

UTAH DEPARTMENT *of*
ENVIRONMENTAL QUALITY

**WATER
QUALITY**

Development of Utah's Small
MS4 Storm Water Retention Standard

June 21, 2016

Presentation Overview

1. Development of Utah's Storm Water Retention Standard
2. Storm Water Hydrology & Management
3. Retention Standard: 90th percentile storm event
4. LID Techniques



DEVELOPMENT OF UTAH'S STORM WATER RETENTION STANDARD



History of Utah's Retention Standard

Utah Small MS4 General UPDES Permit (2010-2015) included a narrative standard:

- Mirror the predevelopment hydrology, or
- Improve the hydrology of a redeveloped site, and
- Reduce the discharge of storm water
- Evaluate and encourage a Low Impact Development (LID) approach

National Storm Water Rulemaking

- EPA/States current approach determined to be unlikely to adequately control storm water's contribution to water body impairment
- EPA began developing new rules in 2009 for a Retention based national performance standard for new development and redevelopment activities based on percentile storm water capture
 - ➡ Apply to development disturbing 1 acre or more (or CPDs)
 - ➡ Numeric performance standard.
 - ➡ SW control measures that infiltrate, evapotranspire, and/or harvest storm water.

Retention Standard Development Deferred to States in 2014

State Stormwater Standards for Newly Developed and Redeveloped Sites

Performance standards that are specific and measurable are an important tool to set clear expectations for controlling stormwater impacts from newly developed and redeveloped sites.

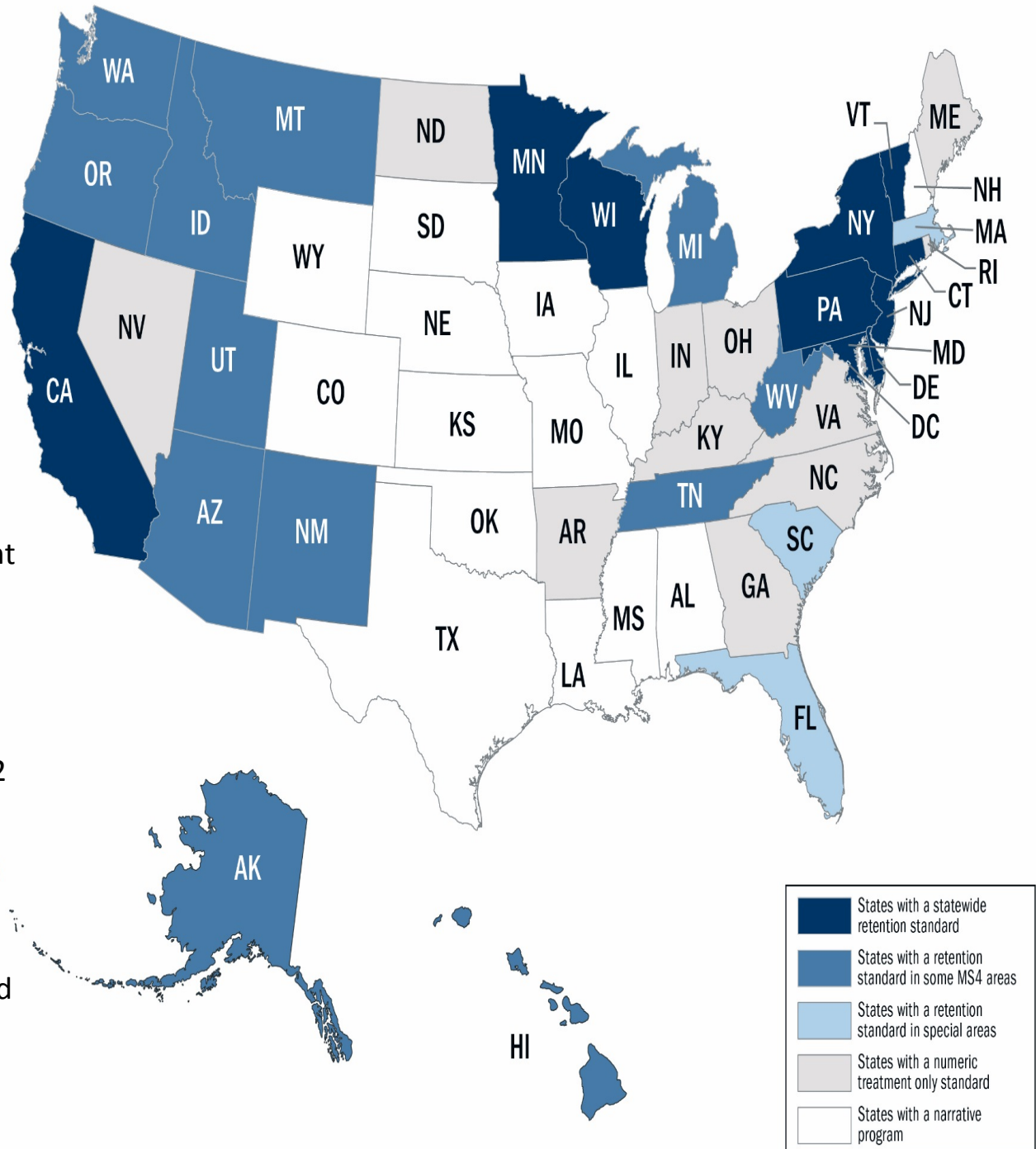
States use three types of approaches:

- Numeric retention standards (50% of states)
(manage stormwater on-site)
- Numeric treatment standards (22% of states)
(address pollutants only)
- Narrative program (28% of states)

States implement retention standards to different extents

- Statewide through the construction stormwater general permit or state regulation (10 states)
- Sites in Phase I and/or Phase II MS4s (12 states)
- Sites in special areas (wetland areas in MA; shellfish water in SC; closed basins in FL)

There are 9 states that apply a retention standard to sites less than one acre.



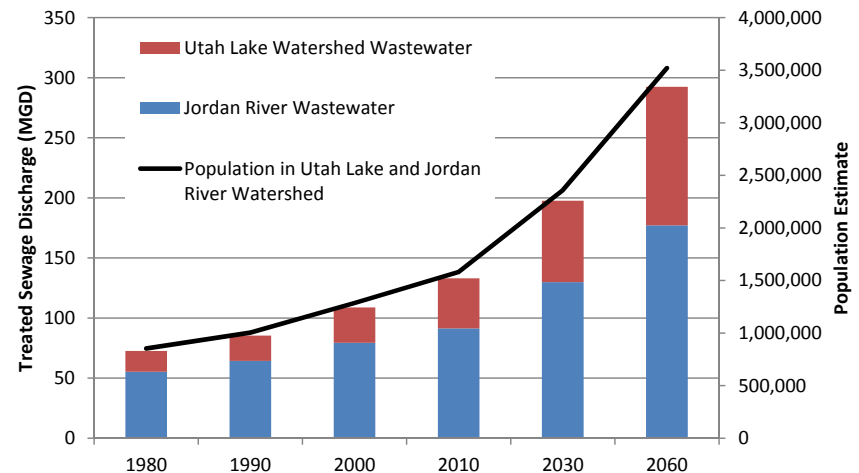
EPA's Permit Quality Review (PQR) Audit

Lone critical finding from the Storm Water Program Review:

- The current narrative post-construction storm water management requirements are insufficient to meet MEP
- The permit should include a specific numeric design standard for all newly developed and redeveloped areas
- Especially in the densely populated/rapidly growing parts of Utah

Projected Growth from 2010 to 2060

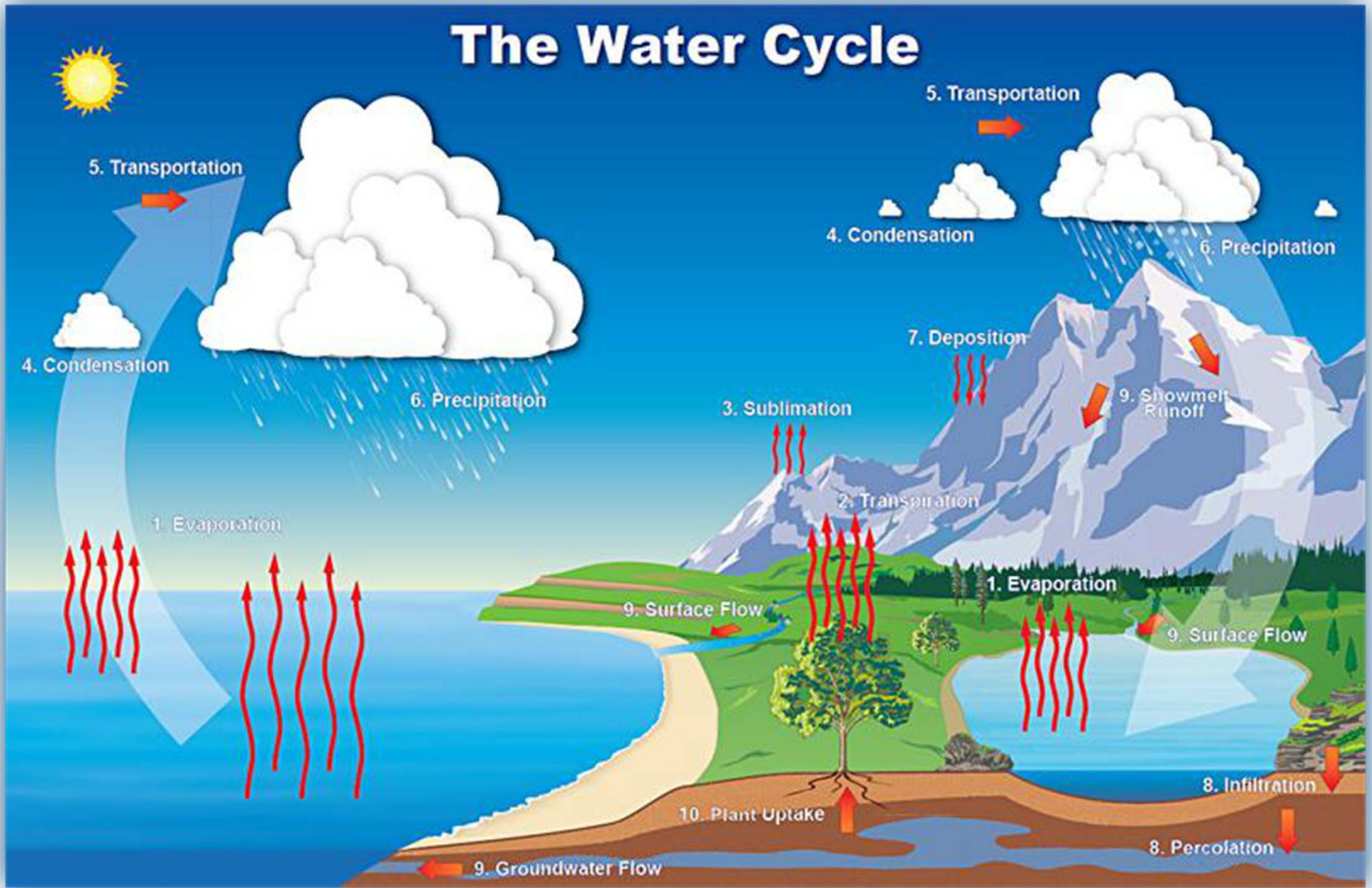
- State of Utah: 115%
- Jordan River Basin: 94%
- Utah Lake Basin: 176%



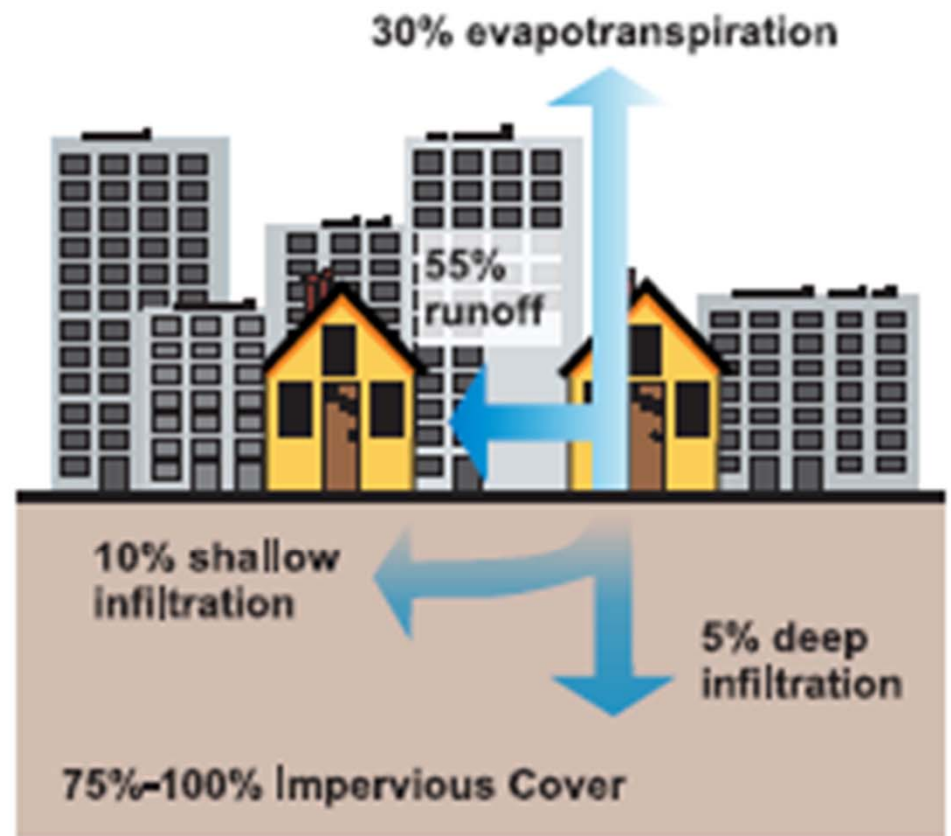
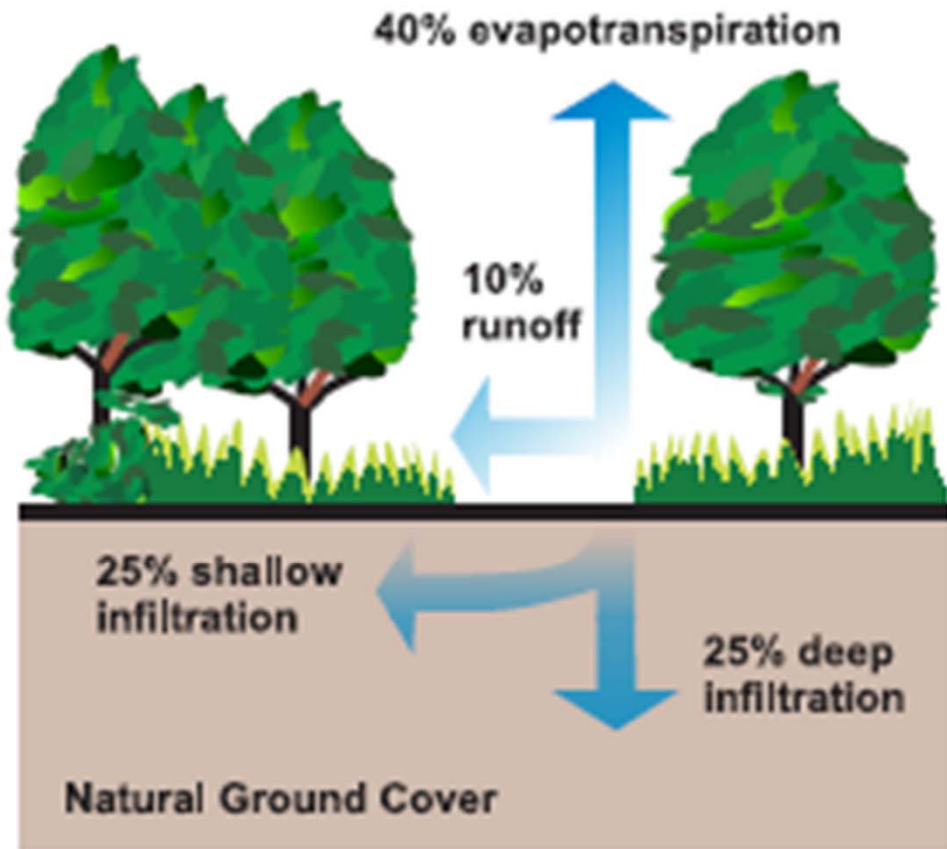
STORM WATER HYDROLOGY & MANAGEMENT



The Water Cycle



	Pre-Development	Post-Development
Surface Runoff	10%	55%
Infiltration	50%	15%
Evaporation	40%	30%

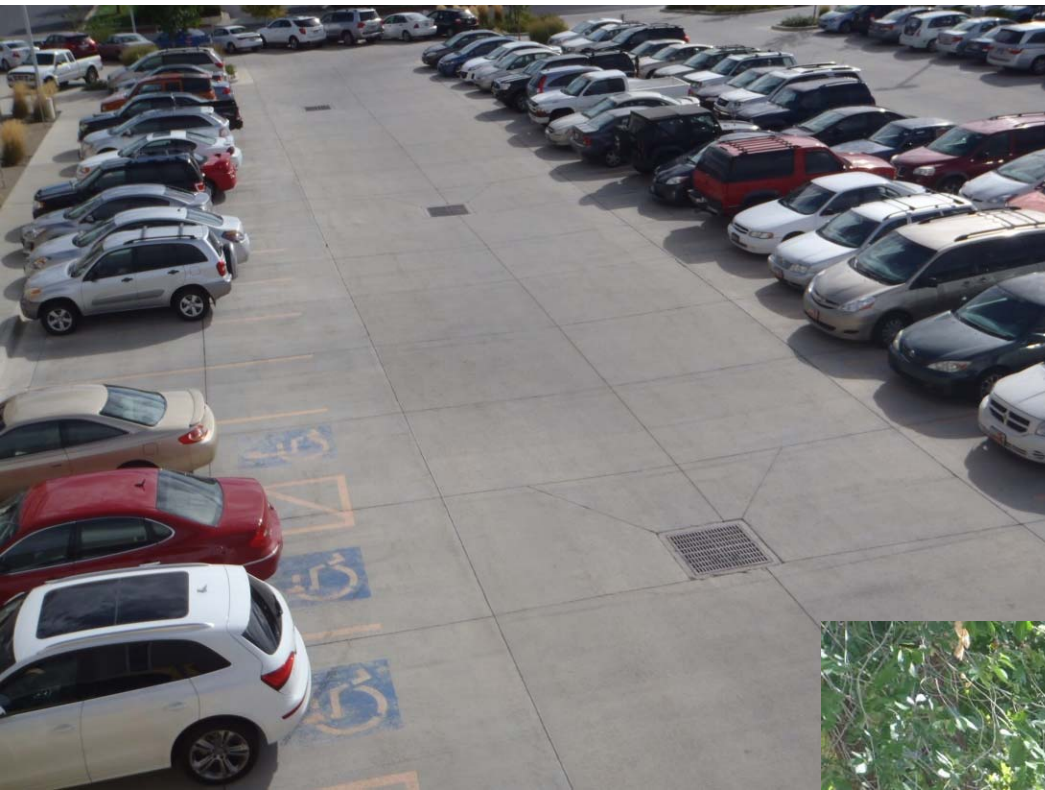




The Problem: Conventional Stormwater Management







**Conventional Storm
Water Management:**
What are the issues
with Collect-Convey-
Discharge?



Impacts on Urban Stream Water Quality

- Nutrient loads promote stream and lake algal growth
- Bacterial contamination during dry and wet weather
- Higher loads of organic matter
- Higher concentrations of metals
- Increased sediment load
- Stream warming
- Trash and debris jams



Philosophy Change

Previous Strategy

Collect and dispose of storm water quickly using engineered systems

Current Strategy

- Avoid and reduce impacts of development
- Manage storm water at its source through LID
- Emulate functions of natural systems to reintegrate rainfall into the water cycle rather than disposing of it as a waste product

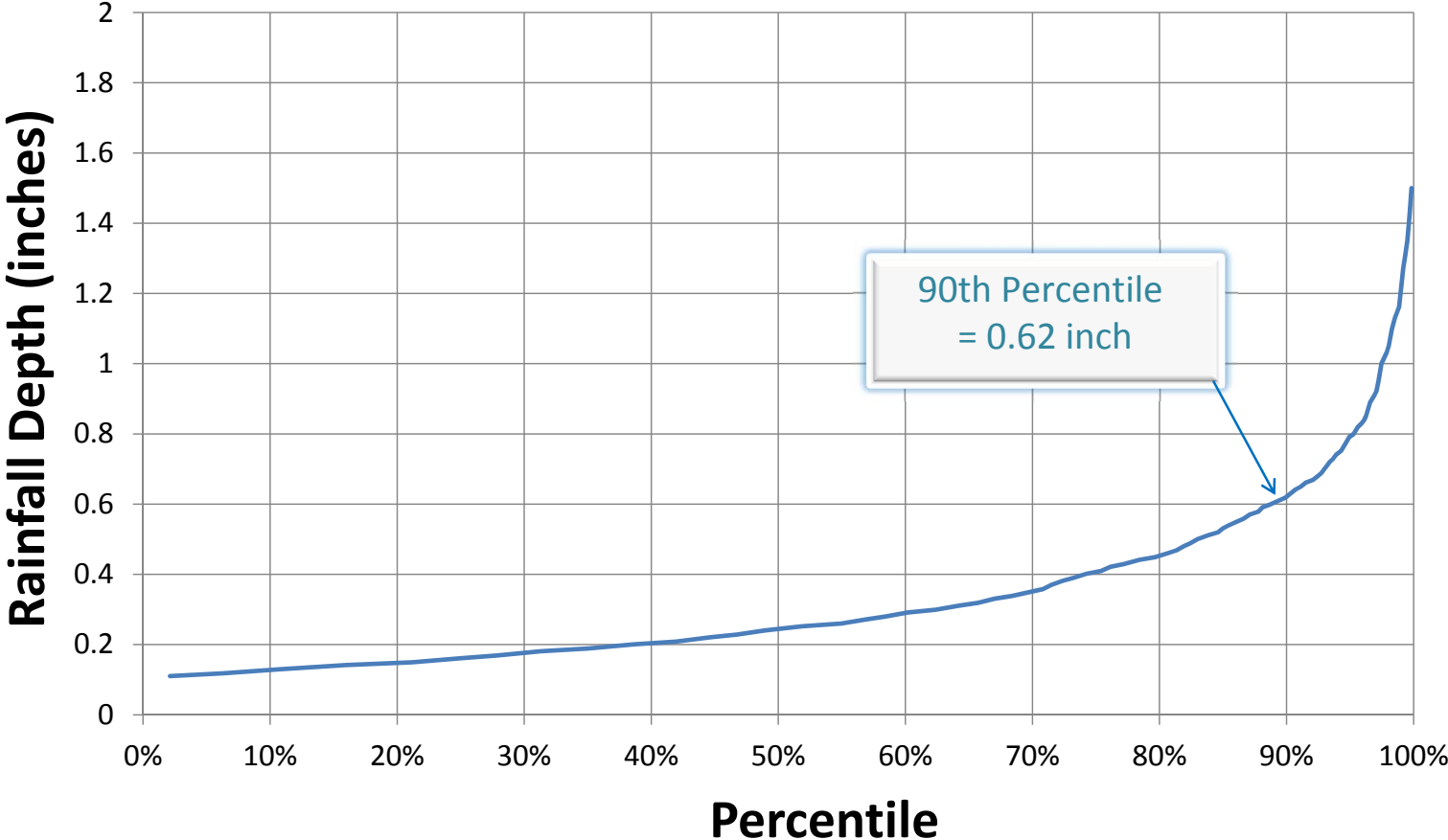
**RETENTION STANDARD:
90th PERCENTILE STORM EVENT**



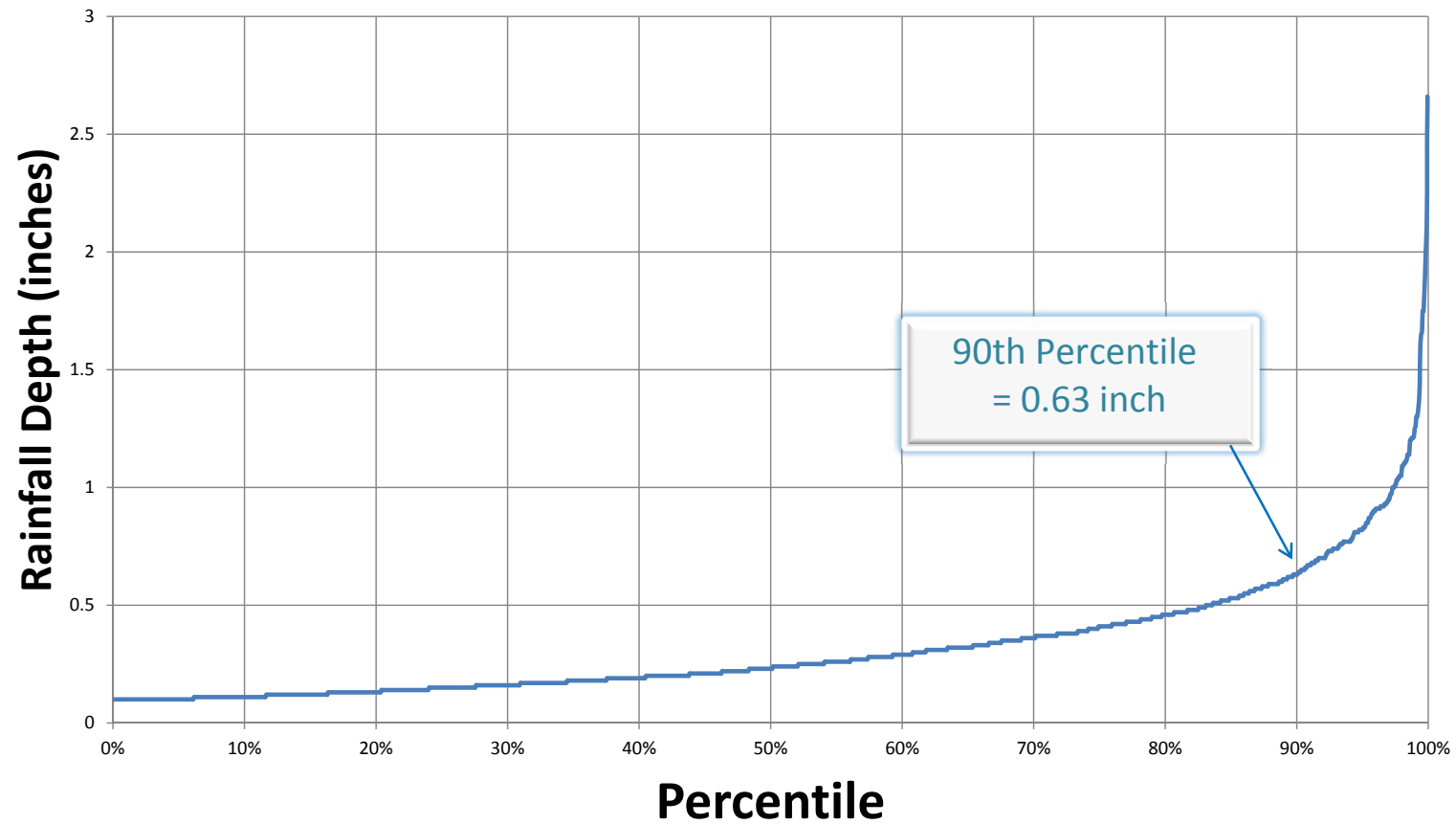
What is the 90th Percentile Storm Event?

- 90th percentile rainfall depth is a numeric translator of the narrative standard
- The depth which is $\geq 90\%$ of all storm events over a given precipitation record
- Represents the small, frequently occurring storms
- For Utah MS4s: 90th Percentile = 0.6 – 0.7 inches

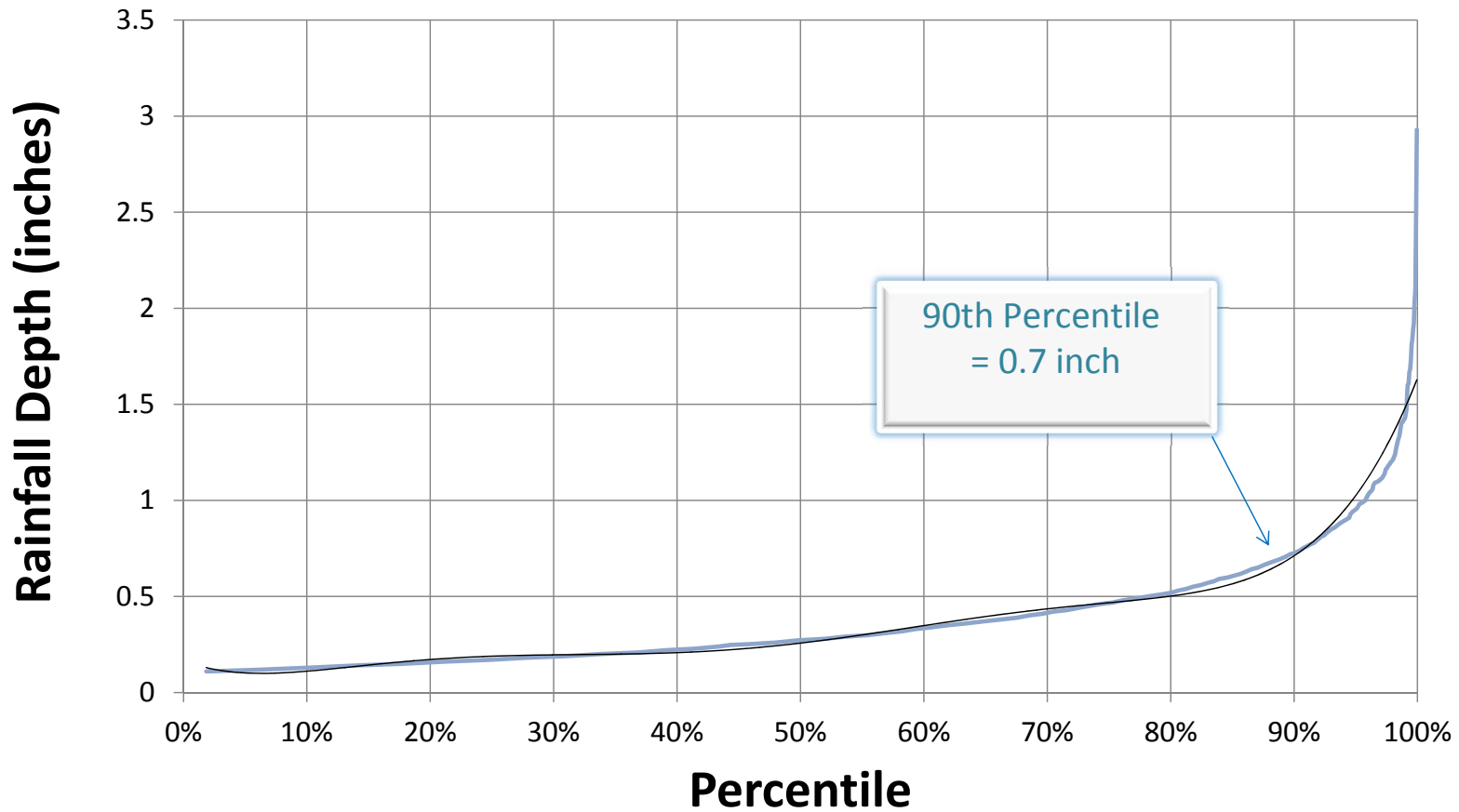
Rainfall Frequency for Orem Treatment Plant



Rainfall Frequency for Logan Experimental Farm



Rainfall Frequency for Brigham City



LID TECHNIQUES



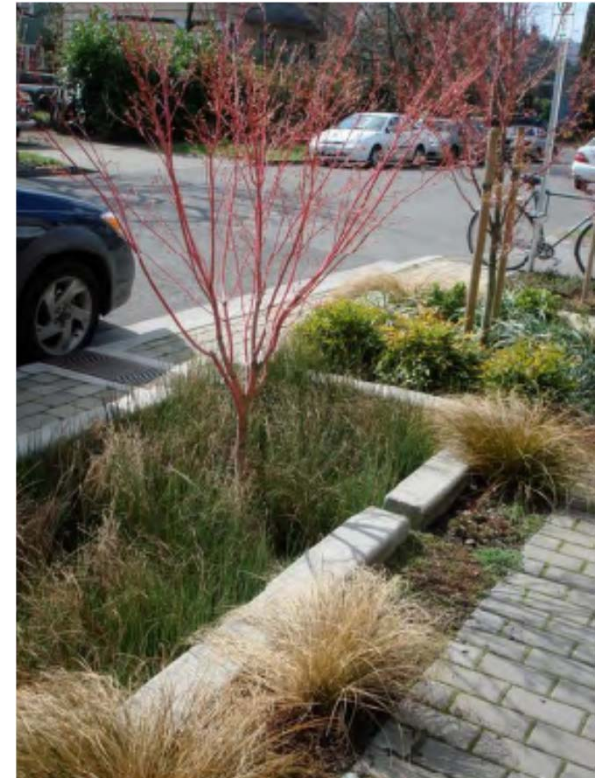
What is Low Impact Development?

- Approach which mimics a site's predevelopment conditions
- Techniques that:
 - Infiltrate
 - Filter
 - Store
 - Reuse
 - Evaporate
 - Transpire
 - Detain runoff close to its source



What is Low Impact Development?

- Preservation of natural systems
- Cluster Development
- Minimization of Impervious Areas
- Green Roofs
- Permeable Paving
- Rainwater harvesting
- Bioretention
- Storm Water BMPs



Preservation of Open Space



Reduction of Impervious Area



Pervious driveways



Shared driveways



Options for Parking Lots



Grass Swale



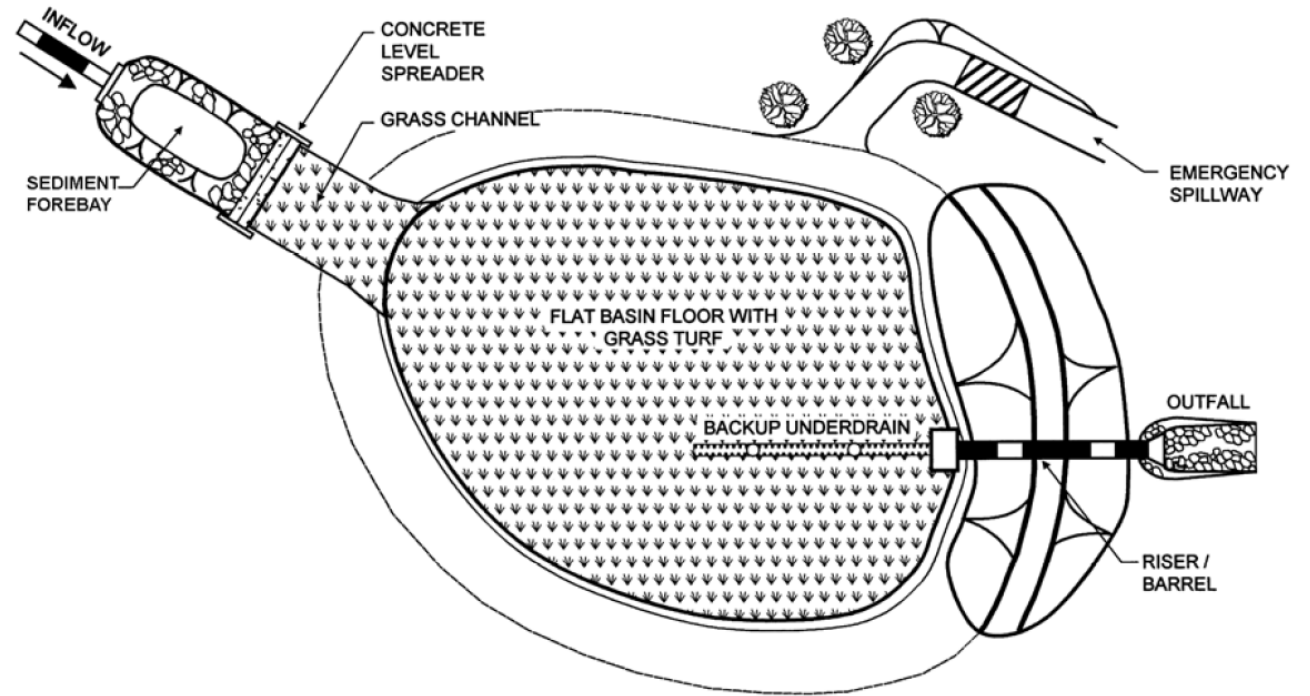
Vegetated Swale



Vegetated Swale



Infiltration Basin



Constructed Wetland



Bioretention



Bioretention



Rain Gardens



Green Roofs



Rainwater Harvesting

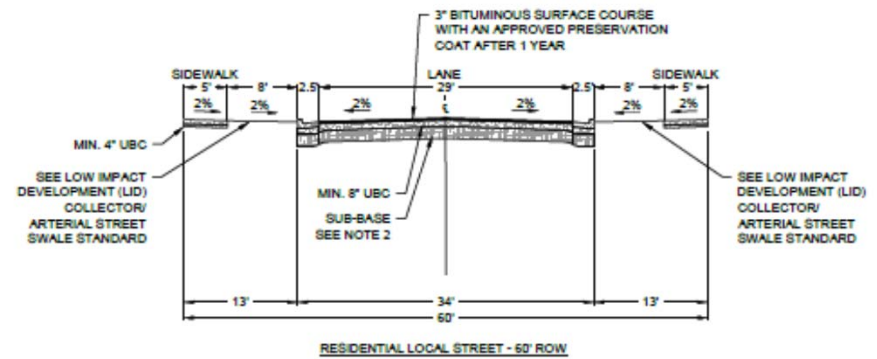
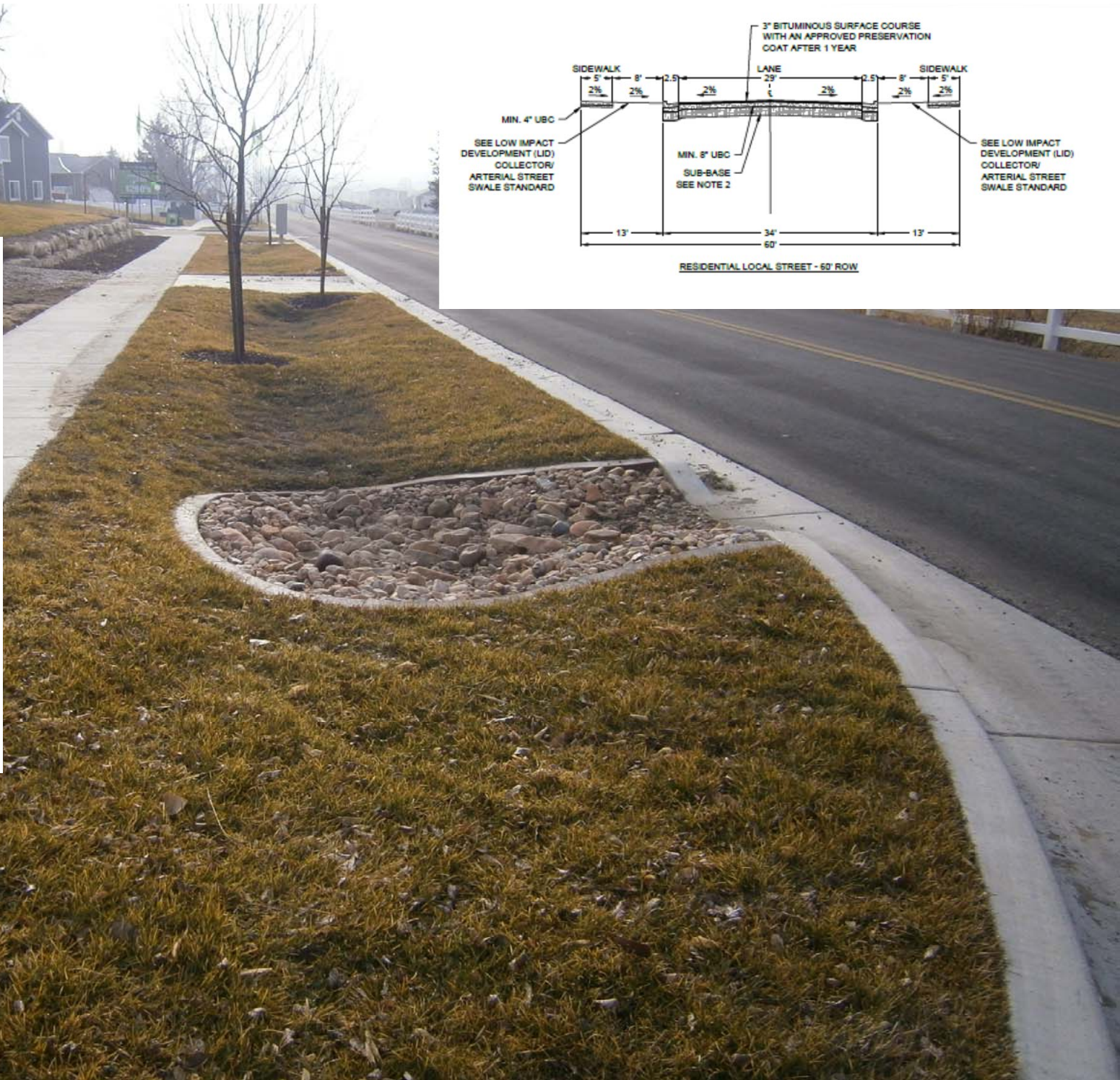
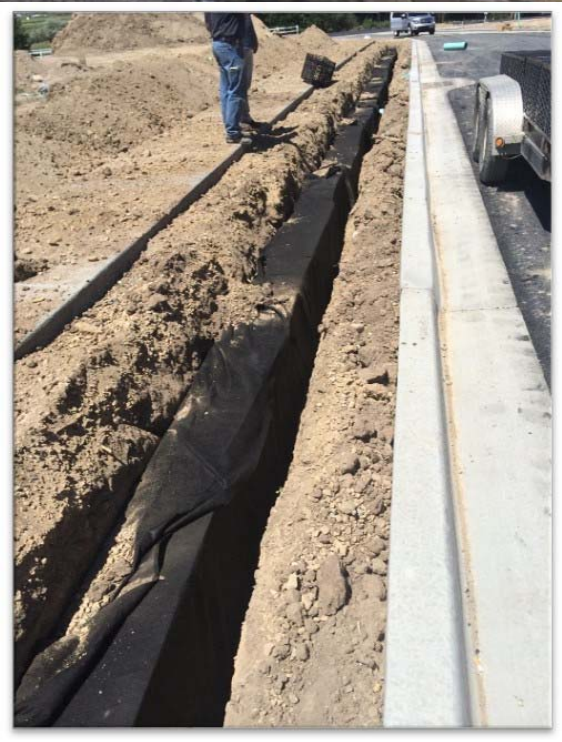


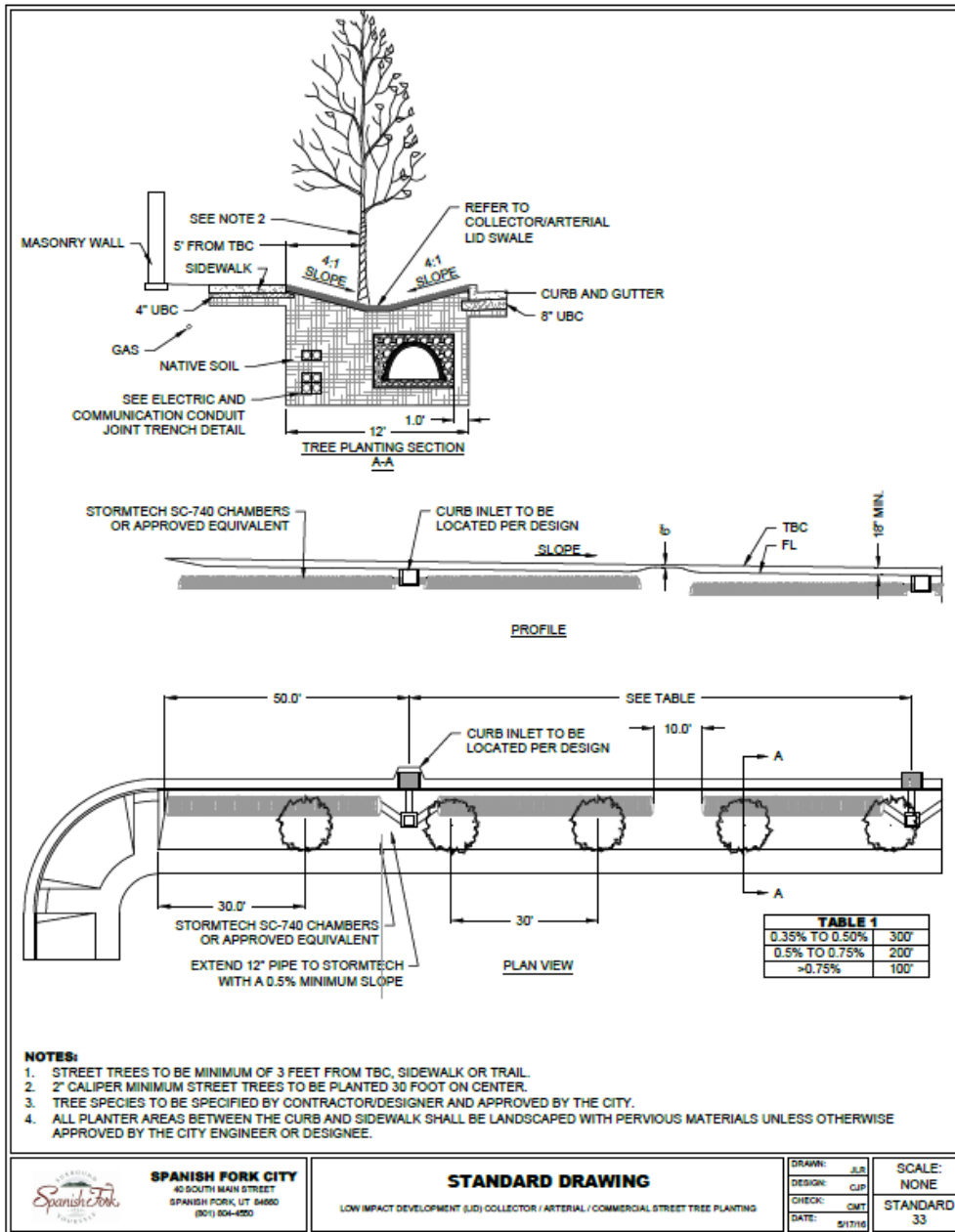
Rainwater Reuse



Pervious Concrete







Homes clustered to allow for native vegetation retention

Permeable parking provided for guest parking - reduced roadway does not allow for on street parking

Shared driveways to reduce impervious surfaces

Bioretention facility for roadway runoff



Pervious trail through shared open space

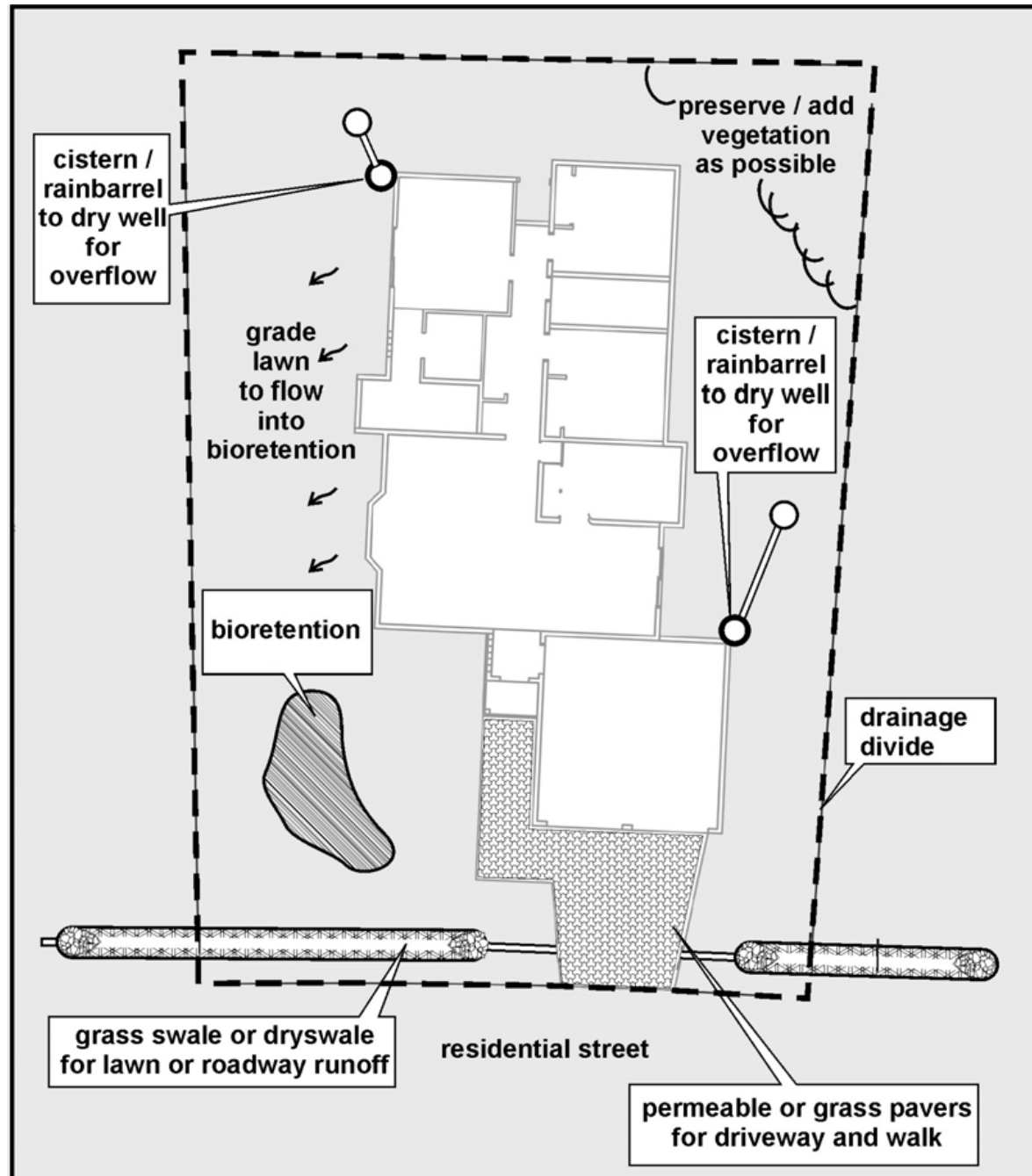
Permeable sidewalks and driveways

Reduced roadway width to reduce impervious surfaces

Rain gardens for roof and driveway stormwater runoff

Dispersion into retained native vegetation

Options for Single Family Home



Why LID?

Environmental Benefits

- Water Quality
- Remove Pollutants
- Flood Control

Livability/Quality of Life

- Shade
- Traffic Calming
- Increased Property Values
- Community Building

Economic Benefits

- Reduce cost of new construction
- Reduced O&M costs
- Reduced water usage
- Increased market value



Cost Benefits of LID

Reduced Street Width = less costly pavement, curb and gutter

Reduce lot sizes = reduced grading and site prep
= more lots for sale

Preserving Natural Features = reduced landscaping costs
= increased property values

LID/Bioretenention = fewer costly detention basins
= less piped conveyance
= reduced O & M costs

Resources

Low Impact Development Center

<http://www.lowimpactdevelopment.org/>

LID Urban Design Tools Website

<http://www.lid-stormwater.net/>

US EPA LID "Barrier Busters" Fact Sheet Series

<http://water.epa.gov/polwaste/green/bbfs.cfm>

US EPA LID Design Manual

http://water.epa.gov/polwaste/green/upload/lid_hydr.pdf



DWQ Storm Water Section

Jeff Studenka

jstudenka@utah.gov

801-536-4395

Jeanne Riley

jriley@utah.gov

801-536-4369

Rhonda Thiele

rthiele@utah.gov

801-536-4396

