LID in the Rust Belt:
Stormwater Management on a Brownfield Site in Flint, Michigan

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Introduction

• Brownfield redevelopment and LID are both important parts of the green cities movement. Without careful consideration however, the intersection of these two fields may potentially increase environmental hazards.

• With modifications, the key principles of LID can be applied to brownfield sites in ways that promote remediation and reduce exposure risks.

• Outline
  – General LID/brownfield principles
  – Introduction to Chevy in the Hole, brownfield site in Flint
  – Application of LID principles to Chevy in the Hole
Guidelines for LID on Brownfields
Guideline # 1

Differentiate between groups of contaminants as a way to better minimize risks

CONTAMINANT CLASSES:

Nutrients
Pesticides
Industrial organic compounds*
  -VOCs
  -PAHs
Pathogenic microorganisms
Heavy metals and other inorganic compounds*

*Most commonly found on Rust Belt brownfields
Guideline # 2

Keep clean stormwater separate from contaminated soils and water to prevent leaching, spread of contaminants

• Careful placement of buildings and other impervious surfaces to act as caps

• Modified LID: *filtration* without *infiltration*

• Importance of site location within watershed: If you’re near the bottom, send stormwater directly to the receiving water
Guideline # 2

Filtration Swale

- Turf Filter Strip
- Mulch Layer
- Clean Soil from Off-Site
- Impermeable Liner
- Gravel Filter Blanket
- Slotted Underdrain Pipe
Guideline # 2

Flow-through planter

- Overflow
- Downspout outfall
- Mulch
- Concrete wall
- Slotted underdrain
  Runs length of planter
- Clean soil
- Impermeable liner
- Gravel filter blanket
- Concrete slab
- Outflow to storm sewer
Guideline # 3

Prevent soil erosion

**Vegetative practices**
- Choose appropriate plants
- Protect existing vegetation
- Plan new plantings to catch potential sediments

**Structural practices**
- Use swales to direct stormwater
- Use sediment basins to collect sediment-laden stormwater

http://keats.admin.virginia.edu/stormwater
Guideline # 4

All new development on and around the brownfield site should include measures to minimize runoff

Green roofs

Green walls

Large tree retention/installation

Rooftop garden terraces

Rainwater cisterns

http://www.wsud.org/Pic_Pages/Green_roofs.htm
Chevy in the Hole, Flint, Michigan
Chevy in the Hole

Industrial Legacy

http://info.detnews.com
Chevy in the Hole

Social History

www.reuther.wayne.edu
Chevy in the Hole

A Scar in the City of Flint
Chevy in the Hole

Channelized Flint River
Chevy in the Hole

Project Goal
Create several plausible alternative designs for Chevy in the Hole, illustrating ways to improve the economic and environmental health of this site while contributing to the Flint metropolitan region.

Chevy in the Hole

Surrounding Land Uses

- Mott Golf Course
- Atwood Stadium
- Kettering
- Flint River Trail
- UM Flint
- Downtown
- School for the Deaf
- Happy Hollow Nature Area
Chevy in the Hole

Flint River Watershed

The City of Flint is located in the Flint River Watershed which drains to Lake Huron.

The Flint River is a tributary of the Saginaw River which flows into Saginaw Bay.

Legend
- Chevy in the Hole
- Flint River
- Major Tributaries
- Urban Areas
Blue arrows represent flows of surface and groundwater onto brownfield site.
Chevy in the Hole

Potential Residual Contamination

Chevy in the Hole Site Assessment
Historical Hazardous Material & Waste Storage

The information shown on this map is from Delphi Automotive Systems Flint West, Extremely Hazardous Waste Locations map, Hubbell, Roth, & Clark, Inc., 1999, and will be used to guide assumptions about potential residual contamination on the site. This map does not indicate current contamination on the site.
Chevy in the Hole

Potential Residual Contamination

Chevy in the Hole Site Assessment
Potential Residual Contamination

This map shows the potential levels of residual contamination on the site, based on interpretation of historical hazardous materials/waste storage maps and documents.
LID Strategies for Chevy in the Hole
Strategy # 1

Retrofit adjacent neighborhoods with LID strategies

• Encourage on-site infiltration in clean areas to prevent runoff onto contaminated site

• Direct excess stormwater through storm drains to the Flint River
Strategy # 2

Prevent groundwater contamination from entering the Flint River

• Maintain concrete channel to prevent lateral movement of contaminated groundwater

• Direct clean surface runoff into vegetated terraces along channel
Strategy # 3

Design areas with fill cap adequate to accommodate plant roots

- Areas where the depth of clean fill allows for a greater density of plant roots and filtration and evapotranspiration. An adequately engineered underdrain system is essential.
Strategy # 4

Control surface runoff in areas of phytoremediation

• Using grading strategies, control the amount of runoff directed to phytoremediation areas to provide for plant needs while minimizing excess flow-through
Strategy # 5

Strategically place parking lots to contribute to cap function

• Institutional controls to regulate the land-use on soils with residual contamination

• Additional precaution with underground cap
  Combined with brownfield adjusted LID strategies
Conclusions: LID on brownfields

• On brownfields, LID should be designed to accommodate for residual contamination

• The practices outlined here should be part of a multi-faceted approach to brownfield redevelopment
Sources


