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Water Solution

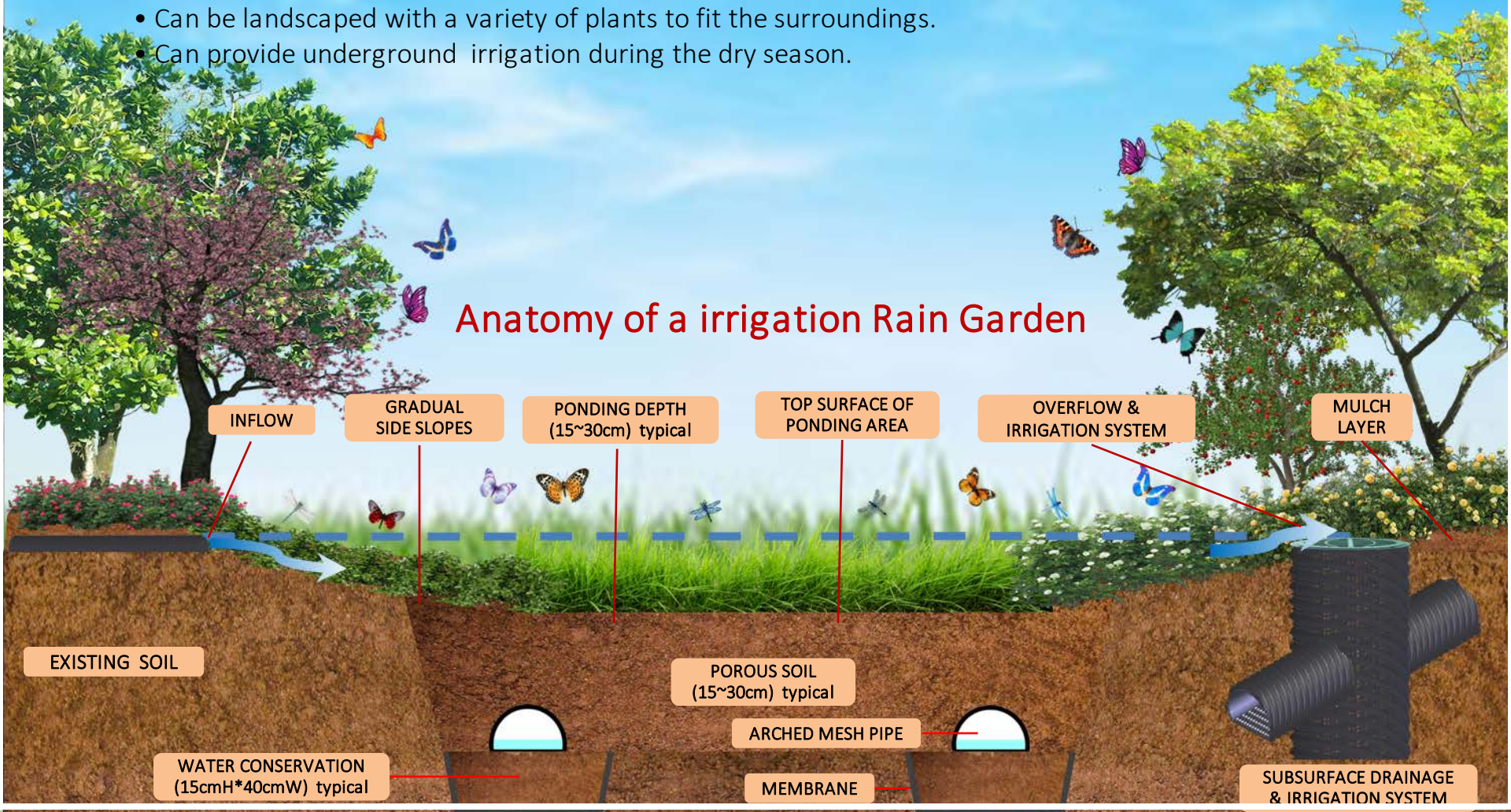
Low Impact Development-Stormwater Management
Roadside Rain Garden - Bioretention

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



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Roadside Rain Garden (Bioretention) - Planning

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Rain Garden Rain Harvesting - Design

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

Rain Garden Design -Refer to Fig.

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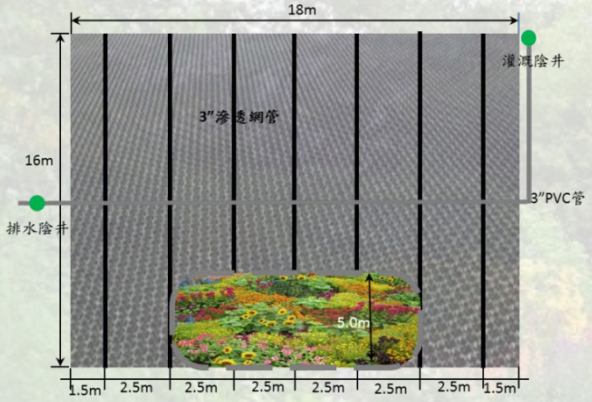
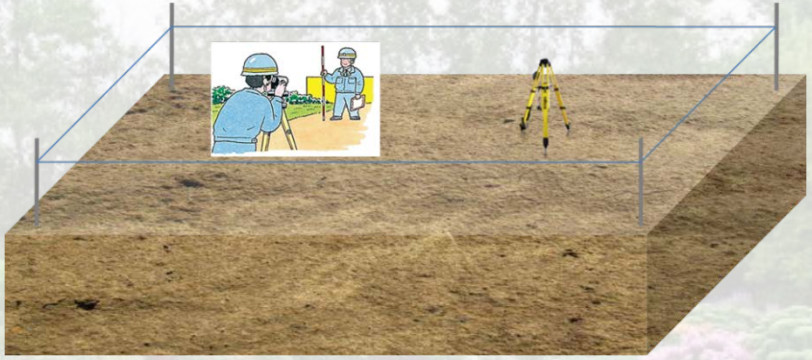
Rain Garden Rain Harvesting – Installation Steps

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%.

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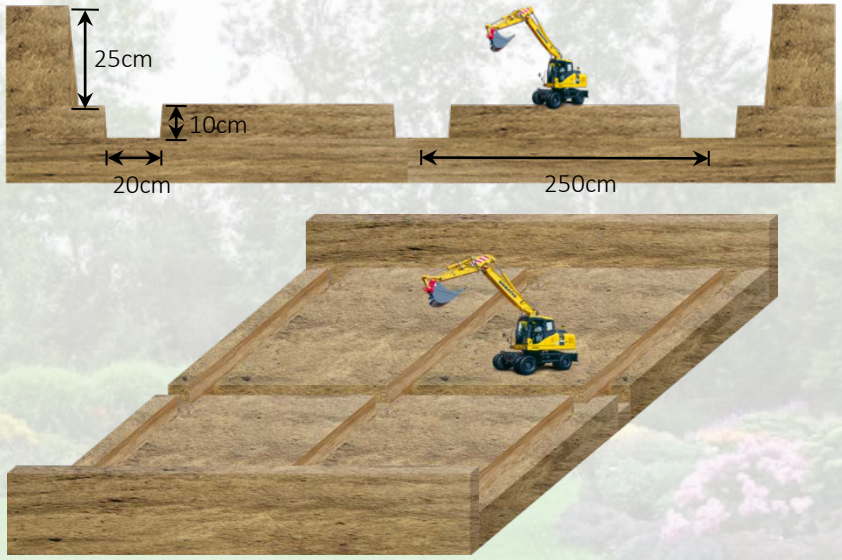
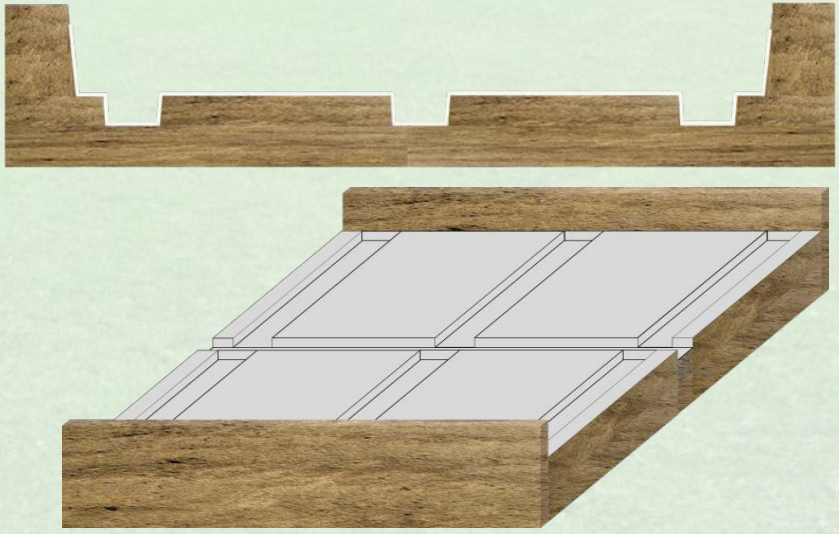
Rain Garden Rain Harvesting – Installation Steps

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.



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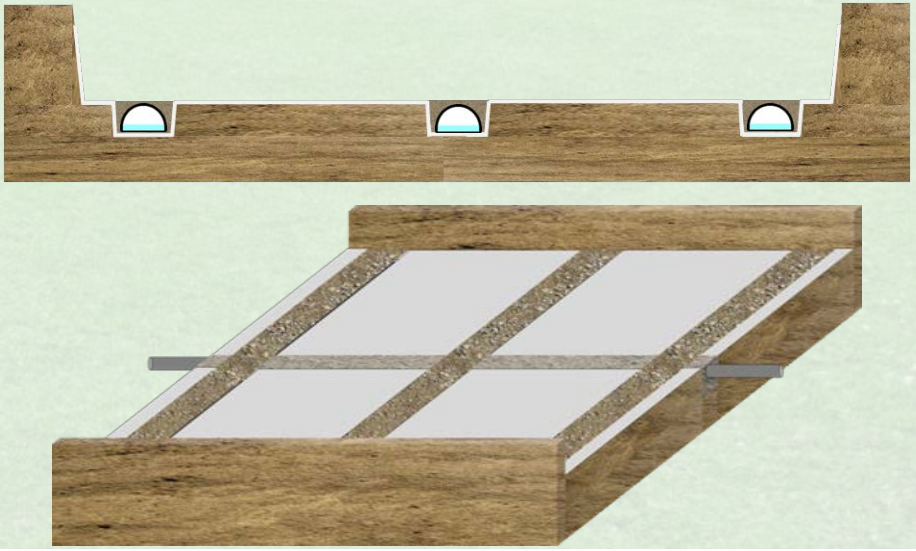
Rain Garden Rain Harvesting – Installation Steps

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

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



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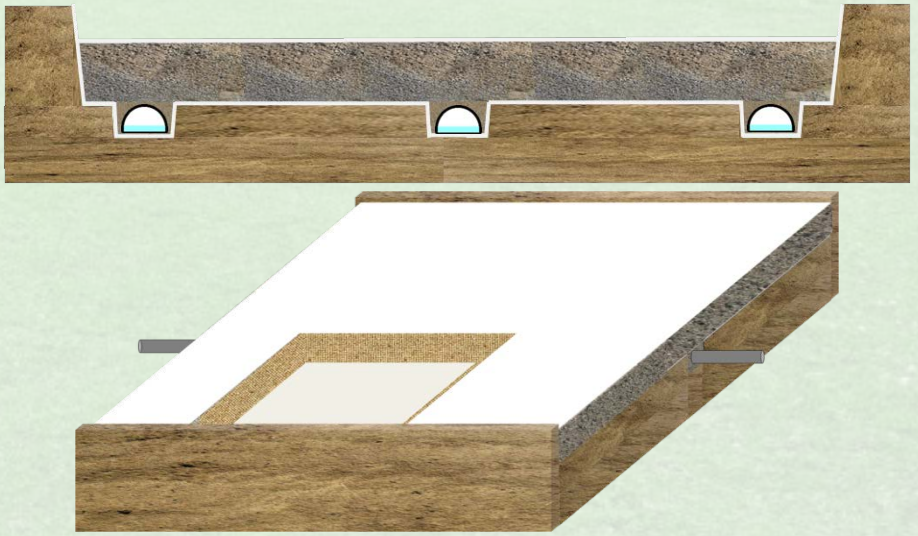
Rain Garden Rain Harvesting – Installation Steps

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.



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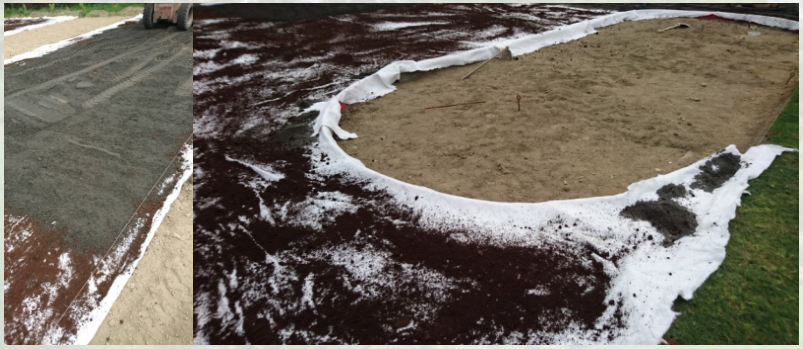
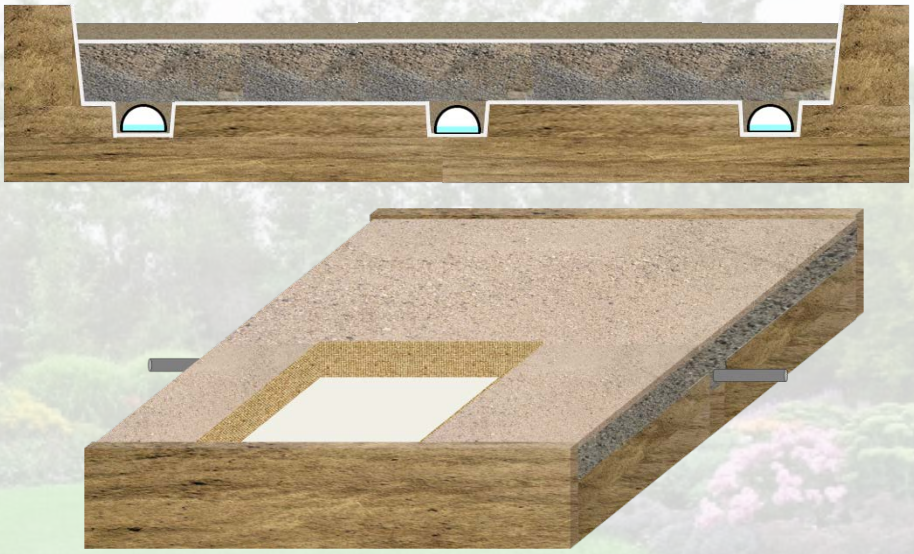
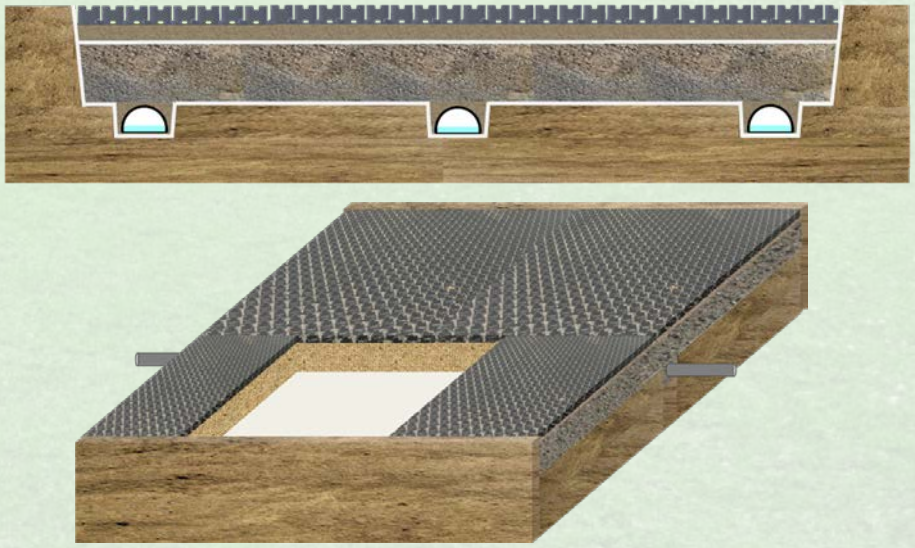
Rain Garden Rain Harvesting – Installation Steps

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





10, Laying grass grid on sandy growing medium layer.



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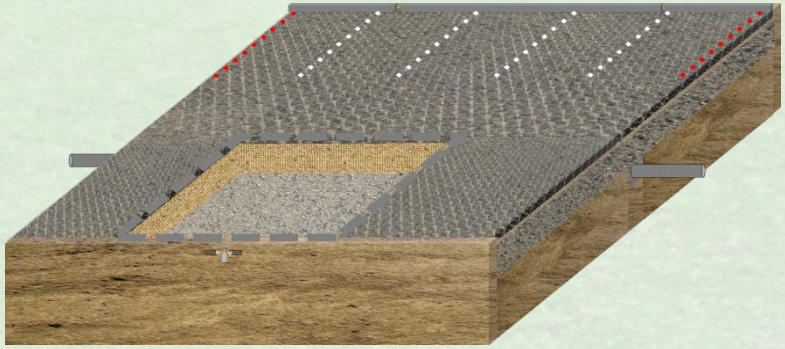
Rain Garden Rain Harvesting – Installation Steps

11, Laying concrete edge

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



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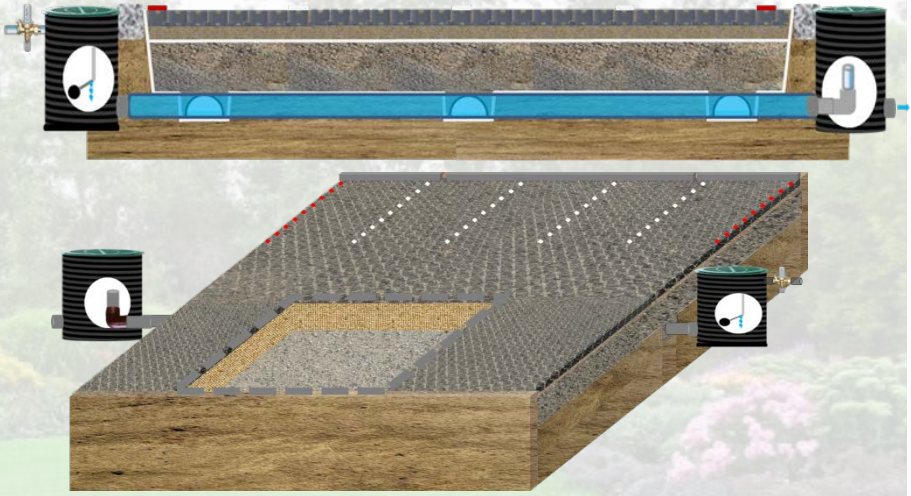
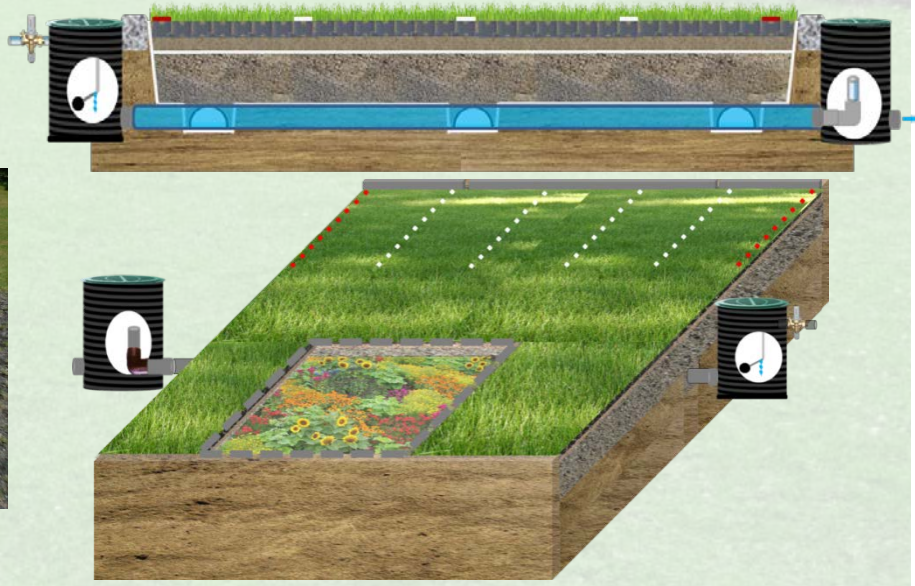
Rain Garden Rain Harvesting – Installation Steps

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



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



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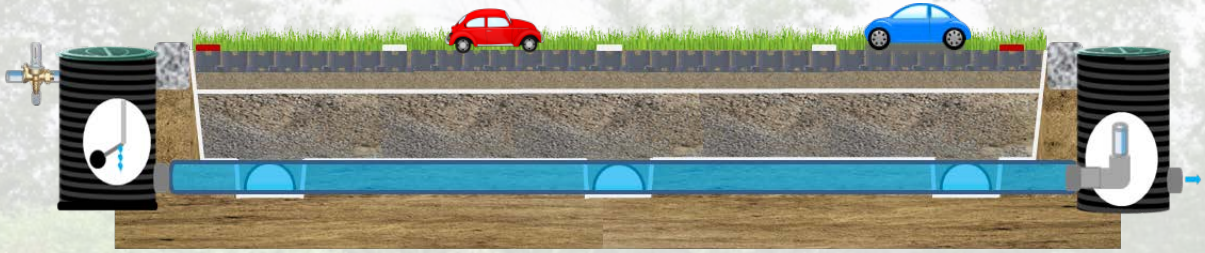
Rain Garden Rain Harvesting – Installation Steps

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



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Rain Garden Rain Harvesting – Installation Steps

Arched Mesh Pipe Sub-irrigation and Drainage System-Experiment

Green Pavers and Roadside Rain Garden (Bio-retention)

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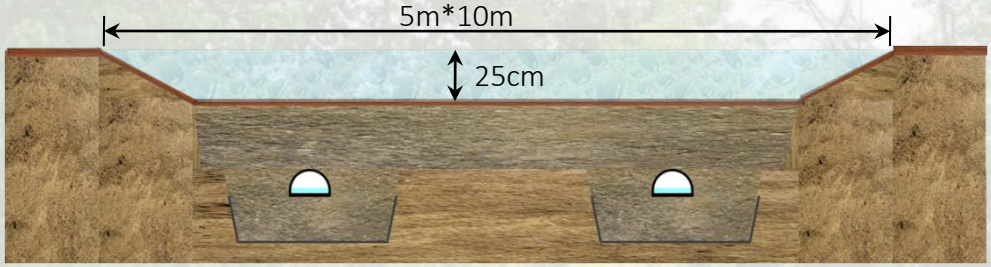
Rain Garden Rain Harvesting – Features

Water Harvesting - experiments



Rain gardens Size (5m*10m*20cm) storage water 7200L
Water Contain in gap of porous soil : 30cm*558m^2*0.3=50220L
100mm/day rainfall *558m^2=55800L/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

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Rain Garden Rain Harvesting – Drainage Features

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: 16m * 18m = 288m^2
Rainfall is 170mm / day = 150L / m^2 / day
288m^2 * 150L = 43200L / day
Drainage 1800L / hr * 24 = 43200L / m^2 / day

After 1hour

After 3hours

After 2hours

After 4hours

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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^2

Infiltration time: 12 hours

Results: 3 " Arched Mesh Pipe 112M, infiltration area = 288m^2

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

Rainfall 55mm / day can be completely infiltration

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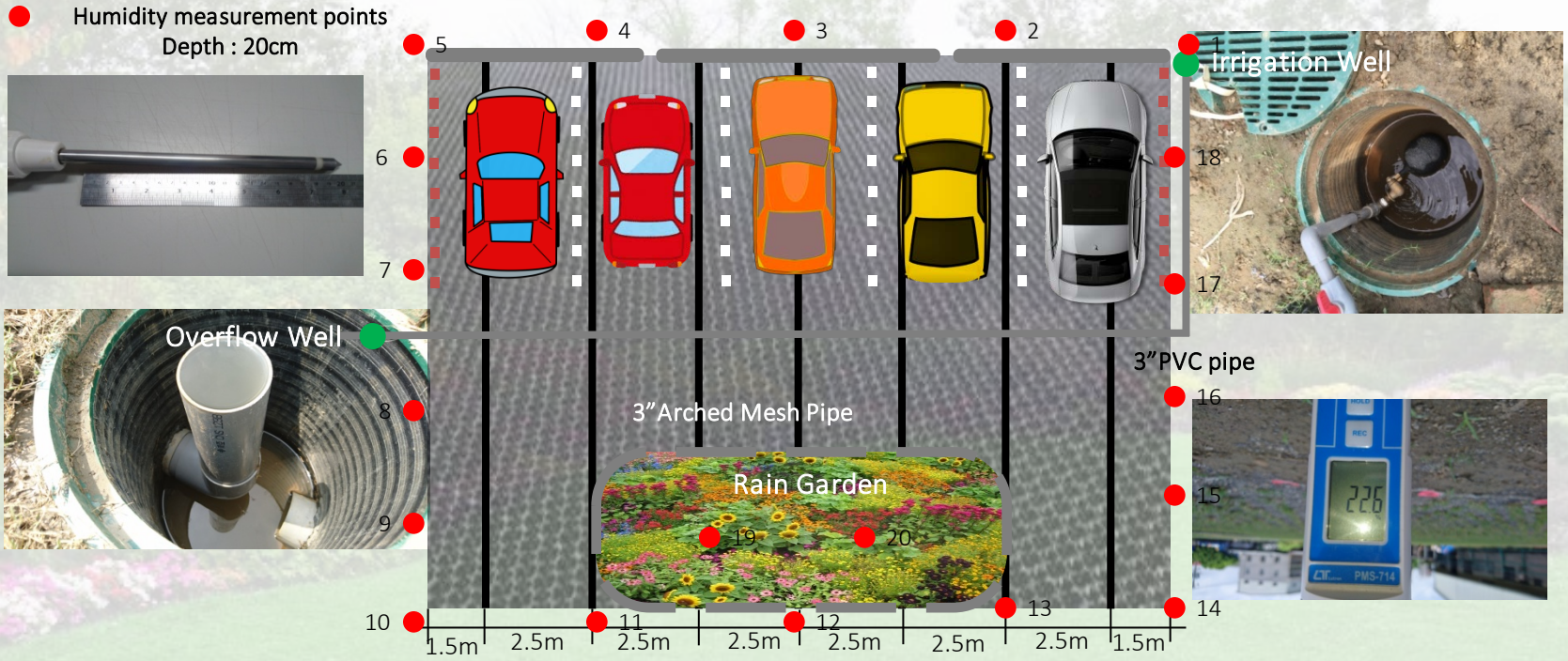
Rain Garden Rain Harvesting – Irrigation Features



Humidity measuring point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
After 2days	17.3 %	16.2 %	22.6 %	20.3 %	21.1 %	16.6 %	17.5 %	17.4 %	16.5 %	16.7 %	17.7 %	16.6 %	17.0 %	19.4 %	22.9 %	23.8 %	22.2 %	19.8 %	20.7 %	21.5 %
After 4days	17.1 %	17.1 %	23.2 %	20.5 %	21.9 %	16.2 %	17.1 %	17.8 %	15.4 %	18.8 %	22.1 %	16.4 %	20.0 %	15.7 %	19.0 %	18.6 %	21.4 %	25.5 %	20.8 %	16.7 %
After 7days																				
After 15days																				