Sustainable Streets

Emerging Priorities,
Emerging Practice

Ellen Greenberg
New Partners for Smart Growth
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The Sustainable Streets project is sponsored by the UC Davis Sustainable Transportation Center through its Visiting Practitioner Program.
Sustainable Streets: Unifying Sustainable Design and Transportation

• Use sustainable design principles
• Support transportation outcomes that serve movement needs while promoting least-polluting ways to connect people and goods to their destinations
• Enhance natural resources and processes
• Minimize air and water pollution
• Contribute to successful integration of land use, urban design, and transportation
Sustainable Streets Project

- Highlighting the connections between street design and sustainability
- Introducing a model of street design addressing the three pillars of community, ecology and movement
- Focusing on urban streets
- Documenting projects built and under construction (49 projects as of January 28, 2008)
- Referencing valuable material for practitioners
- Identifying research questions for further study
Three Pillars
Of Sustainable Street Design

Community
Ecology
Movement
Sustainable Street Design Objectives

Community

1. Positive public health outcomes
2. Compact development patterns
3. Public gathering
4. Independent mobility for non-drivers
5. Community Engagement
6. Adaptability over time
7. Origins & destinations connected by multiple modes
8. Placemaking: Identity, distinction, and beauty through natural and built features
9. Support for infill and compact development
10. Local priorities, traditions, resources and features reflected in design and function
Sustainable Street Design Objectives

1. Highly connected multimodal movement network
2. Network capacity consistent with community character objectives
3. Increased transit mode share
4. Increased non-motorized mode share
5. Vehicle speeds compatible with context and community objectives
6. Improved overall accessibility for non-drivers
7. Necessary access by emergency vehicles
8. Managed parking supply
9. Reduced portion of the average household budget going to travel
10. Limited curb-to-curb street width
Sustainable Street Design Objectives

1. Mitigated urban heat island effect
2. Improved air quality
3. Improved water quality
4. Enhanced ecological health and productivity
5. Reduced negative effects of noise
6. Efficient natural resource use
7. Improved energy performance
8. Reduced use of potable water
9. Preserved natural features and processes
10. Reduced greenhouse gas emissions
Reaching Sustainability Goals
Design Features and Desired Outcomes

• Many features, such as pervious paving on low volume streets and biofiltration swales, have a highly reliable set of outcomes and benefits
• Others, particularly environmental benefits associated with reduction in vehicle miles traveled, involve a complex of factors, with outcomes much less certain
Reaching Sustainability Goals

Design Features and Desired Outcomes

- Because of the multiple systems and the human factors involved in transportation, outcomes and benefits are not highly reliable.
- The presence of known catalysts and complements increase reliability and effectiveness.
- For street design to have a meaningful impact on travel behavior it needs to be part of a comprehensive approach to land use, urban design and transportation services.
Design Features and Desired Outcomes: Examples: Ecology

<table>
<thead>
<tr>
<th>Feature</th>
<th>Catalyst(s)</th>
<th>Complement(s)</th>
<th>Desired Intermediate Effect(s)</th>
<th>Desired Outcomes</th>
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<tr>
<td>Pervious Paving</td>
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<td>Infiltrate runoff and stormwater on site</td>
<td>Reduced Pollutant load, erosion, turbulence and temperature impacts of urban runoff</td>
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<tr>
<td>Biofiltration swales</td>
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<td>Slow runoff rate; remove sediment from stormwater</td>
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Design Features and Desired Outcomes: Examples: Movement

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<tr>
<td>Facilities for non-motorized transport (walk, bike)</td>
<td>Users making choice to bike or walk</td>
<td>Origins and destinations easily accessed by walk, bike or transit</td>
<td>Increase travel by non-polluting modes</td>
<td>Reduced Vehicle Miles Traveled, increased physical activity</td>
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<tr>
<td>Facilities for public transit operations</td>
<td>Public Transit Service</td>
<td></td>
<td>Increase travel by less polluting modes</td>
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Sustainable Streets Album
Sustainable Streets Album

Stormwater Plus
Downtown Revitalization Plus
Movement Plus: Big Streets
Neighborhood Plus
Album Sections

- Stormwater Plus
- Downtown Revitalization Plus
- Movement Plus: Big Streets
- Neighborhood Plus
Stormwater Management Plus...
Holladay Green Street

Gresham, Oregon

Contributors: City of Gresham
Department of Environmental Services

Image: City of Gresham
Holladay G

City of Gresham Dept

Services Green Street

Stormwater management fitted on three blocks

- Porous paving in parking lot
- Three rain gardens on side of street
- Erosion and sediment measures

Image: City of Gresham
Holladay Green Street

Porous paving in parking strip on north side of street

Image: City of Gresham
Holladay Green Street

Rain gardens on south side of street

Image: City of Gresham
Taylor Avenue

Seattle, WA

Contributor: Mithun

Image: Mithun
Taylor Avenue

Project Context
Taylor Avenue

• Redesign and reconstruction of Taylor Way is part of a mixed use development project in Seattle’s Denny Triangle area. While the project included here extends only for a single block of Taylor Avenue, changes have been approved by the City of Seattle for the entirety of Taylor Avenue.

• The project transforms underused roadway into a community amenity and sets a precedent for neighborhood development. Green infrastructure components incorporated into the right-of-way complement green building techniques being constructed at Taylor 28 and integrates sustainability goals into this new street.

• The project is under construction in December 2007
Critical goals for the project were to reconnect this “unclaimed” community to adjacent neighborhoods and to enhance the public realm.

Sustainability features strive to rebalance the streetscape’s ecologic function through rainwater management, restoring urban tree canopy and fostering urban wildlife habitat.
Taylor Avenue

- The pre-existing low-volume street featured a 56’ wide travelway with 2 18’ sidewalks. The project, centered on a 5-story, mixed-use project, reclaims approximately 20’ feet of this underused roadway for the public realm, designing it for both livability and ecological functions.

- This project helps to realize the City of Seattle’s policy for public open space in the Central City, the “Blue Ring Strategy.”

*Image: Mithun*
1. Roof water collection  
2. Downspout to on-site raingarden  
3. Demonstration raingarden  
4. Conveyance to cistern  
5. Cistern  
6. Rainwater to irrigation  
7. Sheet flow to raingarden in row  
8. Raingardens in row  
9. Pervious pavers  
10. Infiltration Zone

*Image: Mithun*
Taylor Avenue
Raingarden Features

1. Unit pavers
2. Concrete curb with drainage slots
3. Raingarden plantings
4. Ponding Zone
5. Freeboard zone
6. Overflow
7. Mulch Layer
8. Raingarden Soil
9. Gravel Filter
10. Washed Rock
11. Perforated pipe sized to increase storage capacity
12. Infiltration Zone
13. Edge restraint

Image: Mithun
Taylor Avenue
Contributor Perspective

“The key thing on this project is the extent of the road diet and the placement of that space in creating a new pedestrian zone, setting a precedent of streets as open space not just for moving cars. This is coupled with aggressive LID strategies for a zero-discharge for the 25-year storm event within this 'plaza street' zone. This area will be transforming quickly...so this project is key in setting the precedent and being a catalyst for positive change for the neighborhood.”

Image: Mithun
12th Street, Kansas City, Missouri

Contributor: BNIM Architects

Image: Jim Schuessler, BNIM Architects
12th Street, Kansas City, MO

This seven-block streetscape project on Kansas City’s main east-west corridor goes through the downtown financial district to the government district. The project includes stormwater management and urban forest features as well as re-design of the roadway to reduce the number of travel lanes from four to three and add on-street parking.

Image: Jim Schuessler, BNIM Architects
Two infiltration “rain garden” bulbs are 300 feet apart in Downtown’s government center, with tree trenches formally aligned along the street.

Image: Jim Schuessler, BNIM Architects
OUR CITY GOES GREEN

SMART STORMWATER MANAGEMENT

IMPROVES WATER QUALITY AND MINIMIZES WATER QUANTITY

PLANTS
Native plants slows down and cleans water.

SOILS
Twenty-four-inch-deep sandy soils encourage infiltration of stormwater runoff to subgrade.

STORMWATER COLLECTION
Rainwater is collected from the street and sidewalk, reducing peak flows, removing pollutants, and promoting infiltration.

RAINGARDEN FOREBAY

KEEP STORM PIPES CLEAR
Trash and debris are collected in the raingarden forebay, keeping storm water clear of debris and heavy metals.

ELIMINATES HARMFUL RUNOFF
Recycling hot water from the building's heating system provides a snow-melt system on the North side of the building that
12th Street, Kansas City, MO

The project introduces trees, flowering plants and grasses into a previously-bare streetscape (shown above).

The rain gardens narrow 12th Street and slow traffic
This rendering shows the design’s emphasis on creating a green corner for year-round interest. The grasses will grow to 3-4 ft tall. The selected species has multicolored leaves, which in the fall has white plumes and turns from green into yellows, browns, and reds. Flowering plants will predominate in the Spring.
12th Street, Kansas City, MO

- Construction and planting of trees, tree trenches, lighting and raingardens was completed in October 2007.
“We sold it by saying you need a bulb out to solve the safety issues, and while we're doing that, let's solve these water issues, and as long as you're spending this amount of money, let's do it with a green solution.”
Contributors:

Conservation Design Forum
Josey Heights Street Plan

- Water storage to meet the City release rate requirements is located in gravel storage trenches under the permeable paving
- Pavers contribute to traditional neighborhood design

Image: Conservation Design Forum
Josey Heights Street Plan

- Bioswales align with back property lines behind this model unit.
- Apartment building in background is part of the surrounding neighborhood.
Josey Heights Street Plan

Image: Conservation Design Forum

- Permeable Paving
- Rain Gardens

stormwater management
Broadview Green Grid, Seattle, WA

• 15 residential blocks were re-aligned with installation of stormwater management features.

• The curbless streets are designed to accommodate storm water flow and emergency vehicle access.

• Rainwater is slowed and biologically filtered in swales and cascades to protect a nearby creek.

Images: Seattle Public Utilities
The meandering shape of the roadway reduces impervious surfaces, makes room for landscaping and a sidewalk, and encourages traffic to slow down.
Engineered cascades make use of steep shoulders along the roadway to retain and filter large amounts of runoff. Sedimentation structures will be cleaned yearly to remove pollutants.

Images: Seattle Public Utilities
Southwest 12th Ave., Portland, OR

- The downtown rain garden example serves as an urban Green Street Demonstration Project.

- Pre-existing planting strips were adapted for stormwater infiltration to reduce design and construction costs.

Contributor and images: Kevin Perry
Planted bulb-outs were installed on a suburban residential street. Almost a dozen native or locally-suited plants were selected for each swale.

Interpretive signs offers public education.
Within the bulb-outs, check dams reduce stormwater overflow by slowing flow speeds and increasing infiltration.
The Chicago Green Alleys Program aims to overhaul 3,500 acres of public alleys with a four-pronged approach, implementing...

...Permeable paving where appropriate
...High albedo surfacing
...Energy efficient & dark sky compliant light fixtures
...and use of recycled materials

Images: City of Chicago  Contributor: Janet Attarian, City of Chicago
Green Alleys, Chicago

Drainage Before and After.

- Alleys flooded without connections to the city stormwater drains.

- Water infiltrates the ground water through permeable pavement or infiltration basins, alleviating basement flooding issues for adjacent properties.

Images: City of Chicago
The City’s Green Alleys Handbook illustrates four possible alley drainage configurations in cross section.
Green Alleys, Chicago, IL

Drainage configurations (plan view).

Images: City of Chicago
Green Alleys, Chicago, IL

Images: City of Chicago
Green Alleys, Chicago

High albedo paving is used for both permeable and impermeable alleys.

High albedo surfaces reflect light and heat, thereby staying cooler and reducing the urban heat island effect. This saves energy and reduces cooling costs in surrounding buildings.

Images: City of Chicago
Green Alleys, Chicago, IL

Yellow high-pressure sodium lamps…

…versus…

…white halide lamps that don’t brighten the night sky.

Images: City of Chicago
Downtown Revitalization Plus...

Riverfront Parkway and Downtown Streets, Chattanooga, TN
South First Street, San Jose, CA
First Street, Livermore, CA

Additional Snapshots

Image: Freedman Tung & Bottomley
Riverfront Parkway and Downtown Streets

Chattanooga, Tennessee
Contributors: City of Chattanooga and River City Company

Image: City of Chattanooga
Riverfront Parkway and Downtown Streets

Supporting compact development and re-use while revitalizing the Downtown was the overarching objective of this major effort.

• The five-lane limited access highway was narrowed to a 2-lane surface street and realigned to create sites for new housing

• On-street parking, crosswalks and a ped-bike promenade were added

• Posted speed limit was lowered

• Two one-way pairs of downtown streets were converted to four two-way streets
### Design Details

<table>
<thead>
<tr>
<th>Lane, Median and Parking Configuration</th>
<th>Travel lane widths</th>
<th>Sidewalk width</th>
<th>ROW width</th>
<th>ADT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>Riverfront Parkway</td>
<td>2, 2</td>
<td>w/median</td>
<td>1,1 w/on st. pkg. on 1 side</td>
<td>12'</td>
</tr>
<tr>
<td>3rd Street</td>
<td>3, 0</td>
<td>1, 2*</td>
<td>9 to 10'</td>
<td>no change</td>
</tr>
<tr>
<td>4th Street</td>
<td>0, 3</td>
<td>2, 2 w/median and left turn lanes</td>
<td>9 to 10'</td>
<td>11'</td>
</tr>
<tr>
<td>McCallie</td>
<td>4, 0</td>
<td>1, 1 w/left turn lane &amp; pkg on 1 side</td>
<td>9'</td>
<td>10' through lanes, w/ 9' left turn lanes; 7' pkg. ln.</td>
</tr>
<tr>
<td>ML King</td>
<td>0, 4 on-st. parking both sides</td>
<td>2, 2 w/ on st. pkg. both sides</td>
<td>10'</td>
<td>no change</td>
</tr>
</tbody>
</table>

* 1 block of 3rd street has one lane in each direction with on-street parking.

**Source:** City of Chattanooga
Riverfront Parkway and Downtown Streets
Contributor Perspective

“Before it felt like a highway, and now feels like a road through a park”. The example offers good transferability too, because other cities do have those ugly highways along the riverfront and the ocean-front.”
South 1st St. / Downtown Transit Mall
San Jose, California
Contributor: City of San Jose
South 1st St. / Downtown Transit Mall

Construction of San Jose’s downtown transit mall had dual purposes: to address the north-south commute in the Silicon Valley, and to bring people into downtown San Jose. The light rail and street changes were viewed as stimuli to two decades of downtown redevelopment, which has brought thousands of housing units to downtown.
South 1st St. / Downtown Transit Mall

The Transit Mall features wide sidewalks with light rail running between two rows of trees within the elevated portion of the right of way. This unusual design puts transit in the pedestrian realm so riders don’t have to contend with vehicle traffic in order to board.

Image: Ellen Greenberg
Changes in the use and design of the public way were accompanied by plantings that have had time to mature, transforming the character of the street.
South 1st St. / Downtown Transit Mall

- Transit mall blocks feature a wide pedestrian realm with the light rail in it’s center
- The original stop design has been modified and waiting areas reconstructed to respond to ADA requirements

Image: Ellen Greenberg
South 1st St. / Downtown Transit Mall

Source: City of San Jose  Illustrated by Greg Pasquali
This early project (relative to others in sample) is a reminder that both patience and a comprehensive approach are needed for transit productivity. While the City of San Jose’s downtown revitalization efforts have been successful, particularly with respect to housing production, ridership on the light rail line is very poor. Contributing factors include the highly dispersed pattern of employment in the Silicon Valley, the typically low residential densities, and the very limited connecting transit services available to light rail riders. The City of San Jose has begun to encourage intensification and transformation of some lower-density employment areas to add a mix of uses as well as urban character. These strategies may ultimately build transit ridership in the area.
First Street
Livermore, California

Contributors:
Freedman Tung & Bottomley (FTB)

Image: Freedman Tung & Bottomley
The First Street Streetscape

The streetscape project works hand-in-hand with newly redefined land uses and a new development code and strategy. The First Street project included:

- Relocating the state highway route off of First Street
- Reducing 4 vehicle through-lanes to 2
- Creating “flexible zones” to host angled parking or outdoor dining as needed by revitalizing businesses.
- New street trees and trellises
- Using pedestrian paving in the “flexible zones” to shrink the perceived car territory
- At the central intersection, closing a slip lane and creating a new town green

Image: Freedman Tung & Bottomley
The First Street Streetscape

Image: Freedman Tung & Bottomley
Existing First Street sidewalks prior to project – with 4 traffic lanes and 2/3 of its width devoted to arterial traffic, the street was still too traffic-dominated to thrive as a pedestrian-oriented main street.
Livermore’s Downtown Specific Plan recommended improvements to five downtown blocks.

Images: Freedman Tung & Bottomley
The First Street Streetscape

<table>
<thead>
<tr>
<th>17'</th>
<th>17.5'</th>
<th>12'</th>
<th>12'</th>
<th>17.5'</th>
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</thead>
<tbody>
<tr>
<td>Side walk</td>
<td>Flex Zone</td>
<td>Travel Lane</td>
<td>Travel Lane</td>
<td>Flex Zone</td>
<td>Side walk</td>
</tr>
</tbody>
</table>

93’ R.O.W.
As constructed

Image: Freedman Tung & Bottomley
First Street before and after. Vertical elements (trees and trellises) invade the “car turf” (parking), restructuring the street’s proportions.

Four 11’ lanes become two 12’ lanes. The visual impact of asphalt is minimized.
First Street today. “Structural soils” in tree wells insure rapid growth of new trees and long term root viability beneath pavement.
17 foot-plus wide flexible zones on First Street allow for sidewalk cafes to be added by business owners, while most of the zone is used for curbside parking to support ground floor shops. Older sidewalk trees are preserved.
A flexible zone sidewalk café, two steps down from the sidewalk.
The First Street and Livermore Avenue crossroads - a traffic island and slip lane are replaced by a town green and pergola with interactive fountain.
The First Street and Livermore Avenue 
crossroads – before and after comparison
The First Street Streetscape
Contributor’s Perspective

The First Street Streetscape demonstrates that a major sustainability challenge for much of America is to achieve successful relationships between people, cars, and our built and natural environments – in the face of development industry sprawl formulas. Wild and agricultural land conservation is made possible when built-out urban environments and places are densely and multiply used, made highly livable and human-scaled, and are vital places to be. In particular, opportunities can be found on most existing urban streets to re-allocate space from cars to people.
Distinctive paving, light fixtures, and bollards provide a new setting for occasional community events on Davis Street.

Contributor and images: Ellen Vanderslice
Festival Street, Portland, OR
Pedestrians, automobiles, and bicycles make equal use of the roadway, which is curbless and designed with colored pavers.
As part of a re-paving project, a state highway was retrofitted to increase parking and better accommodate bikes in the central business district without moving the curbs.

Two travel lanes were replaced with bike lanes, and one side of parallel parking was replaced with back-in angle parking.
Mobility Plus: Higher-volume Streets (20,000 adt +)
Pacific Boulevard
Vancouver, British Columbia

Image: City of Vancouver
Pacific Boulevard’s reconstruction, underway in 2008, is intended to activate and green the street while improving facilities and conditions for bicyclists and walkers. This project stands out as having the highest density development context of any in the Sustainable Streets Album.
This “before” view of the Pacific Boulevard Corridor shows the very high density development context as well as the long crossing distances that the redesigned street seeks to remedy.

The City’s Downtown Plan gives the street multiple roles:

- A major circulation street
- A bus and truck route
- A designated bike route with bike lanes
- A pedestrian route, and
- A future streetcar route

Before Reconstruction

Images: City of Vancouver
Despite wide sidewalks and on-street parking, Pacific Boulevard was seen by the City and community as needing a major “makeover” in order to meet Vancouver’s goals for it to become “a one of Vancouver’s great streets and a preeminent pedestrian promenade for downtown residents, workers and visitors.”

Image: City of Vancouver
Pacific Boulevard, Vancouver, BC

Cross Section Before Reconstruction
122’ Right-of-way, 86’ Traveled Way

Image: Elizabeth Macdonald
The new design for Pacific Boulevard is meant to both unify and identify the redeveloped False Creek neighborhood, one of several new high density residential districts on former industrial land near the city’s downtown. Four distinct segments have different cross-sections, all including a landscaped median with formally aligned trees of a single species.

Image: City of Vancouver
18’ wide sidewalks and a 13” shared parking and bike lane separate ground floor uses from 10’ wide travel lanes. The 8’ parking lanes can be converted to outdoor amenity zones.

A future streetcar could run either on inside travel lanes or in the 20’ wide median.

Image: Elizabeth Macdonald
Pacific Boulevard, Vancouver, BC
High Street: Cambie to Homer

Image: Elizabeth Macdonald
Pacific Boulevard, Vancouver, BC
Intersection Design: Shortening Crossing Distances

Plan: Davie Intersection
Pacific Boulevard

Image: Elizabeth Macdonald
Pacific Boulevard, Vancouver, BC

The Beach Neighborhood:
One-sided Multiway Boulevard with Central Median

- The median and one-sided multiway boulevard configuration is applied to four blocks of Pacific Boulevard with variations reflecting topography and available right of way.
- As with the High Street cross section, travel lanes are 10’ wide and sidewalks are generous. The side access lane is 18’ wide, allowing for curbside parking a a slow-moving local access lane.

Image: Elizabeth Macdonald
Pacific Boulevard, Vancouver, BC
One-sided Multiway Boulevard with Central Median

Image: Elizabeth Macdonald
Pacific Boulevard, Vancouver, BC
Multiway Boulevard Segment

Image: City of Vancouver
“the vision of a future Pacific Boulevard is of a sensuous, moderately paced public right-of-way with a continuous, urban tree-lined median that becomes an extension of the waterfront parkway circulation system to the northwest, that in some places is wider than at present in order to better accommodate cyclists and pedestrians and is tighter at other places where it is currently too wide, and that caters to local neighborhood uses as well as through movement uses.” (from 4/1/02 Memo to Project Team Members from Jacobs Macdonald Cityworks)
Sandy Boulevard

Portland OR

Contributors:
Nevue / Nguyen Associates and City of Portland

Image: Nevue / Nguyen
Sandy Boulevard

This redesign of a connector street carrying almost 30,000 adt matches the Sustainable Streets framework, with objectives addressing movement, ecology, and community. Project goals include:

• Enhance Pedestrian Safety and convenience
• Provide Good Connections Between Neighborhoods
• Improve Drivers’ Safety and Convenience
• Support Access to Businesses and Residential Neighborhoods
• Improve Bicycle Safety and Convenience
• Increase Safety and Convenience for Transit Users
• Enhance Landscaping
• Support the Community Identity

Image: Nevue / Nguyen
The project incorporates several landscaped stormwater treatment areas into the right-of-way. Infiltration basins and landscaped curb extensions are used, achieving the dual purposes of stormwater management and strengthening the identity of selected intersections.
Sandy Boulevard

This plan shows the special features that incorporate stormwater management into landscape design, lending distinction and identity as well as functionality at these locations.

Image: Nevue / Nguyen
Sandy Boulevard

Image: Nevue / Nguyen
Sandy Boulevard

Image: Nevue / Nguyen
Green Street facilities such as this one at Kelley Plaza are integrated into gathering spaces, adding landscape elements as well as stormwater management functions.

Image: Nevue / Nguyen
Pedestrian facilities include new streetscape improvements, curb extensions at transit stops to reduce crossing distance and improve access to buses, and installation of median pedestrian refuges at larger intersections. Public open spaces with benches and gathering places, wayfinding.

Image: Nevue / Nguen
The project includes facilities for bikes, parking, and wayfinding. Seventy new bike racks were installed, with custom designs for different districts.

Image: Nevue / Nguyen
Sandy Boulevard

22nd - 24th Avenue
80-foot right-of-Way
Sandy Boulevard
Contributor's Perspective

"The angle of Sandy Boulevard against the city grid provided opportunities to reduce the asphalt paved areas and create sizable vegetated stormwater facilities that also increase pedestrian safety by reducing the crossing distances at intersection."

Chris Armes, project manager with the Portland Office of Transportation.

Image: Nevue / Nguyen
Sandy Boulevard
Contributor’s Perspective

“Green street facilities had never been installed before on a high volume street like Sandy Boulevard. In addition, this was the first time a consultant designed a city green street project for which there were no city design standards in place. However, overcoming these obstacles led to innovative design and added a unique character to Sandy Boulevard’s streetscape.”

Ross Swanson, landscape architect with Nevue Ngan Assoc.
Aurora Ave

Shoreline, Washington

Contributors: CH2M Hill

Image: Tim Bevan, CH2M Hill
Aurora Multimodal and Interurban Bridges Project

Features of the redesign and reconstruction include:

• intersection capacity improvements,
• Business access/transit lanes,
• two pedestrian/bicycle bridges
• sidewalks
• access management
• utility undergrounding
• landscaping
• lighting
• stormwater management features including bioswales
Aurora Multimodal and Interurban Bridges Project

• Typical “before” conditions along Aurora Avenue in Shoreline

• These conditions persist outside of the project boundaries in both Shoreline and Aurora

Images: Tim Bevan, CH2M Hill
Aurora Multimodal and Interurban Bridges Project

- Bike/Ped Bridge
- Continuous Sidewalk
- Landscape buffer and lighting
Aurora Multimodal and Interurban Bridges Project

- Business Access / Transit Lane
- Access Management
- Works in conjunction with sidewalk improvements
- Continuous Sidewalk

Images: Tim Bevan, CH2M Hill
Aurora Multimodal and Interurban Bridges Project
East 14th St., San Leandro, CA

A four-lane state highway slims down to a two-lane tree-shaded drive as part of a downtown revitalization effort.

Trees grew to the size shown over a period of 8 years.

Contributor and images: Freedman Tung & Bottomley
A monument not only breaks the monotony of what was an “endless stretch” of roadway, but its base meets Caltrans’ requirements for barriers on state highways.
Helmer Rd., Battle Creek, MI

A 4-lane road improves in two phases: First sidewalks and then bicycle lanes.

In some areas, a landscaped buffer protects non-motorized traffic.

Images: Martin Parker

Contributor: Wade Trim Associates
A 2-mile downtown thoroughfare reduced from 6 and 7 lanes to a 4-lane cross section with median.

Pedestrian and aesthetic amendments improve safety, and provide a sense of place for the downtown and university districts that front the road.

Contributor: Roger Henderson, Kimley-Horn & Associates
Image: Cameron Davidson
A substantial increase in vegetation includes canopy trees that will shade the road and walkways.

Gateways at North Carolina A&T University and the downtown district create a sense of place.

Images: Kimley-Horn & Associates (top), Cameron Davidson (bottom)
East Market Street, Greensboro, NC

Before and After

Pedestrian activity is encouraged by wider median protection at crossings.

Ornamental features like pedestrian pavers calm traffic and make a more attractive walking environment.

Image: Kimley-Horn & Associates
Pedestrian-, bicycle-, and transit-oriented improvements revitalize a neighborhood commercial arterial.

The redesigned roadway is the spine of the Fruitvale district, and one block from the district’s BART station.
The design accommodates possible future construction and operation of light rail, trolley bus or rapid bus, with waiting zones in the median.

Image: Elizabeth Macdonald
A tree-lined pedestrian pathway connects International Blvd. with a regional rapid transit station, to further encourage alternative modes of transportation.

Image: Elizabeth Macdonald
Octavia Blvd., San Francisco, CA

Contributor and image: Elizabeth Macdonald
An earthquake in 1989 damaged a stretch of highway, requiring repairs and offering a chance for redesign.

Before redesign, the grade-separated stretch created an unappealing pedestrian environment underneath it.

Image: Elizabeth Macdonald
• The conversion also opened lots for infill development in what is already a transit-oriented area.
• Dense tree coverage invites pedestrian activity.

Image: Elizabeth Macdonald
The multiway configuration allows for high automotive mobility while connecting neighborhoods on either side of the old highway for walkers.

Image: Elizabeth Macdonald
Neighborhood Plus...
New Columbia Street Plan

Contributors:
SERA - Urbsworthes
The New Columbia project transformed an 82-acre public housing site into a mixed-use, mixed-income, sustainable community with 400 housing units, public park, and elementary school. The street plan was designed for social and economic integration of the site into the greater community. The plan maximizes connectivity and community by welcoming for pedestrians and cyclists, and manages the area’s stormwater on-site.
The primary objective of the redevelopment was to reduce the concentration of poverty. A secondary objective was to redevelop the site in the most sustainable way possible.

- High internal and external connectivity
- “Skinny” streets with slow speed and small cross sections
- On-site stormwater management (bioswales, permeable paving)
- Multi-modal design: a fine-grained pedestrian network, transit on-site
- Safe routes to school model project
- Tree preservation
- Small blocks (300’ by 600’) and public alleys; mid-block pedestrian access-ways every 330’.

New Columbia Street Plan
New Columbia Street Plan

Highly connected street grid (shown in dark brown) replaced street pattern connecting to larger community in four locations

Image courtesy Marcy McInelly, SERA-Urbsworks
New Columbia Street Plan

Stormwater flows into planters in the public way, where it filters naturally into the soil.

101 pocket swales, 30 flow-through planter boxes and 41 public infiltration dry wells are included in the project.

98% of stormwater retained on-site; water directed to underground stormwater piping reduced 80%.

Image courtesy Marcy McInelly, SERA-Urbsworks
New Columbia Street Plan

Permeable Paving installed in alley

Image courtesy Marcy McInelly, SFRA Urbisworks
• Street alignment helped to preserve approximately half of the site’s mature trees.
• Mature, broad-canopy trees provide shade, reduce summer ground and air temperature, and provide wind protection in winter, as well as having positive air quality and stormwater benefits.
Image courtesy Marcy McInelly, SERA-Urbsworks
Pringle Creek Community
Salem, Oregon

Contributors:
Sustainable Development, Inc. and Opsis Architecture

Image: Sustainable Development, Inc.
Pringle Creek Community

• Low Impact subdivision with variety of housing products and a mixed use center
• Under construction in 2008
• Typical street section has single 13’ travel channel with 7’ parking lanes
• No curb and gutter
• Porous asphalt and concrete used
Pringle Creek Community

Wide creek buffers are protected as part of project open space, one of Pringle Creek’s sustainability features that adds to the overall quality and character of the project.

Image: Sustainable Development, Inc.
Pringle Creek Community

Typical Street Section

Scale: N.T.S.
Pringle Creek
Contributor’s Perspective

“The streets at Pringle Creek Community combine multiple concepts of sustainable design – narrow intersections, dedicated pedestrian spaces, sidewalks buffered by street trees, trails through 12 acres of open space, existing trees saved, garages tucked down alleys, an all-porous street system – and the end result is a highly desirable neighborhood to live in, one that is safe for walkers and bicyclists, shaded and comfortable, beautiful to look at, easy for traffic to flow through and with ample parking. Best of all, not only are our streets functional, but they enhance the entire watershed, effectively managing stormwater while at the same time recharging the aquifer and significantly reducing our footprint on the environment.”

- Don Myers, Sustainable Development, Inc.
Pringle Creek
Project Perspective

• When fully built-out, Pringle Creek will include a variety of housing types that match the design of project roads.

• The project’s offers an example of a holistic approach to sustainability in a lower-density environment than many album examples.

• Pringle Creek’s sustainability features are actively marketed by the developer, and may allow future observation of market response to this carefully designed low impact development.
Longview Blvd., Lee's Summit, MO

• New Longview is the first Traditional Neighborhood Development in Missouri, situated on an historic horse farm.
• With the expectation of 30,000-40,000 ADT, its main thoroughfare was designed to separate slow-moving traffic accessing homes and shops from fast-moving through traffic with landscaped medians and dense tree cover.

Contributor: 180* Design
Image: Kevin Klinkenberg
Longview Blvd., Lee's Summit, MO

- Longview Blvd.’s multiway design allows medians to shade walkers and break up the total street width into manageable crossing distances.
- The overall circulation plan for Longview emphasizes connectivity, with multiple routes into, through, and out of the neighborhood.

Images: Kevin Klinkenberg
High Point, Seattle, WA

- The High Point community includes 34 blocks of streets in the Longfellow Creek Watershed, and comprises 10% of the area of the watershed.

- Permeable pavements along sidewalks, gravel-paved driveways, and swales contribute to porous surfacing to slow, pre-treat, and infiltrate stormwater into the ground.

Image: Seattle Public Utilities
High Point, Seattle, WA

- The design of High Point considers water flow and greenspace connections on a system-wide level, as shown in this map.

- A basin ensures that excess run-off does not overrun Longfellow Creek.
High Point, Seattle, WA

HOW HIGH POINT DRAINAGE WORKS TO RECHARGE OUR GROUNDWATER AND PROTECT THE CREEK

HOUSES use different strategies to collect, infiltrate, and cleanse rainwater:
- splashblocks
- rocks
- furrows or channels
- stormwater pop-ups
- planted depressions (raingardens)
- yard drains

STREETS slope to one side and cut in curb to direct rainwater into planted and grass swales.

SWALES collect, absorb, and filter rainwater from streets and houses into the ground before going into the city storm drain.

CONVEYANCE FURROWS direct water away from the house via a path of gravel and crushed rock.

32nd Street north of Raymond Street is porous concrete to allow water to pass through into the ground before it goes to the swale.

City storm drain to carry bigger rainstorms to the large pond which slowly releases cleaner stormwater to Longfellow Creek.

Porous concrete sidewalks allow water to pass through into the ground.

Slotted pipe (underdrain) to carry rainwater to swales or a pipe.

Rocky soil holds water until it seeps into the pipe.

Stromwater pop-ups release water into the yard.

Slotted pipes enable water to seep into the ground while moving away from the house and into the rain garden.

Stormwater flows across sidewalks toward swales.
Sustainable Streets

Emerging Priorities, Emerging Practice

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