

# Greening Local Roadways

On the Path to Sustainable Communities

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# Municipal Stormwater Management: Why This Discussion?



# How we got here

- Everyone wants clean water, fewer people want to pay for it – progress



- The incentive for change must be created



# Drivers for change

- Population increases
- Availability of water – future cost
- Pollution
- Climate change
- Resiliency
- Aging infrastructure
- Efficiency
- Increasing standard of living

# Water use and availability

- ❑ Depends on socioeconomics:
  - ❑ Uganda: 24.6 liters/capita/day (all uses), 7.9 (personal)
  - ❑ US: 4625 liters/capita/day (all uses), 555 (personal)
- ❑ Water use must change in the US
  - ❑ Sustainable practices and technology can reduce water demand to 50 liters/capita/day (personal)

# How we can move forward

- Vision: Sustainable communities built around water
  - Water Sustainability:
    - Reclaim wastewater – DPR
    - Reclaim energy
    - Reclaim stormwater
    - Reduce pollution – source control
    - Promote living in cities – disincentives for sprawl
    - Restore urban streams
    - **Low impact development practices**

# History of stormwater management

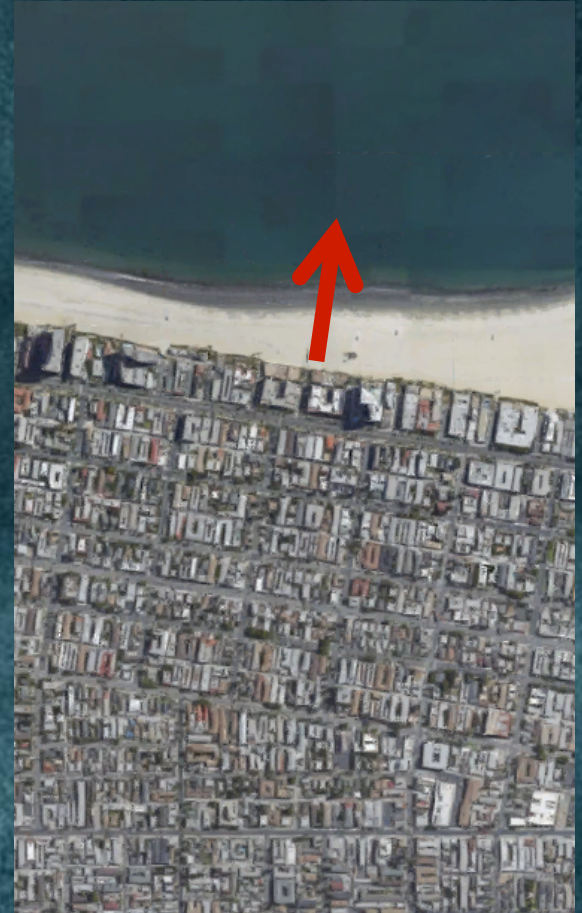
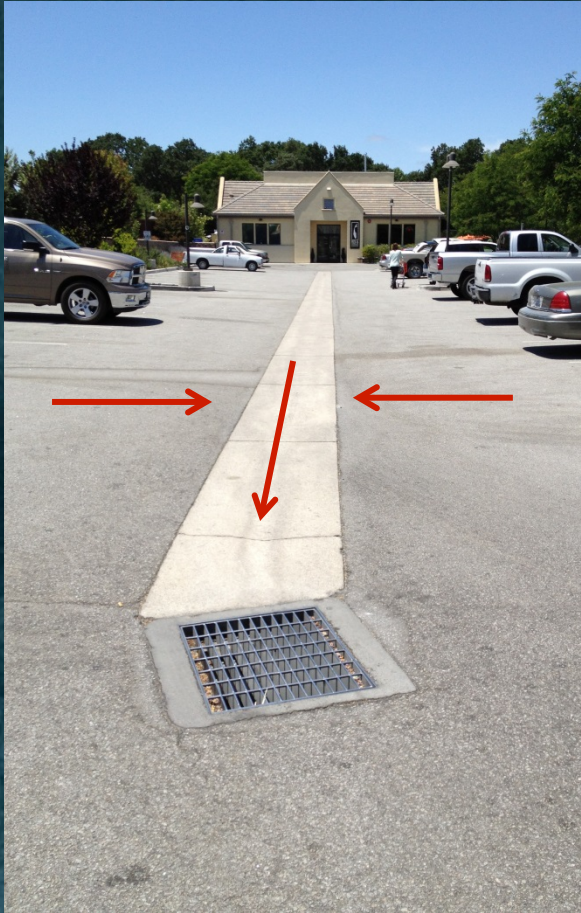
- ❑ First public/safety and health, which promoted a conveyance of water in grey infrastructure
- ❑ Consequence: lowered risk of disease; decrease in loss of property/life; all good. But also, promoted urban sprawl, expensive to construct and maintain, poor performance for outlier events

1955 Santa Cruz Flood



<http://freepages.misc.rootsweb.ancestry.com>

# The current approach





# Problems with conventional stormwater management

- ❑ Urbanization increases peak flow, and runoff volume
- ❑ Hydrology of streams changes, streams physically change, stream functions and values are lost or diminished
- ❑ Pollution efficiently transported downstream
- ❑ Gray infrastructure influences how the public views and values water



Wildcat Creek, Richmond, CA



Beach Advisory, CA



Heal the Bay. Photo: Ben Kay.

# Low Impact Development is a way to:

- ❑ Manage stormwater as close to the source as possible
- ❑ Minimize effective impervious
- ❑ Maintain watershed hydrologic and ecological functions – emulate the predevelopment hydrology
- ❑ Reduce pollution in water



# Low Impact Development: Key Principles

- ❑ Infiltrate urban runoff at points distributed throughout the watershed (instead of channeling water into storm-drains).
- ❑ Preserve natural hydrologic and ecosystem functions
- ❑ LID has multiple benefits for cities – not just stormwater benefits



# We need to engage the public

## The benefits of LID:

- Better Flood Control
  - Money saved on water infrastructure
  - Increased green space and wildlife habitat
  - Reduced urban heat island effect
  - Community beautification
  - Emphasis on green jobs and economy
- 
- The benefits of LID must be presented as part of a ***multi-benefit package*** that includes improvements in transportation, aesthetics, water quality, and water supply.



# Pop Quiz

- What is the percentage of the US population that walks or bikes to work?
- a. 2.1
  - b. 3.4
  - c. 8.9
  - d. 14.2
- Answer: b. 3.4%

## Question No. 2

- What State has the highest percentage of people that walk or bike to work?
  - a. Oregon
  - b. California
  - c. Maryland
  - d. Alaska

Answer: Alaska with 8.9% (California has 3.8%)

# Question No. 3

- What is the percent of land area devoted to streets and parking in the Los Angeles area?
  - a. 15
  - b. 34
  - c. 48
  - d. 59

Answer: d. 59% in the urban core. About 35% of area is dedicated just to roads.

# Green Streets can help!

What is a Green Street?

Green Streets are landscaped spaces that transform street surfaces into living stormwater management facilities. Green Streets capture stormwater runoff from adjacent streets and sidewalks and allow stormwater to infiltrate into the ground and plants and soils filter pollutants.

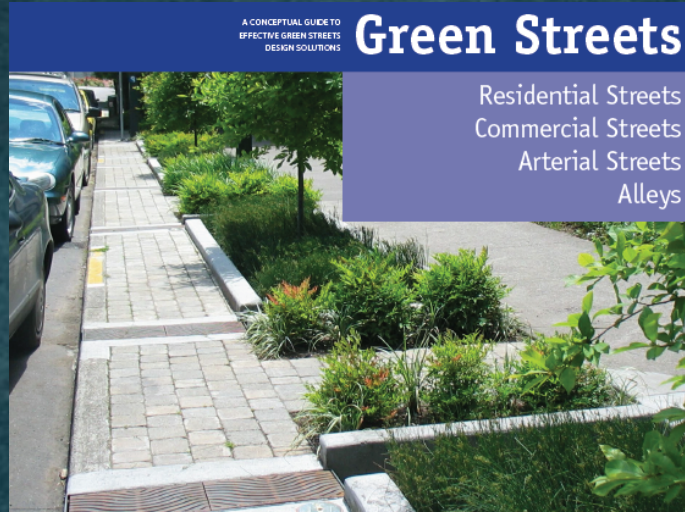




# Designs can accommodate different street types



Santa Monica green street

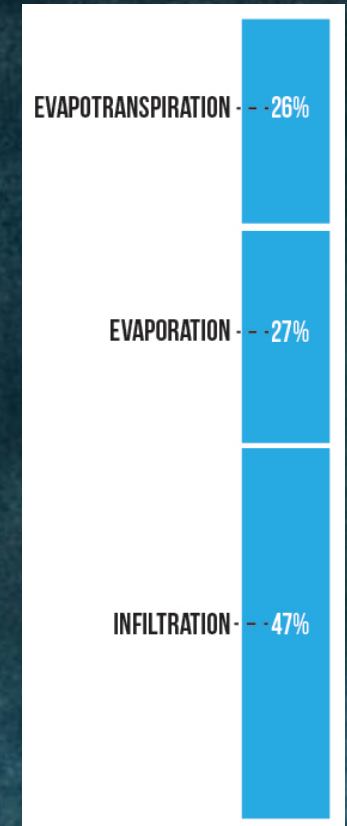
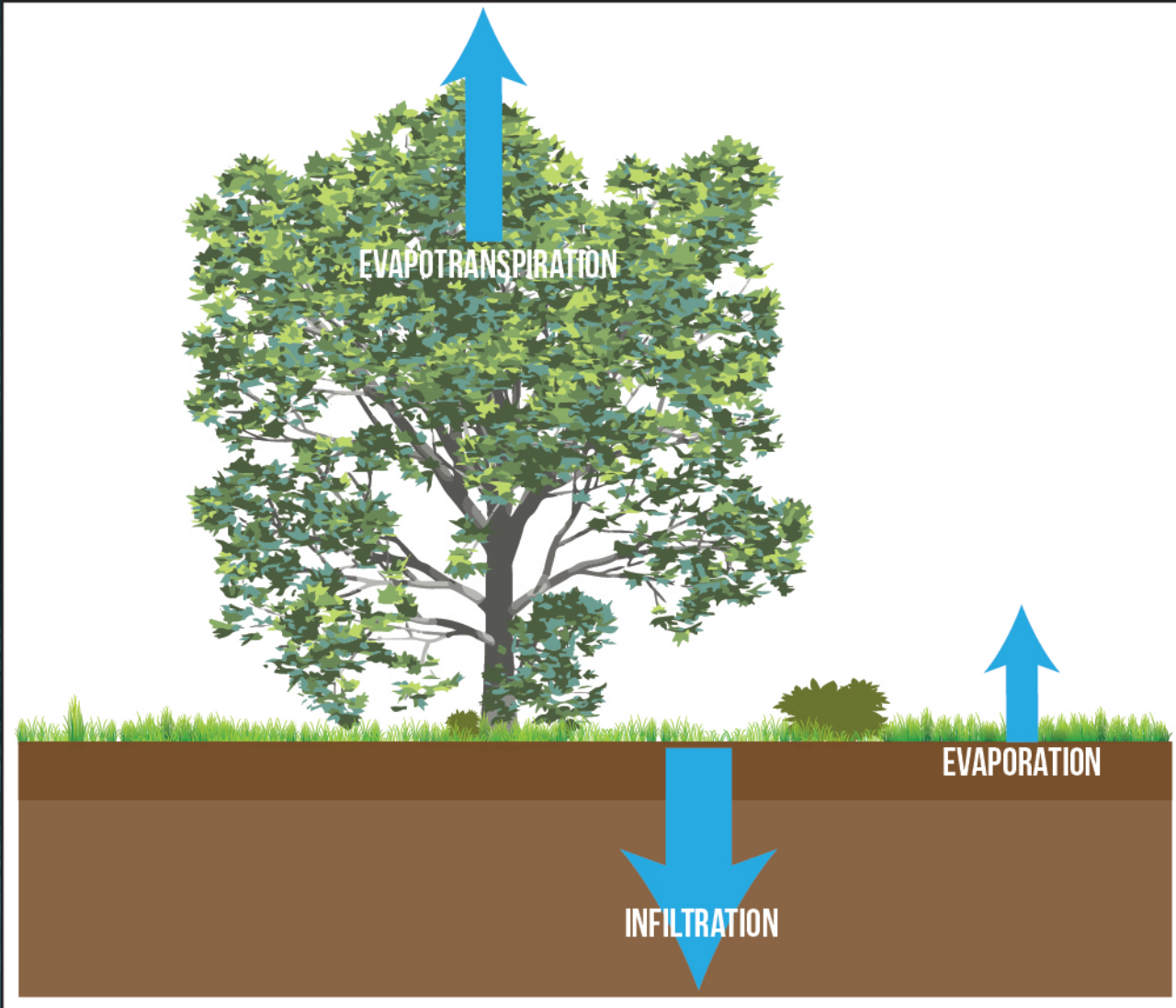


[cleanwaternashville.org](http://cleanwaternashville.org)

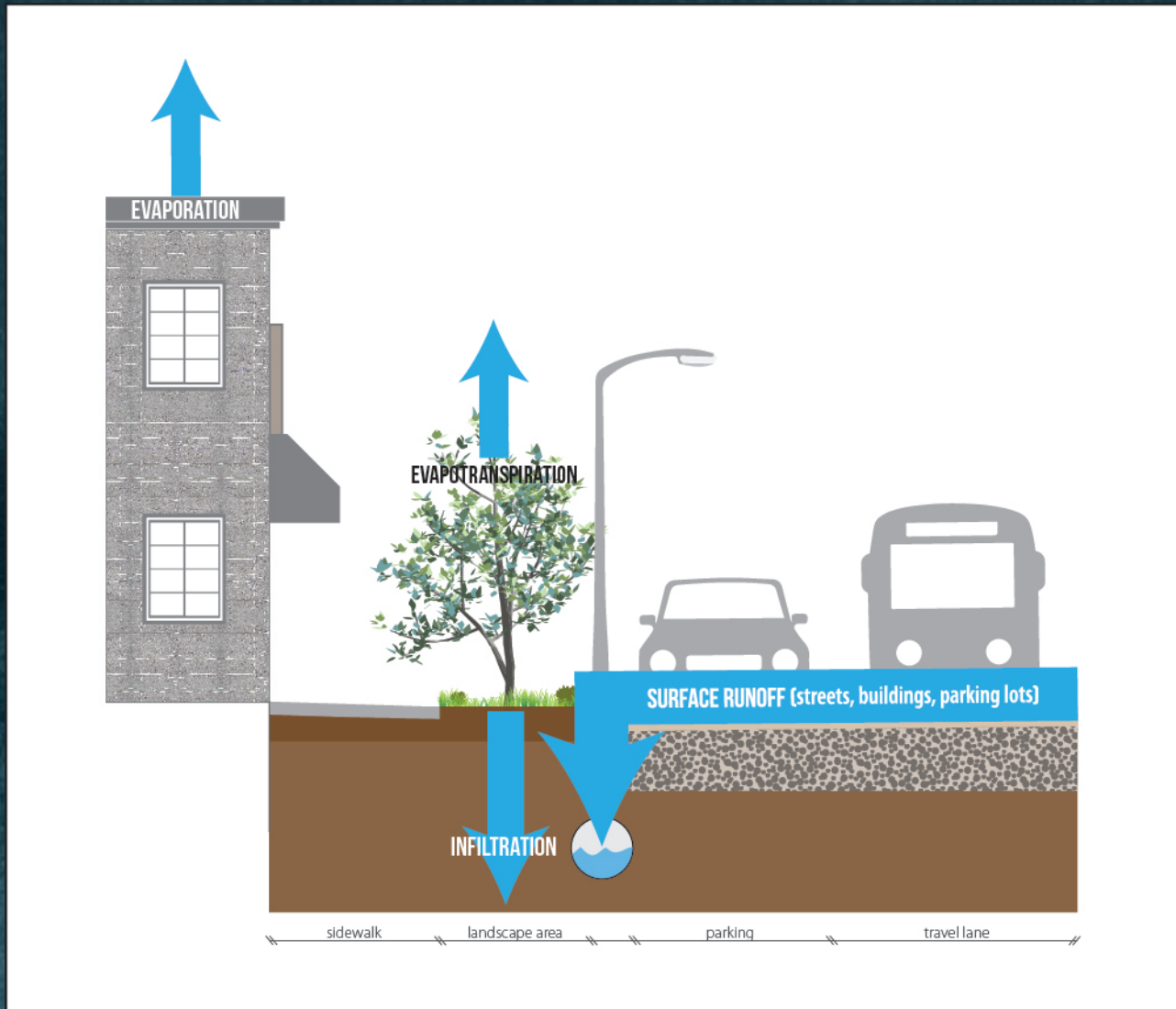


[www.artfulrainwaterdesign.net/projects/](http://www.artfulrainwaterdesign.net/projects/)

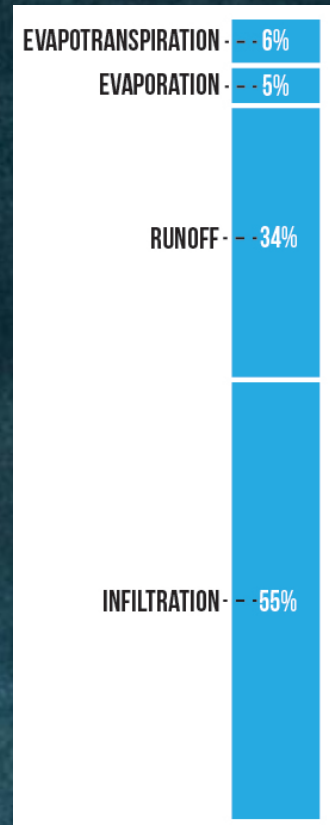
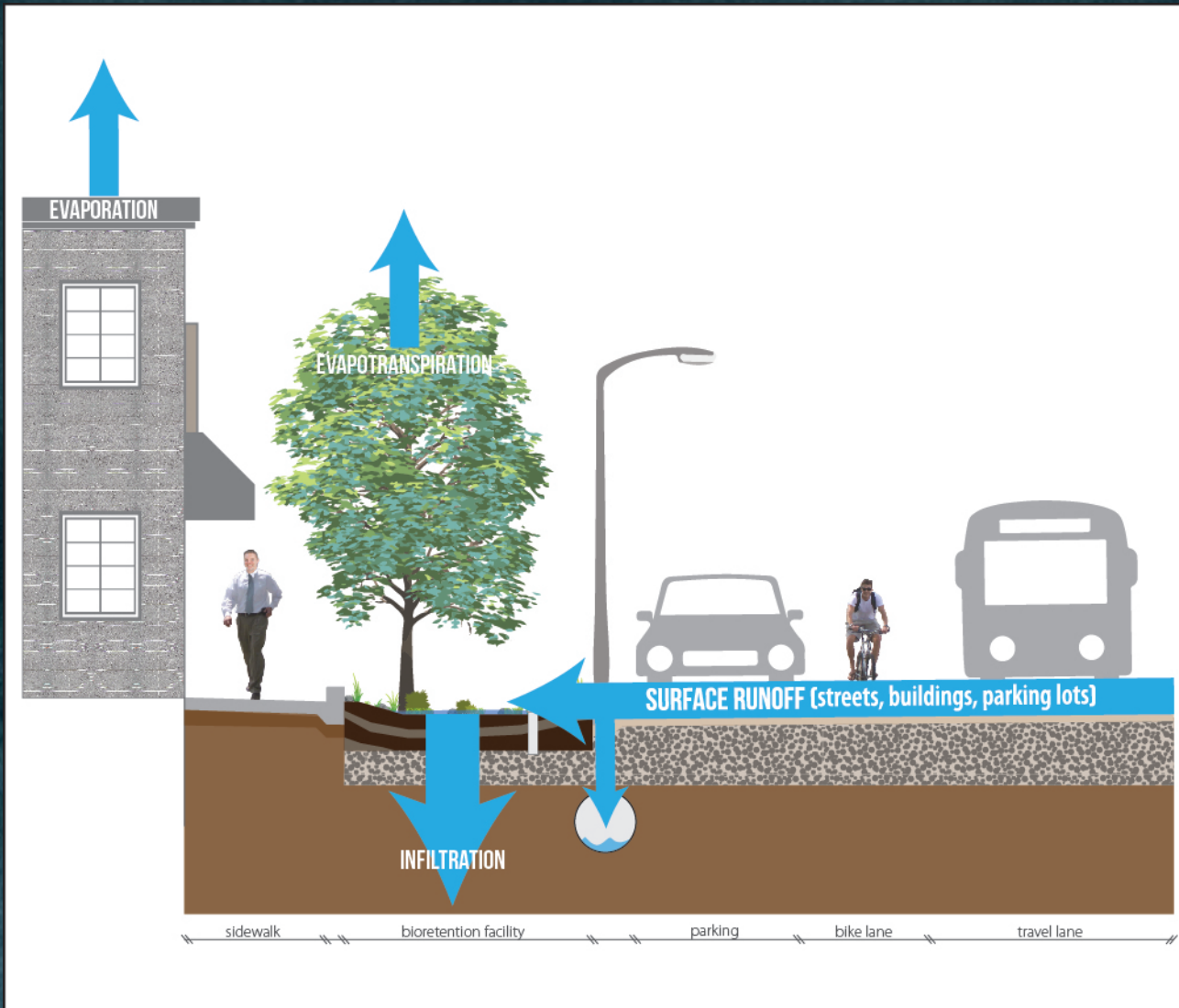
# Where the water goes: predevelopment



# Where the water goes: conventional street



# Where the water goes: green street



Streets represent one of the largest areas of impervious surface in a city and create significant runoff volumes and pollutant loads

Streets are a major component of the stormwater conveyance system

What if we view Streets as a means of water resource management infrastructure?

# Sustainable Complete Streets

- ❑ The target to aim for. Sustainable complete streets are:
  - ❑ Transit and active transportation oriented combined with stormwater practices to 'remake' a street
  - ❑ Traffic, civil design, landscape, stormwater are used to extract more value from an existing public asset.
- ❑ Basic laws are in place: Complete Streets Act (AB 1358) and MS4 stormwater permits

# The City of the Future

- ❑ LID is an important part of building cities of the future
- ❑ As aging infrastructure is rebuilt, incorporate LID and distributed stormwater systems
- ❑ Solutions must be acceptable and desired by the public
- ❑ No more 'wastewater', use and reuse water locally
- ❑ Derive more public benefit from existing infrastructure

# Sustainability

“Humanity has the ability to made development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.”

- World Commission on Environment and  
Development





SOURCE: NEVAE NGAN ASSOCIATES

**Figure 1-23:** This downtown residential street in Chicago, Illinois illustrates how ample landscaping can increase the appeal of a street.



SOURCE: KEVIN ROBERT PENNY - CITY OF PORTLAND

**Figure 1-21:** Neighborhood green streets are commonly seen as a community asset.



SOURCE: NEVAE NGAN ASSOCIATES

**Figure 2-4:** This arterial street emphasizes multiple transit options. The center median has a street car line, bike lanes flank both sides of the street, buses share travel lanes with autos, and pedestrians can safely cross street intersections.



SOURCE: NEVAE NGAN ASSOCIATES

**Figure 2-29:** This well-designed street emphasizes a strong pedestrian realm.



SOURCE: NEVAE NGAN ASSOCIATES

**Figure 2-31:** This street in South San Francisco accommodate both pedestrians and bus transit.



SOURCE: WWW.IUON.COM/PHOTOS/2014/04/03/15

**Figure 2-30:** A bike-friendly street design.



SOURCE: CONTEXTSENSITIVESOLUTIONS.ORG

**Figure 2-81:** Curb extensions can fit nearly anywhere and help calm traffic for a safer pedestrian experience.