



# Building urban resilience: *Integrating raingardens into our streets and highways*

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# We face environmental threats and challenges, but tackling them will present opportunities for Greater Manchester...

## 5 environmental threats and challenges to Greater Manchester

### Climate change – mitigation

More radical local and national action to accelerate CO<sub>2</sub> emissions reductions

### Air Quality

Health impacts of particulates and nitrogen dioxide – NO<sub>2</sub> levels in breach of legal limits

### Production and consumption of resources

Throwaway society and particular issues with plastic and food waste

### Natural Environment

Multiple benefits still yet to be fully realised or accounted for – lack of other sources of investment

### Climate change – resilience and adaptation

Increasing risk of extreme weather events – particularly flood risk but also heat stress

## 3 opportunities in tackling them

### People

Improve health and quality of life, increase productivity and reduce inequality

### Places

Create vibrant and sustainable places and good quality homes

### Economy

First mover advantage – increase prosperity and productivity

# Building resilience in GM

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- Current and future flood risk:
  - Surface water is the greatest and most complex flood risk in GM.
  - Since the 1960s there has been a 35% increase in winter rainfall in North West England.
  - Winter precipitation is predicted to increase a further 10% over the next decades
- Increasing summer temperatures and urban heat island
  - By 2050, and the warmest summer day could rise by 6°C
  - Across the UK +5/6°C Summer mean daily maximum temperatures (UK 2050 CC Predictions).



# Investing in resilience

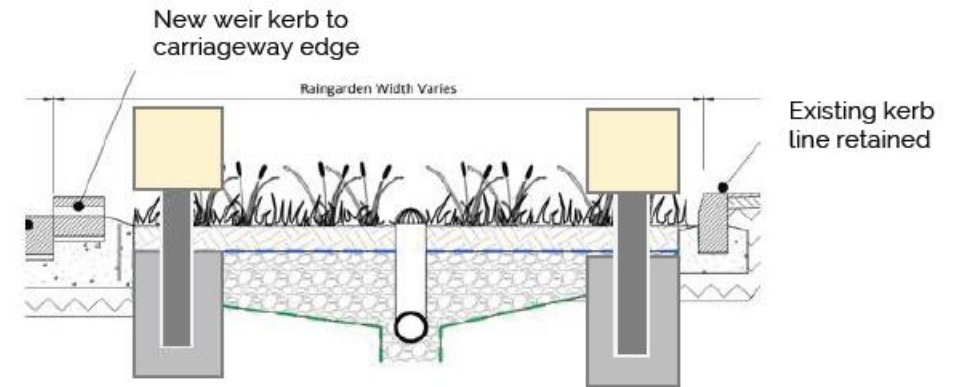
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- Traditionally our roads, highways and civic spaces have been designed to transport rainwater as quickly as possible from where it falls into public sewers.
- With a changing climate, this approach risks overloading the aging drainage system and is no longer sustainable.
- Hard engineered interventions are possible.
- Sustainable drainage solutions, such as raingardens, offer a modern alternative to traditional pipe drainage that better mimics nature.



# Raingardens

- Raingarden are a type of Sustainable Urban Drainage System
- Instead of putting rainwater into pipes under the ground, raingardens are designed to manage rainwater locally by providing spaces for storage of rainwater close to where it falls.
- By slowing, storing and encouraging the infiltration of rainwater close to where it falls, raingardens help to reduce the burden on the drainage system and
- Raingardens are crucial to not only boosting the resilience of spaces but also creating places where people want to live and work.



*Visual and typical section illustrating proposed bench within raingarden to provide hostile vehicle mitigation (not to scale).*

# How do raingardens work?

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- Specially designed garden bed or landscape area.
- Typically consisting of a shallow depression in the pavement, or highway.
- They collect rainwater from adjacent surfaces via kerb inlets and provide space for the storage and filtration prior to slow release
- Generally filled with a filled with a soil mix sitting above a perforated pipe at the base, allowing slow release back into the drainage network
- They store runoff within the soil layer and in ponding on the surface of the raingarden

# Benefits

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<b>Water quantity</b>	Raingardens provide space for the storage and attenuation of rainwater during storm events
<b>Water quality</b>	Raingardens can trap and remove pollutants before returning cleaner water
<b>Air quality</b>	Raingardens can help to improve air quality by trapping and absorbing air pollutants.
<b>Health and wellbeing</b>	<p>Raingarden provide greener more pleasant streets, encouraging recreation, leisure and active travel</p> <p>A study in London found that each additional tree per km of street was associated with 1.38 fewer antidepressant prescriptions per 1000 population per year.</p>

<b>Road safety</b>	<ul style="list-style-type: none"><li>• SuDS can help provide a buffer between pedestrians and road vehicles.</li><li>• Tree-lined streets are reported to make the street feel narrower and encourage slower driving.</li></ul>
<b>Amenity</b>	<ul style="list-style-type: none"><li>• Raingardens can provide attractive areas in typically grey urban environments.</li><li>• 85% of people considered that the quality of open public space has a direct impact on their lives and the way they feel.</li></ul>
<b>Biodiversity</b>	<ul style="list-style-type: none"><li>• SuDS can provide valuable habitats for pollinators and enhance biodiversity in urban areas.</li></ul>

# Howard Street SuDS Enabled Tree pits

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After 3 years of flow monitoring

- average peak flow attenuation was 81%, reducing the rate at which rainfall enters the sewer
- average volume of water that ended up in the sewer was reduced by 78%
- average delay of storm water peak flow (the amount of time it took for rainwater entering the system and then leaving via the sewer) was 68 minutes

*Study by University of Manchester and City of Trees*



# Integrating raingardens into streets and highways in GM



# Raingardens alongside active travel schemes

Urban regeneration and retrofit of raingarden alongside new active travel routes

- Improved cycle safety
- Improved appeal of active travel routes
- Water inlets via flush kerb system
- Underdrain perforate pipe connects back into the drainage systems



*Liverpool road, Salford*



*Carpino place, Salford*

# Integrating raingardens into highways and junction improvements



# Integrating raingardens into large civic regeneration

Multi million-pound regeneration of Oldham town centre, raingardens schemes integrated as part of their wider town centre regeneration masterplan.

- Extensive expansion of the existing cycling and walking infrastructure
- Extensive new greenspaces
- Primary flood risk in the town centre is from surface water – alleviating this risk

West Street suite of SuDS enabled street trees and raingardens alongside highways and public realm improvements

Rock Street car park conversion to large park and attenuation/infiltration feature



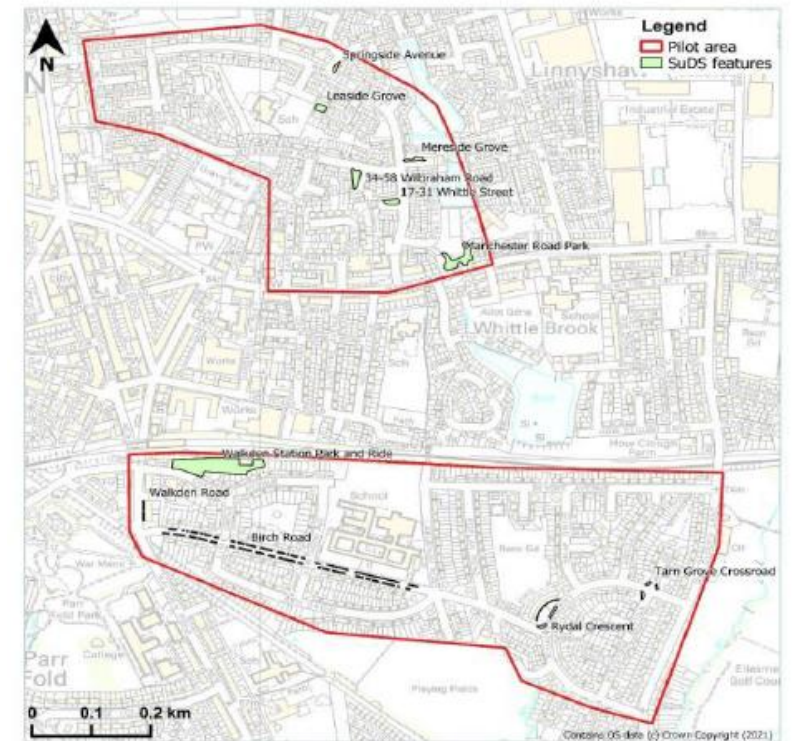
# Strategically retrofitting neighbourhoods and parks at high risk of flooding

Extensive neighbourhood retrofit of suburban areas at risk of multiple sources of flooding: surface water, sewer, rivers and water bodies

No other urban regeneration or highways improvement works involved

Locations of interest to multiple partners

- Increased drainage capacity; headroom in sewers, reduced property flooding
- Amenity and recreational benefits for residents and local business
- Health and wellbeing benefits
- Utilising existing pavements and unused amenity spaces



# Summary

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- Simple solutions to provide more space for water in the urban public realm
- Focus on multifunctionality
- Many barriers to overcome through partnership working and sharing experience among authorities
- Working at multiple scales to maximise a range of opportunities
- Opportunistic as well as targeted approaches to boost resilience wherever possible
- Working together with multiple interested partners with different motivations and priorities – formalising this through Integrated Water Management planning and embedding in design criteria for urban regeneration and highways improvements works

# GREATER MANCHESTER

DOING THINGS DIFFERENTLY FOR THE ENVIRONMENT

