

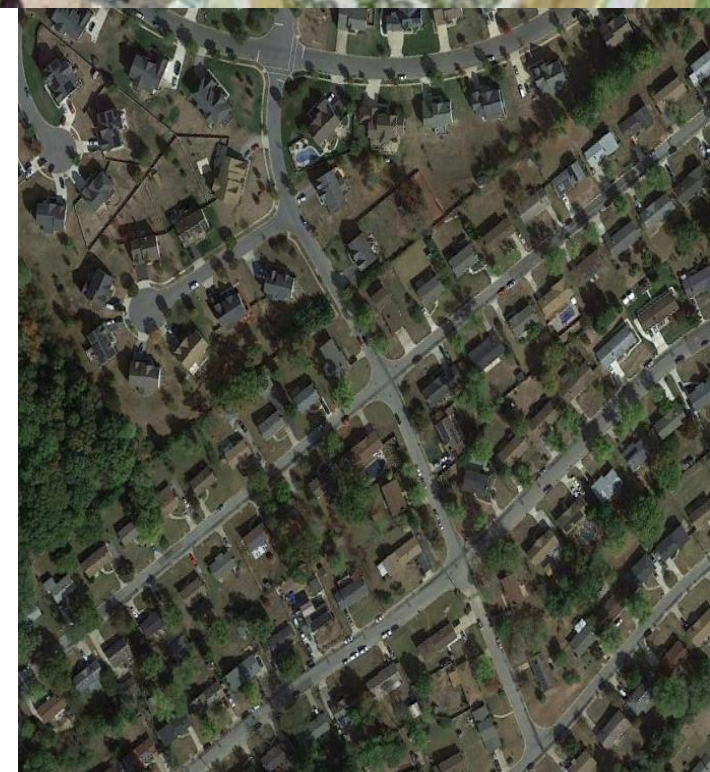


Lead with LID



**Low-Impact Development
as the First Course of
Action in Development
Projects**

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LEED BD+C



In Context: A Simple Survey

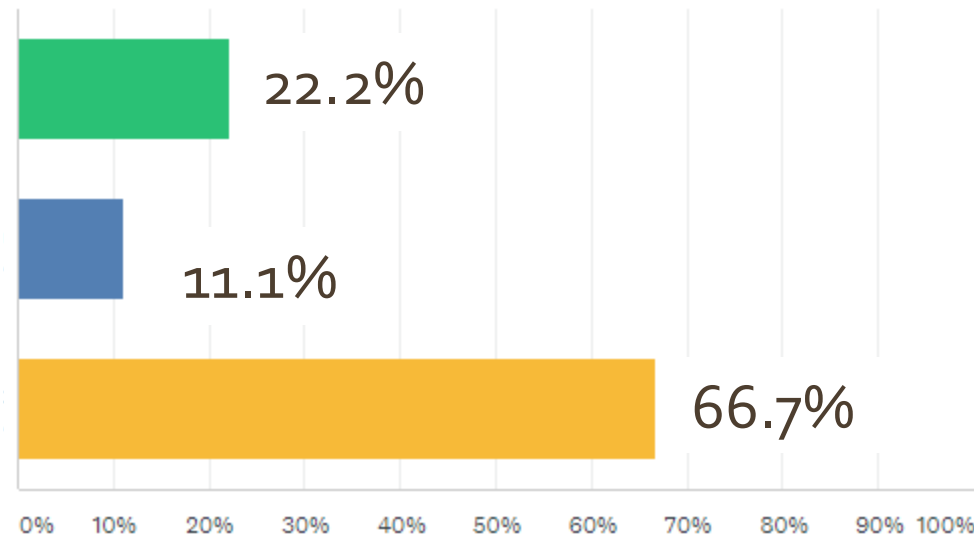
Survey Question:

Are you familiar with LID (Low Impact Development) and apply its principles in your practice/profession?

Yes, I am familiar with LID and apply its principles in my practice/profession

Yes, I am familiar with LID but do not apply its principles in my practice/profession

No, I am not familiar with LID



WHAT IS LID

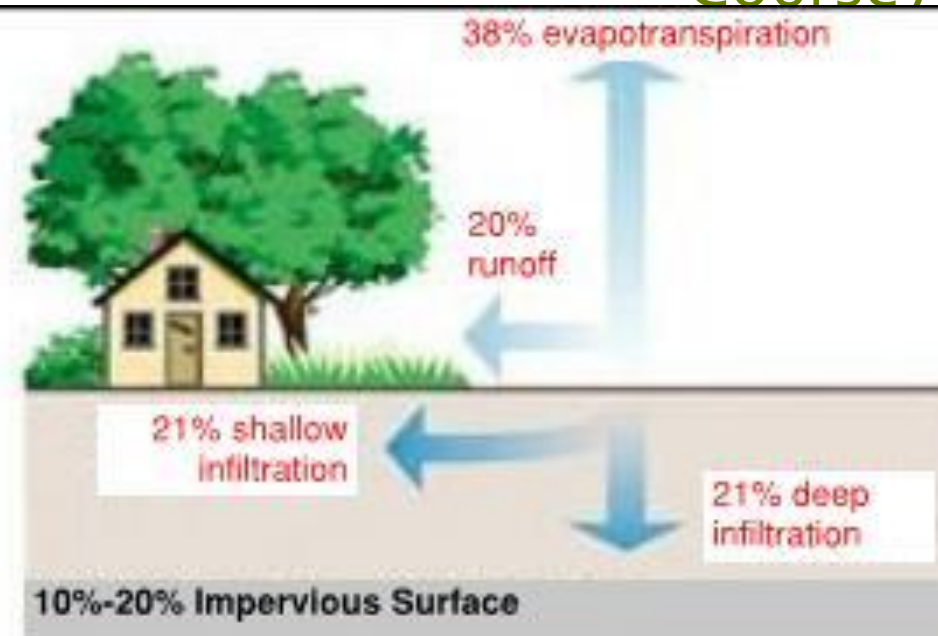
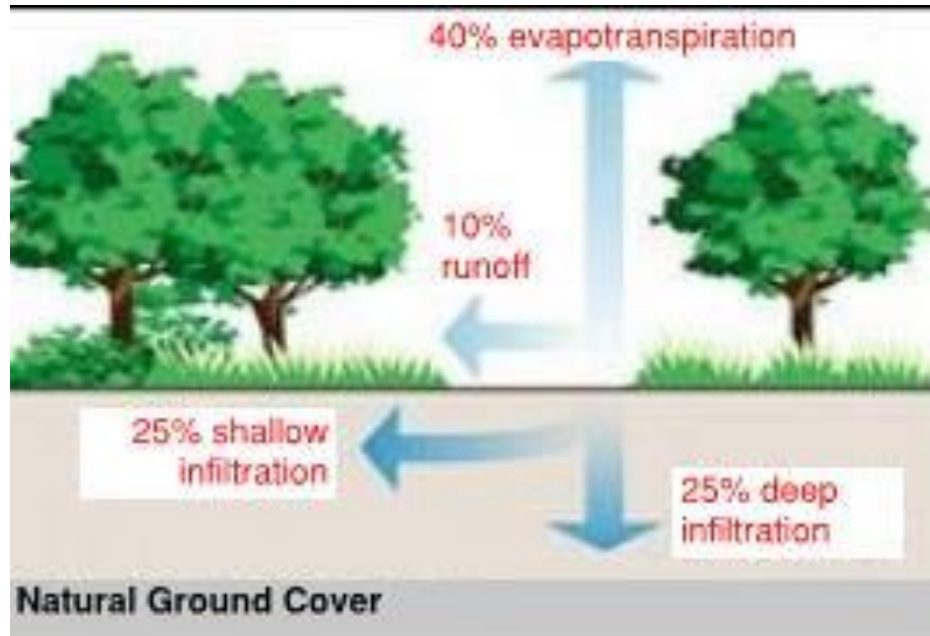
- a stormwater management strategy designed to
 - *maintain site hydrology* and
 - *mitigate the adverse impacts of stormwater runoff* and nonpoint source pollution.

HOW IT'S IMPLEMENTED

- actively manages stormwater runoff by
 - *mimicking a project site's pre-development hydrology*
 - using design techniques that *infiltrate, store,* and evaporate runoff *close to its source of origin.*
- LID strategies provide *decentralized* hydrologic source control for stormwater runoff.

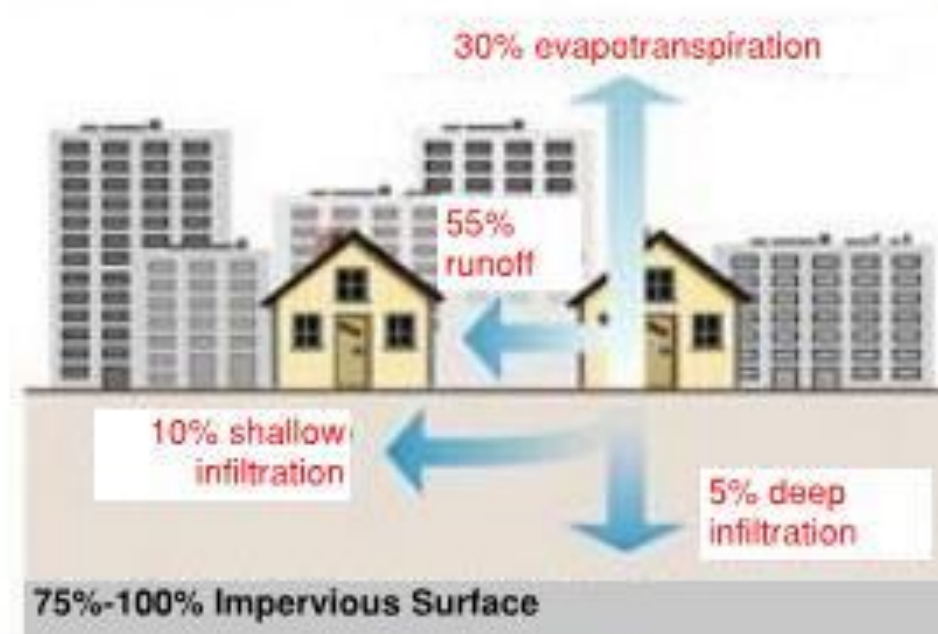
In short, LID seeks to *manage the rain*, beginning at the point where it falls.

PRE-DEVELOPMENT RAW LAND



RURAL REVELOPMENT

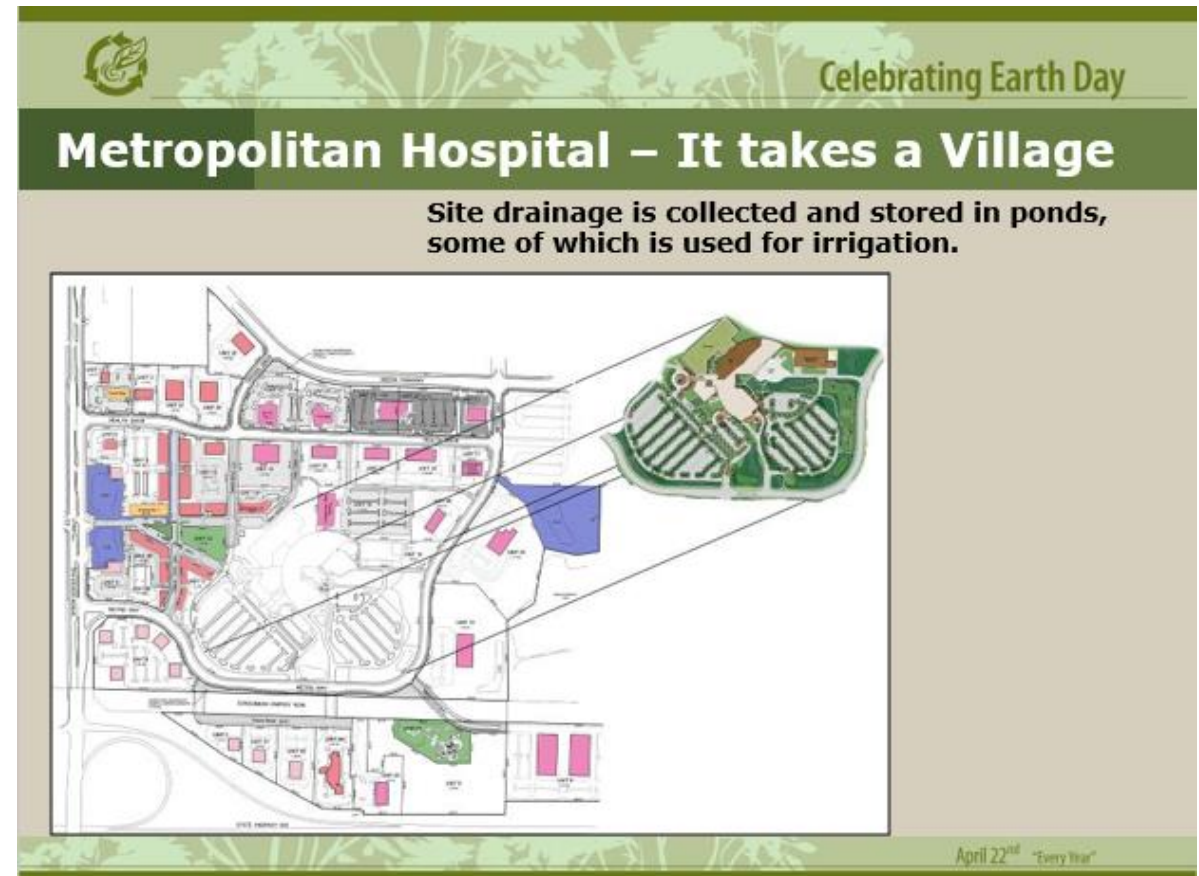
SUBURBAN REVELOPMENT



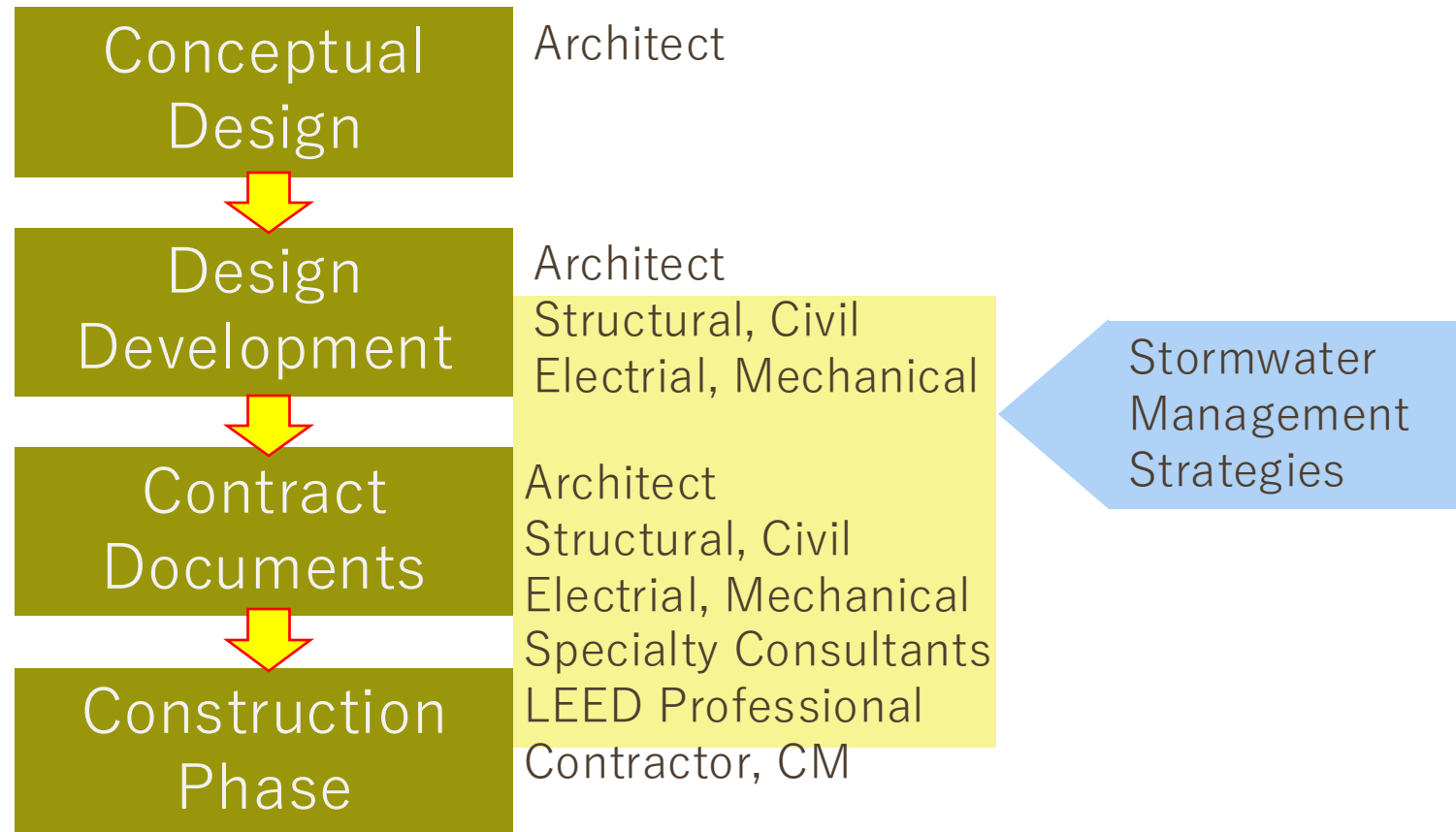
URBAN REVELOPMENT

Deep Dive: Definitions

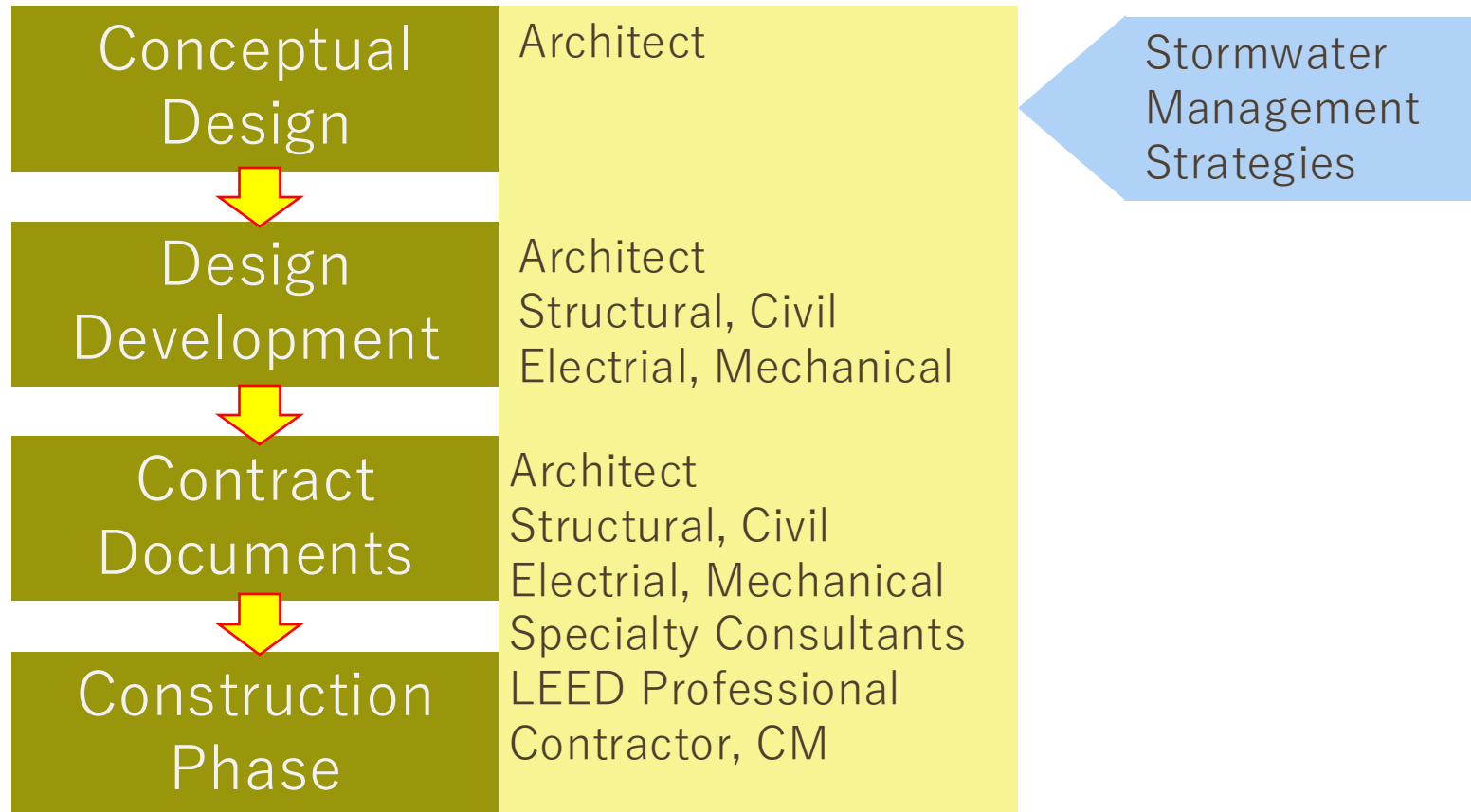
*Managing the rain is not a new concept. However, LID prioritizes and integrates the rain management concept **early** in the design and development process.*



LID Integration – early in Design

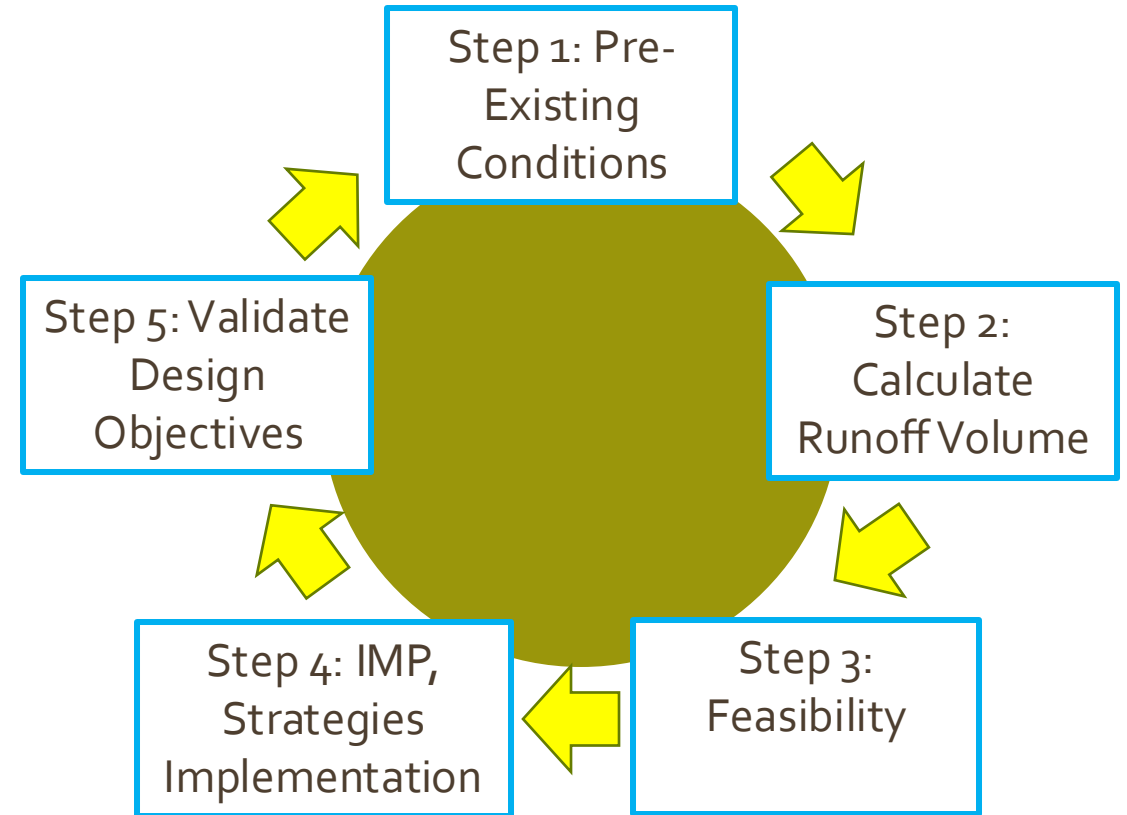


LID Integration – early in Design



The LID Flowchart

1. Documentation: pre-development
2. Calculate Runoff Volumes for pre- and post-development
3. Maximum Extent Technically Feasible vs Technically Infeasible (including cost)
4. Integrated Management Practices and Strategies Implementation
5. Revisit, re-assess, validate if objectives met



Current/Common Practice



A. End-of-Pipe, Conventional Infrastructure

- Surface Runoff Diversion, Underground systems
- Pipe Collection Systems
- Catchbasins, Road Curbs
- Ponds with treatment

B. Centralized, large-scale, expensive

C. High maintenance, non-resilient (will deteriorate)



LID Benefits

A. Economic Benefits due to reduced, smaller-scale infrastructure

- Increased Lot Yield (more lot for features, not infrastructure)
- Reduced Life-Cycle Costs (no large repair allocation for infrastructure)
- Increased Marketability (land development features, parks, recreational)
- Increased Property Values (enhanced livability)

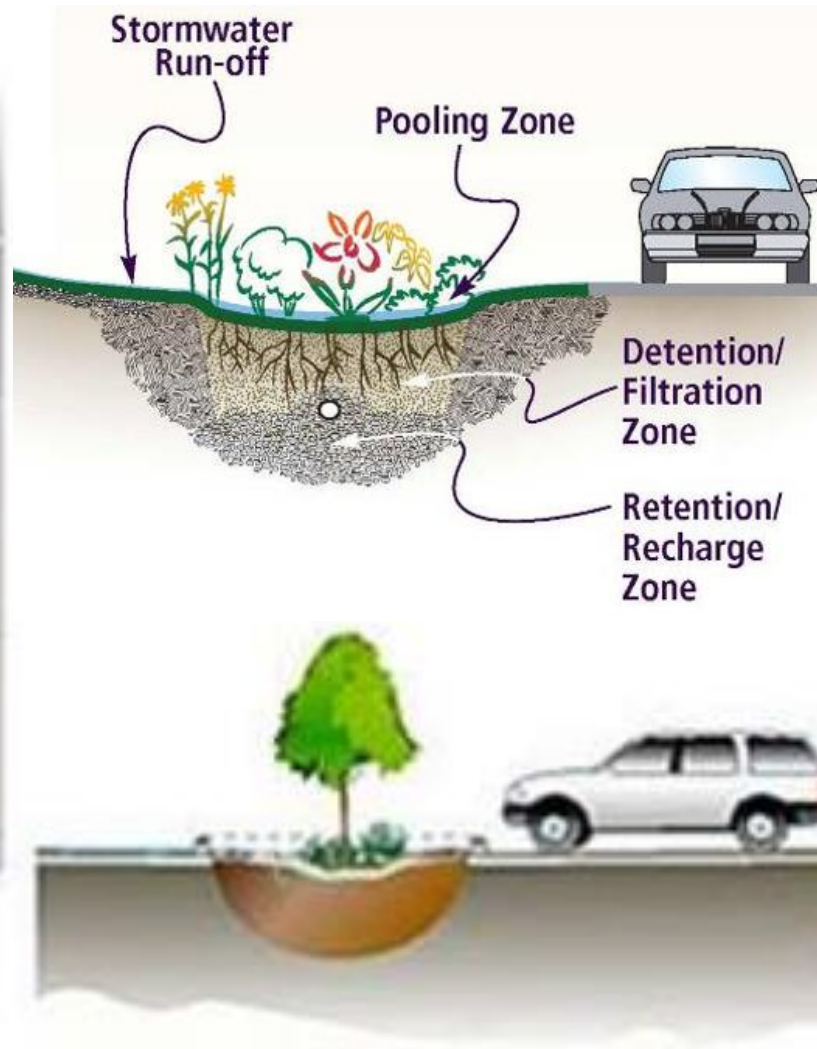
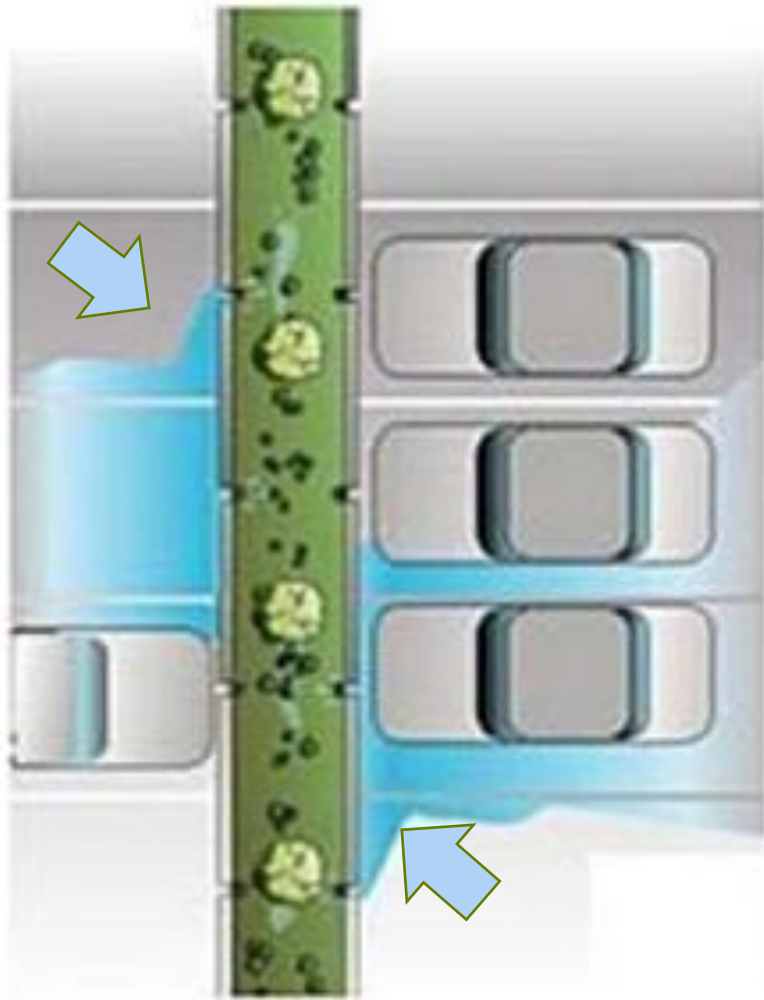
B. Environmental Benefits

- Water Quality Improvement (filtered at source)
- Water Quantity Improvement (aquifer recharge)
- Erosions and Flood Risk reduction
- Protected Biodiversity
- Resilient Infrastructure

How is LID Implemented?

- **BMPs** (Best Management Practices) that aim to achieve (stormwater) Peak Flow control through:
 - **Volume** Reduction
 - Water quality improvement through **filtration** and **treatment** of pollutants
 - Water **conservation**.

Raingardens, or Bioretention Cells



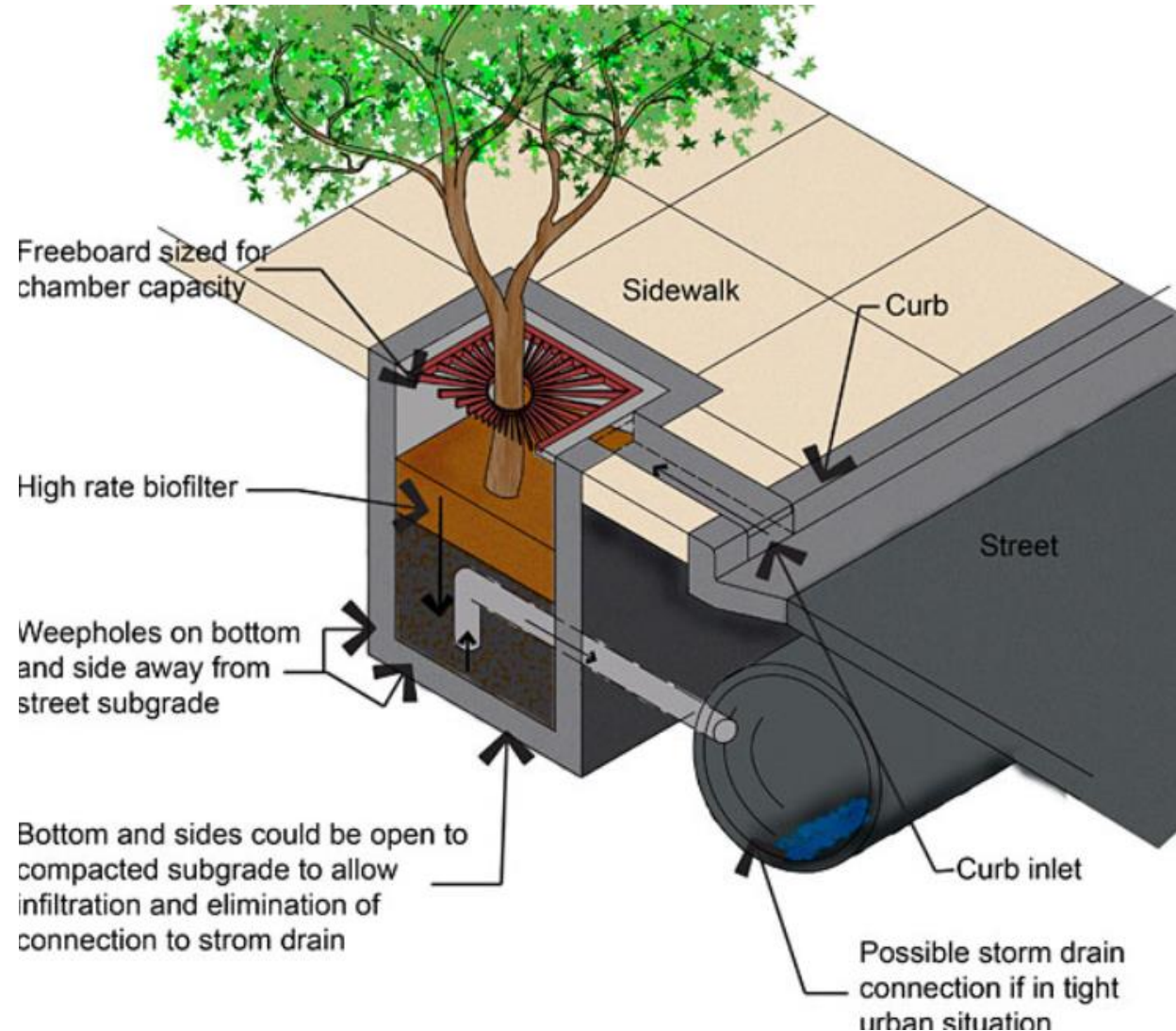
Recessed landscaped area with specialized soil mixture, aggregate base, underdrain, site-appropriate, drought-tolerant plant materials

Treebox Filters



Boxed bioretention cells placed at curb, where storm water is filtered through layers of vegetation and soil before it enters catch basin

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Boxed bioretention cells placed at curb, where storm water is filtered through layers of vegetation and soil before it enters catch basin

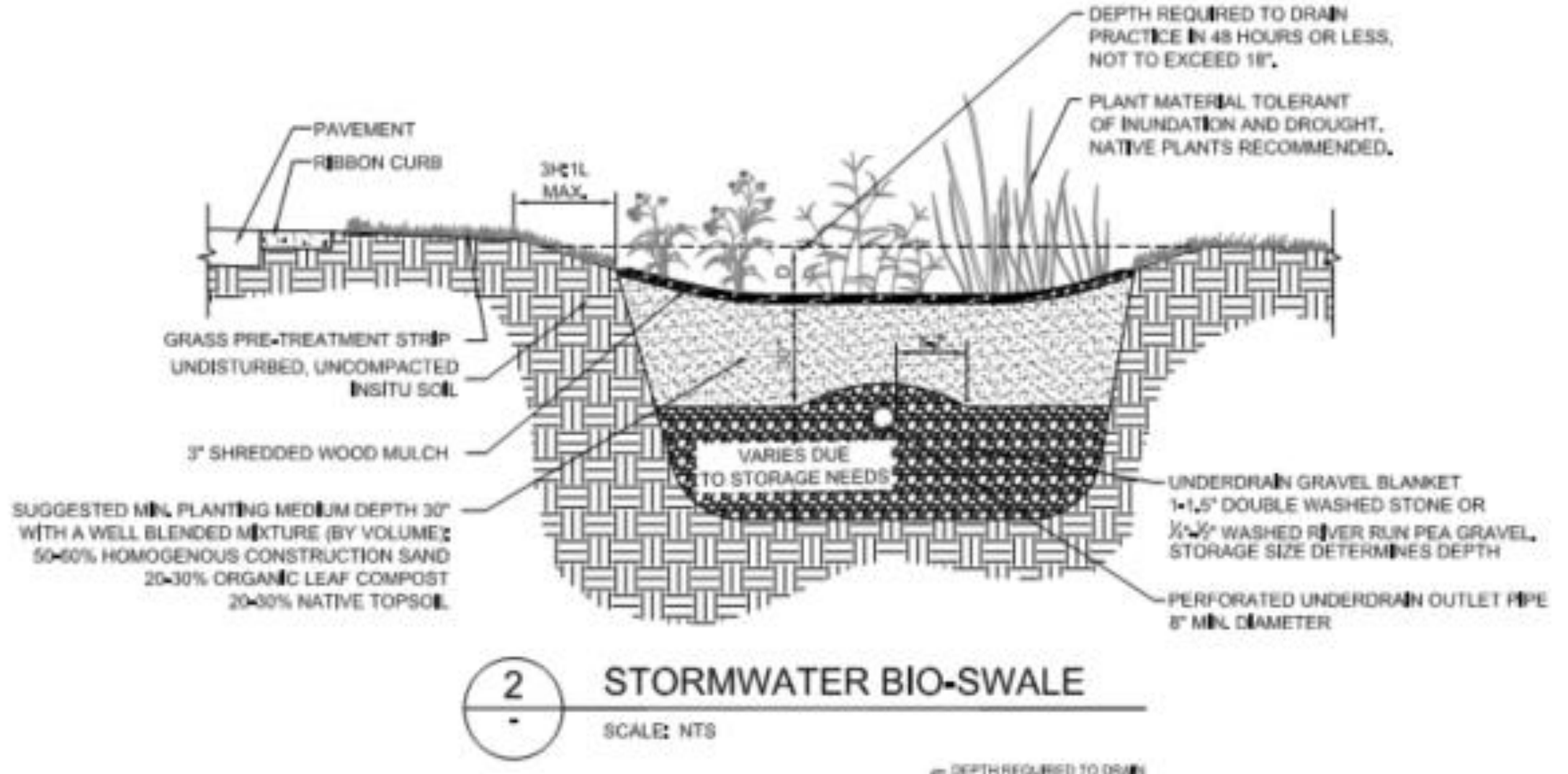
Vegetated Swales (a.k.a. Bio-swales)



- Area of dense vegetation that retains and filters the first flush of runoff



Vegetation Swales (a.k.a. Bio-swales)

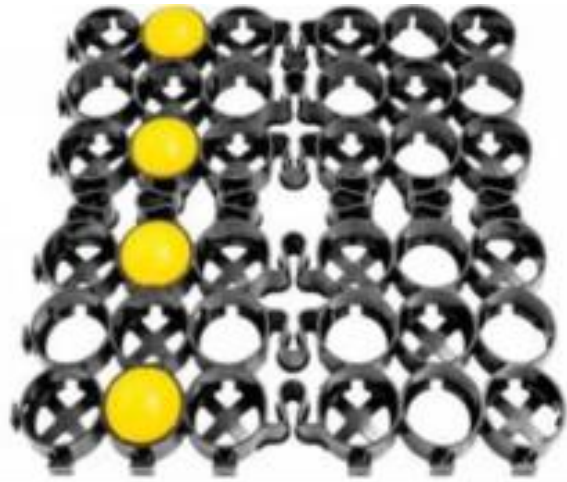


Permeable Surface



- Retains stormwater where it falls
- Infiltrate to subsurface for direct recharge of water table, or temporary storage integrated with subsurface retention basins

Permeable Surface



- Plastic Grids
- Rollout plastic pavers
- Interlocking concrete pavers
- Concrete Grid Pavers
- Porous concrete/asphalt



Subsurface Retention Facilities

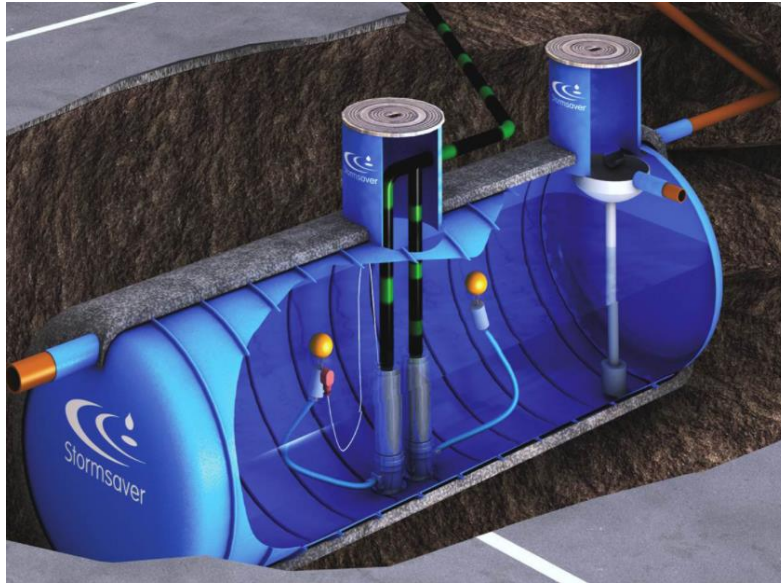


Disconnected Downspouts



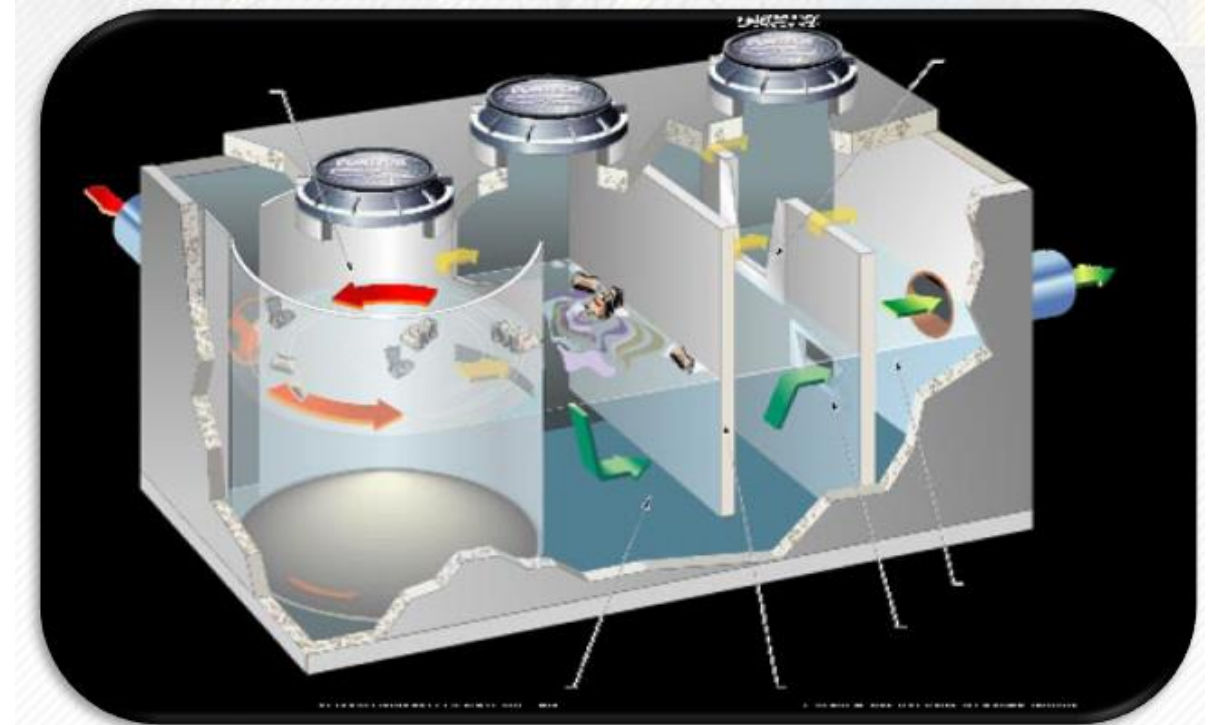
- Rainwater drains directly to the surrounding grounds

Rainbarrels and Cisterns



- Rainwater collection system for irrigation and brown water reuse (non-potable use)
- Aka "Stormwater Attenuation"

Rainbarrels and Cisterns



- Rainwater collection system for irrigation and brown water reuse (non-potable use)
- Aka "Stormwater Attenuation"
- Will require filtration system

Green Roofs

- Retains and filters rainwater before diversion downstream
- Opportunity for outdoor use, small-scale agriculture
- Contributes to thermal mass; acts as insulation
- Blue-roofs provide water storage under walking surface

Green Roofs



Green Roofs



Green Roofs



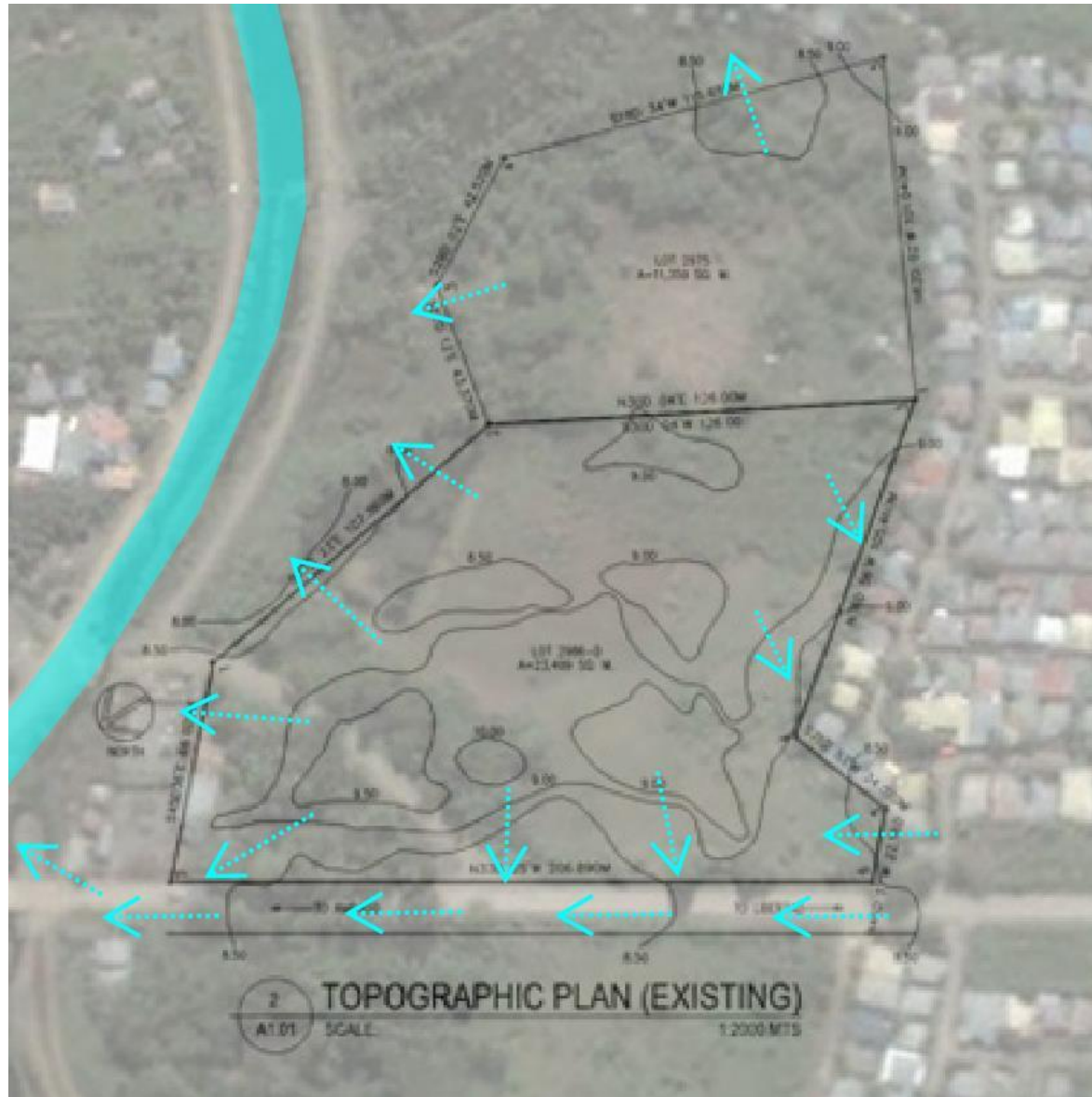
Site-appropriate Landscaping



- Indigenous plants, shrubs, ground covers
- Low-maintenance, drought-resistant or water-tolerant
- Sturdy, resilient, robust
- Alternative to manicured lawns, high-maintenance ground covers

LID Application Sample Project: School Campus

Father S Urios Basic Education Facility
Ambangan, Butuan City



LID Application Sample Project: School Campus

Pre-Design Site Assessment

Topography and Site Evaluation validates storm water flow, high and low areas, peak flow rates, soil percolation

Identify pre-design to guide post-design goals



LID Application Sample Project: School Campus

LID Integration at Site Planning and Development

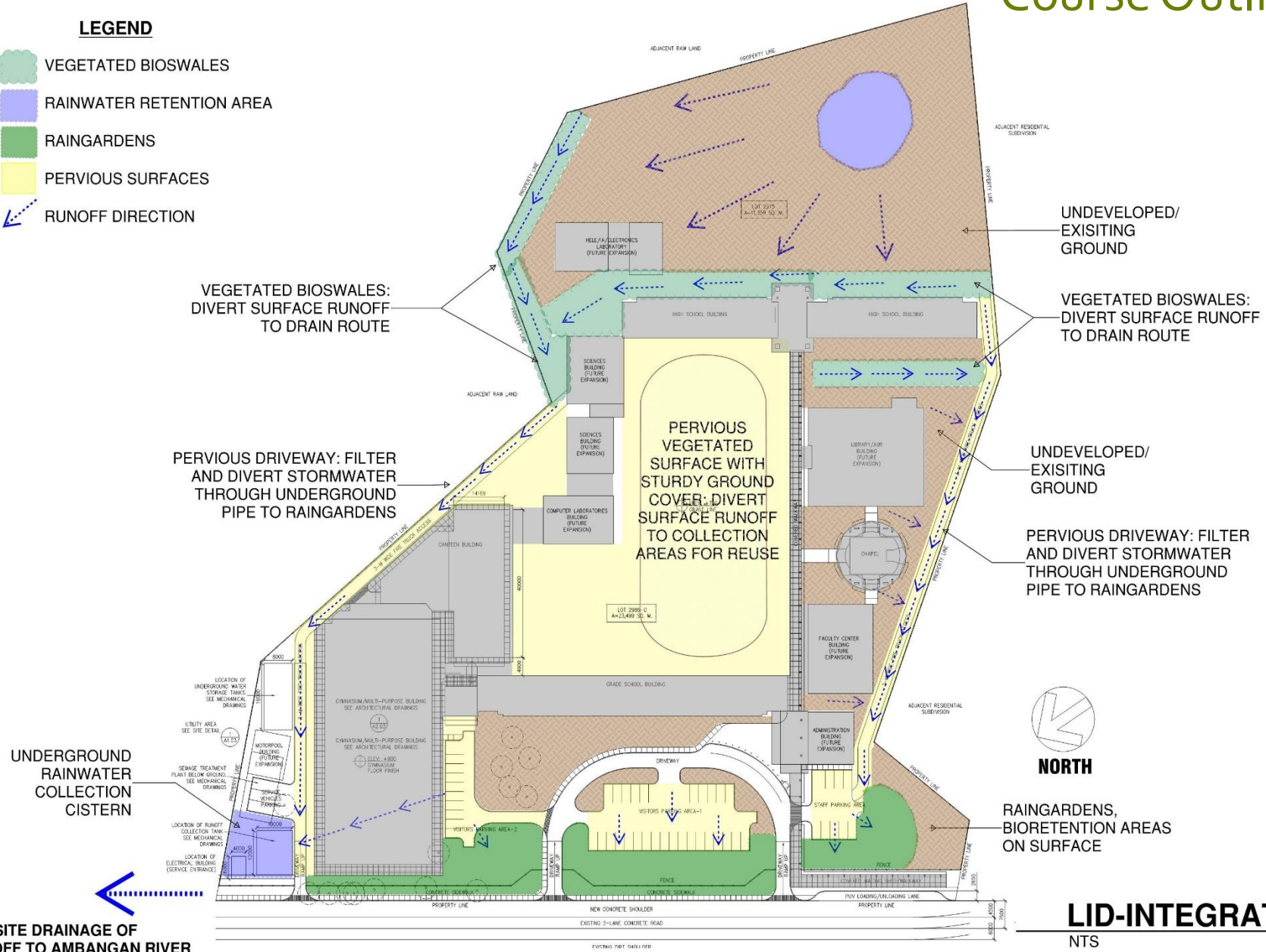
Integrate the basic design requirements and objectives (spatial, visceral needs)

Identify potential LID strategies: raingardens, bioswales, underground retention, rain collection, permeable surfaces, etc.

Course Outline: E. Design Application

LEGEND

-  VEGETATED BIOSWALES
 RAINWATER RETENTION AREA
 RAINGARDENS
 PERVIOUS SURFACES
 RUNOFF DIRECTION



LID-INTEGRATED DESIGN

NTS



LID Application Sample Project: School Campus

Metropolitan Hospital - Site Plan

SUSTAINABLE STRATEGIES

- Green roof, reducing runoff
- Water saving irrigation system
- Irrigation source from detention pond
- Bioswales
- Rain Garden
- Detention Pond
- Native Plantings
- Maintain existing vegetation.



LID Application Sample Project: Metropolitan Hospital

Metropolitan Hospital



A view from the patients window looks over the green roof and the bioswales in the parking lot.



The Entry Drive has a view of the Detention pond

LID Application Sample Project: Metropolitan Hospital

Metropolitan Hospital

Sustainable storm water collection system.



Typical Island Swale

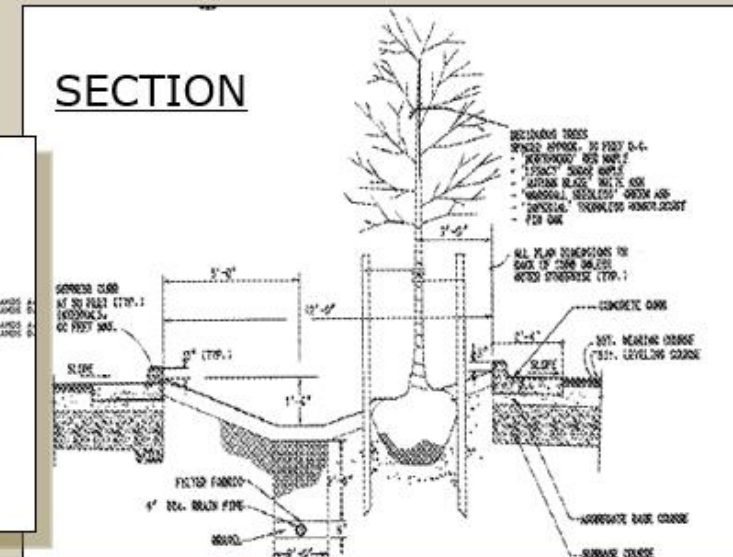
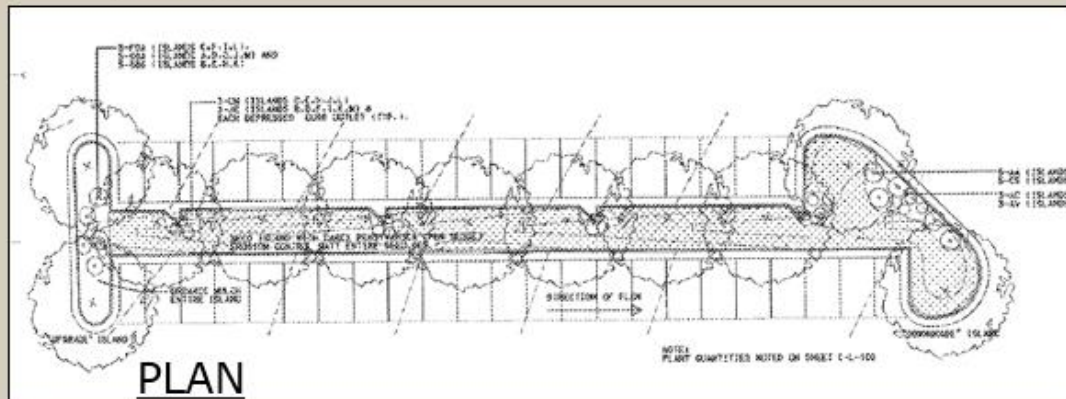


LID Application Sample Project: Metropolitan Hospital

Metropolitan Hospital–Rain Garden Swales



Each parking bay drains to a grassy swale (bioswale) to filter runoff and recharge.



LID Application Sample Project: Metropolitan Hospital

Pittsburg Veterans Affairs Hospital

The Pittsburg VA Hospital features porous pavement, a roof top rainwater harvesting system, and ground stormwater collection for irrigation of a rain garden.



LID Application Sample Project: Pittsburg Veterans Affairs Hospital

Pittsburg Veterans Affairs Hospital



Pervious Pavement

Rainwater drains through the porous pavement into the infiltration basin below grade, recharging the groundwater.



LID Application Sample Project: Pittsburg Veterans Affairs Hospital

Pittsburg Veterans Affairs Hospital



Rain Water Harvesting

Water from the roof is being harvested and stored in a tank under the blue arrow in front of the hospital. Water from the tank is used to irrigate the site and recharge the fountain.



LID Application Sample Project: Pittsburg Veterans Affairs Hospital

Pittsburg Veterans Affairs Hospital



Rain Garden

Water from the purple area is draining into the rain garden.



LID Application Sample Project: Pittsburg Veterans Affairs Hospital

In Conclusion

LID is a *rain-management system*, beginning at the point where it falls, to

- Reduce** runoff volume

- Improve** water quality through **filtration** and **treatment** of pollutants

- Conserve** water through retention and collection

Prioritize and Integrate early on in the Design Process.



Lead with LID

Thank You!

