND STREET
- 3 UPPER BASINGHALL STREET
- 4 ALBION STREET
- 5 KING CHARLES STREET
- 6 THE CORE
- 7 LANDS LANE
- 8 BRIGGATE
- 9 COUNTY ARCADE
- 10 VICTORIA QUARTER
- 11 KING EDWARD STREET
- 12 FISH STREET
- 13 COMMERCIAL STREET/
KIRKGATE
- 14 LEADING TO CENTRAL
ROAD
- 15 CENTRAL ROAD
- 16 BRIGGATE
- 17 BETWEEN HOLY TRINITY
AND BANK STREET
- 18 ALBION STREET
- 19 LOWER BASINGHALL
STREET

Hourly Breakdown of Footfall Week Commencing 25 July 2011





**LEEDS CITY CENTRE
FOOTWAY LINK ROUTES**

- LINK ROUTE
- PEDESTRIAN WALKING ZONE

APPROVED
DATE APPROVED

DRAFT

DESIGN	CHECK	DATE

DESIGNED BY	DATE
APPROVED BY	DATE
DRAWN BY	DATE
CHECKED BY	DATE
INDEXED BY	DATE

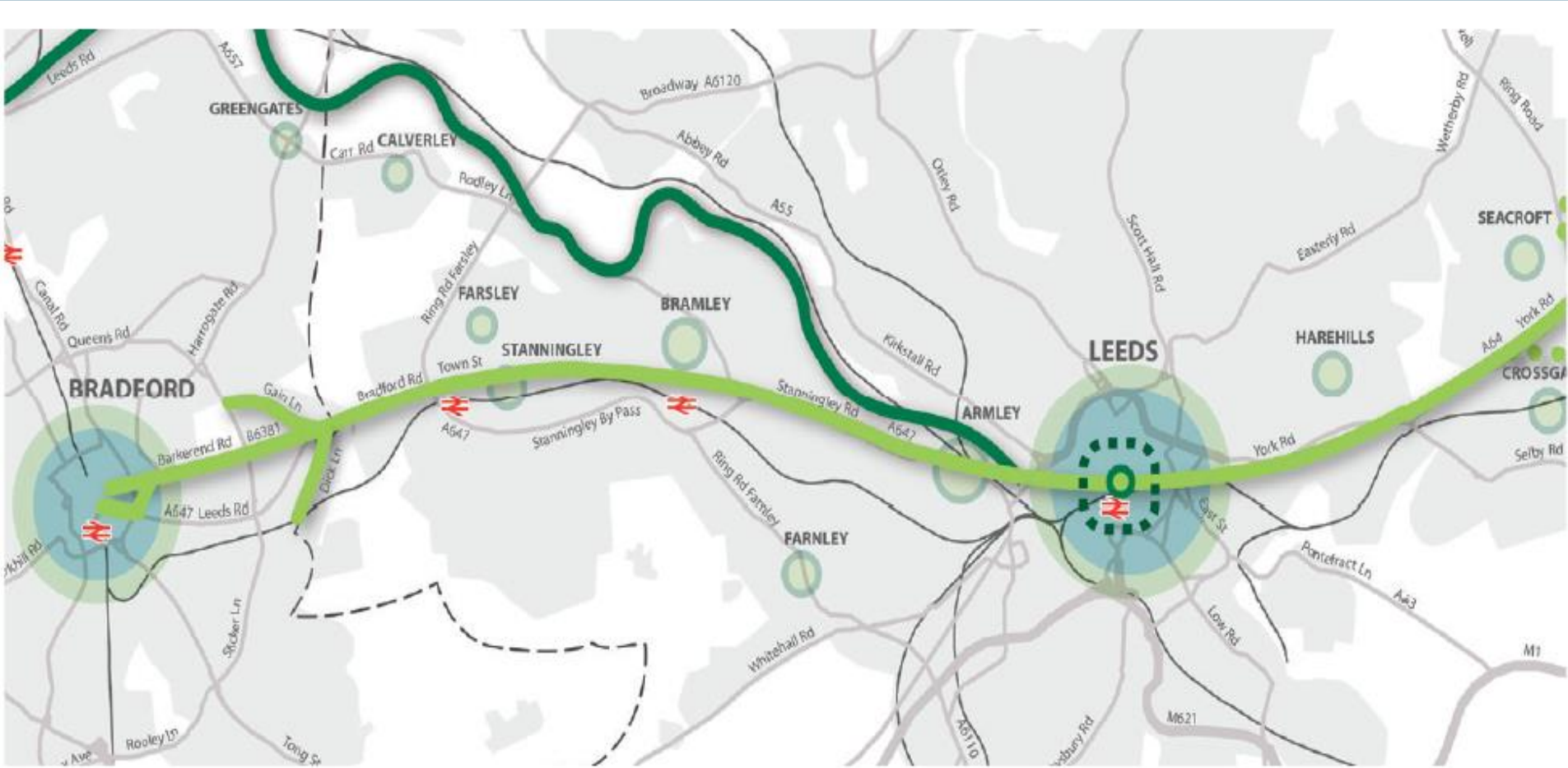
SCALE
N.T.S

sheet No. **A1**



DRAWING NUMBER
HM/PF/GRIT

DATE **September 2011**



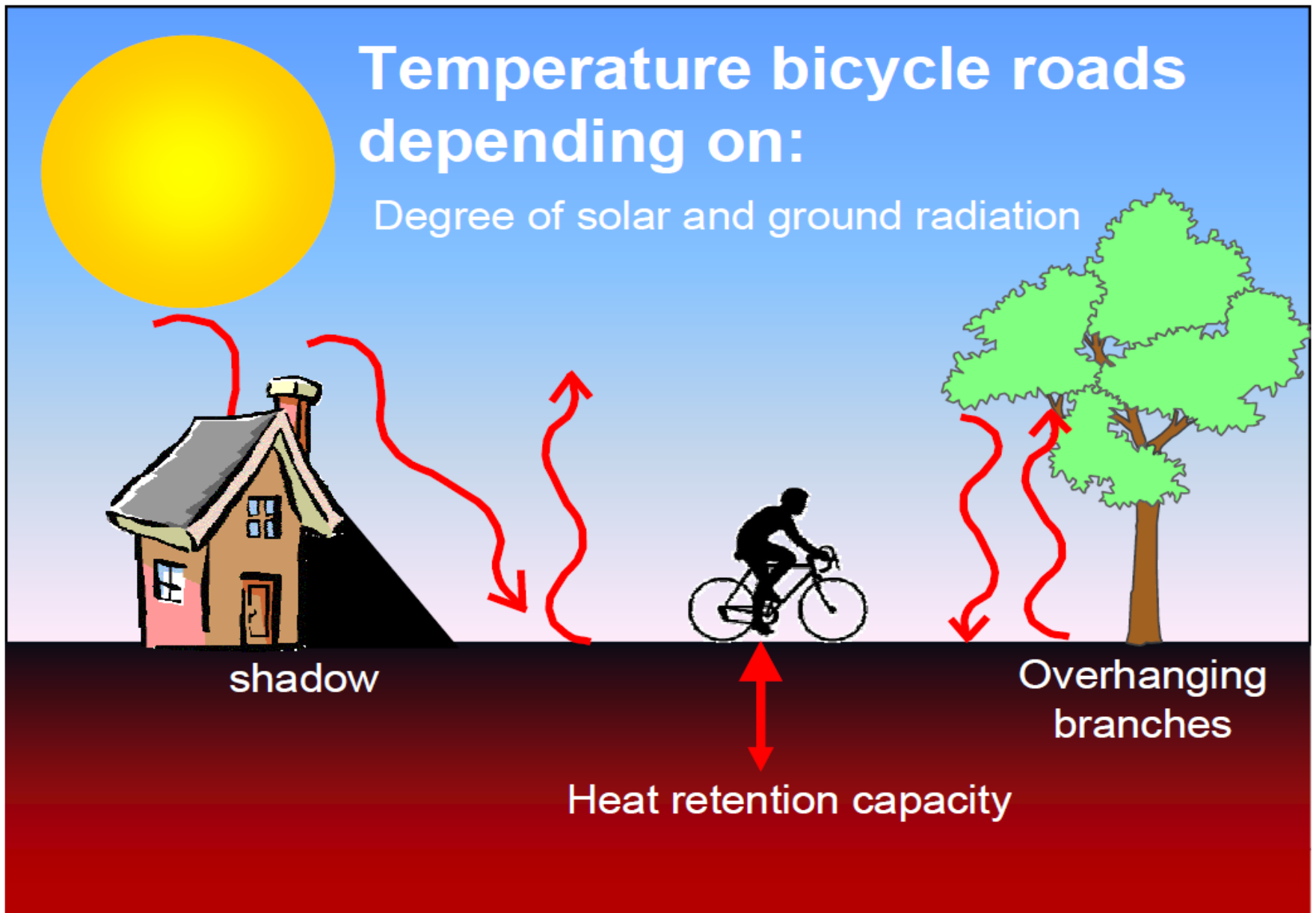
City Connect Project

Factors Influencing Road Surface Temperature (RST)

- **Time of Day** – max early afternoon, min-dawn
- **Solar Radiation**- much less in winter
- **Cloud cover**- Prevents warming in day, aids warming at night
- **Seasonal variations**-
- **Latitude**- affects length of day- solar radiation
- **Altitude**- Higher generally cooler, 6 deg.c. per 1000m
- **Sky view factor**- Amount of visible sky
- **Proximity to water**- Tends to aid warming at night
- **Topography**- Roads in cutting, tree lined-warmer
- **Road Construction**- greater depth of construction=warmer
- **Urban Heat**- Buildings generate heat
- **Traffic** – More traffic= warmer roads

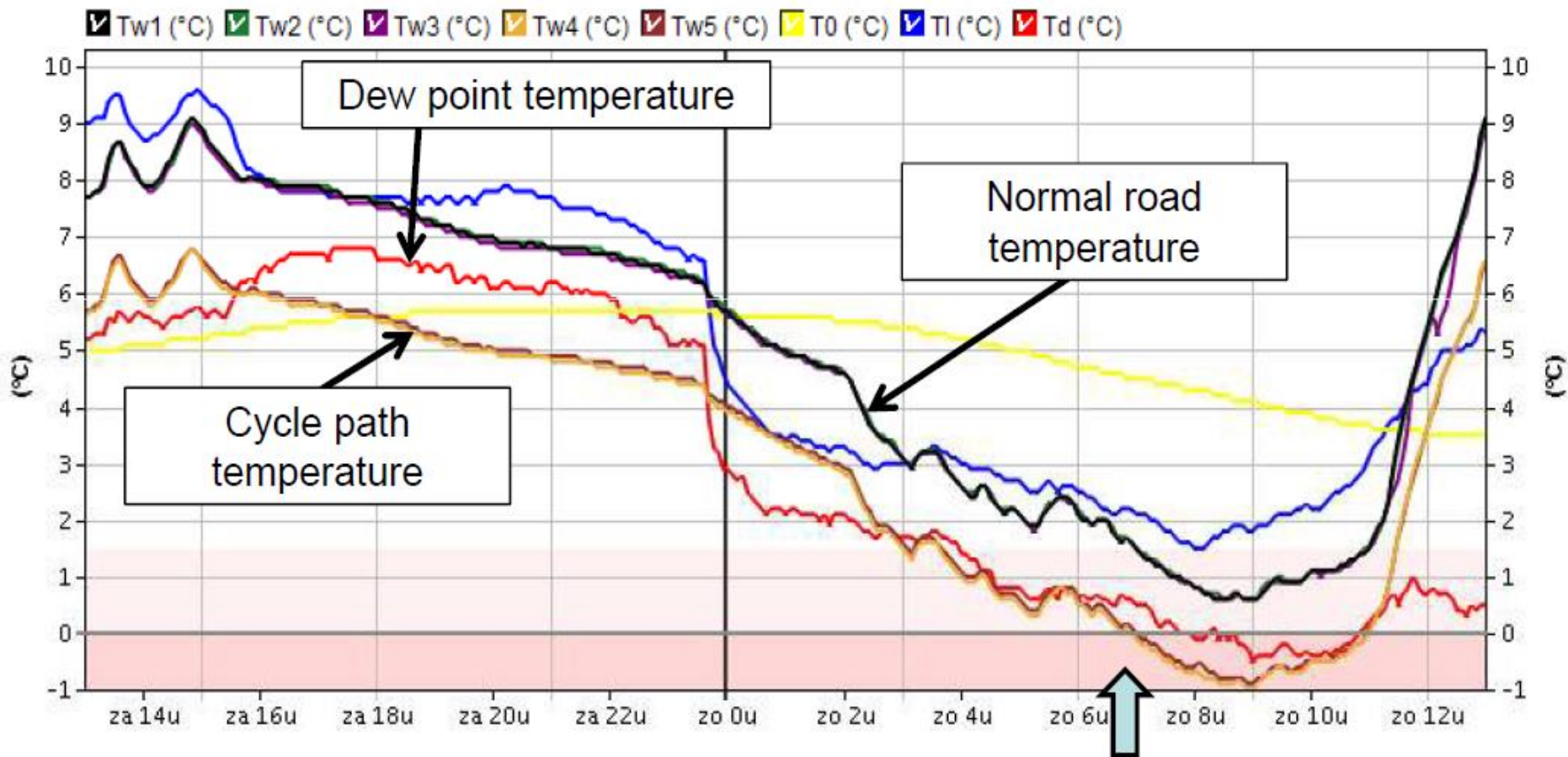
Temperature bicycle roads depending on:

Degree of solar and ground radiation



Cycle path temperature

DAR Van Apelterenweg (2886,1)



Summary of Factors Influencing Cycle Path Temperature

- Cycle paths can be 1-2 degrees colder than a normal road
- Cycle paths are likely to drop below freezing point before a normal road
- Cycle paths will stay below freezing point longer than a normal road
- Cycle paths stay wetter longer: increases the risk of freezing
- Cycle paths are more prone to Hoar Frost due to their lower surface temperature

Physical Constraints

- The route is approximately 32 km long and with an average treated width of 1.5 m this equates to a treatment requirement of 48,000 sqm.
- If we were to use normal rock salt to treat the route this would equate to 720kg for a normal precautionary grit. So a good carrying capacity is required.
- The route is relatively narrow and runs parallel to a footway.
- Movement around bus stops is quite tight so good manoeuvrability must be considered.
- The route is essentially of thin construction so equipment weight and footprint need to be kept low.
- Vehicle speeds will have to be kept low for safety reasons.

Physical Constraints (Cont'd)

- Treatments will generally have to be planned at times of low usage and will normally take place in cold conditions. Driver comfort has to be considered.
- Liquid spray is preferred due to the limited crushing from traffic.
- Vehicle must be conspicuously marked.
- Vehicle must have the ability use a snow plough or snow brush.
- On-going cost; whilst the project might pick up the capital cost of initial equipment purchase, the winter service will carry on well into the future, the cost of which will be picked up by the revenue account. So a cost efficient treatment is preferred.

Section 300 of the Highways Act 1980 states:

No statutory provision prohibiting or restricting the use of footpaths, footways or bridleways shall affect the use by a competent authority of appliances or vehicles, whether mechanically operated or propelled or not, for cleansing, maintaining or improving footpaths, footways or bridleways or their verges, for preventing or removing obstructions to them or otherwise preventing or abating nuisances or other interferences with them, or for maintaining or altering structures or other works situated therein.




Taking into account the above, the use of ride-on vehicles is authorised for cleansing, maintaining or improving footpaths; “cleansing” and “maintaining” are able to be interpreted as precautionary and reactive treatments on snow and ice, and therefore the use of relevant vehicles carrying out these exercises is permissible.

Vehicle Regulations

Section 4 of the Vehicles (Conditions of Use on Footpaths) Regulations 1963.SI 1963 2126 makes reference to limitations on vehicle size and speed when on the footway imposed by regulations made in:

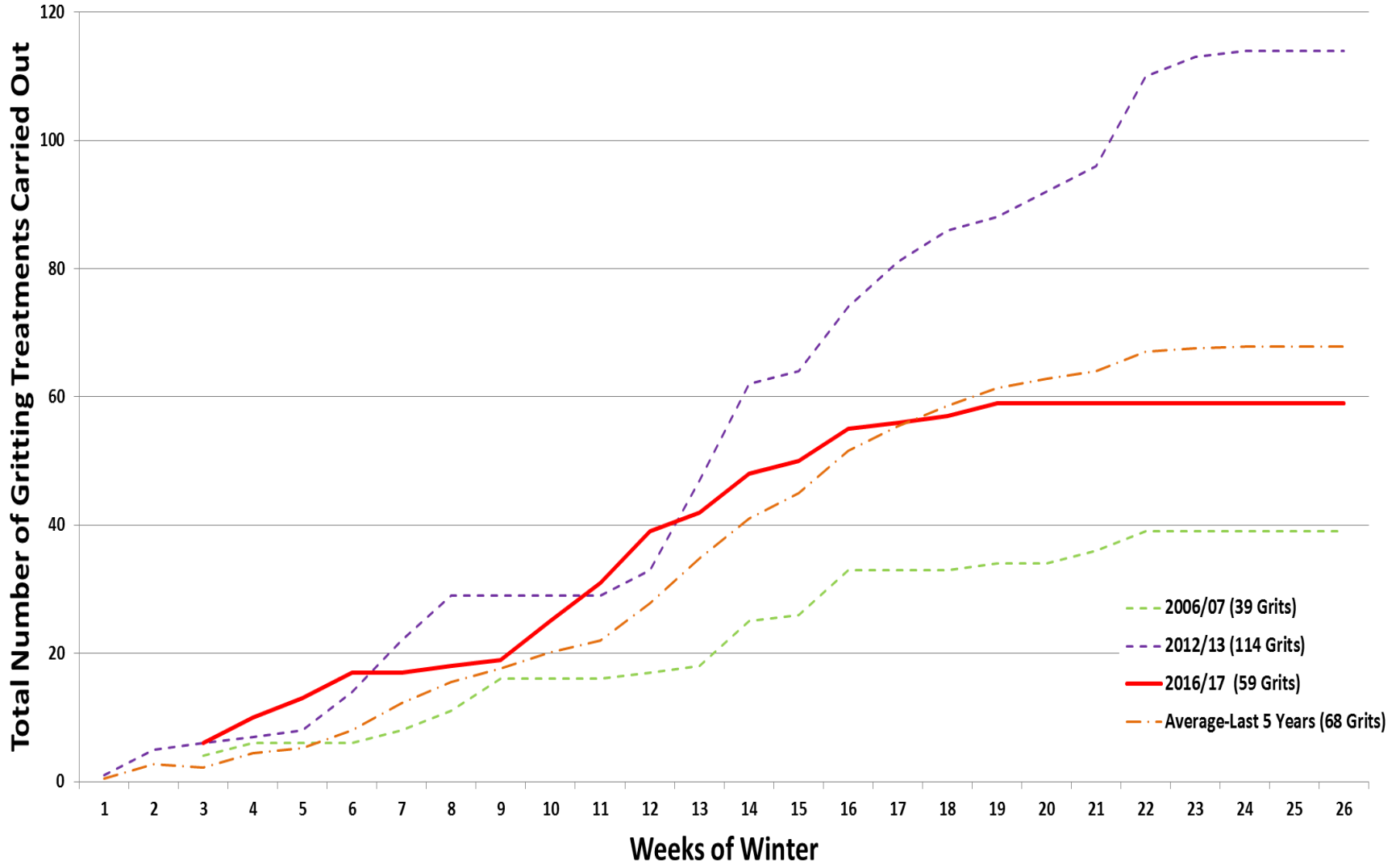
- a. Weight - 1 Ton max
- b. Speed – 5mph

Option	Description	Advantages	Disadvantages
	Quad Bike with towed spreader	<p>Small</p> <p>Already have knowledge of use and relative effectiveness</p> <p>Inexpensive unit price</p>	<p>Limited carrying capacity</p> <p>Driver exposed in cold conditions</p> <p>Would need support vehicles for replenishment en-route</p> <p>Manoeuvring difficulties/ Stability</p>
	Small tractor	<p>Carrying capacity (600-1000 litres)</p> <p>Enclosed cab – driver comfort</p> <p>More power and control</p> <p>Soft footprint</p>	<p>Height (2.4m)</p> <p>Training</p> <p>Width – depending on unit chosen</p>
	Multihog CX	<p>Enclosed cab</p> <p>Low headroom</p> <p>Carrying capacity (1000 litres)</p> <p>Potential for other uses.</p>	Price!

Option	Description	Advantages	Disadvantages
	Epoke Virtus Lift AST	Carrying capacity Optional hand lance for treating difficult areas	Availability
	Schmidt TSS		Discounted as being too long to manoeuvre on route.
	John Deere Gator	Partially enclosed cab. Used by Parks in summer – greater utility. Low headroom Stability	Too wide!

De-icing agent	Advantages	Disadvantages
Brine	Relatively inexpensive raw materials.	Expensive capital costs for mixing and storage. Corrosive. Medium Impact on the environment.
Agricultural By-product (ABP)	More expensive than brine but cheaper than Potassium Acetate. Low corrosion. Claimed to have longer lasting properties, therefore reduced number of treatments.	Detectable odour.
Potassium Acetate	Relatively benign substance, no impact on water chemistry. Non- corrosive to concrete. Claimed to have longer lasting properties, therefore reduced number of treatments. Fast Acting.	Expensive

Gritting Activity For Winter 2016/17 Compared To Average Winter



Summary of Winter Activity 2016/17

59	Primary Salting Network Treatments
1	10g Grits
15	15g Grits
43	20g Grits
0	40g Grits (2X20G)
2	Partial Grit- Cold/Wet Spots
2	Partial Grit - High Routes Only
10	City Centre Ped Area/ Quad Bike Treatment
37	City Connect Cycleway Treatment



❑ Specific issues

- ❑ The mini tractors were not quite ready for the start of the winter season and the first couple of treatments were done using the existing quad bikes and dry rock salt. Whilst this worked and could be achieved in a reasonable timescale a significant amount of resource, in terms of additional men and support vehicles were needed to arrange for refills of the gritter hoppers on route.
- ❑ The support hitch on the mini tractors had to be modified following an early failure relating to hydraulic system pressure.
- ❑ Operatives noticed in the early part of the season that in strong cross winds the spray application could be blown to one side limiting the effectiveness of the treatment. Baffles were fitted to the units in order to counteract the effect.
- ❑ In cab noise levels were also checked with the supplier as they are close to the threshold at which ear defenders would be needed by the operator.
- ❑ On site observations by maintenance staff clearly showed the treatments to be effective and long lasting.

Specific issues (Cont'd)

- Some negative comments were received during the winter about the fact that the cycle route was treated but not the adjacent footway. Pedestrians were observed using the cycleway as a safer walking route on frosty mornings.
- Clarification was also sought by a member of the public about the solution being used. They were concerned about the effect the substance would have on their pet's feet, both directly and if they licked at the substance. Reassurance was given that the solution, in the quantities spread, had no harmful effects.

Financial Considerations

- ❑ Not as efficient as mechanical road gritting. Vehicle speeds are slower, spreading widths are narrower and in the case of City Connect the de-icing chemical is significantly more expensive than rock salt.
- ❑ The Winter Service carries a significant amount of fixed costs. For example having decision makers, supervisors and operatives on standby; maintaining sufficient trucks including spares to ensure all routes are covered, storage facilities for salt/chemicals and so on.
- ❑ In addition to the fixed costs, as this is a reactive service, there are also significant variable costs, covering such things as the quantity of chemical spread, fuel, driver pay and vehicle repairs for example.
- ❑ The cost of winter treatments is always difficult to quantify because of the number and combination of fixed and variable costs, and evidence from previous years has shown that the cost per square metre varies each year. In milder winters for example, the cost can go up because the fixed costs are distributed over fewer treatments.
- ❑ This winter Leeds spent a total of roughly £1.1 million delivering its winter service. Taking into account the area treated and the number of treatments undertaken, this equates to a cost of approximately 0.13 pence per square metre.
- ❑ Using a similar basis for calculation, the cost for delivering the winter service on the City Connect route is approximately 4.5 pence per square metre.
- ❑ Whilst the costs calculated equate to just a few pence per square metre the amount spent rapidly grows due to the size of the area. It is also significant to note, that the chosen method of treatment for City Connect is roughly 30 times that of conventional road gritting. Roughly a quarter of this cost is related to the Potassium Acetate de-icing solution used.

Conclusions

- ❑ The method of de-icer application using the mini tractors works and no negative comments were received from the operatives.
- ❑ The treatment solution is very effective and apart from a few general queries has not generated any new issues or brought about any surprises.
- ❑ Treating a cycleway with de-icing chemicals in winter represents a significant cost outlay borne by the revenue budget. This burden will continue to grow as the City Connect project expands.
- ❑ Whilst the method chosen for treating the cycleway is appropriate, it is financially very inefficient in comparison with conventional road gritting with dry rock salt.

Parish and Town Councils Examples:

- ❖ Aberford Parish – Local Farmer and Quad bike
- ❖ Shadwell – Formal Contract with a third party gritting company
- ❖ Morley Town Council – Arrangement with a third party to precautionary grit some of the secondary Network

Conclusions

- ❑ A changing picture – City Connect and cycle use promotion
- ❑ Park and Rides – Two already and another two planned
- ❑ A growing city – Inevitable increase in demands

Thank You For Listening

Any Questions?

