



# Low Impact Development-Stormwater Management

## Roadside Rain Garden - Bioretention



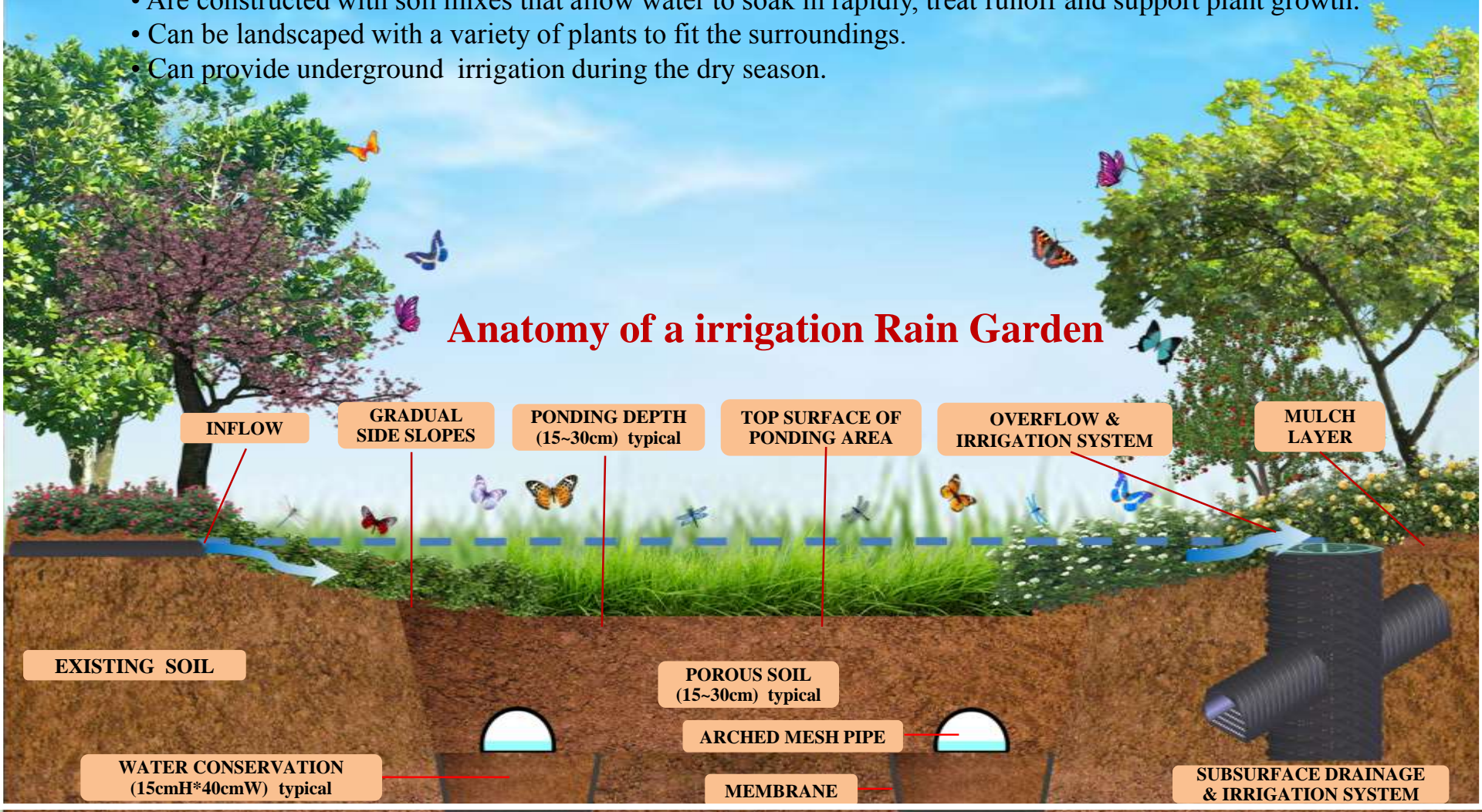
**Rain Garden  
Water Harvesting**

# What Is a *Irrigation* Rain Garden ?

A rain garden is a landscaped area that collects, absorbs, and filters stormwater runoff from roof tops, driveways, patios, and other hard surfaces that don't allow water to soak in. Irrigation and drainage systems provide water detention, drainage and underground wicking irrigation. Rain gardens are sized to accommodate temporary ponding after it rains and are not meant to be permanent ponds. Simply put, rain gardens are shallow depressions that:

- Can be shaped and sized to fit your yard.
- Are constructed with soil mixes that allow water to soak in rapidly, treat runoff and support plant growth.
- Can be landscaped with a variety of plants to fit the surroundings.
- Can provide underground irrigation during the dry season.

## Anatomy of a irrigation Rain Garden



INFLOW

GRADUAL  
SIDE SLOPES

PONDING DEPTH  
(15-30cm) typical

TOP SURFACE OF  
PONDING AREA

OVERFLOW &  
IRRIGATION SYSTEM

MULCH  
LAYER

EXISTING SOIL

POROUS SOIL  
(15-30cm) typical

ARCHED MESH PIPE

WATER CONSERVATION  
(15cmH\*40cmW) typical

MEMBRANE

SUBSURFACE DRAINAGE  
& IRRIGATION SYSTEM



# Low Impact Development-Stormwater Management Roadside Rain Garden (Bioretention) - Planning



# Low Impact Development-Stormwater Management

## *Rain Garden Rain Harvesting - Design*

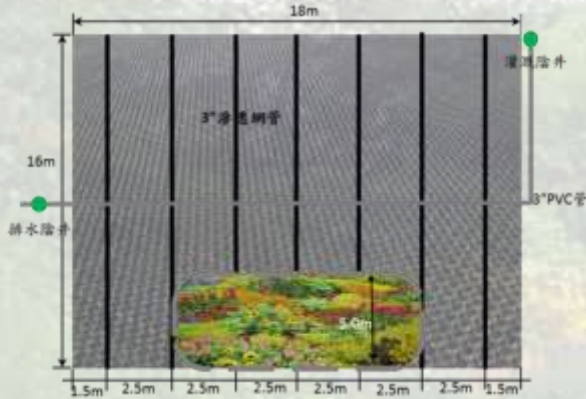


**Arched Mesh Pipe Subirrigation Conservation and Drainage System- Refer to Fig.**

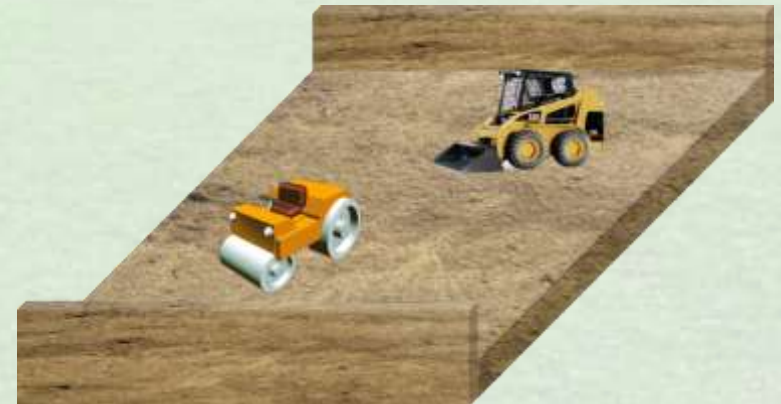


**Rain Garden Design -Refer to Fig.**

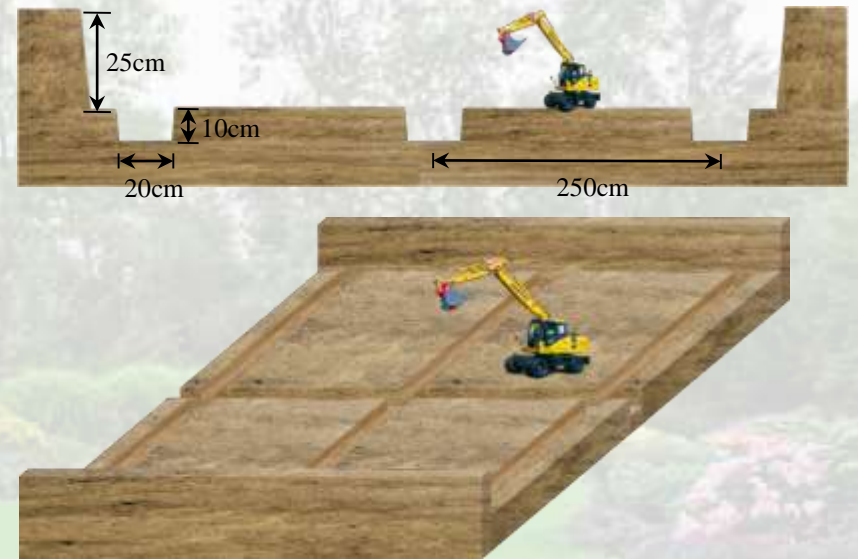
- 1. Position :** measure the exact horizontal level and label the pipe laying locations in accordance with the construction plan indicated range.



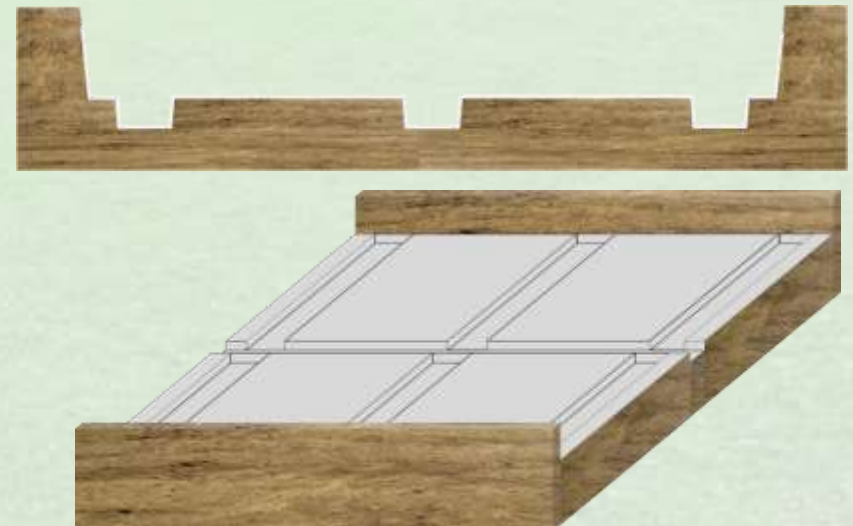
- 2. Excavation :** Excavate soil to the original design height, level and compact the soil to the density higher than 90%.



- 3. Trenching: trench compact soil layer with, 10cm depth \* 20cm width and spacing 250cm**



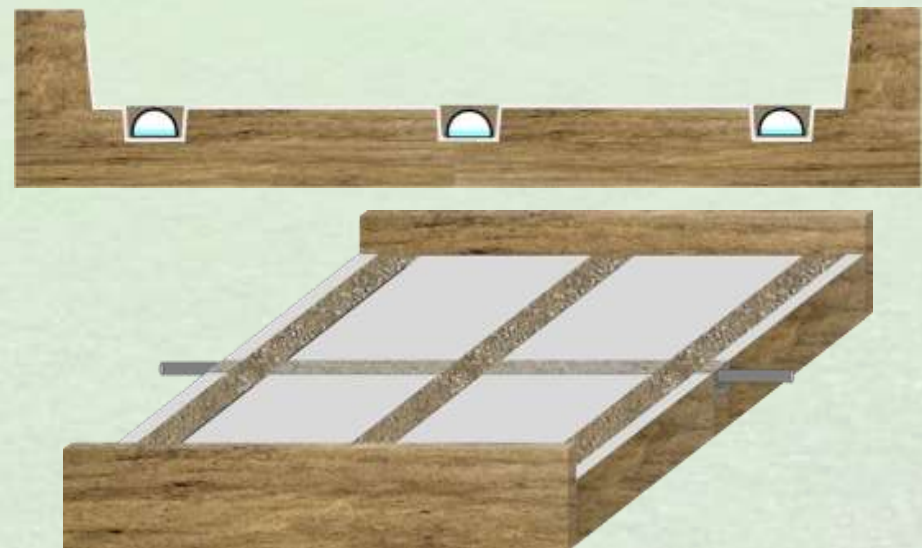
- 4. Geotextile: lap width should be 15cm or more, after the laying of the fabric surface to workers shall strive to smooth, to avoid wrinkles scenario.**



**5, Laying water supply pipes and Arched Mesh Pipe on geotextile.**



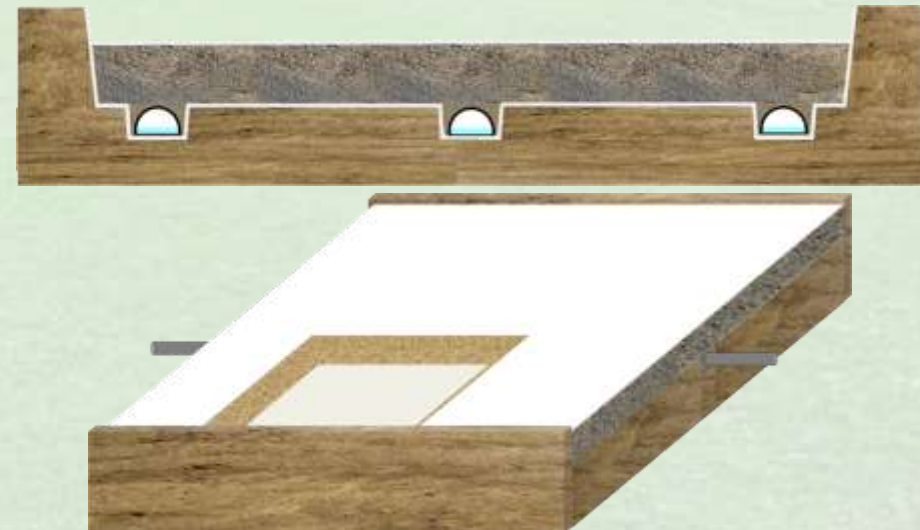
**6. Filling with trenches 3/8 “ graded gravel and compacting.**



7. Rain garden location to partition around, the rest pave 20cm of 1 "gravel grading high on geotextile, leveling, and compacting to the density higher than 90%.



8, Laying geotextile on grade gravel.

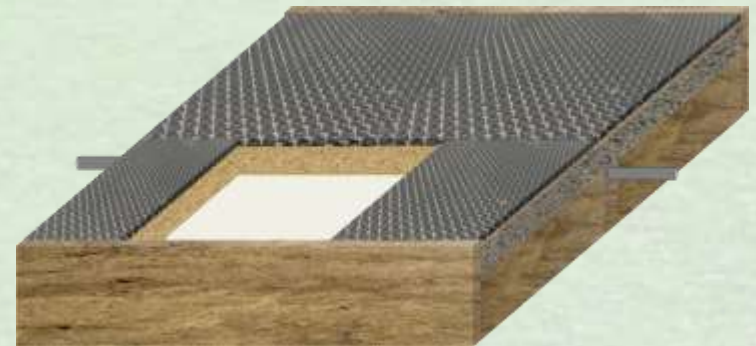




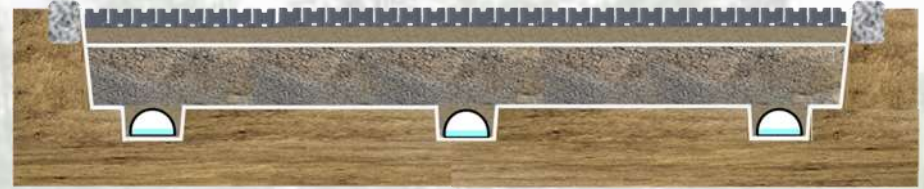
9. Paving 5cm growing sandy soil on the geotextile layer and rolling to dense.



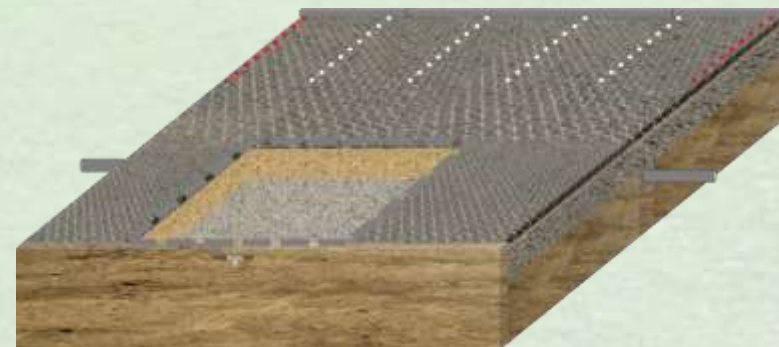
10. Laying grass grid on sandy growing medium layer.



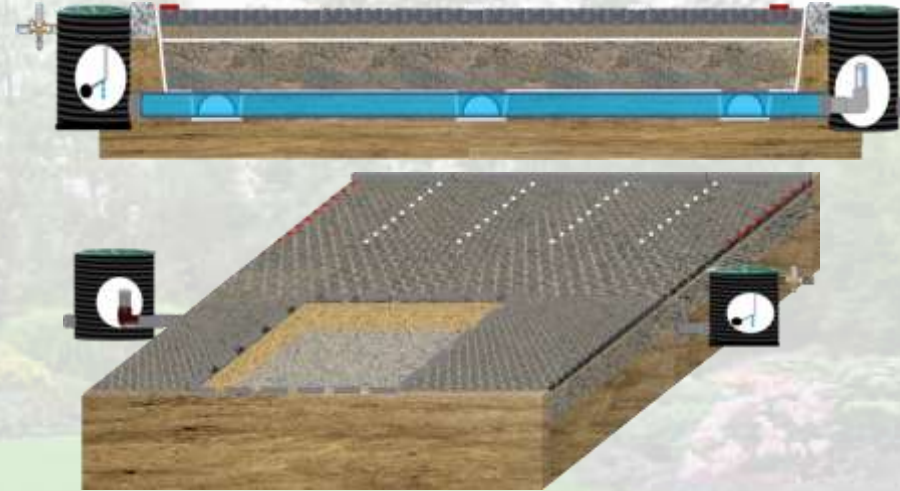
### 11, Laying concrete edge



### 12. Filling the grass grid box with sandy planting medium and labeling.



### 13. Connecting irrigation well, overflow well and water supply pipes.



### 14. Vegetation: vibrate grass root into grass grid by vibration machine after laying turf.



15. Maintain and underground irrigation, until the grass grows for car parking.





# Low Impact Development-Stormwater Management

## *Rain Garden Rain Harvesting – Installation Steps*

### Arched Mesh Pipe Sub-irrigation and Drainage System-Experiment Green Pavers and Roadside Rain Garden (Bio-retention)



Green Driveway



Rain Garden  
Water Harvesting Area

Vegetation

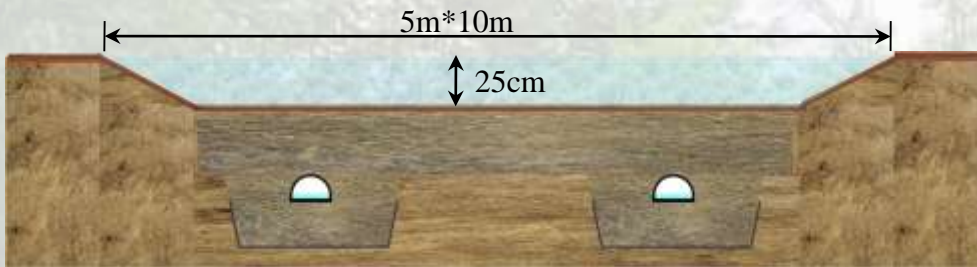


Parking Lot



Rain Garden Water Harvesting

### Water Harvesting - Experiments



Rain gardens Size (5m\*10m\*20cm) storage water 7200L

Water Contain in gap of porous soil :  $30\text{cm} * 558\text{m}^2 * 0.3 = 50220\text{L}$

100mm/day rainfall \*  $558\text{m}^2 = 55800\text{L/day}$

#### Experiment

##### 1. Outflow

Time of water outflow from rain Garden

##### 2. Infiltration

Time of water infiltration from rain Garden

##### 3. Wicking

Absorb or draw off (water) by capillary action



### Water Harvesting - experiments

#### Experiment : Outflow

Rain gardens storage water: 7200L

Drainage time: 4 hours

Results: 3 “Arched Mesh Pipe drainage 1800L / hr

Rain affected area:  $16\text{m} * 18\text{m} = 288\text{m}^2$

Rainfall is  $170\text{mm} / \text{day} = 150\text{L} / \text{m}^2 / \text{day}$

$288\text{m}^2 * 150\text{L} = 43200\text{L} / \text{day}$

Drainage  $1800\text{L} / \text{hr} * 24 = 43200\text{L} / \text{m}^2 / \text{day}$



After 1hour



After 3hours



After 2hours



After 4hours



# Low Impact Development-Stormwater Management

## Rain Garden Rain Harvesting – Retention Features

### Water Harvesting - Experiments

**Project: infiltration time (base water retention capacity)**

Rain gardens water storage: 7200L

3 "Arched Mesh Pipe 112m water storage: 130L

Infiltration area = 288m<sup>2</sup>

Infiltration time: 12 hours

Results: 3 " Arched Mesh Pipe 112M, infiltration area = 288m<sup>2</sup>

Infiltration rate: 610L / hr \* 24 = 14640 / day

Rainfall 55mm / day can be completely infiltration

