3.1 INTRODUCTION

A Green Connection is a special street or path that connects people to parks and open spaces and enhances the ecology of the street environment: routes are intended to improve access to parks for both people and wildlife. The three project goals (see Chapter 1) are served by these special streets:

1) Public Health: Increase active transportation to parks;
2) Sustainability: Enhance urban ecology; and,
3) Livability: Support neighborhood stewardship and placemaking.

A successful Green Connections will encourage people to go out of their way to travel on these routes because they are comfortable, attractive and safer. The routes within the network were selected with consideration for the ideas generated through the community planning process as well as existing and proposed projects related to active transportation, open space and sustainability.

This chapter describes how the Green Connections network was developed, including the considered inputs, the criteria used to select street segments, and how the network was refined in response to data inputs and stakeholder feedback.

3.2 NETWORK CONSIDERATIONS

This section presents the key inputs that informed the development of the network of Green Connections: the streets that are used for walking and biking; the parks and other destinations to which people will connect to; the streets that are best suited to incorporate natural systems and habitat; and existing and proposed projects.

These inputs were identified early in the planning process as important foundations for framing the goals of the network. Throughout the planning process, these maps were utilized to test evolving ideas and inform the final network.
Corridors/Paths/Movement: Routes People Take

This map shows the City’s systems for pedestrians and bicyclists (bike routes, key walking streets, trails and pedestrian staircases), as well as streets identified in the San Francisco Better Streets Plan as having characteristics related to access to green space (park-edge streets, greenways and alleys). This map illustrates the synergies between walking and biking routes and the open space system.
Nodes/Places/Destinations: Where People Go

This map shows places where people congregate to work, shop, learn and play. A guiding principle in developing the network was that routes should start and end at a park. Understanding the locations of where people gather City informed the routes that were ultimately selected.

Ensuring that travel between parks, schools, shopping districts, transit centers and employment centers is comfortable and convenient is critical for getting people to parks. In particular, we looked at the location of schools, both to indicate where children were more likely to travel, as well as opportunities for stewardship and education.
San Francisco’s topography orients people within the city, delineates neighborhood boundaries, and helps define watersheds, micro-climates, and habitats. The city’s topography and water systems informed which streets might be well suited to become Green Connections.

San Francisco’s hills present opportunities and constraints in designing a network of Green Connections. Many of the city’s largest parks like Twin Peaks and Bernal Heights sit atop hills and offer views of the city and region. In some of the City’s steepest areas, staircases facilitate access to important open spaces. Depending on preference and ability, steep streets can be challenging to navigate when walking or biking.

Slopes also impact stormwater design opportunities, as steeper streets are less ideal for effective stormwater management. Since water naturally takes the most direct route to the Bay or Ocean, many key biking and walking streets (the flattest routes) are also former creeks. Relatively flat streets could be good candidates for Green Connections because of the potential to integrate stormwater design features.
Historic Landscapes/Natural Areas: Enhancing Habitat

While the San Francisco peninsula has changed dramatically over the past 200 years, the City still maintains a strong relationship with the regional landscape. Many streets offer panoramic views to water and green spaces.

The City’s diverse open space system provides habitat for native plants and wildlife. Enhancing habitat for plants and animals was a major consideration in developing the Green Connections network. This could be achieved by identifying target species and creating habitat “corridors” or habitat “patches,” as well as selecting plant species appropriate to the landscape and climate for streetscape plantings. Understanding the area’s natural history was formative in identifying potential network routes and outcomes; particularly the network follows historic creeks whenever possible.
Another consideration in developing the network was a number of existing and proposed projects. These present an opportunity to examine possible synergies with project goals. Existing and planned trail networks (including the Ridge Trail, Coastal Trail, Bay Trail and Blue Greenway) were considered in developing the network, as well as community generated ideas for ecological stewardship and bicycle improvements. The following projects, which aim to improve connectivity around the City, for people as well as wildlife, were taken into consideration in developing the Green Connections network.

**Bay Trail.** The Bay Trail is a planned 500-mile trail that will encircle the entire San Francisco Bay, connecting the shoreline of 9 counties and 47 cities. Roughly 60% of the trail is already complete.

**Blue Greenway.** The Blue Greenway is a 13-mile corridor along San Francisco’s Southeastern Waterfront that follows the alignment of the Bay Trail, from Mission Creek to the City’s southern border. The Blue Greenway connects existing open spaces to create a new recreation opportunity and improved access to the waterfront. Through an extensive community process, the Port of San Francisco developed the Blue Greenway Planning and Design Guidelines. A Green Connection route along this historically industrial section of this city will help ensure accessible recreational spaces in this area.

**Coastal Trail.** The California Coastal Trail is a network of trails for walkers, bikers, equestrians, wheelchair riders and others along the entire 1,200 miles of the California coast. The 10.5 mile portion of the trail through San Francisco connects many scenic and tourist attractions along the coastline, including the Golden Gate Bridge, the Presidio, Ocean Beach and Fort Funston. While the current trail is relatively complete, there are a number of improvements necessary to ensure that the trail is accessible and visible for the entire Coastal Trail route.

**Connecting the City.** Connecting the City is a proposal by the San Francisco Bicycle Coalition that envisions 100 miles of crosstown bike routes by 2020 designed for everyone, from an eight-year-old child to an eighty-year-old grandmother. This vision is defined by three routes that connect major institutions, residential neighborhoods and open spaces.

**Cross-Town Trail.** The idea for a cross-town trail came from an outreach effort led by the Mayor’s Open Space Task Force beginning in 2007. This trail is envisioned as a corridor that connects wildlife and people through a series of open spaces and natural areas from the Presidio to Candlestick Point. As the City works with the pertinent Federal, State, local agencies and the community to develop this trail corridor, the Green Connections route can be updated.

**Green Hairstreak Project.** The Green Hairstreak is a project of Nature in the City to connect two butterfly populations with street level plantings of host and nectar sources along the Green Hairstreak Corridor. The Green Hairstreak (Callophrys dumetorum) is a small, nickel-sized butterfly that can be found in three habitats within the city: Hawk Hill and Rocky Outcrop in the Sunset District and the coastal bluffs of the Presidio. The Green Hairstreak corridor is located in the Sunset District and connects Grand View Park and Golden Gate Heights Park.

**The Ridge Trail.** The Bay Area Ridge Trail is a multi-use trail that links the hills and ridges of the nine counties of the Bay Area. It will be approximately 550 miles when completed. The 13.5-mile portion of the trail in San Francisco was completed almost 20 years ago and is in the process of being reevaluated by the Bay Area Ridge Trail Council, with the goal of improving its route, signage and connections to other city and regional trails.
Chapter 3: The Green Connections Network

1. 14th Ave at Pacheco - began 2008
2. Arial steps - began 2008
3. 15th Ave at Noriega - began 2008
4. 14th Ave at Noriega - began spring 2010
5. Mount steps - began fall 2010
6. Quintara steps - began fall 2010
7. Aloha & Lomita - began winter 2010

These are two of the last breeding grounds for the Green Hairstreak butterfly in San Francisco. Our goal is to engage neighbors to create a corridor to connect these populations.

Green Hairstreak Butterfly Corridor
Plant a Coast Buckwheat (Eriogonum latifolium) in your yard or steward a new site!
Contact steward@natureinthecity.org and visit www.natureinthecity.org for plant list, sources, and more info!

Clockwise from below:
Connecting the City Map, San Francisco Bicycle Coalition
Green Hairstreak Corridor, Nature in the City
Regional Trails Map, San Francisco Planning Department
3.3 ROUTE CONSIDERATIONS

The previous section describes the work done to outline citywide network patterns: how people walk and bike around the city, where people like to gather, the opportunities to integrate natural features and enhance local habitat and existing and proposed projects. The next step was to understand the specific qualities of a Green Connection street that would achieve the project goals.

» **Public Health:** Increase active transportation to parks

» **Sustainability:** Enhance urban ecology

» **Livability:** Support neighborhood stewardship and placemaking

The streets that best meet the project goals are predominately residential, with the exception of the northeast quadrant of the City where the character of the streets and land uses is more intensive. Selecting streets that are calmer and have a more residential character ensures a minimal impact on existing transit service and freight movements, while making implementation of the network easier (since only modest improvements may be needed). Because they have fewer spatial constraints, residential streets also provide greater opportunities for repurposing street space to promote pedestrian and bicycle improvements.

This section reviews street qualities that were taken into consideration in developing the Green Connections routes.

**Building on Opportunities**

Streets that currently exhibit some characteristics of Green Connections require lower investment to realize project goals and may have fewer trade-offs.

- **Streets with slow moving traffic.** Streets with slow moving traffic are good candidates for Green Connections, as pedestrians and bicyclists often feel safer and more comfortable on streets with calmed traffic.

- **Streets with low traffic volumes.** Similarly, streets with low traffic volumes can provide additional space for pedestrians and bicyclists while having minimal impacts on traffic flow.

- **Residential Streets (as defined by the Better Streets Plan).** Residential streets often have fewer traffic lanes and slower moving vehicles.

- **Streets near schools.** Many streets near schools have lower vehicle speeds, as the City recently implemented 15 mph zones near schools. Connecting schools to parks increases safe access & physical activity for kids, as well as an opportunity for education and stewardship.

- **Streets with space to gather and play.** Opportunities to gather, play and learn can build community and contribute to a sense of place. Many streets in the city have excess width that can be repurposed for gathering spaces, pedestrian and bicycle facilities, and ecological features like greening and stormwater infrastructure.
Chapter 3: The Green Connections Network

Avoiding Conflicts

Generally, streets that serve heavy volumes of cars, transit vehicles and trucks provide fewer opportunities for extensive pedestrian and bicycle amenities. In developing the Green Connections network, streets with the following features were typically avoided; however, other city programs will continue to invest in important pedestrian and bicycle safety measures on these streets.

**Streets that are part of the existing bicycle network.** The streets in the City’s bicycle network are generally flat and have some degree of existing bicycle amenities. Most of these streets are already being used by bicycles and have been identified as candidates for ongoing improvements.

**Streets that create an opportunity for stormwater management.** Flatter streets are good candidates for low impact design treatments that reduce stormwater runoff. Additional coordination with the SFPUC to ensure that the design of these streets maximizes opportunities for stormwater management.

**Street Slope.** Slopes greater than 10% were generally avoided to facilitate easy walking and bicycling; however, some excellent walking opportunities, such as staircases, have a slope greater than 10% and were included in the network.

**Streets that overlap with historic creeks.** Daylighting historic creeks and watersheds offers significant opportunities for habitat creation, green stormwater management and education about urban watersheds, thus building ecoliteracy.

**Truck routes.** The City has identified truck routes that generally have a wider right-of-way to accommodate freight and goods movement. These street conditions also encourage vehicles to travel at faster speeds.

**High volume streets.** Streets with high volumes of traffic can be less pleasant to walk or bike on due to noise, increased risk of conflicts with vehicles and longer wait times at traffic signals. Also high volume streets may have constraints making it more difficult to reclaim space for pedestrian amenities like sidewalk widening, curb extensions and medians. With higher volumes, potential pedestrian and bicycle conflicts with vehicles is higher.

**Streets with fast moving traffic.** Some streets in the city are designated as major arterials, with higher traffic volumes that would limit the potential for Green Connections enhancements, as discussed above.

**Overlap with the MUNI Rapid Network (Key Muni routes).** Many streets in the City host our transit system. To reduce delays for transit on these streets, the city prioritizes keeping traffic moving and may design streets with wider travel lanes for transit and space dedicated to loading and unloading passengers. These transit requirements could compete with the design needs of a Green Connection street, and will have to be addressed on a per case basis.
3.4 EVOLUTION OF THE NETWORK

Introduction

A network of streets that connect to parks is not a new idea. Burnham and Bennett’s 1905 plan for San Francisco included recommends areas for parks and park connections. The idea for Green Connectors more recently was identified in the Mayor’s Open Space Task Force. The “Connectors” map (pictured, above right) was developed to articulate the concept of a citywide network of Green Connectors. The “Green Streets” in this conceptual map were identified without technical analysis or community input to articulate the idea of routes that connect parks, but this laid the ground work for the Green Connections project.

Network Drafts

The Green Connections network evolved from the concept map shown above. Developing the network was an iterative process relying on technical analysis and community input to identify streets well suited to meet traffic calming, greening and placemaking goals. The maps on the following pages illustrate the evolution from the conceptual Map of a Green Connection Network (above) to the final Green Connections Network. Many of the maps included in this section were working drafts and not actual proposals.
A SYSTEM OF ROUTES: GREEN CONNECTIONS & TRUNKS LINES

The first draft includes 11 east-west routes and 12 north-south routes. Notably, “Trunk” routes are identified to help understand how Green Connections would fit into the larger transportation network. Trunk routes include major bike routes and Market Street, and were intended to compliment the Green Connections routes. Staircases and 15 mph school zones are shown on the map to illustrate how the routes connect to other locations pedestrians might travel.

NAVIGATING THE CITY: DISTINCT NORTH-SOUTH ROUTES AND EAST-WEST ROUTES

This next draft includes 11 east-west routes (darker green), and 10 north-south routes (lighter green). Routes that include steeper streets or staircases are shown in a hashmark to clearly illustrate the route sections that might be better suited for walking than for bicycling.
21 DISTINCT ROUTES AND A COMPLIMENTARY RELATED TRAIL NETWORK

This working draft includes 21 distinctly named and branded routes that are intended to facilitate route identify and neighborhood ownership. Based on further analysis and community input, some redundant routes or ‘options’ in the previous draft were removed. Existing and planned regional trails are included in this map, labeled “related trail network.” These routes also better follow (and honor) former creeks, such as Mission Creek and Yosemite Creek. A citywide loop was created along the periphery of the City, following the alignment of existing trails. Key walking streets and the existing bike network are shown for reference.

26 ROUTES INCORPORATING A TRAIL NETWORK

This working draft includes 26 routes. Some routes that previously spanned larger geographic areas have been divided into more neighborhood-focused routes. Based on community input and feedback from City agencies, this draft further resolves alignments for some routes that are shown on the previous iteration with alternatives. The “Related Trail Network,” routes are incorporated into the Green Connections network. This draft includes a new Grand Circle route (in yellow) that combines the alignment of the Bay Trail, Blue Greenway and the Coastal Trail.
PUBLIC RELEASE: 140 MILES AND 25 DISTINCT ROUTES

This iteration of the network was presented at an open house at the LGBT center on October 5, 2012 with 25 distinct routes. Each route is identified by a number and a name that include a geographic start and end point. Additionally, to emphasize the ecological goals of this project, each route name also includes a target species, intended to correspond with specific recommendations for supportive plants. The target species and habitat were identified as part of the ecology think tanks (discussed in Chapter 4).

25 ROUTES THAT CONNECT TO PARKS

This draft includes 25 unique routes. Following the release of the public draft, the project team integrated feedback from city agencies, project partners and members of the public. Generally the scale of the network was reduced to more realistically reflect feasible implementation over a 20 year period, while maintaining geographic equity. Also network wide routes were altered to originate and terminate at parks, and no longer traverse through parks. Slight tweaks were made to eliminate redundancies and ensure the streets selected were in line with project goals.
Notes:
Some portions of routes may not be ideal for bicycles due to conditions such as steep topography, stairs or trails.

The proposed network falls mostly on public rights of way, but occasionally deviates onto public properties such as park lands.

Connect to future street network as part of Hunters Point Shipyard Development.

Connect to new Bay Trail alignment.
The Network

The final Green Connections network includes 24 routes, totaling over 115 miles. Every household is within a 1/2 mile of a route, and most households are within 1/4 mile of a route.

The name for each route includes a geographic start and end point and a target species or habitat. Complimentary Ecology Guides provide information on local flora, fauna, and habitat that could enhance the ecological function of the route while achieving the other project objectives. See Appendix A1.

Streets on the network should be designed to a Green Connections standard, which is discussed in further detail in Chapter 4. Streets not identified as part of the Green Connections network will continue to receive traffic calming, pedestrian and bicycle amenities as part of existing city programs.

These 24 routes serve the entire city, connecting neighborhoods to one another in addition to improving San Francisco’s access to parks and open space. At the neighborhood scale however, many important destinations may be located within several blocks of a route. These potential offshoots or spurs should be viewed as a design opportunity for linking additional community assets like libraries, community centers, transit hubs and commercial districts to the larger Green Connections network.

Implementation of the network is envisioned over the next twenty years, an ambitious goal for our city streets. Improvements will happen in coordination with funded projects and community led initiatives. As information about funding and schedule for future projects becomes available, changes to the routes could be made. Any changes should be consistent with the criteria outlined in this chapter.
3.5 TESTING THE NETWORK

Throughout the planning process, the proposed network was tested against demographics and city systems to ensure that the network achieved project goals. The maps on the following pages illustrate what factors were considered and how the network performed in relation to these factors.

Testing the Network: Demographics

This project aims to improve access to parks and open spaces, particularly in areas with high concentrations of youth and seniors, lower household income and limited access to private vehicles.

The following maps highlight the relationship between demographics and the Green Connections network. Some neighborhoods have higher population densities, or higher populations of seniors or children. These populations often use parks more and thus are a target population of the Green Connections network. Median household income and vehicle ownership rates are proxies for households with greater need to access neighborhood parks.

In addition to demographics, the network was tested against geographic equity. Every household in the city is within a 1/2 mile of a proposed Green Connection. Most households are within a 1/4 mile.

DEMOGRAPHICS: POPULATION DENSITY

Denser concentrations of people are shown in darker red.
**DEMOGRAPHICS: DENSITY OF CHILDREN & YOUTH**

Denser concentrations of youth and children are shown in darker purple.

**DEMOGRAPHICS: DENSITY OF SENIORS**

Denser concentrations of seniors are shown in darker orange.
**DEMOGRAPHICS: MEDIAN HOUSEHOLD INCOME**

Lower household income is shown in darker brown.

**DEMOGRAPHICS: LIMITED ACCESS TO CARS**

Areas with relative less access to vehicles are shown in a darker color.
Testing the Network: City Systems

The maps on the following pages illustrate how the Green Connections network fits within larger city systems related to land use, transportation and natural systems.

LAND USES: NEIGHBORHOOD COMMERCIAL AND SCHOOLS
This map illustrates how the Green Connections network intersects with neighborhood commercial districts and schools. These land use types are important origins and destinations for users of the Green Connections network.
TRANSPORTATION: MUNI NETWORK
The Green Connections network compliments the existing MUNI transportation network, shown in red. Green Connections routes often run parallel to the MUNI network, providing accessibility while minimizing impacts on transit.

TRANSPORTATION: BICYCLE NETWORK
The Green Connections network compliments the existing bicycle network, shown in blue. Many of the Green Connection routes overlap with existing bicycle routes.
TRANSPORTATION: STREETS WITH CONCENTRATIONS OF PEDESTRIANS

The Green Connections network complements streets with concentrations of pedestrian activity, shown in purple.

TRANSPORTATION: TRAIL NETWORK

This map illustrates how the Green Connections network relates to the existing regional trail network. Route #24, the longest route in the network, spans the length of the City's shorelines and includes San Francisco section of the Bay Trail, Blue Greenway, and the Coastal Trail from the Golden Gate Bridge to Fort Funston. A preliminary alignment for the crosstown trail, Route #23, has been identified through this project. Route #22 follows the alignment of the Ridge Trail.
NATURAL SYSTEMS: CREEKS & WATERSHEDS

This map illustrates the boundary of San Francisco’s eight watersheds, its historic and existing creeks. Public education and stewardship is a core objective of Green Connections. Implementation of Green Connections projects where the routes follow the alignment of creeks provide opportunity to increase public awareness about the City’s natural systems.
This map illustrates the seven general plant communities within San Francisco. Green Connections routes traverse each plant community, accordingly a variety of plantings are appropriate throughout the network. Trees and plants along Green Connections routes should respond to the site conditions to best support target species and habitat. (See Chapter 4 for additional information about urban ecology).
CHAPTER 4
Designing Green Connections