



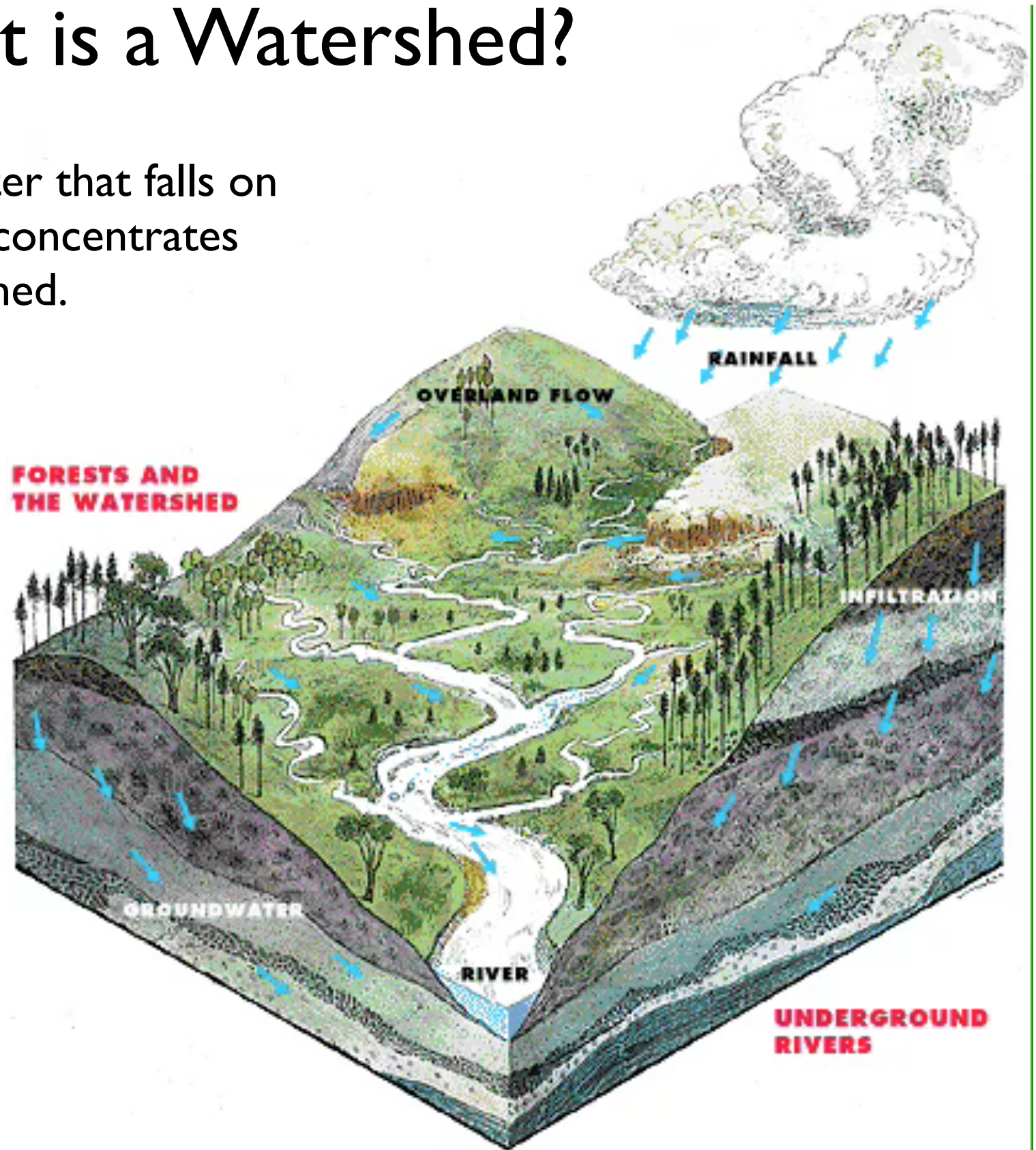
Low Impact Development  
For a Better Boerne

# What is a Watershed?

A watershed is like a funnel. Water that falls on a watershed flows down hill and concentrates at the lowest point in the watershed.

As water flows across a watershed it can come into contact with pollutants that are then carried into creeks and streams.

Low Impact Development strategies and practices are designed to limit the amount of pollutants that migrate into creeks and streams.

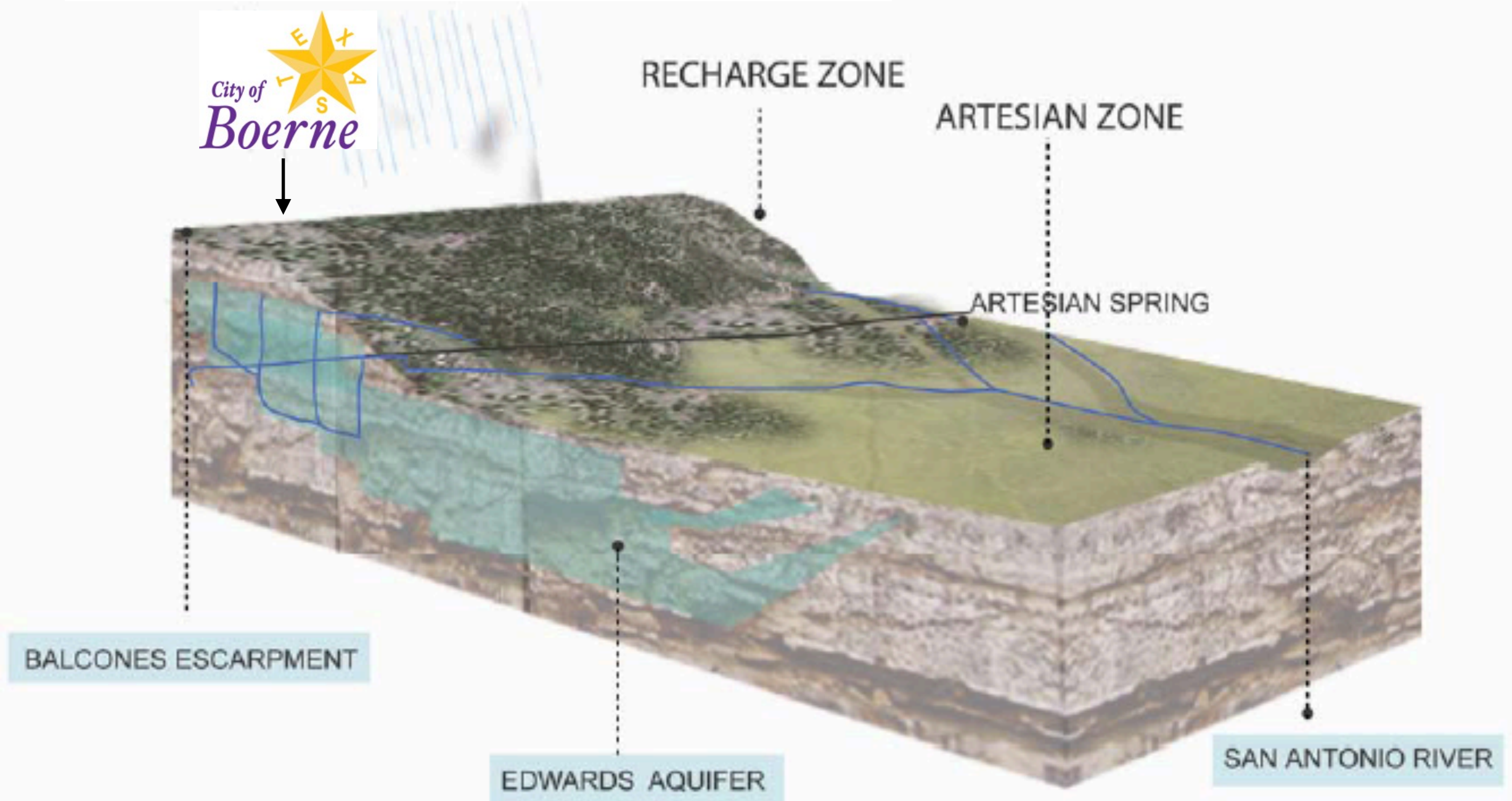


Also Called a “Water Catchment”



# LID Filters Water

Water that falls upon the city's watershed becomes drinking and recreation water for the region. Low Impact Development filters water before it enters the creeks and recharge zones. LID is a responsible and ethical approach to surface water management.





# LID Protects Our Natural Resources

As cities grow, trash and pollutants increase in waterways and flooding becomes more frequent and intense.

LID can reduce the trash and flood intensity.

Want this?



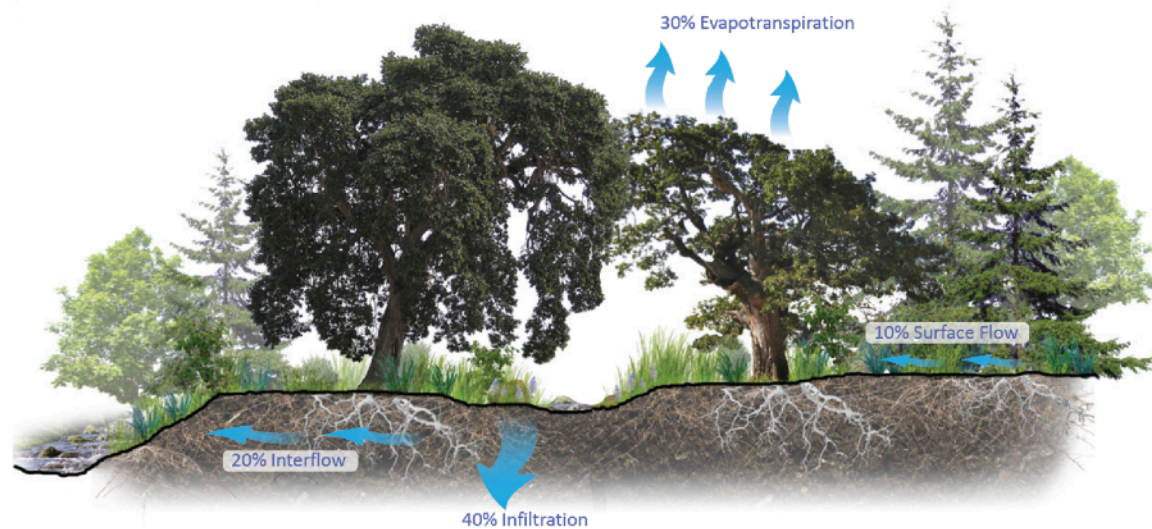
Or this?



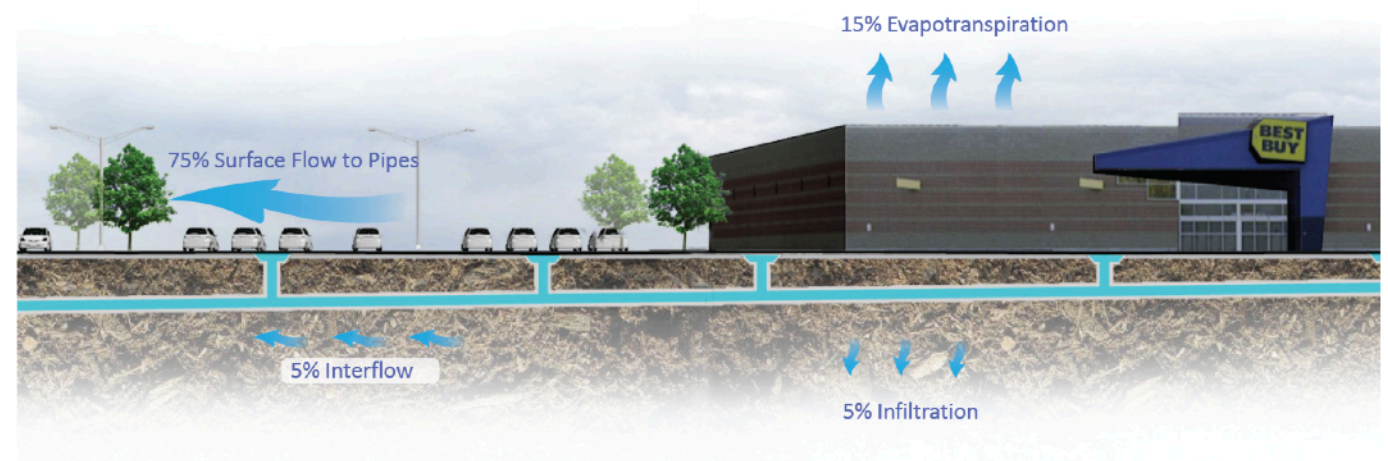


# Comparing Low Impact Development

## Pre-development



## Conventional Development



## Low Impact Development

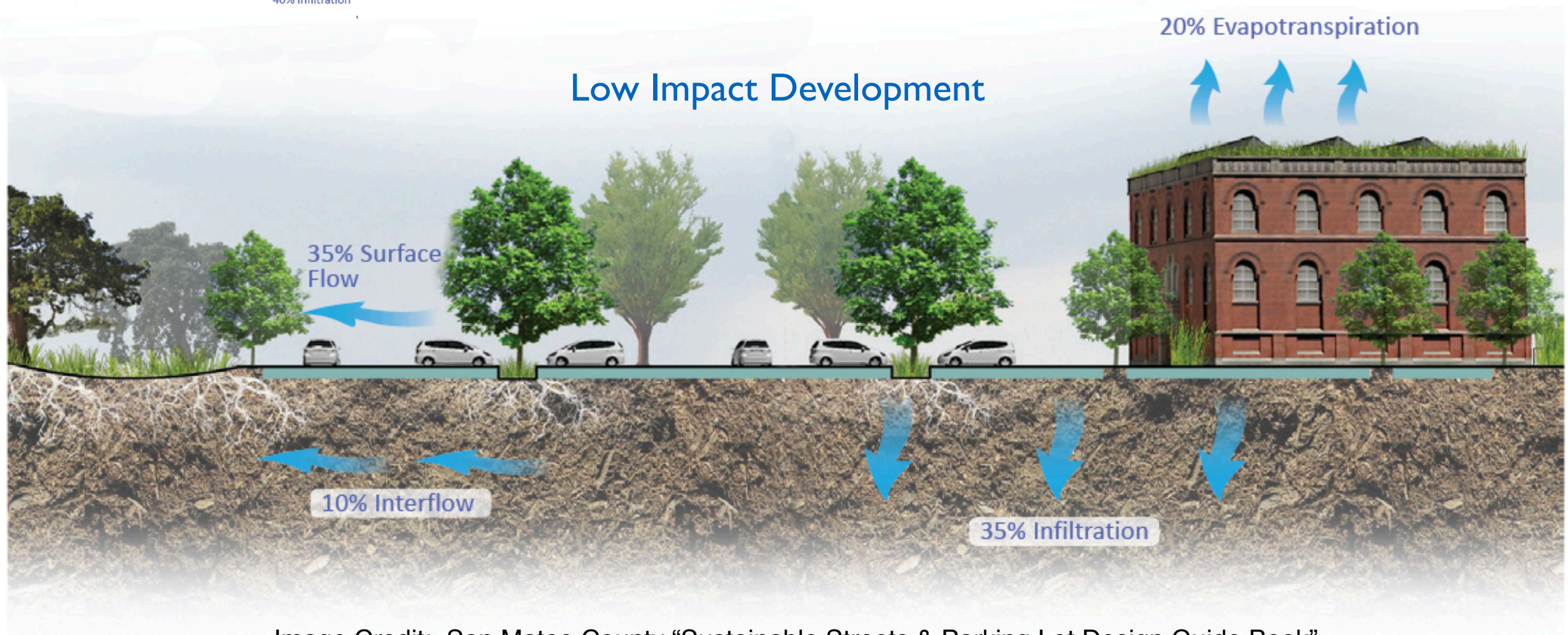
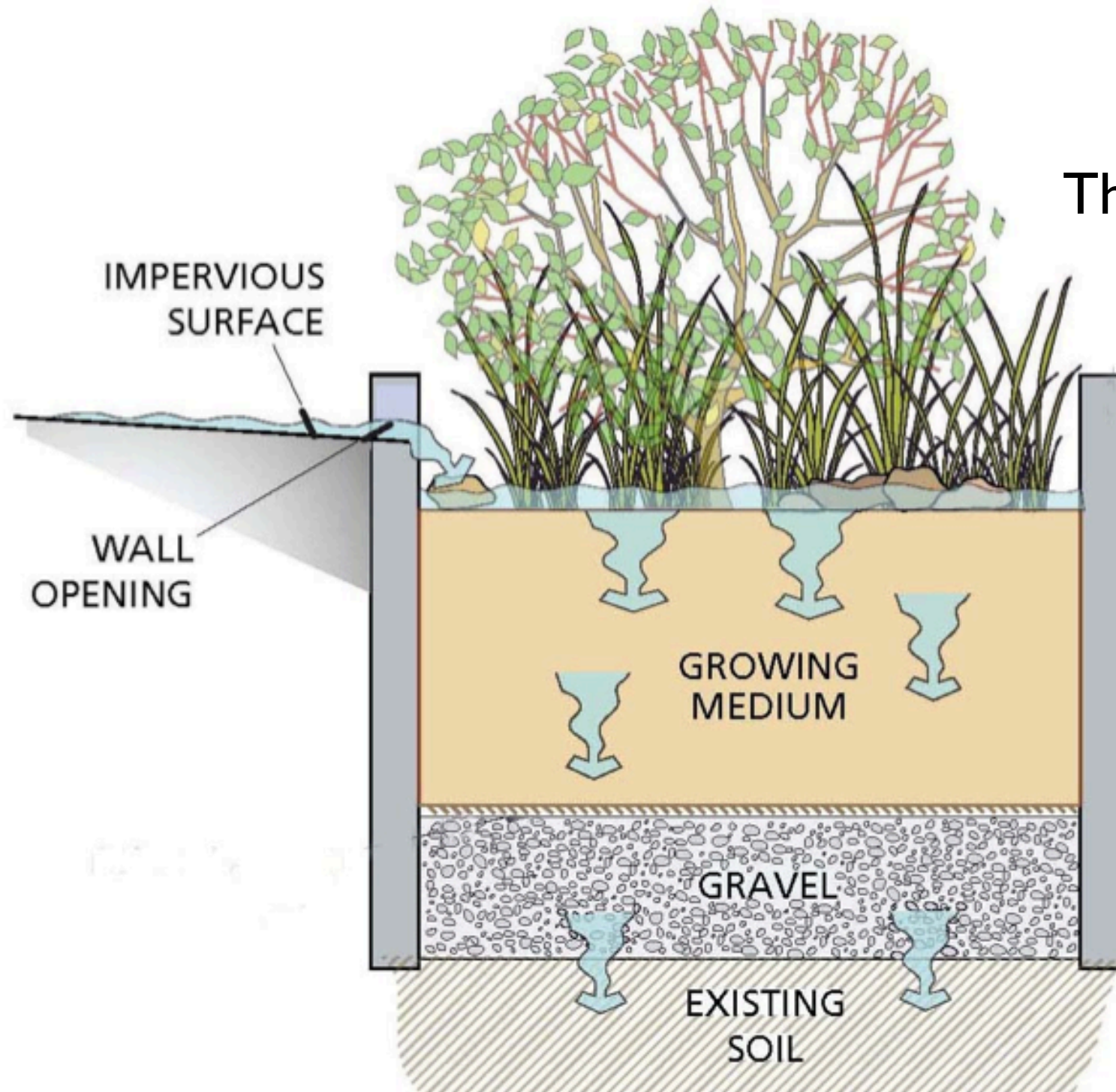


Image Credit: San Mateo County "Sustainable Streets & Parking Lot Design Guide Book"



# Bioswales



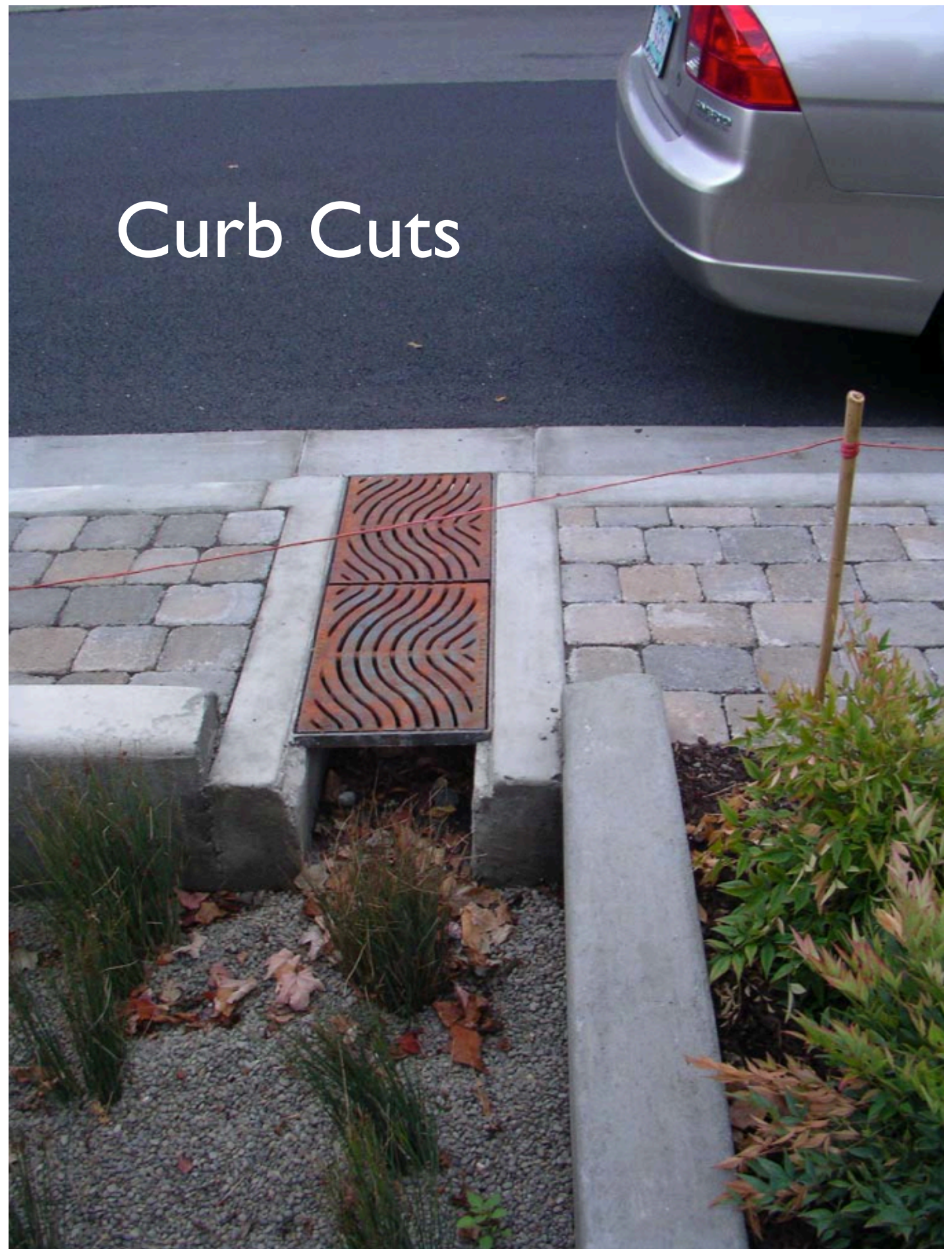
There are many LID techniques.  
Bioswales are a common  
feature of low impact  
developments.



# Curb Cuts

Curb Cuts move water from streets into bioswales and other LID features.

Curb Cuts can be used for both new development and retrofits to urban and suburban landscapes.





# Bioswales



Image Credit: MIG SA Low Impact Development Presentation



Image Credit: David Dods

## Calculation Surface Area of Biofiltration System

$$A_f = WQ_v / [ n ( d_f ) + H + ( k * t_f ) ]$$



$A_f$  = Surface Area of Bio retention bed

$WQ_v$  = Water Quality Treatment Volume ( cu.ft )

$d_f$  = Planting Soil Bed Depth ( ft )

$k$  = Coecient of Permeability of Soil Bed ( ft / day )

$H$  = Average Height of Water Above Bioretention bed ( ft )

$t_f$  = Time Required For Water Quality Treatment

Volume to Filter through the Planting Soil Bed ( Days )

$n$  = Filter Media Porosity

Image Credit: David Batts



# Pervious Pavement



Pervious pavement has become a common LID tool.

Research conducted by the University of Texas has shown significant reductions of heavy metals and petrochemicals when pervious asphalt is utilized.



Image Credit: Michael Barrett



# Pervious Sidewalks



Image Credit: David Dods



# Pervious Parking



Image Credit: Michael Barrett



**Table 1. Cost Comparisons Between Conventional and LID Approaches**

<b>Project<sup>a</sup></b>	<b>Conventional Development Cost</b>	<b>LID Cost</b>	<b>Cost Difference<sup>b</sup></b>	<b>Percent Difference<sup>b</sup></b>
2 <sup>nd</sup> Avenue SEA Street	\$868,803	\$651,548	\$217,255	25%
Auburn Hills	\$2,360,385	\$1,598,989	\$761,396	32%
Bellingham City Hall	\$27,600	\$5,600	\$22,000	80%
Bellingham Bloedel Donovan Park	\$52,800	\$12,800	\$40,000	76%
Gap Creek	\$4,620,600	\$3,942,100	\$678,500	15%
Garden Valley	\$324,400	\$260,700	\$63,700	20%
Kensington Estates	\$765,700	\$1,502,900	-\$737,200	-96%
Laurel Springs	\$1,654,021	\$1,149,552	\$504,469	30%
Mill Creek <sup>c</sup>	\$12,510	\$9,099	\$3,411	27%
Prairie Glen	\$1,004,848	\$599,536	\$405,312	40%
Somerset	\$2,456,843	\$1,671,461	\$785,382	32%
Tellabs Corporate Campus	\$3,162,160	\$2,700,650	\$461,510	15%

<sup>a</sup> Some of the case study results do not lend themselves to display in the format of this table (Central Park Commercial Redesigns, Crown Street, Poplar Street Apartments, Prairie Crossing, Portland Downspout Disconnection, and Toronto Green Roofs). <sup>b</sup> Negative values denote increased cost for the LID design over conventional development costs. <sup>c</sup> Mill Creek costs are reported on a per-lot basis.

Source: “Reducing Stormwater Costs through Low Impact Development Strategies & Practices,” December 2007



# Additional Resources

## San Antonio River Authority LID Technical Guidance Manual

<https://www.sara-tx.org/wp-content/uploads/2015/05/Full-LID-Manual.pdf>

The template for the City of Boerne's manual, which does not yet appear to be publicly available.

## HCA: Patrick Heath Public Library

<http://www.hillcountryalliance.org/uploads/HCA/LID2013.pdf>

Provides information about the Patrick Heath Public Library project and Low Impact Development considerations.

## Low Impact Development: A Cost Comparison

<http://www.eorinc.com/pdf/development-maintenance-cost.pdf>

Provides cost analysis comparing LID with conventional practices.

## Banking on Green

[https://www.asla.org/uploadedFiles/CMS/Government\\_Affairs/Federal\\_Government\\_Affairs/Banking%20on%20Green%20HighRes.pdf](https://www.asla.org/uploadedFiles/CMS/Government_Affairs/Federal_Government_Affairs/Banking%20on%20Green%20HighRes.pdf)

## Green Streets and Parking Lots Design Book

[http://www.flowstobay.org/files/greenstreets/GreenStreets\\_booklayout\\_Guidebook.pdf](http://www.flowstobay.org/files/greenstreets/GreenStreets_booklayout_Guidebook.pdf)

A very visual exploration of Low Impact Development approaches.





[www.InspireBoerne.org](http://www.InspireBoerne.org)