Case Studies
Traditional Options

**Option 1**
Take storm water to the south and outlet to the Red Cedar River. Cost about 23 million dollars.

**Option 2**
Take storm water to the west and outlet to the Grand River. Cost about 26 million dollars.

**Option 3**
Take storm water to the north and outlet to the Looking Glass River. Cost about 29 million dollars or more.

The Tollgate Drain as built was $6.2 Million
THE TOLLGATE DRAIN’S WATERSHED

- 234 acre watershed
- 554 residential properties
- 20+ commercial properties
- 100+ apartment units

The Tollgate Drain’s Watershed is a densely developed neighborhood.
The Solution

- Develop Multi-objective Project Concept to address Problems
- Build Consensus and Stakeholder Buy In
- Intergovernmental Agreements
  - Permits
  - Easement
  - Cost Sharing
- Ongoing Public Outreach
The Multi-objective Project

- Separating Sanitary and Storm Sewers
- Create Wetland/ Upland Retention and Water Treatment System
- Improve Golf Course
- Create Aesthetic, Environmental, and Recreational Neighborhood Amenity
- Education and Public Outreach
Separating Sanitary and Storm Sewers
The neighborhood streets under construction for over a year
Create Wetland/Upland Retention and Water Treatment System

One of many water falls that are made using Lime Stone
Create Aesthetic, Environmental, and Recreational Neighborhood Amenities
The Tollgate Drain Project
And Its Watershed
Photo taken right after construction was finished
Before Construction

Looking north on Fairview Street.
Looking north after construction on Fairview Street.
The first Water Fall in the treatment train right after construction.
Before construction, looking south from Hopkins Street. This seven-acre site, located in Lansing Township, owned by the State of Michigan, and maintained as a park by the City of Lansing, is the site of the first set of project ponds.
Before construction, the seven acres were primarily a monoculture of reed canary grass.
The lower ponds weeks after construction
After 6 months the transition is clear
Second waterfall draining into the peat filter
Water Lilies in one of the ponds at the Tollgate Drain
These Lilies will trans-evaporate into the air thousands of gallons of water in a day.
Green Heron looking for food
He found some
Great Blue Heron with food
Great White Heron feeding at the Tollgate Drain
Pond lilies help to evaporate water by transpiration and evaporation. They also take up nutrients from the water while providing an attractive addition to the wetlands. 

Water lilies and Broadleaf Arrow Head with Narrow Leaf Cattails form a scenic vista at the Tollgate Drain’s wetlands. It is not uncommon to find many people of all ages with easels set up around the ponds, painting pictures of the wetlands. I call this picture the “Tollgate Wetland’s Monet.”

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The Tollgate Drain’s Watersheds drain to the City of Lansing’s Groesbeck Golf Course
Groesbeck Golf Course, a municipal golf course, had no water features prior to the construction of this project. This picture shows the golf course prior to construction.
Wildflower and native vegetation buffer strip around the storm water ponds
Flower buffers around the Golf Course ponds
Conclusions

Urban Retrofit Opportunities for Stormwater Management:

- Can Meet Multi-objective Goals
- Can Make Good Short- and Long-Term Financial Sense
- Can Facilitate Social Change for Environmental Stewardship
Conclusions

An Upfront Investment in Social Attitude and Behavior Change is a Good Investment

Retrofitting Water Resource Protection into Urban Environments Will be More Successful When Accompanied by Education and Public Outreach