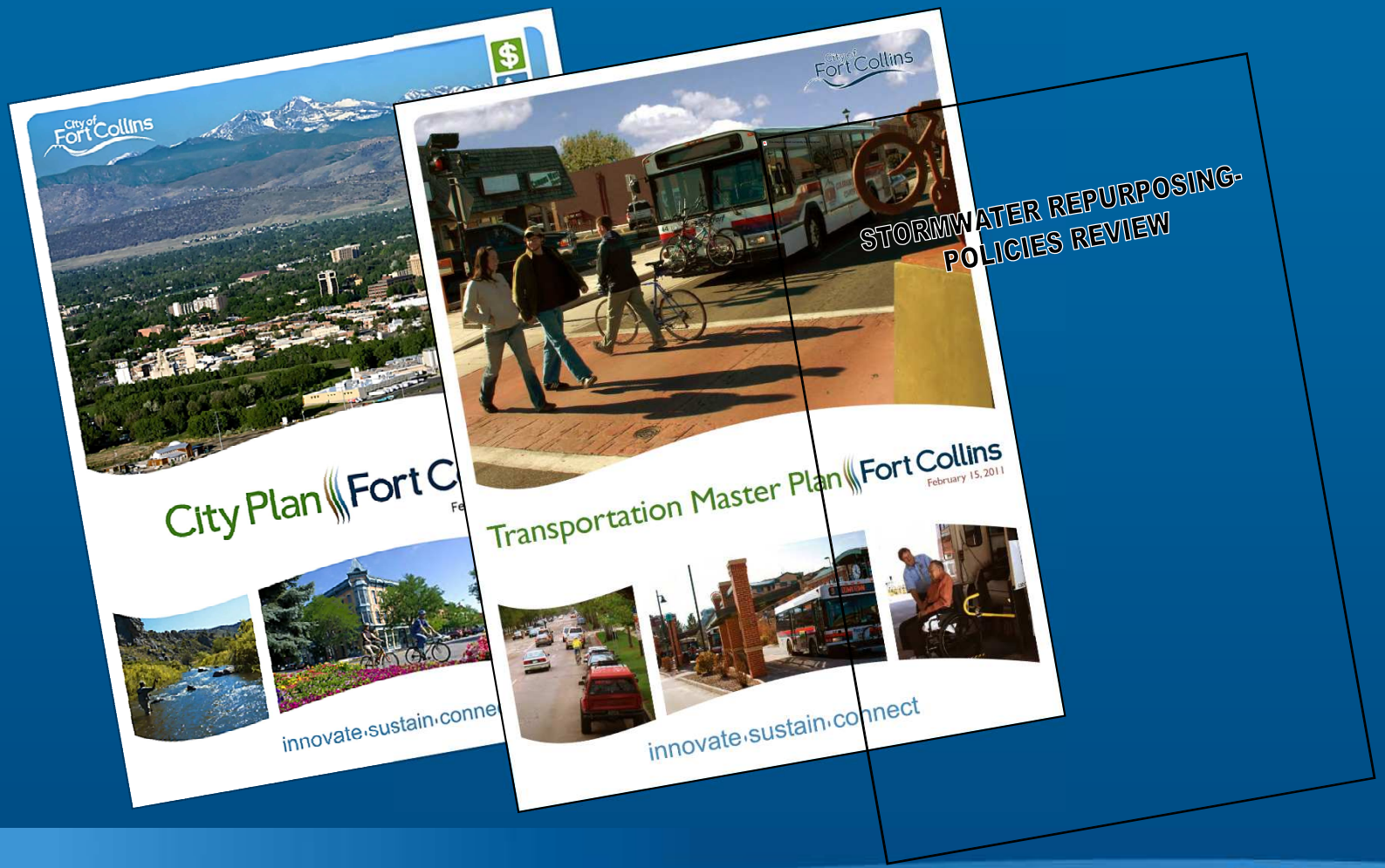
Managing Stormwater Naturally

July 17, 2013

City of Fort Collins

Guiding Documents

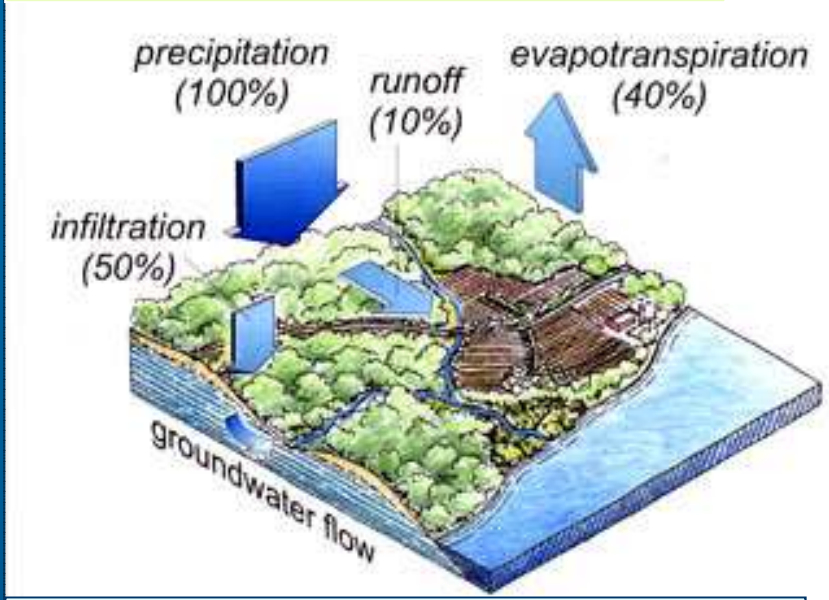


Stormwater Purpose Statement

The City Council hereby finds, determines and declares the City's integrated stormwater management program is for the mutual economic, social and environmental benefits of public safety, flood mitigation, water quality and public welfare while protecting natural areas and their features, protecting and restoring the City's watersheds, its tributaries and the Cache la Poudre River.

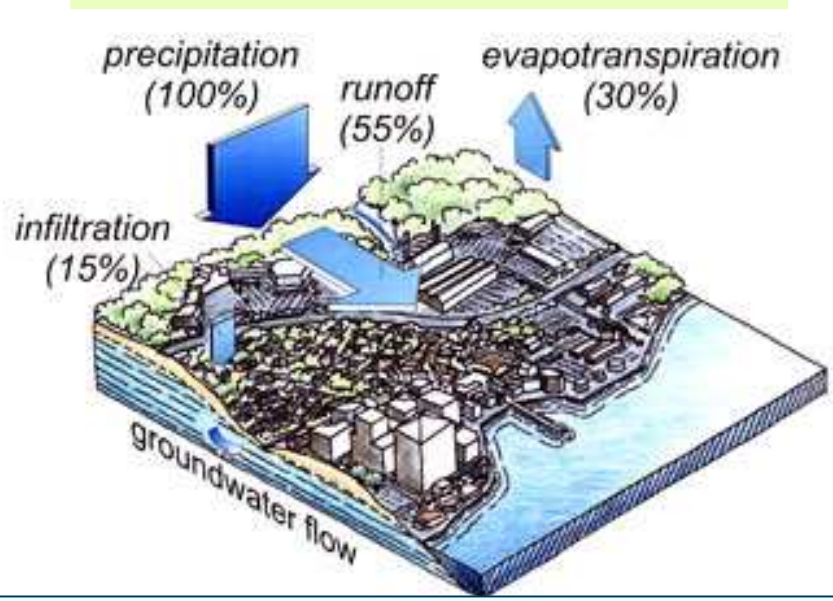
Development Impacts

Smart Development



- Less land clearing and grading costs
- Reduced infrastructure costs
- Protection of regional water quality
- Reduced stormwater runoff

Conventional Development



- Loss of natural land or open space
- Depleted drinking water supply
- Reduced quantity and quality of water resources
- Increased infrastructure costs & maintenance

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What Is Low Impact Development - LID

- Treat and control stormwater at its source
- Small-scale stormwater controls distributed throughout site
- Maintain flow patterns, filter pollutants, and recreate or maintain hydrology
- Strongly encouraged by federal & state regulators

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Benefits of LID

- Improved water quality
- Reduced number and severity of flooding events
- Improved groundwater recharge
- Enhanced property value
- Reduced irrigation and energy demands
- Enhanced neighborhood aesthetics
- Connectedness of built and natural environments

National LID Programs

- Puget Sound (WA): *Required in all protected areas*
- Maryland: *Chesapeake Bay Protection Area*
- New Jersey: *Required for all public projects*
- Philadelphia: *Tree planting initiative - GreenPlan*
- NY: Plan NYC - *Green Infrastructure Plan*
- Chicago: G*reen roofs, green alleys*

Note: LID criteria vary widely from location to location based on geography, climate, hydrology and regulated waterways (i.e. the Chesapeake Bay and Puget Sound)

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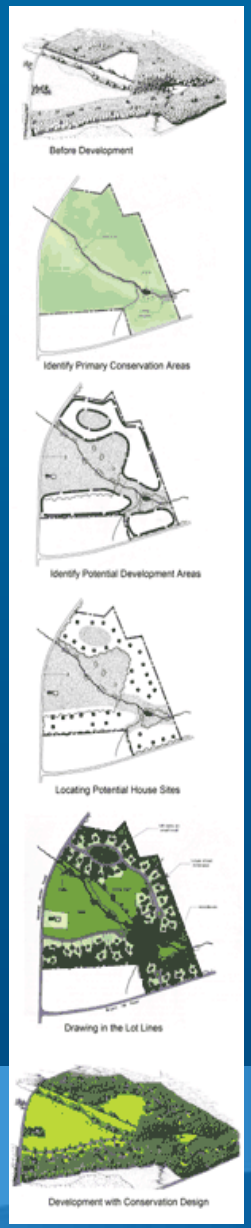
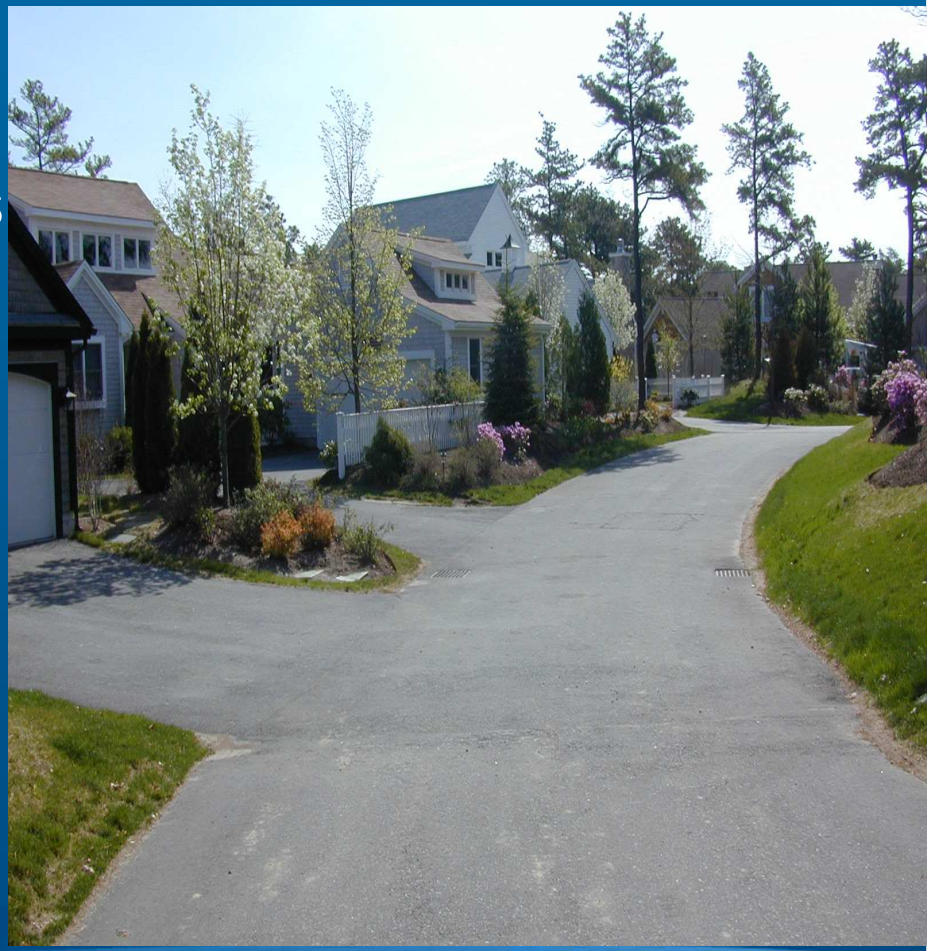
LID Site Design



- Conservation of natural hydrology, trees, and vegetation
- Minimized impervious surfaces
- Dispersal of stormwater runoff
- Conservation of stream & wetland buffers
- Ecological landscaping



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Site Design Practices

GOAL: Infiltrate, filter, store, evaporate, and detain runoff

- Reduce storm pipes, curbs and gutters
- Preserve sensitive soils
- Cluster buildings and reduce building footprints
- Reduce road widths
- Minimize grading
- Limit lot disturbance
- Reduce impervious surfaces

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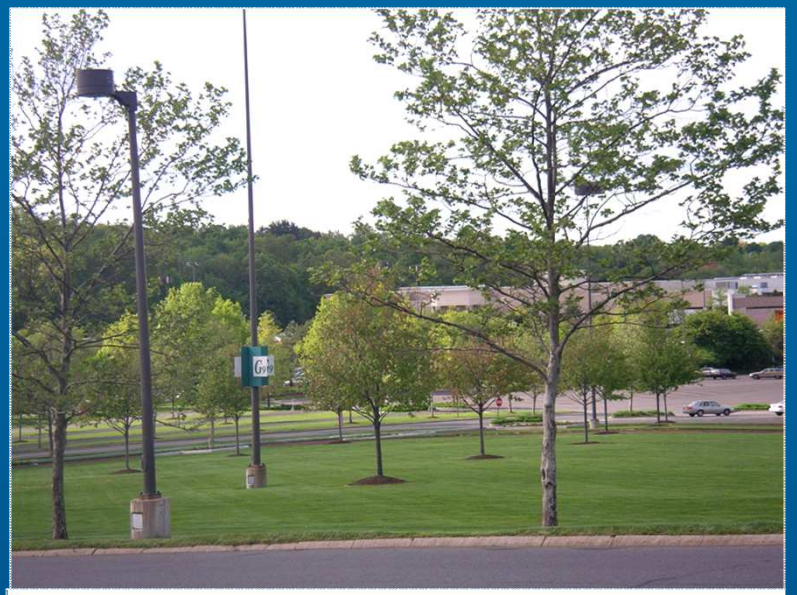
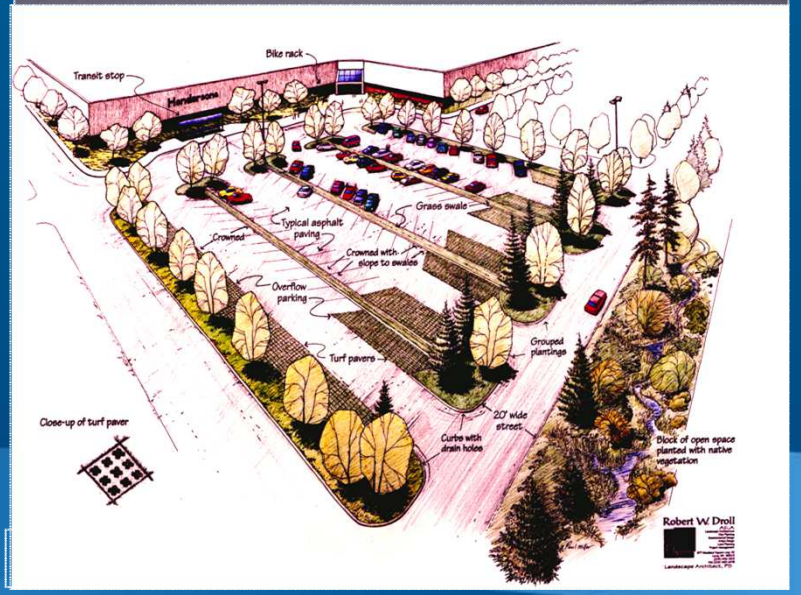
Better Parking Lot Design

- Incorporate green strips and buffers
- Create multiple small lots
- Reduce requirements near transit
- Allow shared parking
- Require compact spaces
- Set parking maximums
- Permeable/Porous pavement





Low Impact Development Policy

Fort Collins LID criteria as of March 2013

- A minimum of 50% of new impervious surface area must be treated by a LID-type device or technology (i.e. bio-retention cell, bio-swale)
- At least 25% of new parking areas must be designed to be pervious
- Implementation of a design alternative that provides equal or better treatment than the previous requirements

LID Stormwater Techniques

- Dry Well Infiltration
- Disconnection of Rooftop Runoff
- Stormwater Planters, Tree Planting
- Vegetative Buffers
- Open Channels
- Bioretention/Bioswales
- Stormwater Wetlands
- Green Rooftop Systems
- Permeable Paving

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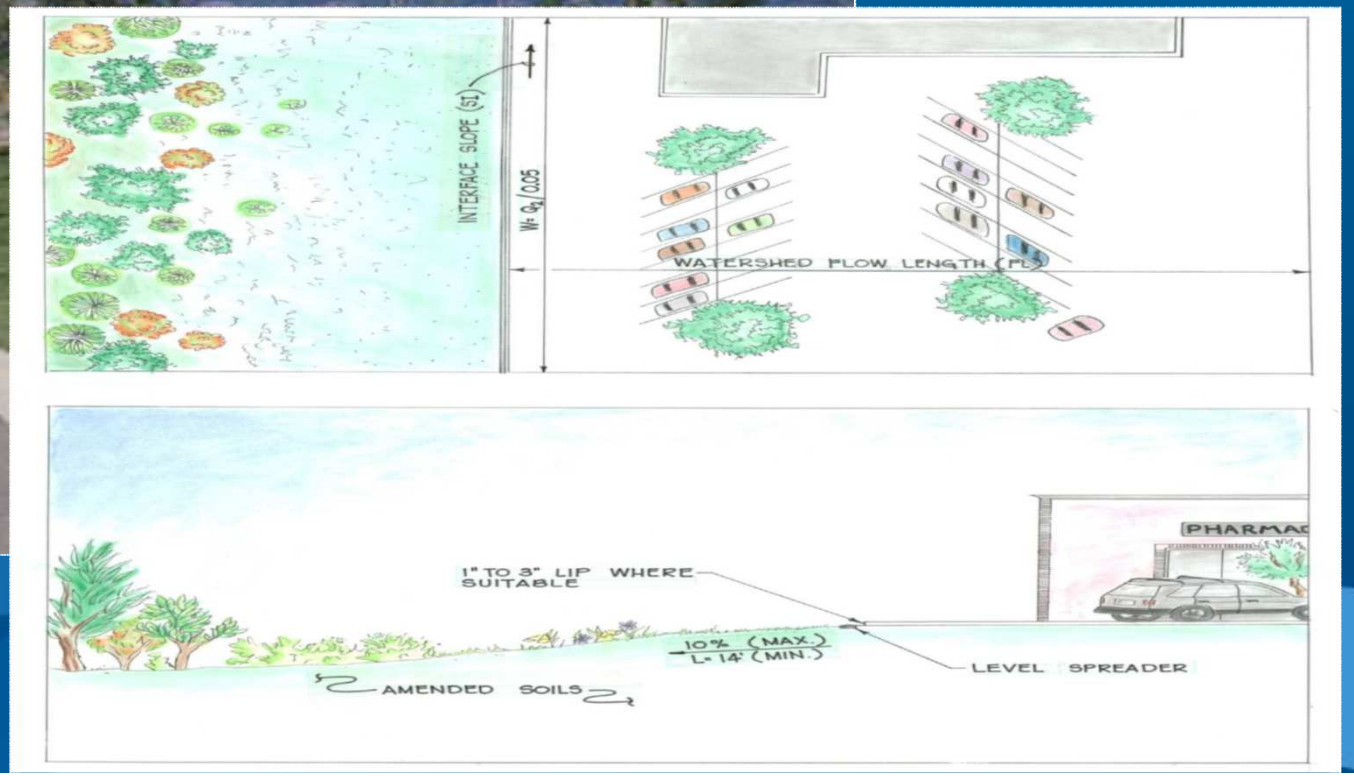
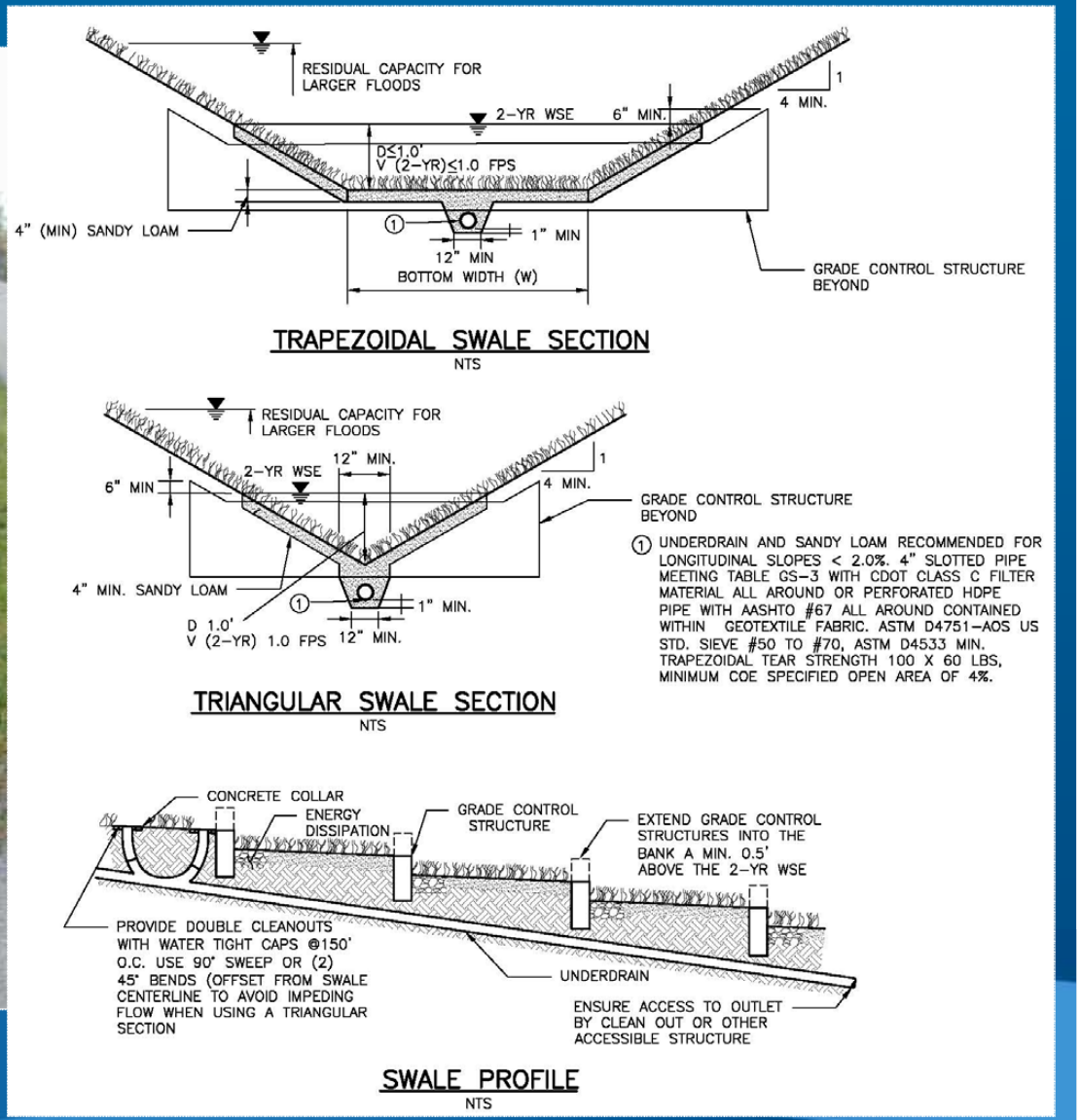
Example LID Technologies

Vegetative Buffer



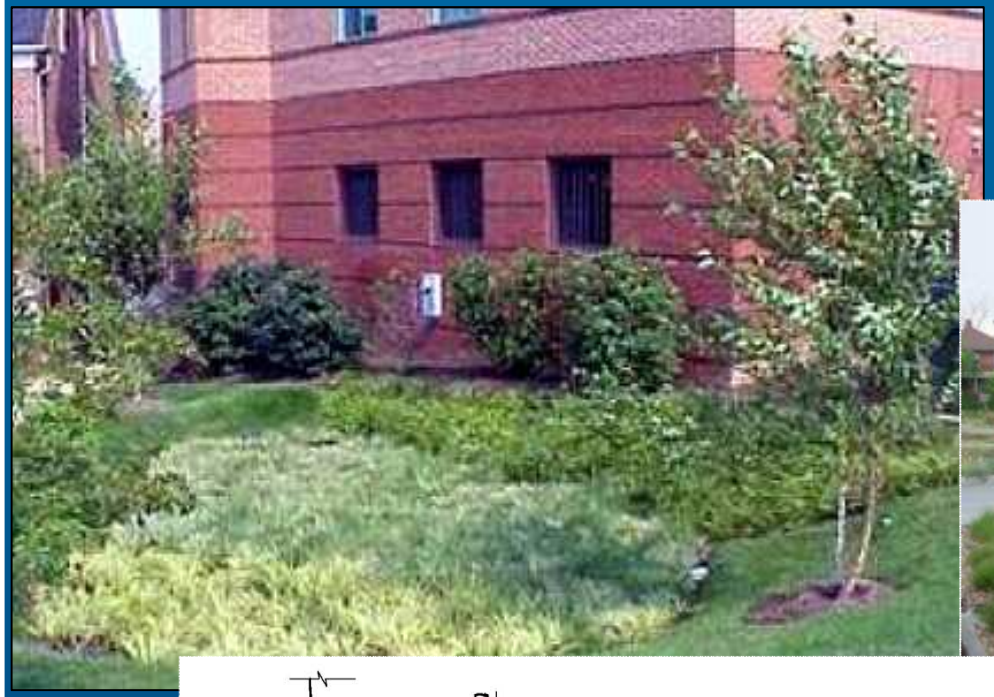
Example LID Technologies

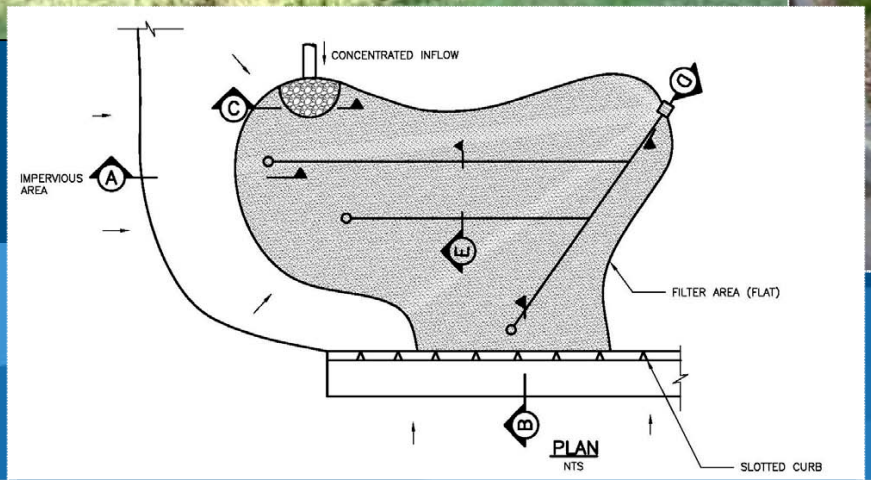
Grass Swale



Example LID Technologies

Bioretention – Rain Garden

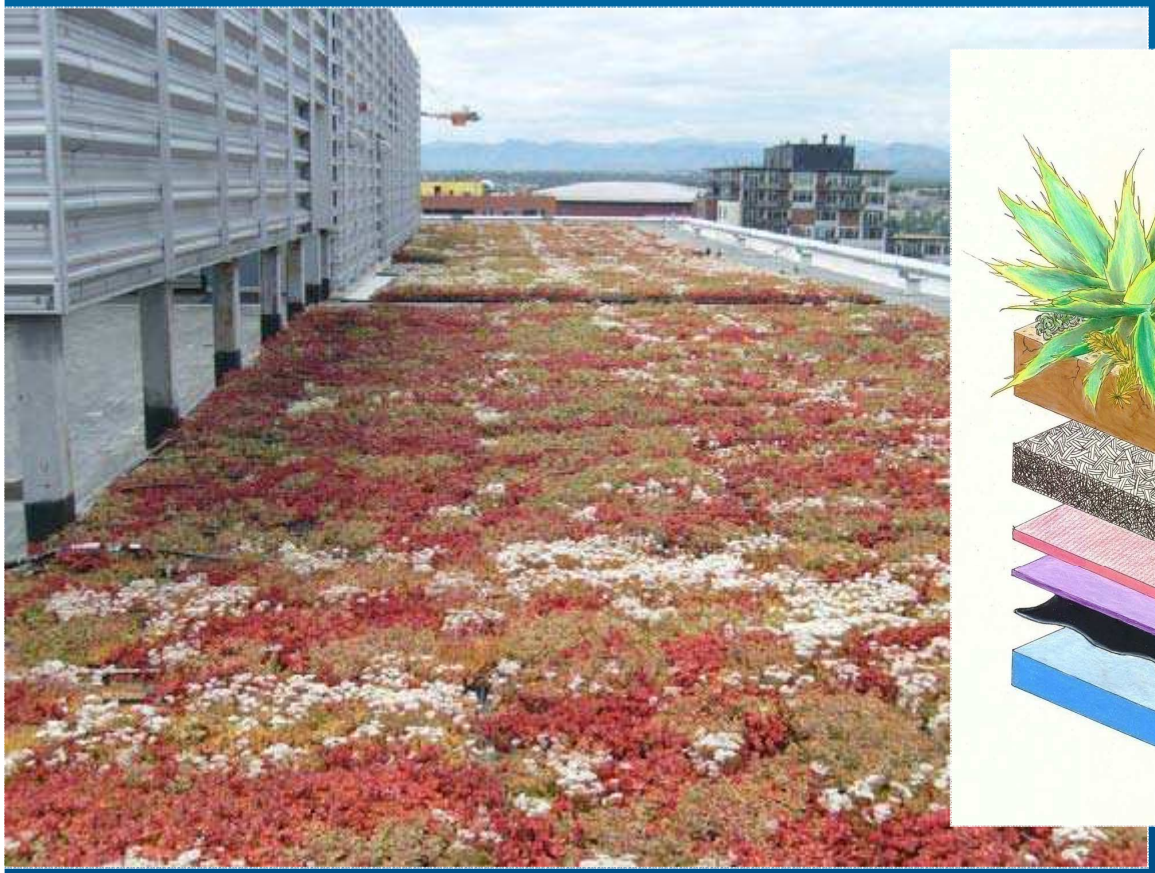


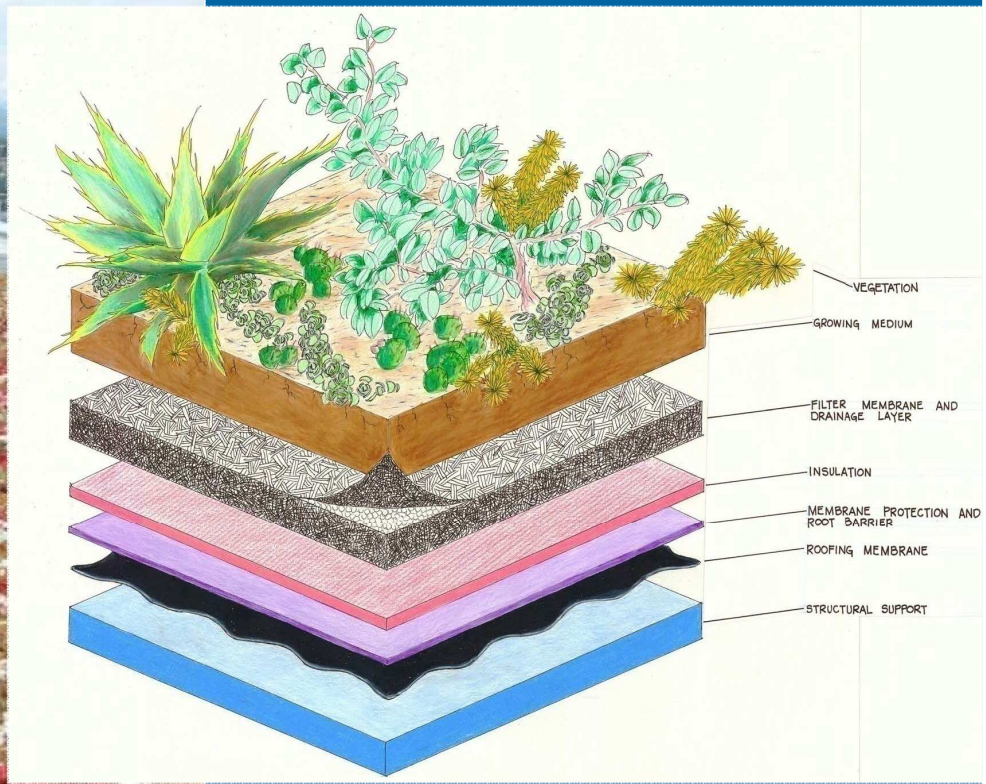


Denver, CO

Example LID Technologies

Green Roof





EPA Region 8 Headquarters, Denver , CO

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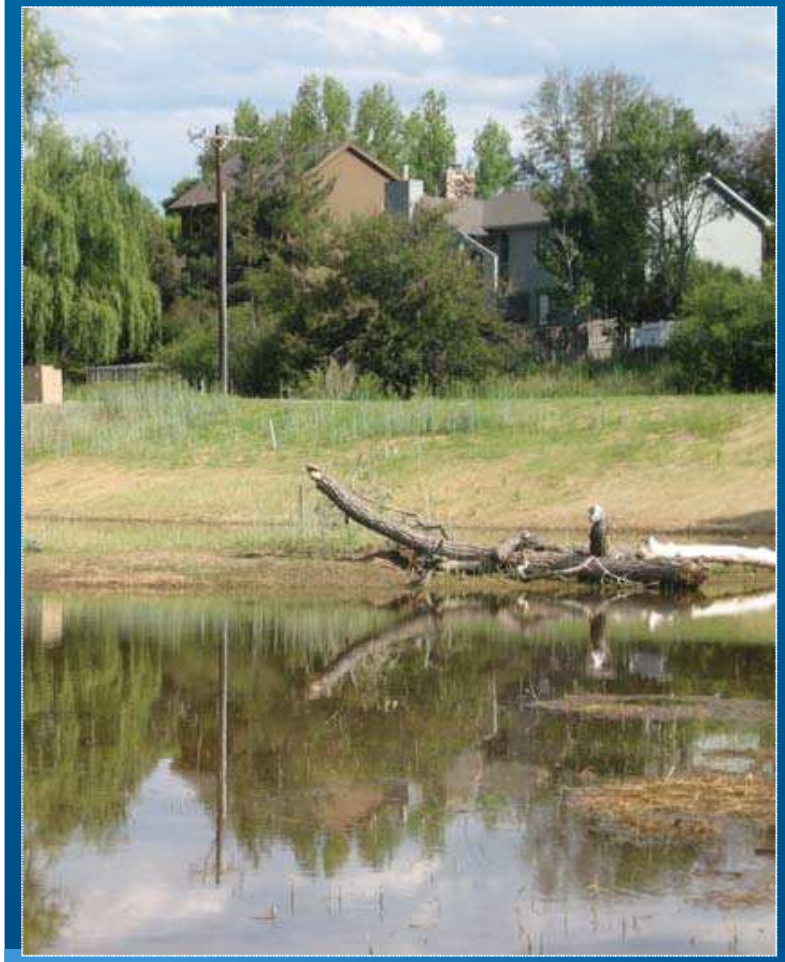
Example LID Technologies

Wet Pond / Constructed Wetlands Channel or Pond



CIPO Project, Fort Collins ,CO

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Example LID Technologies

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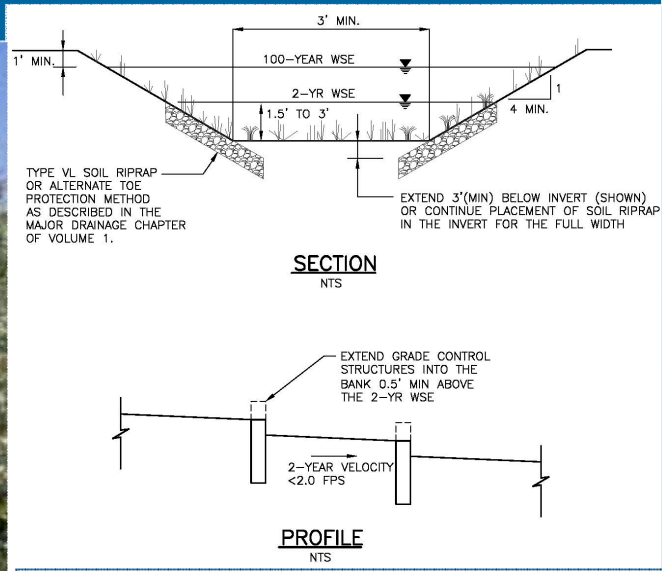

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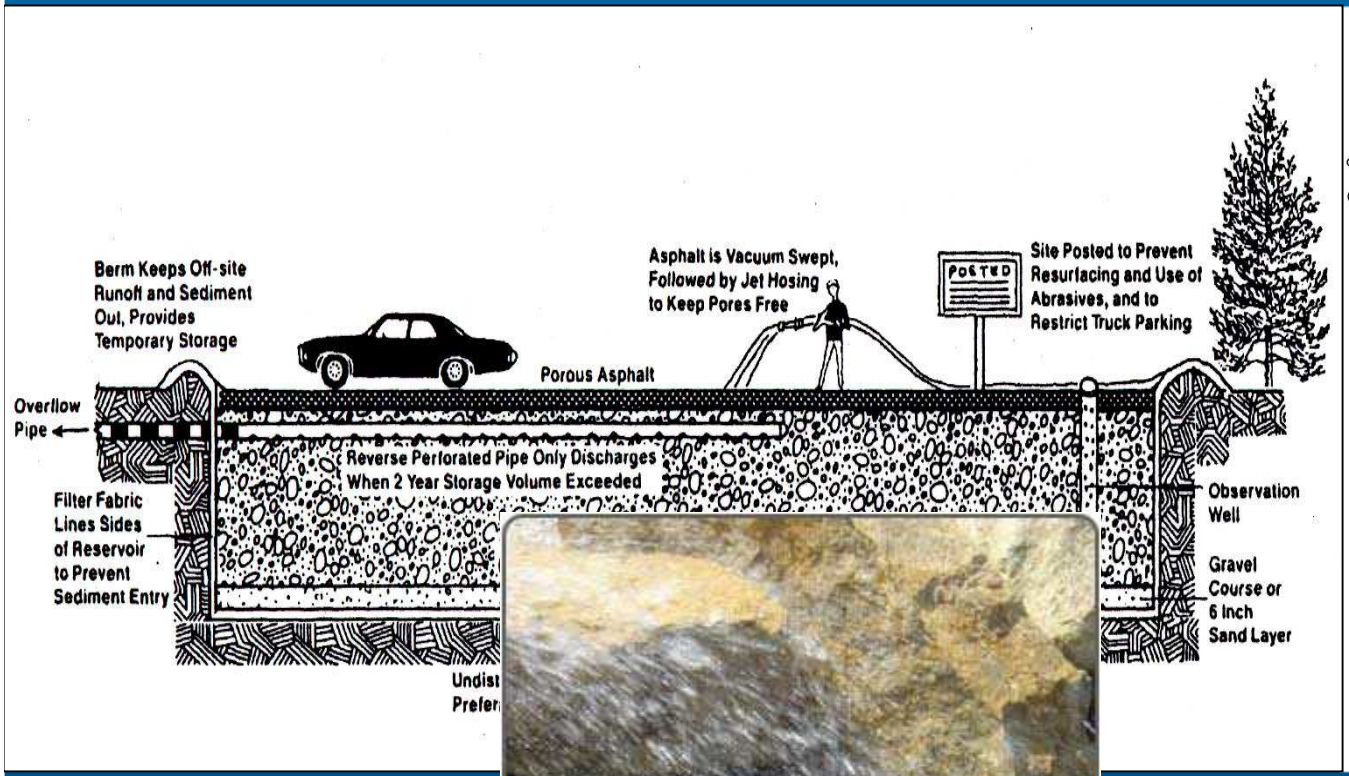
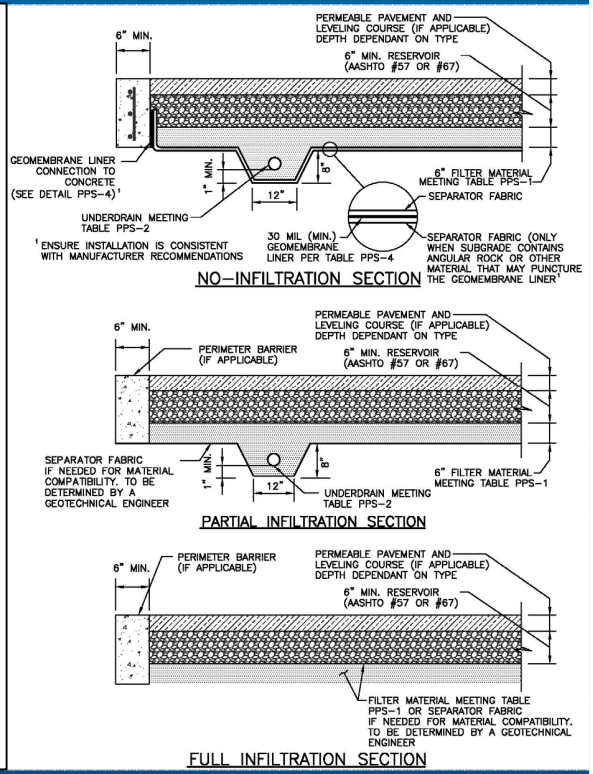
Example LID Technologies

Permeable Pavement Systems





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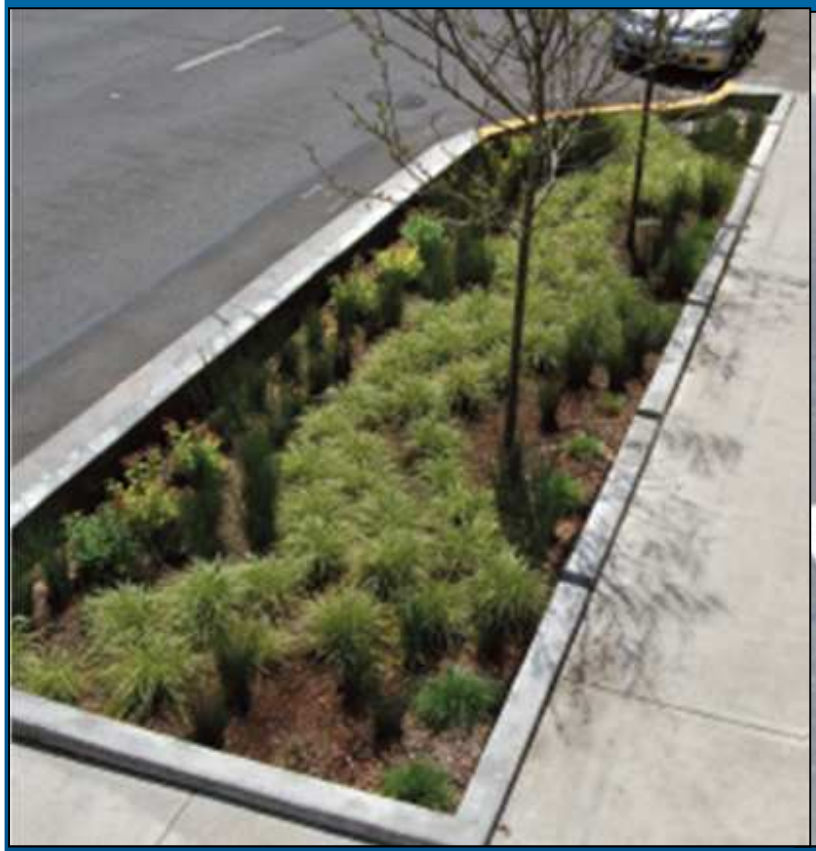
Implementing LID in the ROW



- Reduced street widths - traffic calming
- Rain gardens
- Alternative paving

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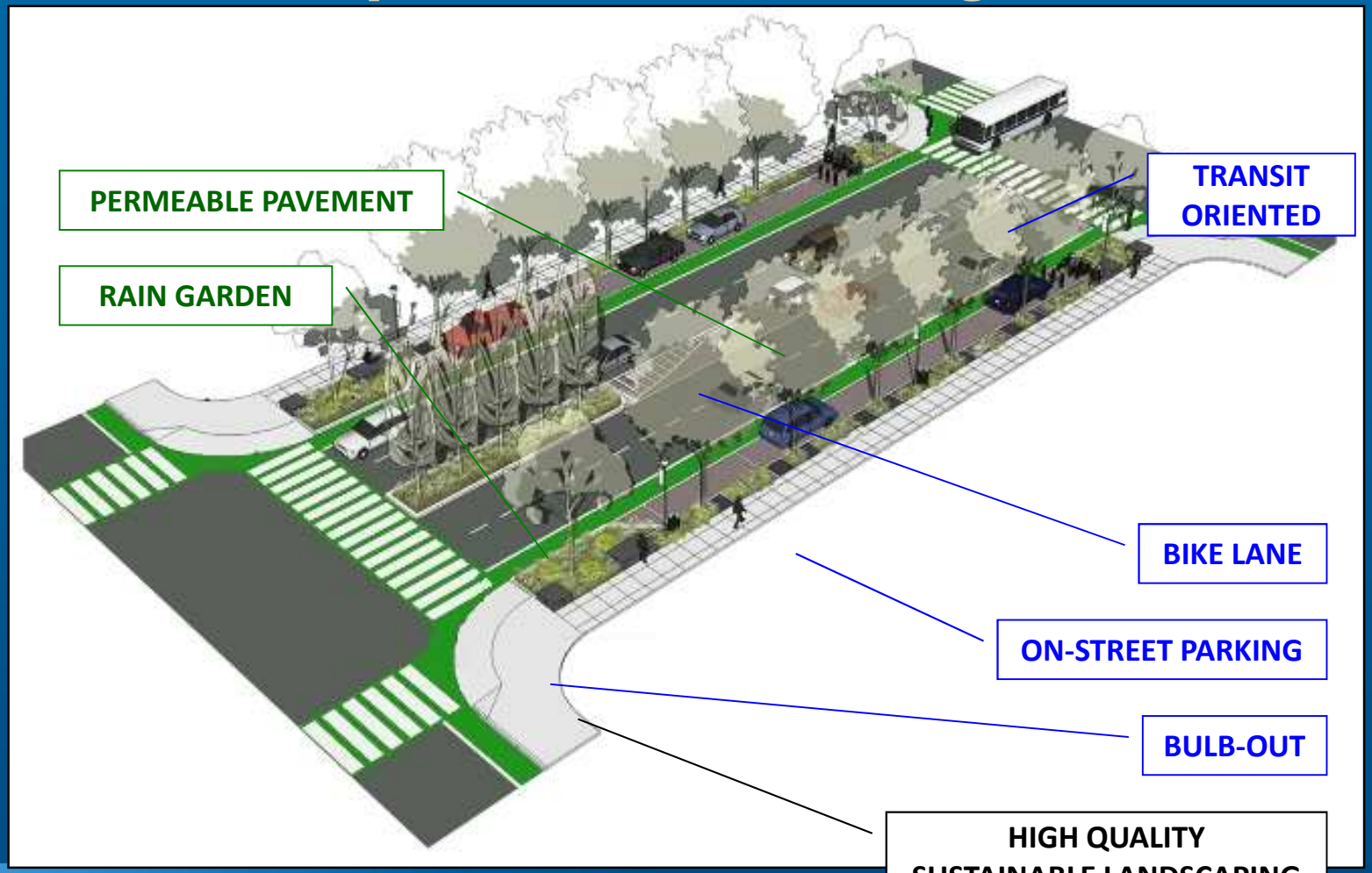
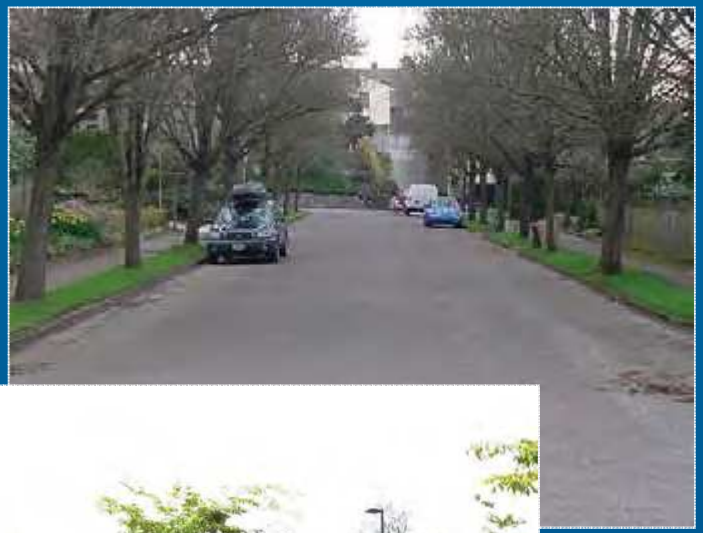
Implementing LID in the ROW – Complete Street Design



Aesthetics of LID – Public Streets



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Application Examples – The Grove

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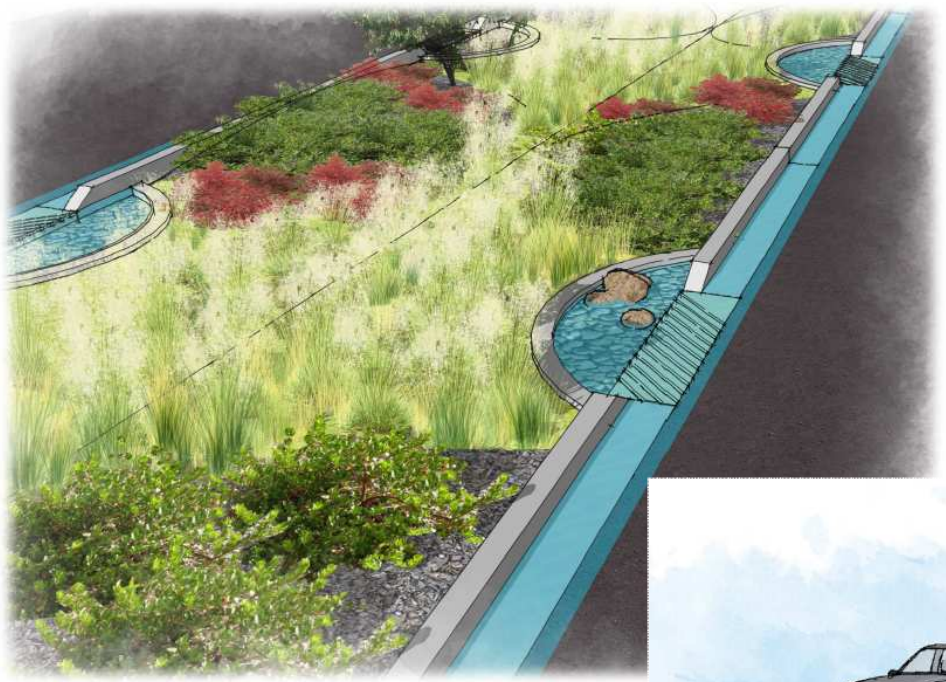
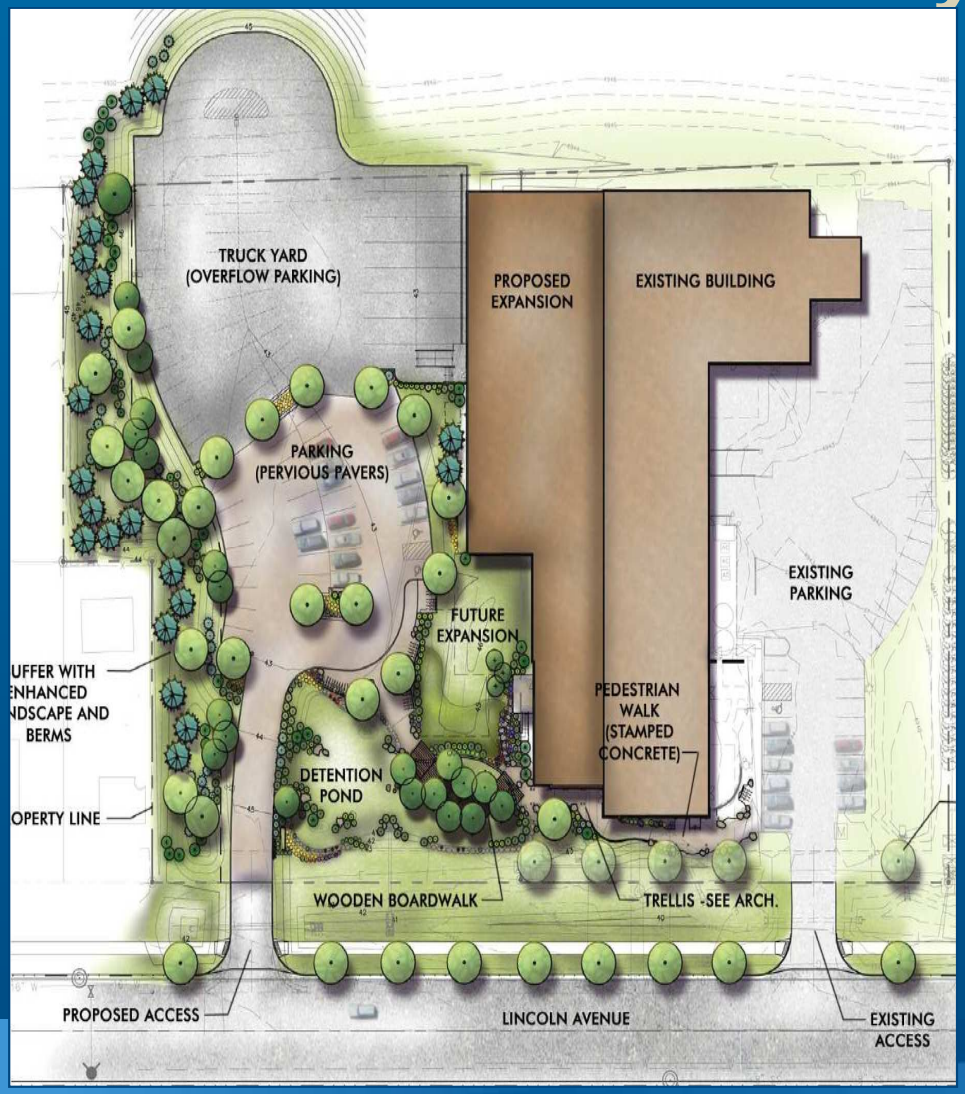
Rain Garden Applications – New Belgium Brewery

Median Applications



Parking Lot Application – Odell's Brewery



Initial Costs vs. Life-Cycle Costs

- Initial Investment
- Maintenance Cost
- Added Value
- Replacement Cost
- Reduced Infrastructure
- Increased Land Value

Initial Installation Cost: $128,000 vs. $50,000

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Odell's Brewery
Construction – Snow – Maintenance

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Aesthetics of LID – Mitchell Block

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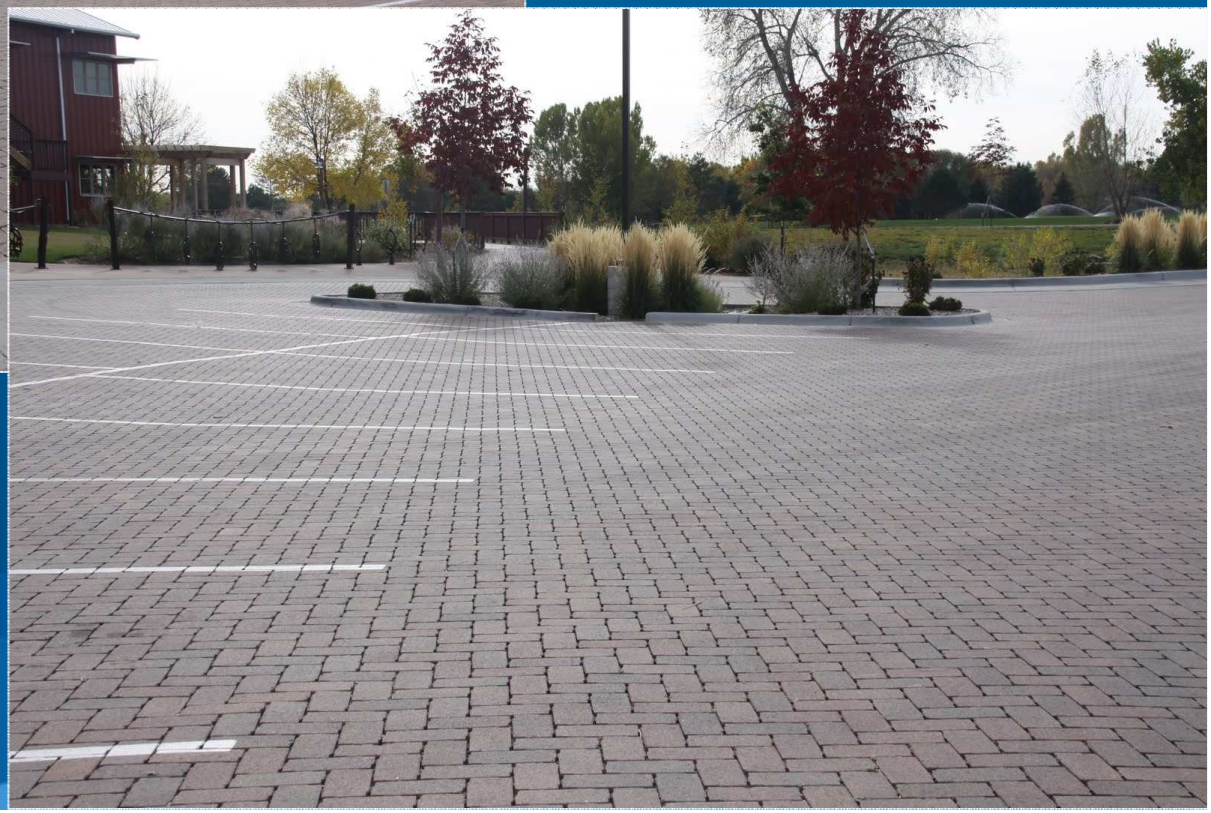
Aesthetics of LID – Odell's Brewery



Keys To Successful LID Implementation

- Start planning early
- Assemble a team
- Create partnerships - Be pro-active
- Use appropriate technique for the site
- Build upon other successes in the region
- Be willing to go the extra mile

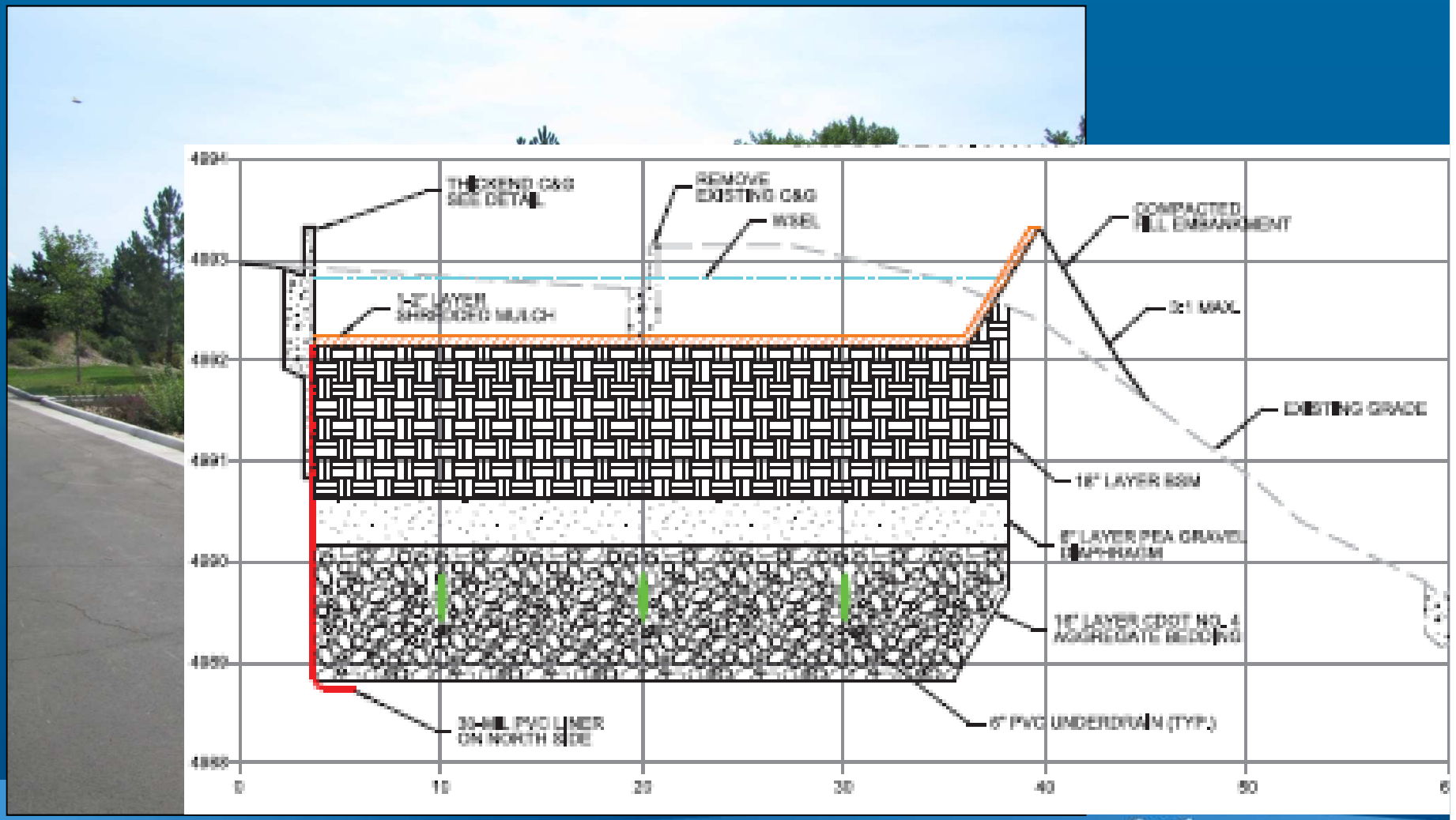
Upcoming Biz Ed programs

- Low Impact Development (LID) Talk & Tour – July 31
- Become a Green Machine – August 21
- Small Business Top 10 Efficiency Actions – September 18
- Multi-Family Utility Management – October 16
- Sector Success: Efficiency Best Practices
  - Retail - November 6
  - Restaurants – November 13
  - Small Healthcare & Daycare – November 20
- Implementing a Sustainability Program – Dec 18

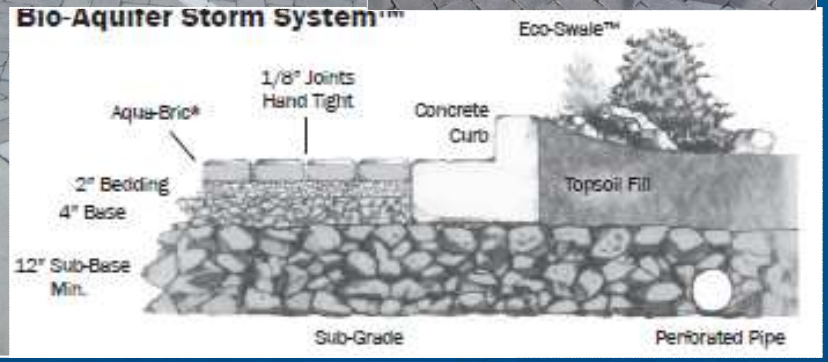
Additional Resources

- *Contact:* Basil Hamdan PE, CFM, Stormwater Quality Engineer, bhamdan@fcgov.com 970 224-6035
- *City:* http://www.fcgov.com/utilities/community-education/adults/biz-ed/
- *EPA LID Site:* *http://water.epa.gov/polwaste/green/index.cfm* http://water.epa.gov/polwaste/green/bbfs.cfm?goback=.gde_4605732_member_219392996
- *NC State LID Guidebook:* http://www.ces.ncsu.edu/depts/agecon/WECO/lid/documents/NC_LID_Guidebook.pdf
- *University of New Hampshire Stormwater Center:* http://www.unh.edu/unhsc/pubs-specs-info
- Villanova University Urban Stormwater Partnership: http://www3.villanova.edu/vusp/

LID Pilot Projects – USC 700 Wood Street



LID Pilot Projects – Mitchell Block



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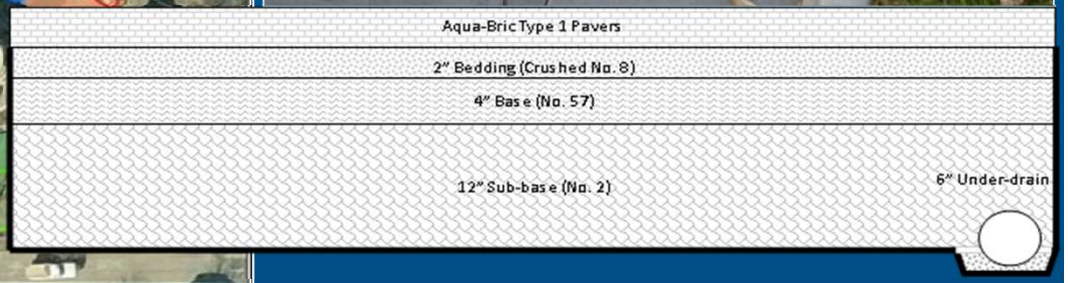

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LID Pilot Projects – CTL Thompson

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