Developments
Protecting Water Quality

A Guidebook of Site Design Examples
Developments
Protecting Water Quality

A Guidebook of Site Design Examples

Prepared by:
EOA, Inc.

April 2004
CREDITS

This document was prepared by the Santa Clara Valley Urban Runoff Pollution Prevention Program (Program) for use by the Program Co-permittees, other local agencies, and the land development community. The Program expresses its appreciation to all those who contributed to this document.

Program Management Consultant:

Eisenberg, Olivieri, & Associates, Inc.
1410 Jackson Street
Oakland, CA 94612
(510) 832-2852

Technical Review/Quality Assurance
Jill Bicknell, P.E., Assistant Program Manager

Project Manager
Wendy Edde, Senior Scientist, Program Staff

Project Engineer
Carina Chen, Associate Engineer, Program Staff

This document was developed under the guidance of the C.3. Provision Oversight (C3PO) Ad Hoc Task Group. We appreciate the comments, suggestions, and guidance provided by the participating Task Group members.

C3PO Ad Hoc Task Group – Active Members

<table>
<thead>
<tr>
<th>Name</th>
<th>City</th>
<th>Role</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joe Teresi</td>
<td>Palo Alto</td>
<td>Kristy McCumby-Hyland</td>
<td>Sunnyvale</td>
</tr>
<tr>
<td>Paramjit Uppal</td>
<td>Milpitas</td>
<td>Erin Walters</td>
<td>Sunnyvale</td>
</tr>
<tr>
<td>Fariborz Heydari</td>
<td>Milpitas</td>
<td>Christine Cannizzo</td>
<td>Sunnyvale</td>
</tr>
<tr>
<td>Cheri Donnelly</td>
<td>WVCWP</td>
<td>Liliana Price</td>
<td>Sunnyvale</td>
</tr>
<tr>
<td>Imad Baiyasi</td>
<td>Los Gatos</td>
<td>Eric Anderson</td>
<td>Mountain View</td>
</tr>
<tr>
<td>Sandy Baily</td>
<td>Los Gatos</td>
<td>Genevieve Fire (consultant)</td>
<td>Cupertino</td>
</tr>
<tr>
<td>Kevin Riley</td>
<td>Santa Clara</td>
<td>Ann Welsh</td>
<td>Saratoga</td>
</tr>
<tr>
<td>Judith Silva</td>
<td>Santa Clara</td>
<td>Lynn Penoyer</td>
<td>Campbell</td>
</tr>
<tr>
<td>Melody Tovar</td>
<td>San Jose</td>
<td>Steve Homan</td>
<td>Santa Clara Co.</td>
</tr>
<tr>
<td>Anastazia Aziz</td>
<td>San Jose</td>
<td>Pamela Wu</td>
<td>Santa Clara Co.</td>
</tr>
<tr>
<td>Joe Vafa</td>
<td>San Jose</td>
<td>Larry Lind</td>
<td>Los Altos</td>
</tr>
<tr>
<td>Ebrahim Sohrabi</td>
<td>San Jose</td>
<td>Mike Campbell</td>
<td>RBF Consulting</td>
</tr>
<tr>
<td>Maria Angeles</td>
<td>San Jose</td>
<td>Daniel Strickman</td>
<td>Santa Clara Co.</td>
</tr>
<tr>
<td>Jenny Nusbaum</td>
<td>San Jose</td>
<td></td>
<td>Vector Control</td>
</tr>
<tr>
<td>Dipankar Sen</td>
<td>SCVWD</td>
<td>Jan O’Hara</td>
<td>Regional Board</td>
</tr>
<tr>
<td>Roger Narsim</td>
<td>SCVWD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Program would also like to thank the following people who provided additional pertinent information and photographs for the manual:

- Jenny Nusbaum (City of San Jose) for photos of SJ-1 to SJ-6 and also design information for SJ-2.
- Mike Campbell (RBF Consulting) for photos of SJ-8 to SJ-12.
- Joe Teresi (City of Palo Alto) for photos of PA-1, PA-2 and PA-8.
- Amanda Jones (City of Palo Alto) for photos of PA-5.
- Dave Dockter (City of Palo Alto) for photos of CB-3 and PA-9.
- Ann Welsh (City of Saratoga) for photos of ST-1.
- Sheila Tucker (Tucker Environmental Consulting) for photos of SJ-7.
- Paul Kephart (Rana Creek Habitat Restoration) for photos of OS-2.

The Program would also like to thank the following individuals who provided tours of individual sites included in this manual:

- Scott Sidlow (Agilent Technologies) for a tour of the Santa Clara Agilent roof garden and photos of the site.
- Janice Nakao, Joy Curl and Tom Flores (Agilent Technologies) for a tour of the Palo Alto Agilent parking lot and detention basin.
- Mark Pettinger (Intel) for a tour of the Intel parking reserve areas.
- Ed Sawicki (Applied Materials), Qaiser Khan (Affiliated Building Services, Inc.) and John Deming (Spill Safe) for a tour of the Applied Materials, Santa Clara campus stormwater spill prevention system and planter boxes on the parking garage.
- Steve Silva (City of Santa Clara Fire Department) for a tour of Santa Clara University and other areas where the fire department was involved in project design.

EOA, Inc., as the Program management consultant, coordinated and compiled the information, took photographs (most photographs were taken by Wendy Edde or Carina Chen unless otherwise noted) and was responsible for the overall preparation of this document.
# Table of Contents

## I. Introduction

<table>
<thead>
<tr>
<th>Background</th>
<th>I-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Planning Concepts</td>
<td>I-1</td>
</tr>
<tr>
<td>Additional Resources</td>
<td>I-3</td>
</tr>
<tr>
<td>Contents of Manual</td>
<td>I-3</td>
</tr>
<tr>
<td>References</td>
<td>I-4</td>
</tr>
</tbody>
</table>

## II. Single Family Residences

| SF-1: Basking Ridge             | II-1 |
| SF-2: Dana Street               | II-2 |
| SF-3: Shelley Avenue 1          | II-3 |
| SF-4: Ortega Avenue             | II-4 |
| SF-5: Bourbon Court             | II-5 |

## III. Multi-Family Residences

| MF-1: Communications Hill/Helzer Ranch | III-1 |
| MF-2: Los Padres and Homestead Condominiums | III-3 |
| MF-3: Stanford West                | III-5 |
| MF-4: Ryland Mews                  | III-6 |
| MF-5: Blossom River Apartments     | III-8 |
| MF-6: Le Mirador Senior Housing    | III-9 |
| MF-7: 801 Homestead                | III-10 |
| MF-8: Shelley Avenue 2             | III-11 |

## IV. Mixed Use Residential/Commercial

| MU-1: The Crossings               | IV-1 |
| MU-2: Santana Row                 | IV-4 |
| MU-3: North Park                  | IV-6 |

## V. Commercial

| CO-1: Agilent – Palo Alto        | V-1  |
| CO-2: Pacific Shores Center      | V-5  |
| CO-3: Agilent – Santa Clara      | V-8  |
| CO-4: SGI/Google                 | V-11 |
| CO-5: Stanford University Medical Center | V-14 |
| CO-6: Gap Corporate Headquarters | V-16 |
| CO-7: Yahoo! Inc.                | V-18 |
| CO-8: Juniper Networks           | V-21 |
| CO-9: Porter Drive                | V-24 |
| CO-10: Hillview Avenue           | V-27 |
| CO-11: Legacy Tech Park          | V-28 |
| CO-12: Pruneyard Towers          | V-30 |
| CO-13: Santa Clara University    | V-32 |
| CO-14: Middlebrook Gardens       | V-35 |
| CO-15: Residence Inn             | V-37 |
| CO-16: Intel                     | V-38 |
## Table of Contents (continued)

### VI. Public Areas

- **PA-1**: Santa Clara Valley Water District Headquarters .................................. VI-1
- **PA-2**: West Valley Branch Library ................................................................. VI-2
- **PA-3**: Palo Alto Trees and Structural Soils ................................................. VI-4
- **PA-4**: North Bay Shore Area Project .......................................................... VI-7
- **PA-5**: Silver Creek Valley Road ................................................................. VI-8
- **PA-6**: Sand Hill Road .................................................................................. VI-10
- **PA-7**: Baylands Parking Lot ....................................................................... VI-12
- **PA-8**: Ulistac Natural Area (Guadalupe River) ........................................ VI-13
- **PA-9**: Saratoga Trails .................................................................................. VI-15
- **PA-10**: San Tomas Aquino-Saratoga Creek Trail .................................. VI-16
- **PA-11**: Santa Cruz Avenue ......................................................................... VI-17
- **PA-12**: Bike Station Project ....................................................................... VI-18

### VII. Indexes

a. Site Design Examples by Best Management Practice.................................. VII-1
b. Site Design Examples by Municipality ......................................................... VII-2
<table>
<thead>
<tr>
<th>Acronyms and Abbreviations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASMAA</td>
<td>Bay Area Stormwater Management Agencies Association</td>
</tr>
<tr>
<td>CO</td>
<td>Commercial</td>
</tr>
<tr>
<td>DCIA</td>
<td>Directly Connected Impervious Area</td>
</tr>
<tr>
<td>LEED</td>
<td>Leadership in Energy &amp; Environmental Design</td>
</tr>
<tr>
<td>HVAC</td>
<td>Heating, Venting, and Air Conditioning</td>
</tr>
<tr>
<td>MF</td>
<td>Multi-Family Residences</td>
</tr>
<tr>
<td>MU</td>
<td>Mixed Use Residential/Commercial</td>
</tr>
<tr>
<td>PA</td>
<td>Public Areas</td>
</tr>
<tr>
<td>PROGRAM</td>
<td>Santa Clara Valley Urban Runoff Pollution Prevention Program</td>
</tr>
<tr>
<td>REGIONAL BOARD</td>
<td>San Francisco Bay Regional Water Quality Control Board</td>
</tr>
<tr>
<td>SCVURPPP</td>
<td>Santa Clara Valley Urban Runoff Pollution Prevention Program</td>
</tr>
<tr>
<td>SF</td>
<td>Single Family Residences</td>
</tr>
<tr>
<td>USGBC</td>
<td>United States Green Building Council</td>
</tr>
</tbody>
</table>
SECTION I

Introduction
BACKGROUND

On October 17, 2001, the San Francisco Bay Regional Water Quality Control Board (Regional Board) adopted Order 01-119, amending the Santa Clara Valley Urban Runoff Pollution Prevention Program’s (Program’s) Permit Provision C.3. (New and Redevelopment Requirements). Per Provision C.3.j of the permit, the Co-permittees recently reviewed their local design standards and guidance for opportunities to make revisions that would help reduce impacts to water quality. The Co-permittees must revise and fully implement their standards and guidance by September 15, 2004. For more information on permit requirements, see the Program’s C.3. Stormwater Handbook.

This Guidebook has been created as part of the effort to encourage the use of site design measures that benefit water quality in project designs. It is intended to serve as a reference during the conceptual design and review stage and to be used by both project applicants and municipal staff. This document provides examples of innovative site design elements, primarily in the Santa Clara Valley. In some instances, exceptional sites outside of the Santa Clara Valley but within the greater Bay Area are also used to illustrate the wide variety of techniques that are available.

SITE PLANNING CONCEPTS

Site design measures integrate basic stormwater management and hydrologic concepts into site planning to create developments that mitigate their impact on stormwater quality. Examples include working with the natural topography of a site, clustering the development on the least sensitive portions of a site while protecting sensitive areas, and using design techniques to minimize impervious surface area and infiltrate runoff. This document presents examples of site designs that incorporate the following approaches.

Protect Sensitive Areas from Encroachment

This concept includes such techniques as ensuring adequate protective setbacks from creeks, wetlands, and riparian areas; preserving significant trees and native or significant vegetation to protect soil structure, increase soil permeability and reduce the volume and velocity of rainwater runoff; and avoiding construction on and disturbance of erosive soils and slopes, such as steep or large continuous slopes, soils high in silt or fine sand, or soils lacking vegetative cover.

1 The Co-permittees are the thirteen (13) Cities and Towns together with Santa Clara County and the Santa Clara Valley Water District that share a common permit to discharge storm water to South San Francisco Bay. (Refer to Credits for a full listing of the Co-permittees.)
Minimize Impervious Surface Area

- **Street and right-of-way widths**

Streets make up about 25% of a development’s total land area, and street pavement makes the largest contribution to a site’s impervious land coverage. Designing streets with less surface area by reducing widths, incorporating parking pullouts, or using permeable pavements for low use or parking areas can protect water quality while preserving the street’s primary function. (BASMAA, 1999)

Fire department requirements for minimum street widths and cul-de-sac radii can conflict with better site design goals. In addition, street and parking areas need to be designed to withstand the impacts of heavy load vehicles (i.e., fire, garbage and delivery trucks). For these reasons, the fire department should be included in the development of design standards to ensure safety while allowing measures such as narrow streets, alternative turnarounds, and permeable pavement such as turf block.

- **Cluster or infill development**

Clustering high density development on a portion of the site while preserving high quality open space elsewhere on the site can improve overall watershed health. Although the densely developed area has a high percentage of impervious land coverage, the total impervious area is reduced and land disturbance is minimized. (BASMAA, 1999)

- **Parking lots**

Parking lots make up a large portion of land use and are constructed mostly of impervious pavement. Some municipal zoning codes and standards mandate that parking exceed the usual parking demand. (BASMAA, 1999) In order to provide adequate, but not excessive parking supply, site design features such as overflow parking and landscaped reserve areas can be used. Also, curb cuts allowing drainage into swales and landscaping; trees; and permeable pavement materials can be installed in order to reduce and treat parking lot runoff.
Use Drainage as a Design Element

Landscaping combined with site engineering (grading and drainage) can improve stormwater quality. Runoff draining to landscaping can be filtered by biota and infiltrated into the soil. Site design features that can be included are areas that drain to a detention basin; streets and parking lots draining to vegetated and rocky swales, biofilters (vegetated channels), vegetated cul-de-sacs or turnarounds; and roof downspouts that drain to landscaping (“disconnected downspouts”). Disconnecting impervious surface areas (i.e., allowing runoff to drain to pervious surfaces in between impervious surfaces) reduces the velocity and amount of water, lowers downstream peak flows and reduces flood and erosion potential.

Promote Alternatives to Automobiles

Automobiles are a major source of water pollution. Designing sites that promote a variety of transportation alternatives has the potential to reduce automobile trips. Design examples are provided that promote bicycling, walking, carpooling, and mass transit.

ADDITIONAL RESOURCES

For more detailed descriptions and guidelines on these topics, refer to the Bay Area Stormwater Management Agencies Association’s (BASMAA’s) Start at the Source Manual (1999) and its companion document Using Site Design Techniques to Meet Development Standards for Stormwater Quality (2003) (available at the Program’s website www.scvurppp.org). Of substantial benefit to project proponents, using site design techniques to help meet the requirements of Provision C.3. can also result in fewer or smaller-sized treatment controls required and a corresponding savings in the operation and maintenance costs over the life of the project. Additional information regarding stormwater quality-friendly site designs is available on the Program’s website and in the Program’s C.3. Stormwater Handbook.

CONTENTS OF MANUAL

This document provides examples of local site design measures that control storm water quality impacts. The examples are organized into Sections II through VII, based on type of development. For each site, the design examples provide the location, features with pictures, cost information and lessons learned (where available), and contact information. Contacts were asked for additional information including construction and maintenance costs and considerations, project size and completion date. This information is provided where available.
Section I contains the background and introduction to the Santa Clara Valley Urban Runoff Pollution Prevention Program’s Guidebook of Site Design Examples.

Section II focuses on single-family residences, where many site design techniques can be integrated for maximum effectiveness.

Section III focuses on multi-family residences. For the purposes of this document, the distinguishing factor between single- and multi-family houses is that in the latter, the residences share adjoining walls.

Section IV focuses on mixed-use developments, generally high density residential units combined with commercial businesses.

Section V focuses on commercial and industrial developments. This section is divided into campus/industrial parks and other areas. Generally campus/industrial parks are on large sites dedicated for one or more businesses and include common areas that provide opportunities for features that can improve water quality.

Section VI focuses on projects that are on publicly owned and managed land. These include greenbelts, bike paths to parks, and public buildings.

Section VII includes two indices to assist the user in locating: 1) particular site design techniques illustrated in this document; and 2) all the examples within a specific municipality.

REFERENCES

Bay Area Stormwater Management Agencies Association, Start at the Source, 1999.
SECTION II

Single Family Residences
Basking Ridge
SF-1

Site Location:
Basking Ridge Avenue
San Jose, CA

Features:
• Two detention ponds
• Wetland vegetation
• Parking pullouts and narrower streets

Stormwater Benefits:
• Natural treatment of runoff
• Reduced velocity of flows
• Reduced impervious surface area

Stormwater runoff is directed into the detention pond which temporarily holds the water, allowing for settling of sediments and pollutant removal to occur. The system releases runoff slowly to reduce downstream peak flows.

Parking pullouts allow narrower streets that require less land area and provide more space for trees and grass. These landscaped areas reduce the volume and velocity of rainwater and maximize infiltration. Properties on narrow streets with tree-lined landscapes typically have higher property values. The use of narrow streets also reduces construction costs.

Wetland vegetation helps to remove dissolved metals and nutrients. A walking trail bordering the pond on Dana Court demonstrates how a stormwater treatment device can benefit the environment and be attractive, thereby enhancing the neighborhood character.

Municipal Contact:
Jenny Nusbaum
City of San Jose
(408) 277-4576
Jenny.Nusbaum@sanjoseca.gov

Site Contact:
Phil Alne
Shea Homes
(925) 245-3600
Dana Street
SF-2

Site Location:
235 & 239 Dana Street
Mountain View, CA

Feature:
- Shared driveway
- Flared driveway

Stormwater Benefit:
- Reduced impervious surface area

These two (2) houses share a driveway leading towards a shared garage area. This reduces the amount of impervious surface area required per home. The driveway is also flared – allowing for a wider area for parking than the single-lane entrance/exit way.

Municipal Contact:
Eric Anderson
City of Mountain View
(650) 903-6225
Eric.Anderson@ci.mtnview.ca.us
Shelley Avenue 1  
SF-3

Site Location:  
63 & 65 Shelley Avenue  
Campbell, CA

Feature:  
• Shared driveway serving multiple houses

Stormwater Benefits:  
• Reduced impervious surface area

Two (2) single-family houses share a driveway. Shared driveways reduce the amount of impervious surface required per home, especially when houses are set back far from the street. Shared driveways are often used for hillside developments but can be incorporated into many subdivisions.

Municipal Contact:  
Geoff Bradley  
City of Campbell  
(408) 866-4140
Ortega Avenue
SF-4

Site Location:
North End of Ortega Avenue (adjacent to railroad tracks)
Mountain View, CA

Features:
• Landscaped parking and turnaround area located at the end of a dead end street

Stormwater Benefit:
• Reduced impervious surface area

Landscaping, including a street tree, is provided in a center island where there is also an area for parking. The design allows adequate room for a turnaround, providing easier access for fire and other service vehicles.

Other Opportunities:
• To improve the site design from a stormwater quality perspective, the island could have been designed to accept runoff from the street through such features as concave landscaping with pavement protection, curb cuts, and grading the street to drain to the island.

Municipal Contact:
Eric Anderson
City of Mountain View
(650) 903-6225
Eric.Anderson@ci.mtnview.ca.us

This is an alternative view of the turnaround, as you would approach it if driving.
Bourbon Court  
SF-5

Site Location:  
South End of Bourbon Court  
Mountain View, CA

Features:
• Landscaped recreational and turnaround area in a cul-de-sac

Stormwater Benefit:
• Reduced impervious surface area

Landscaping around this center island allows for some infiltration to occur while allowing easier access for public service vehicles such as fire and garbage trucks. Also within the island is a recreational area with a pool and associated facilities for nearby residents.

Other Opportunities:
• To improve the site design from a stormwater quality perspective, the island could have been designed to accept runoff from the street through such features as concave landscaping with pavement protection, curb cuts, and grading the street to drain to the island.

Municipal Contact:  
Eric Anderson  
City of Mountain View  
(650) 903-6225  
Eric.Anderson@ci.mtnview.ca.us
SECTION III

Multi-Family Residences
Communications Hill/Helzer Ranch

MF-1

Site Location:
3000 Narvaez Avenue
San Jose, CA

Features:
- Landscaped areas provide detention for floods and stormwater
- Downspouts disconnected
- Higher density housing

Stormwater Benefit:
- Reduced impervious surface area
- Reduced directly-connected impervious area (DCIA)
- Natural treatment of runoff
- Reduced velocity runoff

Rooftop runoff drains through downspouts to landscaping for treatment and infiltration.

This large grassy swale provides area for runoff to percolate into the soil, reduce downstream peak flows, and to receive treatment via settling and filtration.
Communications Hill/Helzer Ranch
MF-1 (cont.)

This outdoor space for the community to enjoy also acts as a detention basin for stormwater.

Infiltration is allowed to occur in this detention basin before entering the drainage system.

**Municipal Contact:**
Jenny Nusbaum  
City of San Jose  
(408) 277-4576  
Jenny.Nusbaum@sanjoseca.gov

**Site Contact:**
Matt Steinle  
Development Director  
(408) 993-2908
Los Padres and Homestead Condominiums
MF-2

Site Location:
Los Padres and Homestead Road
Santa Clara, CA

Features:
• Turf block fire lanes are used for fire access
• Narrow 20-foot wide streets
• Higher density housing

Stormwater Benefit:
• Reduced impervious surface area.

Close-up picture shows the concrete turf block matrix not covered in grass.

Fire access is marked where the fire truck can drive up over the curb across the turf block to access this housing development.

Signs clearly posted in order to prevent people from blocking access to the turf block fire lanes in emergencies.
Los Padres and Homestead Condominiums
MF-2 (cont.)

The narrow streets within the complex provide only 20 feet of access, thereby reducing the amount of impervious surface area. With this narrow access, any parked vehicles can impede fire access. Red curb paint and signs can be used to denote fire lanes throughout complexes. (This driver remained in his vehicle.)

Municipal Contact:
Judith Silva
City of Santa Clara
(408) 615-2456
jsilva@ci.santa-clara.ca.us

Fire Department Contact:
Steve Silva
Santa Clara Fire Department
(408) 615-4978
ssilva@ci.santa-clara.ca.us
Stanford West
MF-3

Site Location:
700 Clark Way (off Sand Hill Road)
Palo Alto, CA

Features:
- Apartment development was planned with cul-de-sacs, but redesigned to use a grid system
- Area dedicated as a covered car wash area plumbed to the sanitary sewer
- Detention basin on the east end that also serves as a recreational playing field

Stormwater Benefit:
- Washwater treatment
- Natural treatment of runoff in recreational area
- Reduced velocity of flows discharged to nearby creek
- Transportation-related pollution reduction (grid street system reduces vehicle miles traveled)

This covered car-washing area drains water to the sanitary sewer system. This prevents car wash water, soap, and pollutants from entering storm drains.

A recreational play field also serves as a detention basin for runoff. The detention basin temporarily holds runoff, allowing for settling, infiltration and pollutant removal to occur, such as allowing fine sediments to settle out. The system releases runoff slowly to reduce downstream peak flows.

Municipal Contact:
Joe Teresi
City of Palo Alto
(650) 329-2129
Joe_teresi@cityofpaloalto.org

Site Contact:
Dave Richwood
Brian-Kangas-Foulk
(408) 467-9100
drichwood@bkf.com
Ryland Mews  
Transit-Oriented Development Corridor  
MF-4

Site Location:  
4115 North 2nd Street  
San Jose, CA

Features:
- High density housing near First Street Light Rail Line  
- Located near downtown  
- Disconnected downspouts drain to landscaping  
- Multi-story buildings reduce the building footprint

Stormwater Benefits:
- Reduced impervious surface area  
- Reduced directly-connected impervious area (DCIA)  
- Transportation-related pollution reduction

Light Rail runs nearby, promoting the use of alternative transportation. Motor vehicles can be the sources of metals, oil, and grease which can be harmful to aquatic organisms and, in high enough quantities, can contaminate drinking water supplies. (BASMAA, 1999) Using alternate transportation can reduce the amount of these pollutants from entering waterways.

Open space surrounding high density housing allows residents to enjoy the outdoors (e.g., grass and trees) and also provides good drainage areas.
Ryland Mews
Transit-Oriented Development Corridor
MF-4 (cont.)

Rooftop runoff drains through downspouts to landscaping where it has the opportunity to be filtered by plant material and infiltrate into the soil. Disconnecting impervious surface area reduces the speed and amount of water which can result in benefits such as lower peak flows downstream and reduced flood and erosion potential.

Municipal Contact:
Jenny Nusbaum
City of San Jose
(408) 277-4576
Jenny.Nusbaum@sanjoseca.gov

Site Contact:
Dan Sell
Barry Swenson Builder
(408) 983-6338
dsell@barryswensonbuilder.com
Blossom River Apartments  
**MF-5**

*Site Location:*
1000 Blossom River Way  
San Jose, CA  

*Features:*
- High density residential area  
- Rocky swale

*Stormwater Benefits:*
- Reduced impervious surface  
- Natural treatment of runoff  
- Reduced velocity of runoff  
- Reduced directly-connected impervious area (DCIA)

Runoff enters the rocky swale from the parking lot and is filtered before entering the storm drain.  

Turf landscaping around the rocky swale provides an area for infiltration Multi-story buildings reduce the building footprint.

*Municipal Contact:*
**Jenny Nusbaum**  
City of San Jose  
(408) 277-4576  
Jenny.Nusbaum@sanjoseca.gov
Le Mirador Senior Housing  
MF-6

**Site Location:**  
1191 Coleman Road  
San Jose, CA

**Features:**  
- High density multi-story senior housing area  
- Vegetative swale

**Stormwater Benefits:**  
- Reduced impervious surface area  
- Natural treatment of runoff  
- Reduced velocity of runoff  
- Reduced directly-connected impervious area (DCIA)

**Before**  
Photograph courtesy of Mike Campbell (RBF Consulting)  
This photo illustrates the swale when plant growth was hindered by the native clay soil. The parking lot is graded to drain to the swale.

**After**  
Photograph courtesy of Mike Campbell (RBF Consulting)  
The densely landscaped vegetative swale was made possible by replacing the native clay soil with sandy loam soil.

**Lessons Learned:**  
- Over 2 feet of the native clay soil was replaced with sandy loam, which improved growth and infiltration.

**Municipal Contact:**  
**Jenny Nusbaum**  
City of San Jose  
(408) 277-4576
801 Homestead
MF-7

Site Location:
801 to 827 Homestead Road
Santa Clara, CA

Features:
- Narrow shared driveway
- “Tucked under” parking reduces the building footprint
- Street trees

Stormwater Benefits:
- Reduced impervious surface area
- Reduced volume and velocity of runoff

Because the long, narrow, dead-end driveway, exceeds the maximum 150 feet required for fire truck access, fire sprinklers were installed in the rear units to provide additional response time.

Municipal Contact:
Judith Silva
City of Santa Clara
(408) 615-2456
jsilva@ci.santa-clara.ca.us

Fire Department Contact:
Steve Silva
Santa Clara Fire Department
(408) 615-4978
ssilva@ci.santa-clara.ca.us
Shelley Avenue 2
MF-8

Site Location:
Shelley Avenue near White Oaks Avenue
Campbell, CA

Feature:
- “Tucked under” parking reduces the building footprint
- Shared driveway

Stormwater Benefit:
- Reduced impervious surface area

This site features “tucked under” parking for multi-family houses. This design reduces the impervious surface area per unit by reducing the building footprint. More land would be required if the parking garages were separate, not underneath the living areas.

Municipal Contact:
Lynn Penoyer
City of Campbell
(408) 866-2747
lynnp@ci.campbell.ca.us
SECTION IV

Mixed Use Residential/Commercial
The Crossings
MU-1

Site Location:
2255 Showers Drive
Mountain View, CA

Features:
- High density (multi-story) housing with reduced building footprints integrated with commercial areas
- Located near mass transit including bus lines and CalTrain station
- Disconnected downspouts drain into landscaping
- Turf block fire lanes
- Landscaped center of driving circle

Stormwater Benefits:
- Transportation-related pollutant reduction
- Reduced impervious surface area
- Reduced velocity of runoff
- Reduced directly-connected impervious area (DCIA)
- Natural treatment of runoff

“The Crossings” is conveniently located across the street from the San Antonio CalTrain Rail Station.

Turf block fire lane provides access during emergencies. The bollards can be removed for emergency access.
Multi-story housing reduces the building footprint and, thus, impervious surface area. Rooftop runoff drains into landscaping rather than directly to the storm drain system.

Drive around circle has a landscaped island, providing an area for infiltration.

This rain gutter drains into landscaping reducing the amount of directly-connected impervious area (DCIA).

The Crossings is located within walking distance to major commercial areas for groceries and other shopping needs, thereby reducing the need for auto use.
The Crossings
MU-1 (cont.)

Mixed use commercial businesses located within the Crossings encourage residents to walk to shops thereby reducing the reliance on motor vehicles.

Other Opportunities:

- To improve the site design from a stormwater quality perspective, the island could have been designed to accept runoff from the street through such features as concave landscaping with pavement protection, curb cuts, and grading the street to drain to the island.
Santana Row
MU-2

Site Location:
360 South Winchester Blvd.
San Jose, CA

Features:
• Mixed-use high-density housing and regional commercial
• Encourages pedestrian activity and public use of outdoor space
• Preserved mature trees in redevelopment areas
• Use of multi-story buildings reduces building footprints
• Street trees

Stormwater Benefits:
• Transportation-related pollutant reduction
• Reduce impervious surface area
• Reduce volume and velocity of runoff

Mixed-use, high-density multi-story housing combined with commercial areas, provide access to conveniences without the need to drive. Street trees have many benefits, including stormwater management.

Shops conveniently located below housing units promote pedestrian activity.
Trees in place before redevelopment were maintained for the new residents to enjoy. Trees reduce the volume and velocity of rainwater.
Santa Clara Valley
Urban Runoff
Pollution Prevention Program

Site Design Examples

North Park
MU-3

Site Location:
155 & 175 River Oaks Parkway & 3491 Zanker Road
San Jose, CA

Features:
- High density housing near North First Street Light Rail Line
- Encourages pedestrian activity and public use of outdoor space
- Multi-story building reduces the building footprints

Stormwater Benefits:
- Reduced impervious surface area
- Transportation-related pollutant reduction

Open space surrounding high density housing for residents to enjoy also provides good drainage areas.

Commercial areas conveniently located below housing units promote pedestrian activity.

Multi-story buildings reduce the amount of impervious surface.
North Park
MU-3 (cont.)

Light rail runs within walking distance, conveniently located behind the park and adjacent to housing.

Other Opportunities:
- Disconnected downspouts could have been drained to landscaping to break up directly connected impervious area.

Municipal Contact:
Jenny Nusbaum
City of San Jose
(408) 277-4576
Jenny.Nusbaum@sanjoseca.gov

Site Contact:
Alison Covert-Mader
Irvine Company
(408) 392-4102
Amader@irvinecompany.com
SECTION V

Commercial
Agilent – Palo Alto
CO-1

Site Location:
395 Page Mill Road
Palo Alto, CA

Features:
• Detention basin with native vegetation along banks
• Parking lot vegetated swales
• Roof downspouts draining to landscaping
• Promotes alternative transportation by providing bike racks and lockers, an onsite bus stop, and carpool/vanpool parking
• Structured parking lot (2 levels with top level draining to rock filter bed).

Stormwater Benefits:
• Reduced impervious surface area
• Natural treatment of runoff
• Reduced volume and velocity of runoff
• Reduced transportation related pollutants
• Reduced directly-connected impervious area (DCIA)

The detention basin, known as “The Swale” by Agilent employees, provides stormwater collection and treatment for the parking areas, visual amenities for employees, and a visual buffer for the neighboring residential community.

The parking lot is graded to drain into vegetated swales, shown here, and the detention basin.

Storm drains from the parking lot enter the detention basin through drains like this one.
The detention basin has two outlets to protect against localized flooding and to ensure that the basin drains within 72 hours for vector control.

Bike racks and showers encourage employees to bike to work. Additional bike lockers and a bus stop are located at the Page Mill Road entrance.

Runoff from this parking structure drains to the filter bed, described below. The two-story parking structure allows for roughly twice the number of vehicles for the same area of a typical surface parking lot, while allowing enough room on-site for the detention basin.

Agilent encourages employees to carpool by providing designated car/van pool areas. Reducing vehicle trips traveled reduces the amount of pollutants such as hydrocarbons and brake pad dust released to the environment.
The runoff drains from the top of the parking structure to this rock filter bed for treatment and then to the storm drain system via the detention basin.

Storm drains are clearly labeled with an educational “no dumping” message.

This rocky swale is used to slow and treat rooftop runoff before draining to the storm drain. A minimum two percent (2%) slope away from the building protects the building foundation from water damage.

The detention basin collects water from the parking lot. The concrete edging protects the asphalt from water damage while the bumper stops help prevent cars from traveling over the vegetated swales.
Lessons Learned:

- The irrigation heads originally installed for the retention basin caused some ponding for greater than 72 hours until they were modified to target areas requiring water. The local vector control agency brought mosquito fish for mosquito control while the irrigation challenge was being diagnosed and addressed.

- During the rainy cloudy days, the water in the parking lot catch basins may take longer than 72 hours to drain. Maintenance staff must periodically clean debris from catch basins.

- The detention basin has also served as a useful indicator for irrigation leaks for sprinklers within the parking lot biofilter landscaping. When maintenance staff sees ponded water in the detention basin during a dry spell, they investigate for potential leaks.

- The landscape service provider must carefully control the scheduling of irrigation system to prevent overwatering and water build up in the detention basin.

- Shredded bark was installed initially along the detention basin banks to hold the soils without clogging the system until vegetation became established.

- The site designer highly recommends checking after the first rain to make sure the entire system is working correctly. For the roof downspouts, the rainwater initially started pooling behind the header boards at the bottom of the roof downspouts. Notches cut in the header board ensure proper drainage away from building with a minimum 2% slope.

- Maintenance costs and effort are comparable to that for typical landscaping according to Agilent maintenance staff.

Municipal Contact:
Joe Teresi
City of Palo Alto
(650) 329-2129
Joe.teresi@cityofpaloalto.org

Designer Contact:
Bill Southard, ASLA
DES Architects and Engineers
(650) 364-6453
bsouthard@des-ae.com

Environmental Site Contact:
Janice Nakao
Agilent Technologies
(408) 553-7817

Site Facility Contacts:
Joy Curl
Agilent Technologies
(650) 752-5226

and

Tom Flores
Agilent Technologies
(650) 752-5409
Pacific Shores Center
CO-2

Site Location:
1500 Seaport Boulevard
Redwood City, CA

Features:
• Multi-purpose detention basin and playing fields
• Second detention basin with cobble bottom
• Parking lot vegetated swales
• 3 miles of paved trails that are an extension of the Bay Trail

Stormwater Benefits:
• Reduced amount of impervious surface area
• Natural treatment of runoff
• Reduced volume and velocity of runoff
• Reduced directly-connected impervious area (DCIA)

This athletic field also serves as a detention basin. The basin is designed to fill up to a four-foot depth and drain within eight (8) hours.
This photograph offers an aerial view of baseball fields and detention basin.

The multi-story buildings allow for vast landscaping that helps reduce the amount of runoff from the site.

Aerial view of Pacific Shores Center shows an ideal area to enjoy the Bay Trail.

Parking lot dividers are used as infiltration areas with vegetated swales and trees. Boulders are used to prevent automobile encroachment across the swale.

The parking lot is graded to drain to these vegetated swales, planted with vegetation and trees. The swales were excavated and backfilled with imported sandy loam soil to increase porosity, and constructed with perforated sub-drains. The concrete strip protects the asphalt from water damage. This image was taken prior to grass establishment.
Cobbles along this detention basin run for several hundred feet to prevent channeling during high runoff.

This photo shows the vegetated swale after the native vegetation has grown in.

**Lessons Learned:**
- Trees planted with only two (2) stakes for support in sandy loam soil within the vegetated swales blew over during a windstorm prior to root establishment. Using three (3) stakes per tree are now recommended.
Agilent – Santa Clara

CO-3

Site Location:
5301 Stevens Creek Boulevard
Santa Clara, CA

Features:
• Roof garden
• Disconnected downspouts

Stormwater Benefits:
• Reduced impervious surface area
• Reduced volume and velocity of runoff

Photograph above courtesy of Scott Sidlow (Agilent).

The roof garden is located on the second floor of the Agilent building.

Large areas of vegetation are located on top of the second floor of the office building.

Trees are planted as part of the roof gardens.
Rooftop runoff is directed to drain through the vegetation.

Exhaust vents for HVAC* systems are integrated into roof garden areas.

*HVAC = heating, venting, and air conditioning

Another view of the roof garden shows a large shady tree that can reduce rainfall velocity and runoff.

Photograph above courtesy of Scott Sidlow (Agilent)
Agilent – Santa Clara
CO-3 (cont.)

Lessons Learned:
• Leakage occurred due to roots penetrating the roof membranes, however after patching the barriers underneath the garden, leakage was prevented.

• The membrane integrity was also compromised by heavy vehicle traffic (for deliveries to the café on the roof garden level). The amount of deliveries was minimized to prevent more leaks.

Municipal Contact:
Judith Silva
City of Santa Clara
(408) 615-2456
jsilva@ci.santa-clara.ca.us

Site Contact:
Scott Sidlow
Agilent EH&S Specialist
(408) 553-3780
scott_sidlow@agilent.com
Site Location:
1600 Amphitheater Parkway
Mountain View, CA

Features:
- Green roof – entire ground level of complex including landscaped area is built above an underground parking lot
- Permeable pavement
- Native vegetation
- Multi-story buildings reduce building footprint
- Bike racks promote bicycle commuting

Stormwater Features:
- Reduced building footprint
- Natural treatment of runoff
- Transportation-related pollutant reduction
- Reduced velocity of runoff
- Reduced impervious surface area

This tree in the parking lot grows up through an opening in the roof garden area. Trees and other vegetation help reduce the volume and velocity of rainwater.

This grassy rooftop area planted with trees reduces and provides some natural treatment of runoff.

The parking lot can be seen below the turf on the level above.
Permeable pavement is used in this courtyard.

Bike racks promote alternative transportation, perhaps providing easy access to other buildings on the campus.

Permeable pavement and landscaped areas fill the courtyard on top of the parking structure.

Turf and gravel surrounds this pathway, providing an area for infiltration to occur.
Permeable pavement and native vegetation surround this multi-story complex.
Stanford University Medical Center
CO-5

*Site Location:*
300 Pasteur Drive
Palo Alto, CA

*Features:*
- Roof garden above parking structure
- Street trees
- Native vegetation

*Stormwater Benefits:*
- Reduced impervious surfaces
- Natural treatment of runoff
- Reduces volume and velocity of runoff

Photograph courtesy of Joe Teresi (City of Palo Alto)

From this angle, it is possible to see the parking structure beneath the roof garden.

Photograph courtesy of Joe Teresi (City of Palo Alto)

This roof garden provides not only aesthetic benefits, but also a large area for stormwater infiltration to occur.

Photograph courtesy of Joe Teresi (City of Palo Alto)

At the end of the pathway, trees line the nearby street. The trees and the rooftop vegetation reduce the volume and velocity of stormwater runoff while providing for some natural treatment.
University Medical Center
CO-5 (cont.)

The roof garden uses only one type of vegetation, which facilitates maintenance.

Photograph courtesy of Joe Teresi (City of Palo Alto)
Aerial view of the building’s roof garden shows the vegetative areas planted on top of the building made to appear like rolling hills.

**Location:**
901 Cherry Avenue
San Bruno, CA
Completed 1997
195,000 sq. ft.

**Costs:**
- Roof garden: approx. $24/sq.ft. ($1.6 million)
- Total cost for building ~ $60 million

**Stormwater Benefits:**
- Reduced impervious surface area
- Natural treatment of runoff
- Reduced volume and velocity of runoff

**Features:**
- 69,000 sq. ft. green roof blends in with surrounding hillside grasslands
- Native grasses and wildflowers
- Natural day lighting
- Raised floor for individually-controlled air delivery
- Preserved grove of native oaks
- 2nd most energy-efficient building in California (exceeds requirements by 30%)
- Received a Green Roofs Award of Excellence in 2003.

---

2 Paul Kephart estimates that the costs for green roofs have dropped to roughly $8-11 per square foot in the United States (pers. comm., November 12, 2003).
Gap Corporate Headquarters
CO-6 (cont.)

Project Details:
• It is estimated that the roof garden captures and stores about 70% of the rainfall. Other benefits include better insulation of the building, reducing the costs of heating and cooling, and mitigating the “heat island effect.”

• The roof irrigation system and annual mowing help mitigate fire risks. The roof is irrigated once per year and mowed by 10 gardeners armed with “weed eaters” in early July. The clippings are left on the roof to provide nutrients for the vegetation.

• The roof membrane has a 40-year warranty against leakage.

• GIS is used to map and manage the roof garden, allowing the building owner to index plants and locate utilities, such as water and electrical lines for maintenance purposes.

• The roof was planted using live plugs of six (6) different types of grasses (as opposed to hydroseeding or hand broadcasting) in six (6) inches of soil. The vegetation has grown to form a 5-inch mat of fibrous roots.

Lessons Learned:
• Gap estimates that the cost of the roof, HVAC, lighting, and other environmental features will be repaid in cost savings from reduced energy and maintenance bills within eight (8) years.

• The roof provides an effective acoustic barrier from the nearby San Francisco Airport.

• Cost-benefit study shows annual maintenance costs are about 70% of the costs for a conventional roof.

For more information, go to: http://www.bayareacouncil.org/bp/bestpractices/bp185.html

Living Roof Design Specialist:
Paul Kephart
Rana Creek Restoration
(831) 659-3820
www.ranacreek.com

Architect:
William McDonough & Partners
410 East Water St.
Charlottesville, VA 22902
www.mcdonoughpartners.com

Mechanical, Electrical and Structural Engineers:
Ove Arup and Partners USA
901 Market Street, Suite 260
San Francisco, CA 94103

Client and Project Manager:
Gap Inc. Corporate Architecture Department
901 Cherry Avenue
San Bruno, CA 94066

Architect of Record/Interior Design:
Gensler Architecture, Design & Planning
Worldwide
600 California Street
San Francisco, CA 94108

Landscape Architect:
Hargreaves Associates
Yahoo! Inc.
CO-7

Site Location:
701 First Avenue
Sunnyvale, CA

Features:
- Rocky swales
- Multi-story buildings reduce building footprint
- Access to the Bay Trail open space area including parking available for visitors
- Permeable walkways

Stormwater Benefits:
- Natural treatment of runoff
- Reduced impervious surface area
- Reduced directly-connected impervious area (DCIA)

This rocky swale has a storm drain for excess flows.

Rocky swale with curb cuts allows for infiltration to occur.

Rectangular stones are used to create a rocky swale.
Pervious walkways used to minimize impervious surfaces.

On-site parking is provided for visitors to the Bay Trail (located behind the Yahoo! Campus).

This walkway slopes toward landscaped vegetation; with multi-story buildings in background.

Pervious walkways used between concrete sidewalks.
Curb cuts (see arrow) allow runoff to drain off parking lot into the vegetation.

**Municipal Contact:**
Robert Gallo
City of Sunnyvale
(408) 730-7737
rgallo@ci.sunnyvale.ca.us

**Site Contact:**
Kate Young
Yahoo! Inc.
(408) 349-3300
Juniper Networks
CO-8

Site Location:
1194 N. Mathilda Avenue
Sunnyvale, CA

Features:
• Multi-story buildings reduce building footprint
• Rocky swales and trees in parking lot
• Rooftop runoff drains to landscaping
• Promotes alternative transportation
• Permeable pavement
• Located buildings to protect existing heritage tree

Stormwater Benefits:
• Reduced impervious surface area
• Reduced transportation-related pollutants
• Natural treatment of runoff
• Reduced volume and velocity of runoff
• Reduced directly-connected impervious area (DCIA)

This pathway made of pervious pavers allows infiltration through the sand filled crevices. Also, these benches are provided on pervious surfaces.

Runoff from rooftop drains into landscaping reducing the directly-connected impervious area (DCIA).

Parking lot runoff drains through curb cuts and then filters through the rocky swale. Trees provide visual amenities as well as reduce the volume and velocity of runoff.
The convenience of the Light Rail Station across the street encourages employees to take public transportation to work.

Charging stations allow employees with electric vehicles, like the Sparrow pictured here, to charge-up while at work.

Covered bike racks are provided for employees who prefer to ride their bicycles to work.

Plenty of carpool parking encourages employees to share rides to work.
An existing oak tree was preserved in the development of this project.

Lessons Learned:

- During storms, ponding does occur in parking lots. This can be prevented through better design and construction of the rocky swales to ensure that the infiltration rate of the swale is fast enough to prevent ponding, or by adding a perforated drainage pipe for runoff overflow. It is also important that the site is graded properly to direct water toward the swale.

Municipal Contact:
Robert Gallo
City of Sunnyvale
(408) 730-7737
rgallo@ci.sunnyvale.ca.us

Site Contact:
Barbara Rigden
Juniper Networks
(408) 745-2000
Santa Clara Valley
Urban Runoff
Pollution Prevention Program

Site Design Examples

Porter Drive
CO-9

**Site Location:**
3150 Porter Drive
Palo Alto, CA

*Features:*
- Vegetated swale
- Native vegetation

*Stormwater Benefits:*
- Natural treatment of runoff
- Reduced volume of runoff
- Reduced velocity of runoff
- Reduced pesticide requirements
- Reduced directly-connected impervious area (DCIA)

Photograph courtesy of Joe Teresi (City of Palo Alto)

The bioswale, shown before landscaping had fully matured, was planted using native vegetation along the banks. Check dams extend the retention time, allowing for additional infiltration (see arrows).

Photograph courtesy of Joe Teresi (City of Palo Alto)

The same bioswale, after landscaping has become established, appears natural and aesthetically pleasing.

*Municipal Contact:*
Joe Teresi
City of Palo Alto
(650) 329-2129
Joe.Teresi@cityofpaloalto.org

*Designer Contact:*
Dave Richwood
Brian Kangas Foulk
(408) 467-9100
drichwood@bkf.com
Porter Drive
CO-9 (cont.)

_Site Location:_
3170 Porter Drive
Palo Alto, CA

_Features:_
- Pervious pavement
- Vegetated swale

_Stormwater Benefits:_
- Natural treatment of runoff
- Reduced impervious surface area
- Reduced directly-connected impervious area (DCIA)

The parking area, adjacent to heritage oak trees, is made of permeable pavement which decreases the amount of impervious surface area at the site.

The edges of the vegetated swale are flush with the parking lot, so that runoff can drain into the swale.

_Municipal Contact:_
**Joe Teresi**
City of Palo Alto
(650) 329-2129
Joe.Teresi@cityofpaloalto.org

_Designer Contact:_
**Dave Richwood**
Brian-Kangas-Foulk
(408) 467-9100
drichwood@bkf.com

This is a close-up photograph of the permeable pavers in the parking stalls.
Porter Drive
CO-9 (cont.)

Site Location:
3180 Porter Drive
Palo Alto, CA

Features:
• Unit pavers of Ecostone on sand
• Vegetated swale

Cost of Ecostone Pavement:
• $9-15/s.f. for installation

Stormwater Benefits:
• Reduced impervious surface area

This photo shows the construction of the permeable pavement in the parking area. The spaces between pavers are filled with sand instead of grouted, allowing infiltration through the pavement. The concrete border (see arrow) protects the asphalt from water damage.

Municipal Contact:
Joe Teresi
City of Palo Alto
(650) 329-2129
Joe.Teresi@cityofpaloalto.org
Hillview
CO-10

Site Location:
3300 Hillview
Palo Alto, CA

Features:
• Parking lot biofilters
• Commercial building courtyard with pervious pavement
• Courtyard also serves a buffer between multi-story building and the creek behind
• Section of parking lot drains to swale of native plants between courtyard and riparian area
• Buildings set back from riparian corridor

Stormwater Benefits:
• Reduced impervious surface area
• Natural treatment of runoff
• Reduced runoff velocity
• Setback from riparian corridor
• Reduced directly-connected impervious area (DCIA)

Pervious pathway placed through the courtyard allows easy access for visitors as well as drainage areas for stormwater. The creek runs behind the trees towards the back. Between the trees and the benches is a swale of native vegetation that treats water from the parking lot.

The parking lot design incorporates biofilters to filter and infiltrate runoff before entering the storm drain. Concrete edging protects the asphalt parking lot from water damage.

Municipal Contact:
Joe Teresi
City of Palo Alto
(650) 329-2129
Joe_teresi@cityofpaloalto.org

Site Contact:
Barry Schmitt
Kier & Wright
(408) 727-6665
bschmitt@kierwright.com
Legacy Tech Park
CO-11

Site Location:
Gold Street and Hwy 237 (in Alviso)
San Jose, CA

Features:
- Vegetative swales
- Curb cuts
- Rock cobbles to prevent erosion

Stormwater Benefits:
- Natural treatment of runoff
- Reduced volume and velocity of runoff

Grassy swale drains toward storm drain after filtering runoff.

The vegetative swales at this site are one of San Jose’s first examples in an industrial park, and are very well maintained.

Curb cuts allow runoff water to drain toward rock cobbles, then into the vegetated areas. The cobbles help prevent the runoff from eroding the soil and vegetation where the water runs from the parking lot into the swale.
Legacy Tech Park  
CO-11 (cont.)

The curb cut allows runoff from the fire lane to enter the concave turf swale for natural treatment. The cobbles help prevent soil erosion.

Municipal Contact:  
Jenny Nusbaum  
City of San Jose  
(408) 277-4576  
Jenny.Nusbaum@sanjoseca.gov
Pruneyard Towers
CO-12

Site Location:
1999 W. Campbell Avenue
Campbell, CA

Feature:
- Trees in structural soils

Stormwater Benefits:
- Reduced volume of runoff
- Reduced velocity of runoff

Trees in structural soils frame the entrance to the Pruneridge Tower. These trees not only reduce the volume and velocity of rainwater, but the structural soil helps prevent pavement damage.

A variety of top-dressing and landscape designs may be used. Colorful planting, irrigation and injection capability were built into this structural soil installation.
Pruneyard Towers  
CO-12 (cont.)

As an experiment, London plane trees from the same nursery and grow lot were planted in structural soil in 1999 (shown above) as well as in traditional tree pits (shown to the right). After 3.5 years, the trees above are over 30 feet tall providing more canopy to absorb the impact of and to collect rainwater.

These trees are not yet 20 feet tall and are developing at a much slower rate.

_Municipal Contact:_  
**Geoff Bradley**  
City of Campbell  
(408) 866-4140
Santa Clara University  
CO-13

Site Location:  
500 El Camino Real  
Santa Clara, CA

Features:  
• Turf block fire lanes are used throughout the campus for fire access.  
• A few streets have been diverted and replaced with landscaping. To maintain proper fire access, turf block fire lanes have been installed.  
• Multi-story buildings reduce building footprint.

Stormwater Benefits:  
• Reduced impervious surface area  
• Reduced volume and velocity of runoff

Design Specifications:  
• Turf block must withstand 76,000 pounds of gross weight and 20 feet in width for fire trucks (with risers)  
• Maintenance performed by Santa Clara University (SCU)

Here the sidewalk and turf block with grass is used for fire access. The arrows point to concrete blocks that mark the extent of the turf block areas.

Concrete blocks mark the fire lanes throughout campus (also see photograph to left).
Santa Clara University  
CO-13 (cont.)

This street used to extend directly through campus. Now the sidewalk and turf block is used for fire access while providing more areas for infiltration and aesthetic value.

Concrete blocks mark the turf block fire lane so that fire trucks can drive along the proper area without sinking. “No Parking” signs and red curbs help denote the fire lanes. Note that the nearest tree will need to be relocated to maintain the necessary width.

The fire lane here uses both the sidewalk and turf block for access. Bollards can be removed for emergency access.

Multi-story dormitories reduce the building footprint size and thereby decrease impervious surface area. Turf block allows emergency access to these dormitories.
Santa Clara University
CO-13 (cont.)

This street, which extended through the university, was redirected and replaced with turf block and sidewalks for fire access. This sidewalk also provides emergency vehicle access. The fire lane continues on through the shrubs onto the turf block.

Lessons Learned:
- Periodic inspection of fire lanes and training is important to remind SCU staff not to place obstacles in fire lanes (e.g., trees, garbage bins, oversized shrubs).

Municipal Contact:
Judith Silva
City of Santa Clara
(408) 615-2456
jsilva@ci.santa-clara.ca.us

Fire Department Contact:
Steve Silva
Santa Clara Fire Department
(408) 615-4978
ssilva@ci.santa-clara.ca.us
Middlebrook Gardens
CO-14

Site Location:
SE corner of W. Julian Street and
Pleasant Street
San Jose, CA

Features:
• Office complex redeveloped from
  relocated and restored turn-of-the-
  century homes from the surrounding
  neighborhood
• Project objective was to create zero
  runoff
• Multiple types of pervious pavements

Stormwater Benefits:
• Reduced impervious surface area
• Reduced volume of runoff

Photograph courtesy of Mike Campbell (RBF Consulting)
This walkway is constructed of decomposed granite, which promotes infiltration.

Photograph courtesy of Mike Campbell (RBF Consulting)
The parking lot is made completely of Gravel-Pave porous pavement, minimizing
the amount of impervious surface onsite.

Brick courtyard is not grouted to allow runoff to seep through the bricks.
Middlebrook Gardens  
CO-14 (cont.)

This is a close-up view of the Gravel-Pave driveway made up of a plastic framework of open cells (circles) filled with gravel.

**Municipal Contact:**  
**Jenny Nusbaum**  
City of San Jose  
(408) 277-4576  
Jenny.Nusbaum@sanjoseca.gov

**Landscaping Contact:**  
**Middlebrook Gardens**  
76 Race Street, San Jose  
(408) 292-9993
Residence Inn
CO-15

Site Location:
4460 El Camino Real
Los Altos, CA

Features:
• Turf block fire lane provides access for fire crews to the rear of the hotel.

Stormwater Benefits:
• Reduced impervious surface area.

Grass covers the turf block lane used for fire access, while reducing the overall impervious surface area for site. Landscaping provides an aesthetically pleasing area for people to enjoy while also functioning as a fire lane.

Municipal Contact:
Larry Lind
City of Los Altos
(650) 947-2624

Site Contact:
General Hotel Information
Marriott’s Residence Inn
(650) 559-7890
info@losaltosresidenceinn.com
Intel
CO-16

Site Locations:
2200 Mission College Boulevard
Santa Clara, CA

Features:
• Reserved landscaped parking
• Gravel reserved parking areas allow for infiltration to occur.
• Multi-story buildings and parking garages reduce building footprint

Stormwater Benefits:
• Reduced impervious surface area

A section of a 1996 Site Map shows area in which landscaping was used in a parking area being reserved for future potential growth.

The area indicated in the map (shown at left) has since been converted into these parking spaces that were developed when parking area renovations were required for terrorism safety precautions.
This off-site gravel lot is designated for overflow parking and allows infiltration to occur during the rainy season.

**Lessons Learned:**
- Reserved landscaped areas can be used as a mitigating tool to help assuage fiscal lender fears when proposing site designs with reduced parking ratios. Although this reserved area was ultimately converted to pavement, temporary benefits occurred while the area was landscaped, and might still be occurring if not for extenuating circumstances.

**Opportunities Missed:**
- When the parking area was renovated, permeable pavement could have been used for the outlying parking stalls.
SECTION VI

PUBLIC AREAS
Santa Clara Valley Water District Headquarters
PA-1

Site Location:
5700 Almaden Expressway
San Jose, CA

Features:
• Parking lot swales
• Rooftop downspouts drain to landscaping
• Multi-story building allows reduced building footprint

Stormwater Benefits:
• Reduced impervious surface area
• Reduced directly-connected impervious area (DCIA)
• Natural treatment of runoff

Rooftop runoff drains to landscaping, breaking up directly-connected impervious area (DCIA).

Municipal Contact:
Jenny Nusbaum
City of San Jose
(408) 277-4576
Jenny.Nusbaum@sanjoseca.gov

Photograph courtesy of Jenny Nusbaum (City of San Jose)

Multi-story building allows room for ample landscaping onsite for rooftop drainage and aesthetics.

Swale Vegetation Contact:
Rick Austin
Vegetation Specialist
Santa Clara Valley Water District
(408) 265-2607 x3861

Vegetative swales within the parking lot collect drainage through curbside gaps. Concrete curb protects asphalt.

Photograph courtesy of Jenny Nusbaum (City of San Jose)

Site Contact:
Patrick Stanton
Santa Clara Valley Water District
(408) 265-2607 x2029
pstanton@valleywater.org

VI. Public Areas
Page VI-1
April 2004
West Valley Branch Library
Green Building
PA-2

Site Location:
1243 San Tomas Aquino Road
San Jose, CA

Features:
- Green building based on United States Green Building Council and Leadership in Energy and Environmental Design rating
- Decomposed granite used for pedestrian paved areas

Stormwater Benefits:
- Reduced impervious surface area
- Reduced directly-connected impervious area (DCIA)
- Natural treatment of runoff

Rooftop runoff drains to downspouts that drain to landscaping reducing directly-connected impervious areas (DCIA).

Ample landscaping onsite allows for infiltration of rooftop drainage.

Pedestrian walkway created with decomposed granite.
Valley Branch Library
Green Building
PA-2 (cont.)

This artichoke fountain serves as an aesthetic drainage conduit for rooftop runoff to the storm drain system.

Other Opportunities:
- Instead of leading directly to the storm drain system, fountains could be designed to recirculate the water, or to drain to landscaping surrounding the fountain to disconnect impervious surface areas.

Site and Municipal Contact:
Domenic Onorato
City of San Jose
(408) 277-4777
Domenic.Onorato@sanjoseca.gov
Palo Alto Trees and Structural Soils
PA-3

Site Location:
Various Locations
Palo Alto, CA

Features:
- Structural soils
- Street trees

Stormwater Benefits:
- Reduced volume and velocity of runoff

Costs:
- Majority of cost is to remove existing soil
- Approximately $30/cubic yard
- Cost savings for reduction in pavement maintenance
- Estimated savings of $7/tree yearly for stormwater runoff reduction

Structural Soil Components:
- 70-75% crushed granite stone
- 25-29% clay loam soil
- 0.03% hydrogel
- Other soil amendments

Bryant Street: Roots growing in a planter strip eventually cause repetitive damage to hard surfaces such as the sidewalk near this tree related. Sidewalk repairs can cost a city hundreds of thousands of dollars per year.

University Avenue: The use of structural soil allows the planting of large shade trees in narrow medians where the tree planting area would otherwise conflict with infrastructure. The large tree canopies reduce the amount of rainwater reaching the street. The trees absorb much of the force of the rainfall, allowing for reduced velocity of runoff entering the storm drain system. Reduced velocities can result in less stream erosion or scouring at the outfalls.
999 Alma Street: A green-building technique using engineered structural soil under pavers encourages rapid growth of trees and roots with a minimum of damage to the parking lot.

Hillview Avenue: A vegetated swale at the Tibco campus is surrounded by parking spaces with a new lattice base material, providing the young London plane and Chinese pistache trees a larger root growing volume.

390 Lytton Avenue: On the surface, this appears as a typical planting pit. Below surface, over 1,200 cubic feet of Structural Urban Tree Soil Mix (per tree) will help large shade trees grow for at least 40 years. The structural soil allows the roots to grow down, protecting nearby pavement, and also infiltrates stormwater. The engineered soil provides enough strength for load-bearing surfaces such as the roadway and sidewalk pictures above.

Stanford University: This 20-foot-wide pedestrian connector is lined with trees that should produce a long-term shade-covered canopy. The entire area is installed with structural soil to a 24” depth.
Palo Alto Trees and Structural Soils  
PA-3 (cont.)

Lessons Learned:

- Trees with extensive root systems have damaged streets and sidewalks, costing cities a lot of money to repair. By installing structural soils, this can be prevented, because root systems can be directed to grow down and away from the pavement.

- Tree growth is limited by the amount of space the roots have to grow. Structured soils can be installed under the paved areas, creating a larger area for the roots to grow. This allows trees to grow to medium or large shade trees, improving aesthetics, as well as decreasing the amount and velocity of rainwater runoff.

- In the Alma Street example, although the parking lot trees are growing without problems related to the lot’s infrastructure, there have been many replacements of tree guards due to automobile accidents. In the future, trees may be designed outside of the main parking areas, where the tree will may be better protected.

- Large trees, and evergreen trees provide better stormwater benefit than deciduous trees because most precipitation in the Santa Clara Valley occurs in the winter.

- Based on studies in Modesto, CA and coastal Southern California, the City of Palo Alto estimates it is receiving a stormwater benefit from reduced runoff of $7/tree annually for each of its 30,000 street trees, or $210,000 per year.

References:


Municipal Contact:

Dave Dockter, Managing Arborist  
City of Palo Alto  
(650) 617-3145  
dave.dockter@cityofpaloalto.org
North Bay Shore Area Project
PA-4

Site Location:
Off Stierlin Court (Private facility)
Mountain View, CA

Features:
• Multi-purpose flood control
detention basin and athletic field

Stormwater Benefits:
• Reduced peak flows
• Natural treatment of runoff

Note:
• This site is adjacent to a City flood
control basin and pump station and
Stevens Creek.

Storm drain shown on the field.

Nearby office workers can enjoy picnic area.

Panoramic view of the athletic field that provides detention for the area.

Municipal Contact:
Eric Anderson
City of Mountain View
(650) 903-6225
Eric.Anderson@ci.mtnview.ca.us

Site Contact:
Equity Office
(408) 969-0346
Silver Creek Valley Road  
PA-5

Site Location:  
Silver Creek Valley Road between  
Hwy. 101 and Hellyer Avenue  
San Jose, CA

Features:  
• Vegetative swales  
• Street trees

Stormwater Benefits:  
• Natural treatment of runoff  
• Reduced volume and velocity of runoff  
• Reduced directly-connected impervious area (DCIA)

The street serving this industrial campus area is graded to drain to the swale, providing adequate slope for proper drainage. The flush concrete curb protects the asphalt from water damage. When swales are designed to include trees, locating the trees on the banks of the swale, as shown in this photograph, is recommended. Otherwise, the trees may become over-saturated, or their roots may create high areas at the bottom of the swale that could impact the swale’s performance.

This parking lot has curb cuts in order for the water to drain from the parking lot into the vegetative swale.
Silver Creek Valley Road
PA-5 (cont.)

Photograph courtesy of Mike Campbell (RBF Consulting)

This is another grassy swale with street trees. Trees that maintain their canopies during the wet months provide greater stormwater benefit than deciduous trees.

Municipal Contact:
Jenny Nusbaum
City of San Jose
(408) 277-4576
Jenny.Nusbaum@sanjoseca.gov
**Sand Hill Road**  
**PA-6**

*Site Location:*
Sand Hill Road  
Palo Alto, CA

*Features:*
- Roadside bioswales  
- Curb cuts

*Stormwater Benefits:*
- Natural treatment of runoff  
- Reduced volume and velocity of runoff  
- Reduced directly-connected impervious area (DCIA)

*Construction Cost for Bioswale*:  
- $80/linear foot for 4,000 linear ft.  
  ($320,000 total)

Photograph courtesy of Joe Teresi (City of Palo Alto)

Curbside gaps allow runoff to drain off street into the swale.

Photograph courtesy of Joe Teresi (City of Palo Alto)

Vegetation has grown in on the swale. Swale is wide enough that mowing and regular maintenance is not difficult.

Photograph courtesy of Joe Teresi (City of Palo Alto)

Designed swale shown before landscaping has fully grown in.

* The street borders Stanford University, which paid for the improvements.
Sand Hill Road  
PA-6 (cont.)

Photograph courtesy of Joe Teresi (City of Palo Alto)

Storm drain inlet shown up close in swale.

Lessons Learned:

- Make curb cuts wider.
- The roadside bioswale is most useful for stretches of road without driveways that would interrupt the swale.

Municipal Contact:  
Joe Teresi  
City of Palo Alto  
(650) 329-2129  
Joe.Teresi@cityofpaloalto.org

Designer Contact:  
Dave Richwood  
Brian-Kangas-Foulk  
(408) 467-9100  
drichwood@bkf.com
Baylands Parking Lot
PA-7

Site Location:
East end of Embarcadero Road
(Adjacent to PA Sailing Station)
Palo Alto, CA

Features:
- Bioswales
- Non-petroleum paving materials

Stormwater Benefits:
- Natural treatment of runoff
- Reduced directly-connected impervious area (DCIA)

Note:
- The bioswale was under construction at the time these photographs were taken (November 13, 2003).

The bioswale surrounds the parking lot, providing runoff treatment before it drains to the storm drain.

Parking lot is graded so that runoff drains into the swale.

Municipal Contact:
Joe Teresi
City of Palo Alto
(650) 329-2129
Joe.teresi@cityofpaloalto.org
Ulistac Natural Area  
(Guadalupe River)  
PA-8

Site Location:  
Lick Mill Boulevard  
at Tasman Drive  
Santa Clara, CA

Features:  
- Provides natural buffer area between the Guadalupe River and urbanized areas  
- The City removed existing buildings to put in pocket parks and to restore natural preserve areas  
- Provides habitat for flora and fauna  
- Promotes community outdoor educational activities including volunteering with restoration efforts

Stormwater Benefits:  
- Riparian buffer  
- Reduced impervious surface area  
- Open space benefits

Trees and open space provide permeability for stormwater runoff, wildlife habitat, and a buffer area for the Guadalupe River.

This 40-acre nature area, preserved on January 20, 1997, by the City of Santa Clara, attracts many birds.

Wilcox High School students spend the day in the nature area and help with the restoration efforts by weeding.
Ulistac Natural Area  
(Guadalupe River)  
PA-8 (cont.)

A bird sits on the vegetation at the Ulistac Natural Area, which once served as a pear orchard and golf course.

Municipal Contact:  
Judith Silva  
City of Santa Clara  
(408) 615-2456  
jsilva@ci.santa-clara.ca.us

Site Contact:  
Kelly Crowley,  
Outreach Coordinator  
kcrowley@scu.edu  
(408) 554-5419  
http://www.scu.edu/envs/ulistac/
Saratoga Trails
PA-9

Site Locations:
Saratoga, CA

Features:
• Pedestrian and bike access trails created as part of subdivisions

Stormwater Benefits:
• Reduces transportation-related pollutants (promotes alternative transportation)
• Reduced impervious surface area
• Open space benefits

This trail is located on Prospect Road between Beauchamp Lane and Parker Ranch Road and provides open areas for pedestrians to enjoy.

This pathway located on Villa Oaks land east of the intersection with Deer Trail Court, provides access for people to hike or bike into the hills beyond the houses.

Municipal Contact:
Ann Welsh
City of Saratoga
(408) 868-1230
awelsh@saratoga.ca.us
San Tomas Aquino-Saratoga Creek Trail  
PA-10

Site Location:
Sterling Boulevard at Barnhart  
Cupertino, CA

Features:
• Pedestrian and bike bridge allows access

Stormwater Benefit:
• Reduced transportation-related pollutants

Notes:
• This section of the creek trail will eventually connect to the regional trail system.

The pathway provides access for locals to take advantage of the creek trail in their neighborhood. The trail promotes alternative transportation by providing convenient access for pedestrians and bicyclists.

Pathway leads to bridge that crosses creek to the San Tomas Aquino-Saratoga Creek Trail.

Municipal Contact:
Carmen Lynaugh  
City of Cupertino  
(408) 777-3354  
carmenl@cupertino.org
Santa Cruz Avenue
PA-11

Site Location:
Santa Cruz Avenue
Los Gatos, CA

Features:
- Pedestrian activity
- Bike activity
- Bulbouts at crosswalks
- Street trees

Stormwater Benefits:
- Reduced transportation-related pollutant
- Reduced volume and velocity of runoff

Lessons Learned:
- Pedestrian vehicle accident rate has dropped significantly since the road was narrowed.

Bulbouts at crosswalks encourage pedestrian activity by resulting in slower traffic speeds and by providing shorter distances across traffic lanes for improved pedestrian safety.

Bike lanes on streets adjacent to Santa Cruz Avenue help promote alternative transportation to the downtown area.

Among the many benefits of street trees are the reduction of the volume and velocity of stormwater runoff and aesthetic value.

Municipal Contact:
Trish Duarte
Town of Los Gatos
(408) 399-5771
tduarte@losgatosca.gov
Bike Station Project
PA-12

Site Location:

Palo Alto Caltrain Station
95 University Avenue
Palo Alto, CA

Features:

• Promotes several modes of alternative transportation including bicycles, the Caltrain commuter rail, Santa Clara County and Sam Mateo County bus lines (SamTrans and VTA), Dumbarton Express, the Palo Alto Free Shuttle and Stanford University Marguerite shuttle lines.
• Attended bicycle parking– Free during regular business hours.
• Bicycle lockers for after-hours parking
• Bicycle repairs and sales
• Bicycles rentals – Offered by the hour for short commute trips or leisure rides.

Stormwater Benefits:

• Reduced transportation-related pollutants.

Bike lockers store bikes, a service that is free during regular business hours. The Bike Station project currently serves about 50 commuters per day.

The Bike Station provides not only free valet parking, but also coffee and bikes for sale.
Bike Station Project  
PA-12 (cont.)

The City of Palo Alto and its sponsors provide this service to local commuters. This Bike Station employee tags the bicycle for storage in the bike lockers, while the commuter takes an alternate mode of transportation to her destination.

Photograph courtesy of Amanda Jones (City of Palo Alto)

Municipal Contact:  
Amanda Jones  
City of Palo Alto  
(650) 329-2568  
amanda.jones@cityofpaloalto.org

Site Contact:  
Bike Station  
(650) 327-9636 (Tel)  
(650) 328-0323 (Fax)  
http://www.bikestation.org

Commuters can take their bicycles on the Caltrain and bike from the Caltrain station to and from work and/or home.
Bike Station Project
PA-12 (cont.)

Other:

- The City of Palo Alto also provides a $20/month benefit to encourage City of Palo Alto employees to ride bicycles to work, and provides bicycle education classes to the public.

- The City of Palo Alto Alternative Transportation Coordinator is available to consult, free of charge, with local employers and residents for all transportation demand management programs.
SECTION VII

INDEXES
### INDEX

**Site Design Examples by Best Management Practice**

<table>
<thead>
<tr>
<th>Better Site Design Technique</th>
<th>CO-1</th>
<th>CO-2</th>
<th>CO-3</th>
<th>CO-4</th>
<th>CO-7</th>
<th>CO-8</th>
<th>CO-9</th>
<th>CO-10</th>
<th>CO-11</th>
<th>CO-12</th>
<th>CO-13</th>
<th>CO-14</th>
<th>CO-15</th>
<th>CO-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Transportation</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>93</td>
<td>142</td>
<td>143</td>
<td>67</td>
<td>119</td>
<td>98</td>
<td>19-22</td>
<td>10-119</td>
<td>18</td>
<td>41</td>
</tr>
<tr>
<td>Carpool/Vanpool/Pedicab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Transportation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearly Marked Storm Drain Inlets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detention Basin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detention Basin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnected Drum Pumps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riparian/Bay Buffer Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced Building Footprint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrow Streets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native Plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open Space Areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permeable Pavement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocky Slope</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof Top Landscaping/Green Roof</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum DCA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shared Driveway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree Planting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuck Under Parking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turf Block/Free Driveway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetation, Stabilization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Describe)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* This indicates the page number in Start at the Source that may provide additional information on the Site Design technique listed.
Site Design Examples by Municipality

A. City of Campbell
   CO-12: Pruneyard Towers
   MF-8: Shelley Avenue 2
   SF-3: Shelley Avenue 1

B. City of Cupertino
   PA-10: San Tomas Aquino-Saratoga Creek Trail

C. City of Los Altos
   CO-15: Residence Inn

D. Town of Los Gatos
   PA-11: Santa Cruz Avenue

E. City of Mountain View
   CO-4: SGI/Google
   MU-1: The Crossings
   PA-4: North Bay Shore Area Project
   SF-2: Dana Street
   SF-4: Ortega Avenue
   SF-5: Bourbon Court

F. City of Palo Alto
   CO-1: Agilent – Palo Alto
   CO-5: Stanford University Medical Center
   CO-9: Porter Drive
   CO-10: Hillview Avenue
   MF-3: Stanford West
   PA-3: Palo Alto Trees and Structural Soils
   PA-6: Sand Hill Road
   PA-7: Baylands Parking Lots
   PA-12: Bike Station Project

G. City of San Jose
   CO-11: Legacy Tech Park
   CO-14: Middlebrook Gardens
   MF-1: Communications Hill/Helzer Ranch
   MF-4: Ryland Mews
   MF-5: Blossom River Apartments
   MF-6: Le Mirador Senior Housing
   MU-2: Santana Row
   MU-3: North Park
   PA-1: Santa Clara Valley Water District Headquarters
   PA-2: West Valley Branch Library
   PA-5: Silver Creek Valley Road
   SF-1: Basking Ridge
H. City of Santa Clara
   CO-3: Agilent – Santa Clara
   CO-13: Santa Clara University
   CO-16: Intel
   MF-2: Los Padres and Homestead Condominiums
   MF-7: 801 Homestead
   PA-8: Ulistack Opens Space

I. City of Saratoga
   PA-9: Saratoga Trails

J. City of Sunnyvale
   CO-7: Yahoo! Inc.
   CO-8: Juniper Networks

K. Outside of the Santa Clara Valley
   CO-2: Pacific Shores Center
   CO-6: Gap Headquarters