Cottage Grove
Low Impact Development
Demonstration Project

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One Company. Unlimited Potential.
• Discuss Project Objectives
• Define Low Impact Development
• Describe Cottage Grove Project Pre- and Post-Construction Conditions
• Identify Challenges During Design and Construction
• Discuss Storm Water Sampling Results
What is Low Impact Development?

Low Impact Development is a comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds.
Project Team

- City of Houston
- Texas Commission on Environmental Quality
- Rice University
- Project Consultant Team
  - Jones|Carter
    - Watearth
    - B & E Reprographics
    - HVJ Associates
    - Berg-Oliver Associates
    - KGA/DeForest Design
Project Description

- 2-Block Reconstruction of Darling Street Incorporating LID Features
  - Darling Street from T.C. Jester Blvd. to Reinerman St.
  - White Oak Bayou Watershed (Impaired for Bacteria)
- Evaluation of Effectiveness of LID Features
  - Will there be a reduction in E.coli, suspended solids?
  - Sampling and testing of storm water runoff before and after construction
- TCEQ Grant Funding Portion of the Project
Project Location
Project Limits

• Darling Street from T.C. Jester Boulevard to Reinerman Street (Approximately 1,425 linear feet)

• Petty Street used as the control street for sampling
Pre-Project Land Use

• Property along Darling Street
  – Mostly original single family residences and new townhomes
  – City of Houston Fire Station No. 11

• Property in Surrounding Areas
  – Mostly original single family residences and new townhomes
Darling Street (2012)
Roadway (Pre-Construction)
Darling Street ROW
Darling Street ROW

DARLING ST.
Darling Street ROW

DARLING ST.
Darling Street ROW
Proposed LID Features

Rain Gardens

Tree Boxes
Proposed Roadway Design

• 2 lane, 2-way traffic
• 28-foot wide concrete pavement
• Tree Boxes
• Rain gardens within bulb-outs at intersections
• 4’ to 5’ Sidewalks
Proposed Roadway Design
Bulb-outs with Rain Gardens

DARLING STREET
PROPOSED SECTION NEAR DETERING STREET
Proposed Roadway Design
Tree Boxes
Proposed Detering St. Storm Sewer

- Routes Existing Flow around LID Features
- Provides Depth for LID Features
Tree Boxes

Section A-A

- **Tree Frame & Grate**: Cast in top slab
- **Cleanout Cover**: Cast in top slab
- **Plant**: As supplied by Americast (not shown for clarity)
- **Curb and Gutters**
- **Street**
- **Dowel Bars**: @ 12 O.C.
- **Filter Media Provided by Americast**
- **Perforated Underdrain System by Americast**
- **Mulch Provided by Americast**
- **Underdrain Stone Provided by Americast**

Dimensions:
- 4'-2" to 3'-6" top to top
- 3'-6" interlocking joint (typ)

**SECTION A-A**
Tree Boxes
Rain Gardens

RAIN GARDEN CROSS-SECTION

RAIN GARDEN CROSS-SECTION @ CHECKER PLATE
Rain Gardens
Construction Cost

Total = $1,681,000
Construction Phase

• January 6, 2014
• Construction Issues
  – New Townhomes
  – Utility issues
  – Traffic Control Plan
  – Roof/Yard Drains from existing buildings
Detering Street Storm Sewer
Construction East Bound Lanes
Construction West Bound Lanes
Construction LID Features
Project Conclusions

Benefits

- Improved Storm Water Quality
- Improved Drainage
- Provide typical 28-foot wide pavement
- Improved traffic conditions
- Addition of sidewalks
- Usable on-street parking
- Allows evaluation of LID features
LID Evaluation/Results

- Rice University
- City of Houston Lab
Sample Information

- >0.1 inch rainfall in event
- Testing included
  - Inflow and outflow grab samples
  - Velocities
- 30 min intervals
- Dates Sampled
  - April 10, 2015 (North)
  - April 14, 2015 (North)
  - June 30, 2015 (South)
  - November 17, 2015 (South)
Sampling Event #1

Average Nitrate Concentration of Inflows and Outflows for Event 1 (April 10, 2015)

Nitrate-N

Average Total Phosphorus Concentration of Inflows and Outflows for Event 1 (April 10, 2015)

Total Phosphorus

Average Total Suspended Solids (TSS) Concentration of Inflows and Outflows for Event 1 (April 10, 2015)

Total Suspended Solids

Average E.coli Concentration of Inflows and Outflows for Event 1 (April 10, 2015)

E. coli
Sampling Event #2

Average Nitrates Concentration of Inflows and Outflows for Event 2 (April 14, 2015)

Nitrate-N

Average Total Phosphorus Concentration of Inflows and Outflows for Event 2 (April 14, 2015)

Total Phosphorus

Average Total Suspended Solids (TSS) Concentration of Inflows and Outflows for Event 2 (April 14, 2015)

Total Suspended Solids

Average E. coli Concentration of Inflows and Outflows for Event 2 (April 14, 15)

E. coli
Sampling Event #3

Average Nitrate Concentration of Inflows and Outflows for Event 3 (June 30, 2015)

Nitrate-N

Average Total Phosphorus Concentration of Inflows and Outflows for Event 3 (June 30, 2015)

Total Phosphorus

Average Total Suspended Solids (TSS) Concentration of Inflows and Outflows for Event 3 (June 30, 2015)

Total Suspended Solids

Average E.coli Concentration of Inflows and Outflows for Event 3 (June 30, 2015)

E. coli
Sampling Event #4

Average Nitrate Concentration of Inflows and Outflows for Event 4 (November 17, 2015)

Nitrate-N

- Inflow
- Outflow

Average Total Phosphorus Concentration of Inflows and Outflows for Event 4 (November 17, 2015)

Total Phosphorus

- Inflow
- Outflow

Average Total Suspended Solids (TSS) Concentration of Inflows and Outflows for Event 4 (November 17, 2015)

Total Suspended Solids

- Inflow
- Outflow

Average E. Coli Concentration of Inflows and Outflows for Event 4 (November 17, 2015)

E. Coli

- Inflow
- Outflow
Questions?