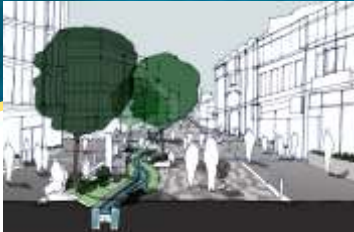



## Surface Water Management Planning An Example of the Process from Glasgow

CIWEM Urban Drainage Group  
Stirling, 18<sup>th</sup> March 2014  
Neil.McLean@MWHGlobal.com

### What should be included in a SWMP

**As a minimum it should:**

- Identify where surface water flood risk is greatest
- Identify & prioritise drainage areas, using risk based approach
- Identify priority receptors to address
- Collate and review existing information
- Identify a long list of potential measures
- Short list measures
- Undertake high level cost benefit analysis of measures.

### Retrofitting SWM measures

5 steps involved in retrofitting surface water management measures

1. Understand the catchment
2. Define the problem
3. Identify retrofit opportunities
4. Identify groups of measures
5. Link measures with opportunities

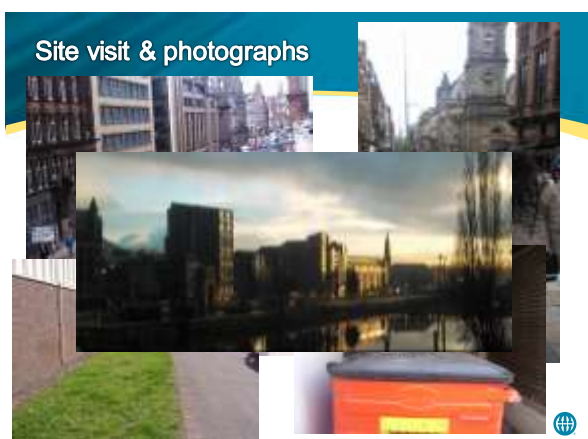
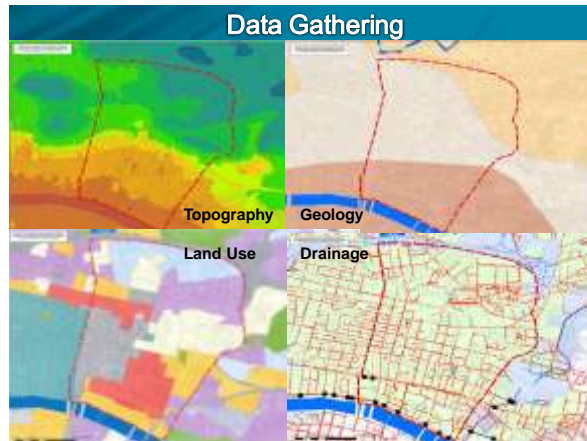
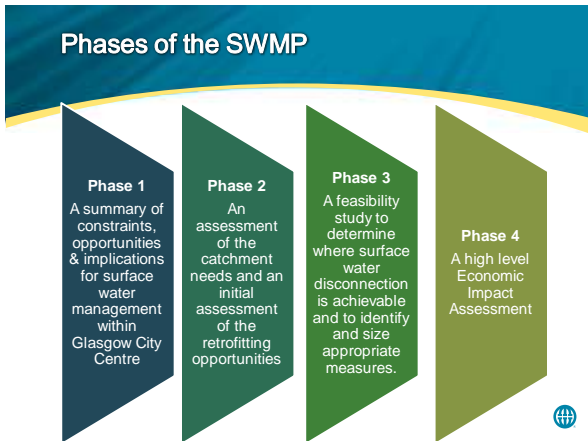
ANNUAL AVERAGE DAMAGES	
Present Day	£3.6m
Future	£4.5m

### The Glasgow City Centre SWMP



- Common opportunities**
  - Example; Residential housing
- Target opportunities**
  - Example; Large impermeable areas
- Future opportunities**
  - Example; Re-development and regeneration areas

Study Area Boundary





## Types of retrofit measures

Structural	Non-structural
Managed overland flow pathways	Asset maintenance / asset management planning
Surface water storage areas	Land use planning policy
Retrofit SuDS	Emergency response plans
Property / site level protection	Awareness raising
Storage Tanks	Strategy for the separation of surface water run-off from the combined sewerage system
Increased size of drainage pipes	Relocation / removal of receptor
Exceedance channels	
Conveyance routes	



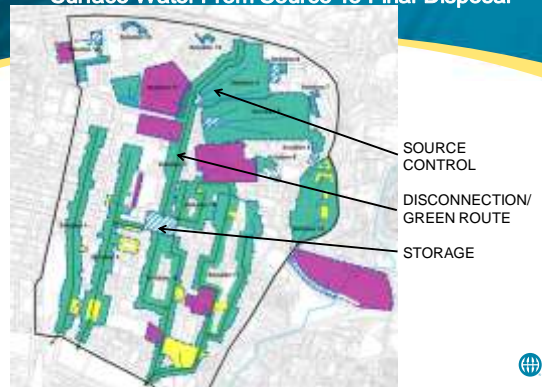
## The "Short List" of Measures

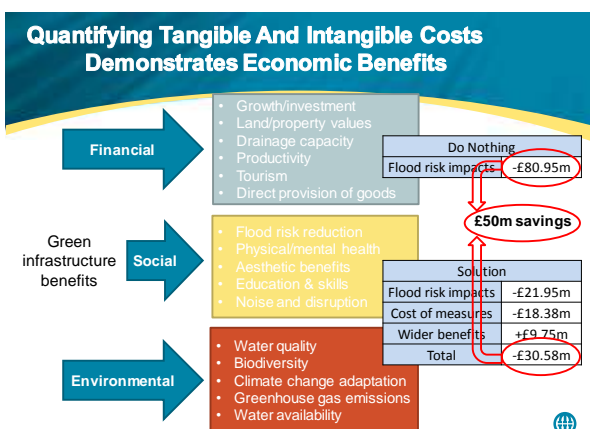
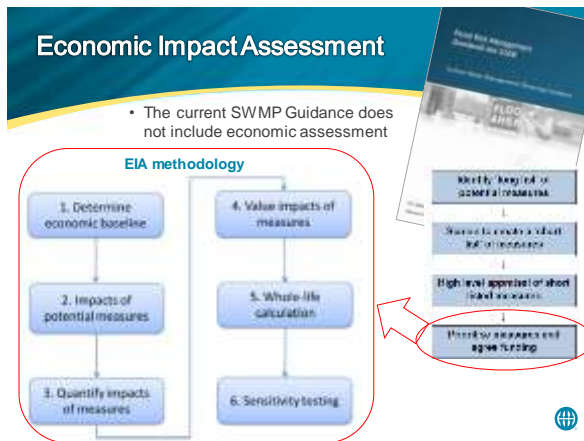
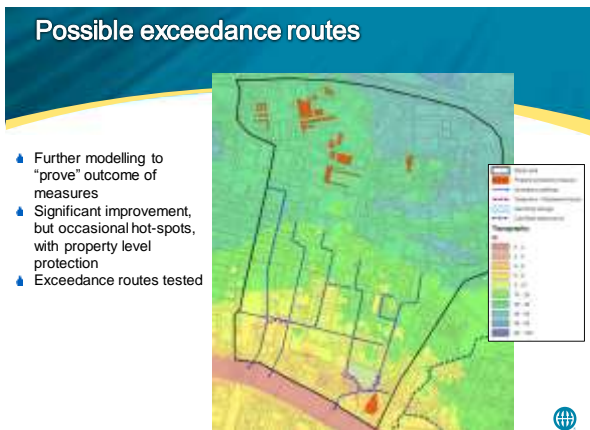
1. Ponds & basins
2. "Green Routes"
3. In-street exceedance
4. Green Roofs
5. Swales
6. Geocellular modules
7. Permeable paving
8. Deep gutters
9. Raised thresholds-PLPs
10. Bioretention - rain gardens
11. Sacrificial storage
12. Pipes

## Opportunities within Glasgow City Centre



## A Solution Combines Measures To Manage Surface Water From Source To Final Disposal





### Consider the particular intentions for the area

#### Linking the SWMP to the City Centre Core Strategy

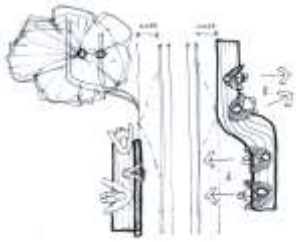
**GCC Core Strategy Vision:**  
*'Glasgow city centre will provide an excellent and sustainable quality of life and experience for its citizens, visitors and investors that will drive growth in employment, population and shared prosperity'*

The SWMP was therefore developed to ensure that:

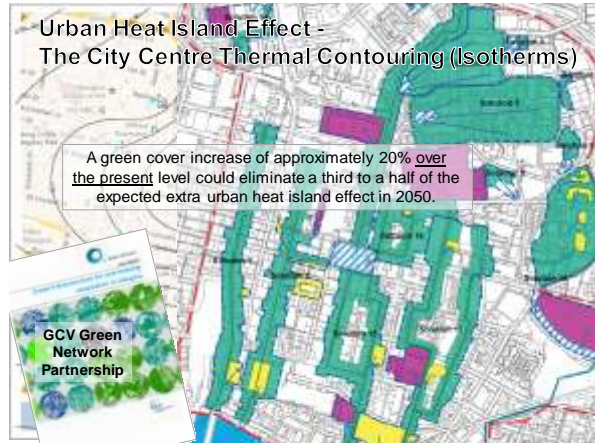
- Green infrastructure is used to address flood risk wherever possible
- Grey infrastructure (such as pipes) are only used where more sustainable measures are not appropriate
- Water is kept out of sewers wherever possible and kept above ground
- Green infrastructure is used to help mitigate against the impacts of the heat island effect

### Additional benefits

- Urban heat island effect
- Air quality
- Water quality
  - Reduced CSO spills
  - Introduction of SuDS
- Lower risk
  - £
  - safety
- Health & well being
- Place-making
- Increased sewer capacity
- Carbon reduction
- Development opportunities
- Economic investment

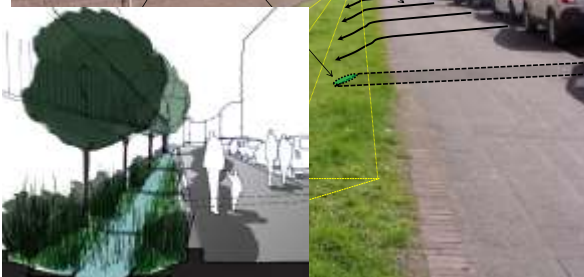


### Urban Heat Island Effect - The City Centre Thermal Contouring (Isotherms)



### Site appraisal – Retrofitted swale option

- Down pipe disconnection
  - Footpath runoff direct
- Road runoff, via shallow pipe



### Site appraisal – Retrofitting Rain Garden

#### Shallow Rain Gardens

Use rain gardens to protect/separate cyclists & pedestrians from road traffic

