The Sustainable Water Resource Engineering Laboratory
at Drexel University

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Client/Sponsor:
The Partnership Community Development Corporation

Dates:
Spring 2011-present

Key Personnel:
Scott Jeffers
Ge Pu
Franco Montalto

Key Services Rendered:

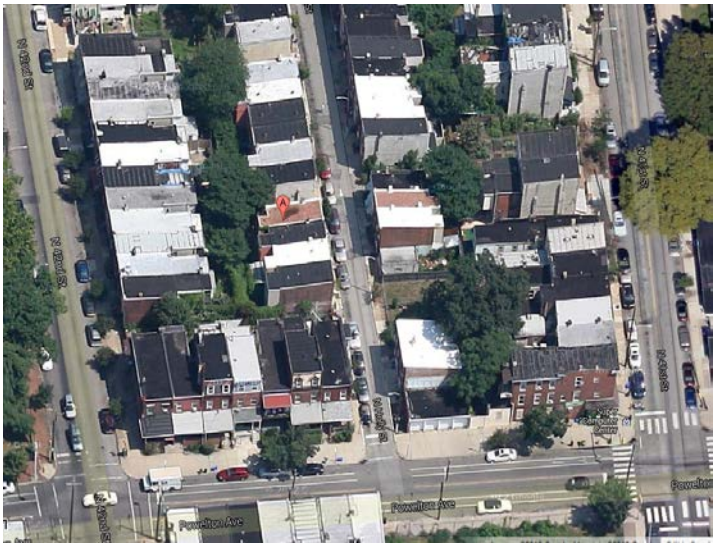
- Design and installation of monitoring system
- Stormwater Discharge Monitoring
- Green Roof Surface Temperature Monitoring

Green Roof Alterations to Urban hydrology and Surface temperature of a Philadelphia Row House

The Partnership CDC has installed pilot green and cool roofs in two neighborhoods of West Philadelphia. The green roofs consist of a layer of gravel and vegetation, and the cool roof is painted with a reflective white paint. Beginning in 2010, the CDC began collaborating with researchers from Drexel University's Sustainable Water Resource Engineering Lab to assess the environmental benefits of these projects. Drexel is one of several universities of the Consortium for Climate Risk in the Urban Northeast, and is actively studying the role that green infrastructure technologies can play in climate change adaptation strategies in urban areas. Green roofs can reduce runoff and thermally insulate buildings from incident solar radiation. Cool roofs reflect the sun's rays also modifying the building energy budget. The goals of the Drexel efforts are to:

- Assess the value of cool and green roofs can for reducing urban heat island effects
- Quantifying the reduced rate and volume of runoff generated from green roofs compared to non-vegetated rooftop surfaces.

Surface temperature variation was quantitatively measured using surface temperature probes and compared to traditional pre-existing black roofs and white roofs. To measure runoff, rainwater from the black roof and the green roof were rerouted to rain barrels and measured using water level transducers.



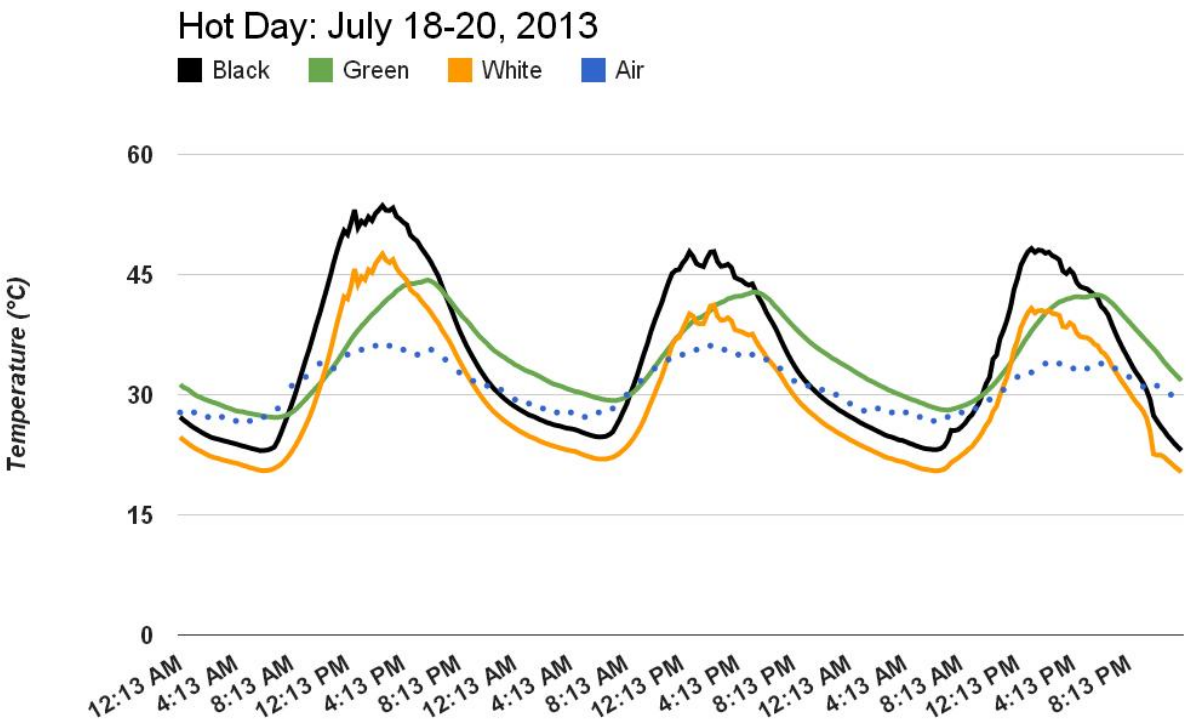
Aerial view of the residential block lined with row houses. There are two green roofs on this block identified light red coloring roofs in the center of the image. Green roofs appear red due to the recycled brick material used in their construction.

Dr. Franco Montalto, PE
Lab Director

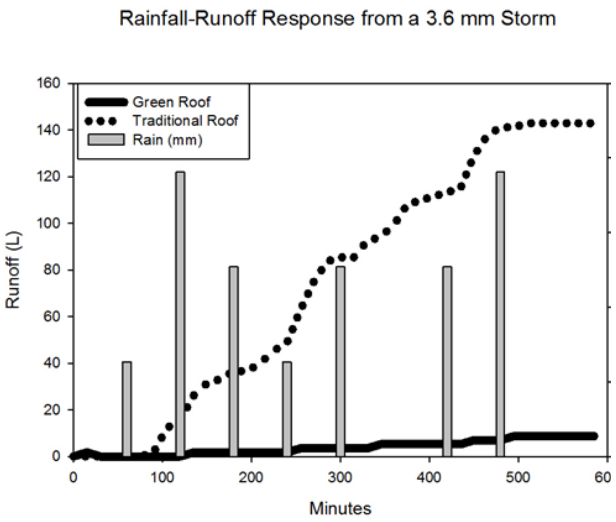
PECO An Exelon Company

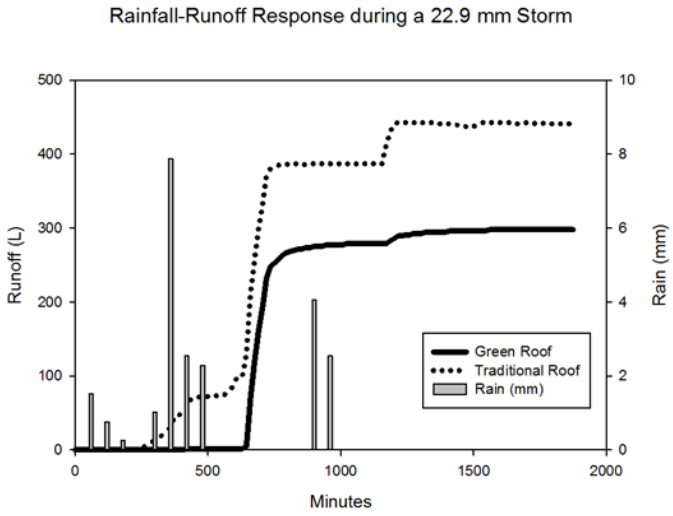
The Partnership CDC

SWRE The Sustainable Water Resource Engineering Laboratory at Drexel University



The finding of this research is that the green roof insulates the roof reducing peak max temperatures while increasing peak min temperatures throughout the year as compared to the traditional black and white roofs. Illustrated above, the temperatures of each roof were plotted over a hot summer period.





Differences in discharge between the Powelton green roof and the traditional roof were plotted during a small 3.6 mm a large 22.9 mm rainstorm. The green roof produces significantly less discharge than the traditional roof. When it begins to rain, the traditional roof immediately starts to produce discharge. Discharge from the green roof, however, is delayed. This delay is due to the ability of the green roof growing medium to absorb the rainwater. Once the growing medium becomes saturated and can no longer hold water, the green roof produces discharge at rates similar to the traditional roof.