



2

Best Practices

Overview	3
Berkeley	4
Vancouver	6
Portland	12
Seattle	20
New York City	24
Minneapolis	26
Denver	29
Chicago	34
Worldwide	36

Prepared by: Ben Caldwell, Green Connections Summer Intern, 2012

OVERVIEW

San Francisco's Green Connections project is an effort to connect people to open spaces via a new kind of street that is itself green and sustainable. In this effort, the project is fortunate to be able to draw inspiration and expertise from established and successful neighborhood greenway and greens streets programs around North America and the world. Learning from the most successful cities is critical to the success of Green Connections. Examining some of the most successful individual projects is likewise important in learning what it takes to make one project more successful than another.

"Greenway" and "Green Street" are the terms most often used for the most relevant types of projects from which the Green Connections can learn best practices. The concept of a "Green Street" is still new. Most green street projects emphasize what is a key part of Green Connections: stormwater management within the right-of-way, ideally within an integrated system that can significantly reduce the amount of runoff that goes directly to waterways. Many green streets are used as demonstration projects, intended to be highly visible components of a system of "green infrastructure" that is incorporated into the design of the street. Most green streets include significant increases in tree canopy cover. Finally, green streets generally aim to ensure that the street has a minimal impact on its surroundings, particularly at locations meeting other ecologically sensitive areas.

In general, the word "greenway" is most often used in the US to describe a project characterized by a car-free separated multi-use trail running through a significant and mostly-uninterrupted open space. Greenways typically go through, rather than around or beside, parks, and often but not always use rights-of-way from rail or other unused transportation corridors, as is the case with the East Bay's Ohlone Greenway.

Only very recently (perhaps beginning in the US with Portland's Neighborhood Greenways program, likely adapted from Vancouver's City Greenways program) has the word greenway been used for a route on a city street that prioritizes active transportation by calming or diverting car traffic for safe active transportation travel and "greens" the street with trees and low-impact design (LID) stormwater features that make the street and route look and feel more "park-like." Few cities have made a truly integrated effort to envision new green connectors as both sustainable streets that manage stormwater and safe and park-like active transportation connectors, and even fewer have attempted to prioritize and enhance wildlife corridors along these routes.

BEST PRACTICE CITIES & PROJECTS

BERKELEY

- Bike Boulevards

VANCOUVER

- City Greenways Plan
- Neighborhood Greenways
- Green Streets

PORTLAND

- Neighborhood Greenways
- Green Streets

SEATTLE

- Neighborhood Greenways
- Green Streets & Sea-Edge Alternative (SEA) Streets

NEW YORK CITY

- Greenways

MINNEAPOLIS

- National Scenic Byways
- Midtown Greenway

DENVER

- Denver Moves Integrated Active Transportation Plan

CHICAGO

- Bike 2020 Plan and Bike Boulevards

WORLDWIDE BEST PRACTICE EXAMPLES

Berkeley Bike Boulevards

<http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6650>

DESIGN GUIDELINES



BIKE BOULEVARD EXAMPLES

Bike Boulevard diverter



Channing



Milvia



Ellsworth/Parker Traffic Circle



THE GUIDELINES

Berkeley's Bike Boulevards were ahead of their time, and the first such facilities in the US. Guided by design guidelines published in 2000, and helped in part by traffic diverters that had long been in place along some of the routes, they seek to create a calm street with slow traffic and a distinctive look and feel. Wayfinding is likewise distinctive. Unwarranted stop signs were removed, and traffic diversions of various kinds are common. Most routes are calm and quiet, but major arterial crossings continue to pose a challenge along some routes.

Source: Berkeley Bicycle Boulevard Design Tools and Guidelines, p. 4-1

KEY ELEMENTS

Design the bicycle boulevards to be visually unique from surrounding streets and to invite safe, easy bicycling that is appealing to all ages and abilities.

Minimize changes to existing traffic patterns on bicycle boulevards and adjacent residential streets.

When traffic-calming devices are needed, utilize ones that do not significantly inhibit access of emergency vehicles and that also provide access for people with disabilities.

Where possible redesign existing barriers to allow emergency vehicle access.

Seek ways to improve neighborhood livability through bicycle boulevard designs.

Incorporate pedestrian safety elements near schools, parks, public meeting places and major pedestrian crossings.

Develop cost effective strategies for bicycle boulevards.

After changes are made, continue to evaluate the bicycle boulevards to make sure they are functioning as designed and make changes as necessary.

Source: Berkeley Bicycle Boulevard Design Tools and Guidelines, p. 1-3

PLAN DETAILS:

Official Plan Name:	Berkeley Bicycle Boulevard Design Tools and Guidelines
First Approved:	2000
Most Recent Update:	None
Number of Routes:	7
Total street ROW %:	over 90%
Total Expected Cost:	\$10.7 million (2000 dollars)

PLAN GOALS:

To create a safe bicycling environment for people of all bicycling abilities.

To develop a network of efficient routes for bicyclists.

To increase the visibility of bikeways in Berkeley.

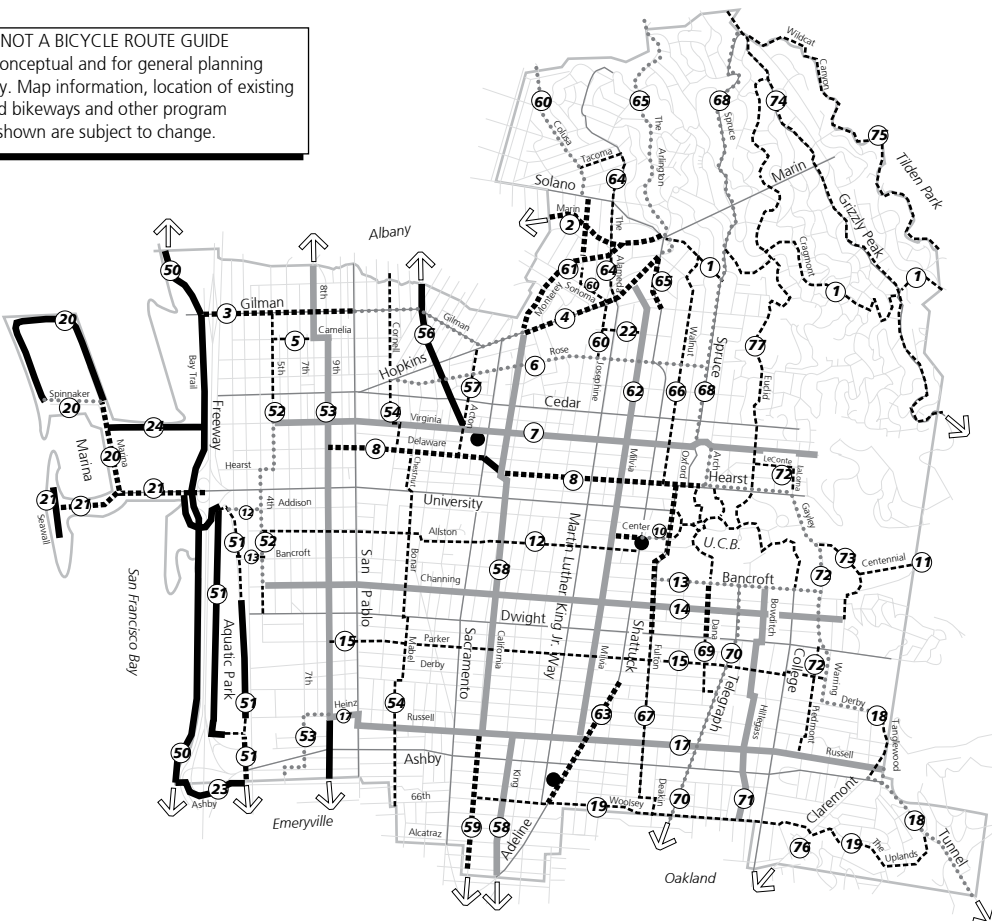
Source: Berkeley Bicycle Boulevard Design Tools and Guidelines, p. 1-2

GC Best Practices:

Berkeley's Recommended Bikeway Network

This map of Berkeley's Recommended Bike Network, from the city's Berkeley Bicycle Boulevard Design Tools and Guidelines, shows Berkeley's existing and proposed bikeways, including its system of 7 bicycle boulevards that crisscross the city. Most bike boulevards are parallel to (and just one block away from) major commercial thoroughfares.

THIS MAP IS NOT A BICYCLE ROUTE GUIDE
This map is conceptual and for general planning purposes only. Map information, location of existing and proposed bikeways and other program information shown are subject to change.



Berkeley Bicycle Plan

Figure 2
Recommended
Bikeway Network

Legend

- Paths (Class 1)**
(multi-use trail, non-motorized only)
- Boulevards** (bicycle priority street)
NOTE: Exact alignment of Bicycle Boulevards to be determined during the Bicycle Boulevard planning process
- Lanes (Class 2)**
(striped lane for bicycles only)
- Class 2.5**
(upgraded bike route with targeted improvements)
- Routes (Class 3)**
(signed route - no special markings)
- Connections to Existing / Proposed Routes in other Cities**
- BART Station**
- Bikeway Network Number**

Sources:

- Proposed & Existing Bikeways Inventory, 4/14/998
- Wilbur Smith Associates
- City of Berkeley Staff

North **Draft for Inclusion in the General Plan** **12/28/98**

WILBUR SMITH ASSOCIATES

ENGINEERS • PLANNERS

in association with:

2M Associates, Landscape Architects
HPV Transportation Consulting

Vancouver City Greenways

WWW. <http://vancouver.ca/engsvcs/streets/greenways/index.htm>

PLAN



GREENWAY EXAMPLES

Carroll Street



Seaside



Central Valley



Granville (Proposed)



THE PLAN

Vancouver's Greenways are "linear public corridors for pedestrians and cyclists that connect parks, nature reserves, cultural features, historic sites, neighbourhoods and retail areas." They include "waterfront promenades, urban walks, environmental demonstration trails, heritage walks and nature trails. Greenways expand opportunities for urban recreation, provide alternate ways to move through the city and enhance the experience of nature, community and city life." Vancouver's sixteen-route network "will be approximately 140 km long when complete. Greenways are generally evenly distributed throughout the City, but more concentrated in areas with greater population density and a higher number of destinations. Several Greenways already are or will be also on Vancouver's Bike Network."

Source: City of Vancouver Greenways website

KEY ELEMENTS

- City Greenways "expand the opportunities for urban recreation, provide alternate ways to move through the city, and enhance the experience of nature and city life."
- A City Greenway is intended to be "no more than a 25-minute walk or a 10-minute bike ride from every residence in Vancouver" when the network is complete.
- Differ from Bike Network routes by enhancing the public realm "through a wider range of improvements, for example, by expanding parks, increasing landscaping, incorporating public art or installing drinking fountains."
- Balanced consideration is given to the needs of all road users, but the "focus is to improve walking and cycling for people of all abilities between the ages of 8 to 80."
- LID features are incorporated into designs, but are not a primary focus.

Source: City of Vancouver Greenways website

PLAN DETAILS:

Official Plan Name:	Vancouver Greenways Plan
First Approved:	1995
Most Recent Update:	None
Number of Routes:	16
Total Planned Miles:	87 (~140km)
Total Built Miles (2012):	54 (~90 km)
Total street ROW %:	over 50%
Total Expected Cost:	\$12 million/per spent on average
Central Valley Greenway Cost:	\$24 million

PLAN GOALS:

- Make walking more interesting
- Make cycling safer and more convenient
- Reduce the impact of the car
- Make the Greenway 'greener'
- Use public art to make the Greenway more interesting

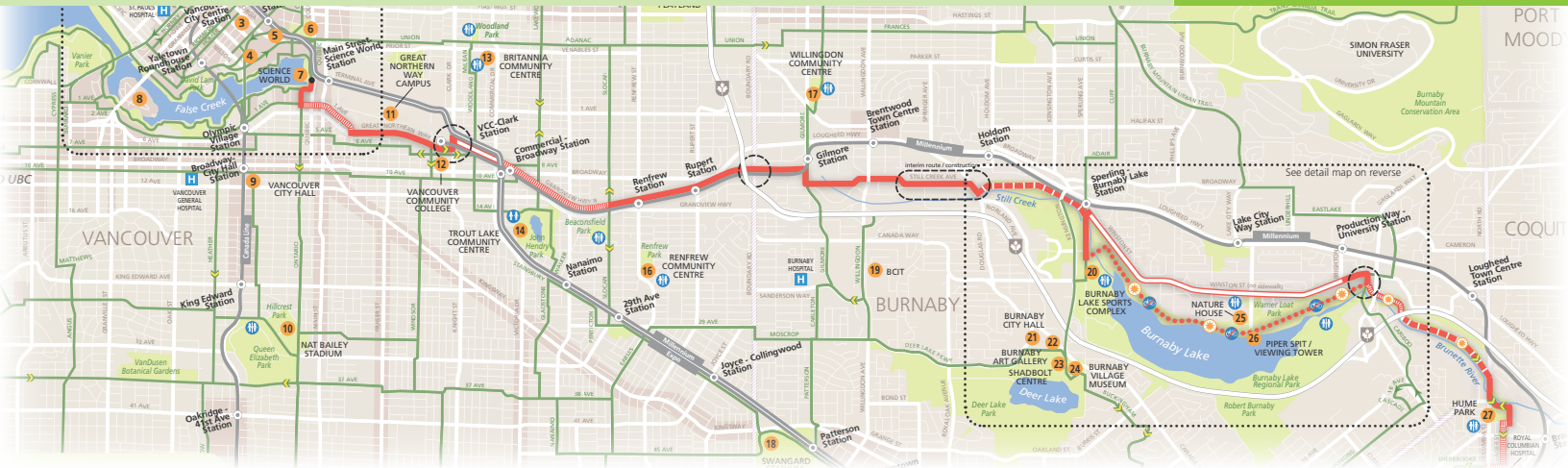
Source: City of Vancouver Greenways website

Vancouver City Greenways

CENTRAL VALLEY GREENWAY

<http://vancouver.ca/engsvcs/streets/greenways/city/central.htm>

GREENWAY



KEYS TO ITS SUCCESS

ALL-PURPOSE, FOR EVERYONE

"The Central Valley Greenway – or CVG for short – is a scenic, direct, comfortable and relatively flat route for people of all ages to cycle and walk around their neighbourhoods, commute to important destinations, and connect to transit."

Source: City of Vancouver Greenways website



COMPLETE, LINKED, & SIGNED

The Central Valley Greenway was fully completed in 2009, recording 650,000 trips in its first year, and has continued to be improved since.

The CVG was designed to link to every possible nearby active transportation and transit network.

Distinctive, consistent, and clear signage was a priority throughout the route.



FLEXIBLE & VARIED

"The CVG is a combination of off-road paths and high quality on-street routes. Most sections are suitable for all kinds of walking and wheeling."

The CVG takes advantage of routes through parks and along a primary rail corridor; uses sidewalks and sidepaths throughout when needed for safety; and is innovative when going through the dense central city.

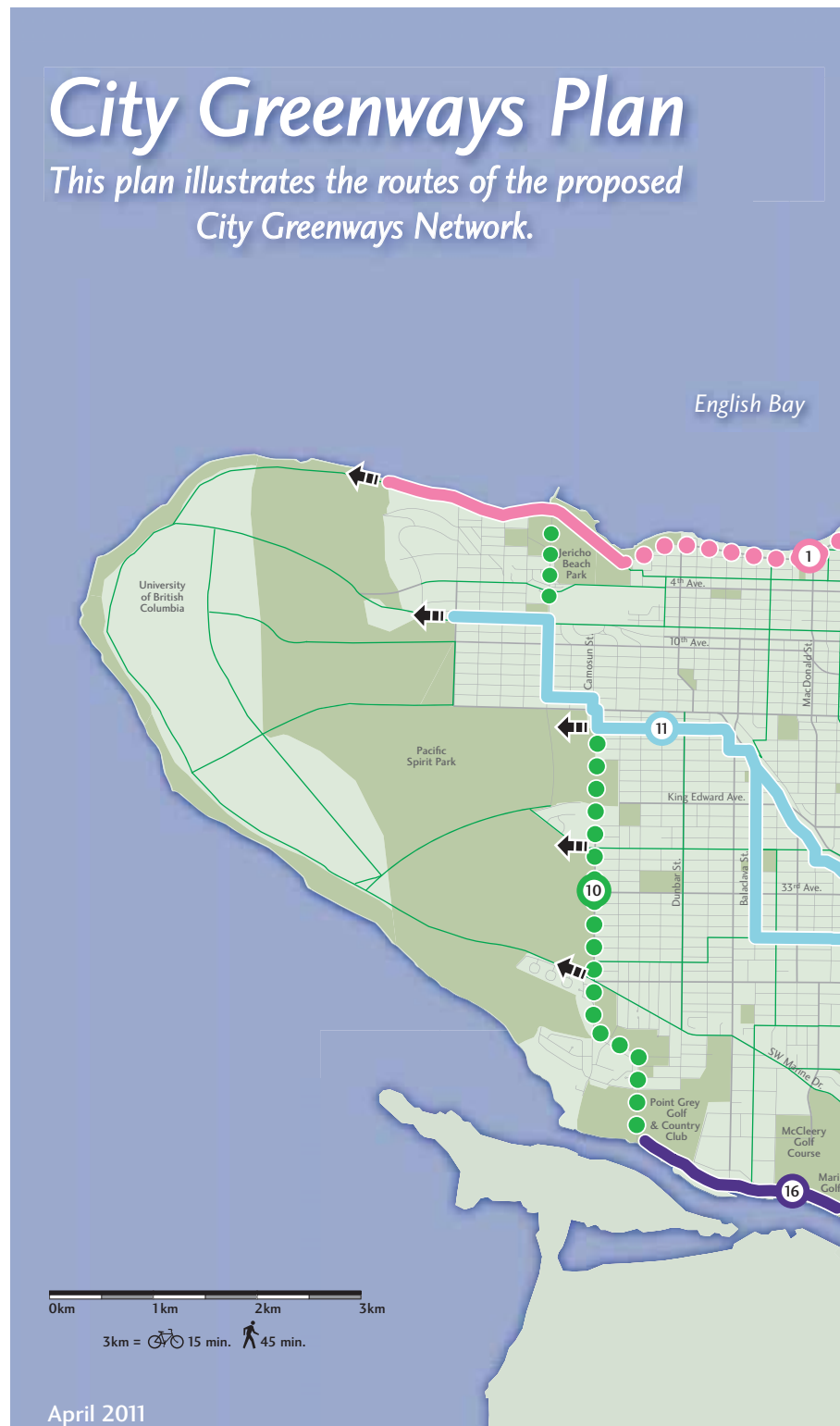
Source: City of Vancouver Greenways website



GC Best Practices: Vancouver's City Greenways Plan

This map of Vancouver's City Greenways presents a clear and clean vision for the routes of the proposed City Greenway system in Vancouver. There are 17 individual routes, each distinctly branded with its own color and name. 8 greenways are mostly are completely constructed, while 9 remain to be designed and built. Concentration of routes is heavy in downtown, and the spacing of routes is outside of downtown is even.

It was this map, more than any other greenway map example, that the Green Connections project drew inspiration from as we envisioned our own citywide network of Green Connector routes.





Vancouver

NEIGHBORHOOD GREENWAYS & GREEN STREETS

<http://vancouver.ca/engsvcs/streets/greenstreets/index.htm>

PROGRAMS



GREENWAYS & GREEN STREETS

Cedar Cottage Greenway



Manitoba & 14th Ave



Tupper Greenway



Kamloops & Charles



Renfrew Ravine Greenway



Garden & 11th



Windsor Greenway (Proposed)



Cambie & 14th



THE PROGRAMS

Vancouver's Neighborhood Greenways are much smaller-scale than City Greenways. There are "small-scale, local connections for pedestrians and cyclists that respond to a neighborhood's unique needs, linking parks, natural areas, historic sites, amenities and commercial streets. They provide opportunities to express the unique character of the neighborhood and often include public art. Projects are initiated by local residents and are seen as a partnership between the City and the community. The City provides assistance in the design, development and construction and the community is expected to take the lead and to maintain the space once completed."

Vancouver's Green Streets is likewise small in scale and scope. The program began as a pilot in 1994, and "encourages citizens to beautify their neighbourhoods by tending street gardens in traffic circles and corner bulges." Today there are over 350 Green Streets gardens cared for by volunteers.

Source: City of Vancouver Green Streets website

KEY ELEMENTS

- Like San Francisco's Pavement to Parks programs, the success of the programs is partly a function of the small size and scope of the projects, keeping both construction and maintenance manageable for a neighborhood.
- Citizen involvement is key to the success of both programs. The City of Vancouver expects the local community to cover the majority of costs, and do most of the work, taking care of these small public spaces.
- Green or LID features are incorporated into the designs as much as possible and as is feasible.

Vancouver Green Streets

CROWN ST SUSTAINABLE STREETSCAPE

<http://vancouver.ca/engsvcs/streets/design/crown.htm>

GREEN STREET



KEYS TO ITS SUCCESS

BOLD, VISIONARY THINKING

- Called "Canada's first sustainable street," the 2006 redesign of Crown St. turned a standard, crumbling street (left) into a model of sustainability that significantly calmed the street, efficiently managed stormwater, and even helped heal a nearby salmon stream.



MEANDERING NARROW STREET

- The "meandering lane" concept, breaking the long sight lines of a standard straight, was central to the traffic calming of Crown Street.
- Narrowing the road was crucial to the traffic calming elements of the street: The road was narrowed from the standard 28' to 21'. A center asphalt strip of 11'6" is bordered by 3' concrete strips and 2' of grass on each side.



GREEN THROUGHOUT

- Innovative stormwater management and green features are common throughout: Runoff is captured and treated by a network of swale and retention ponds. Pollutants are filtered by the vegetation and rainwater runoff permeates into the ground naturally.



Portland Neighborhood Greenways

<http://www.neighborhoodgreenways.org>

PLAN



GREENWAY EXAMPLES

Spokane



87th & Division



Holman



Going



THE PLAN

Formerly known as Bike Boulevards, Portland's Neighborhood Greenways are residential streets with low traffic volumes and low speeds that prioritize bicycles and pedestrians. Though they represent only 1% of Portland's overall roadway network, yet have proven popular "due to the level of comfort they provide, the mobility function they serve and their proximity to where people live and travel."

Source: Portland Bike Plan 2030, p. 42

Greenway Intersection



N Wabash



PLAN DETAILS:

Official Plan Name:	Part of Portland Bike Plan 2030
First Approved:	1973
Most Recent Update:	2010
Planned # of Routes:	16
Total Planned Miles:	286
Total Built Miles (2012):	30
Portion on street ROWs:	over 90%
Total Expected Cost:	\$38,540,000

PLAN GOALS:

- Reduce auto cut-through traffic
- Provide safer bicycling and pedestrian connections
- Reduce auto speeds
- Guide people on the route, help them get where they are going
- Provide more eyes on the street

Source: Portland Bureau of Transportation website

KEY DESIGN ELEMENTS

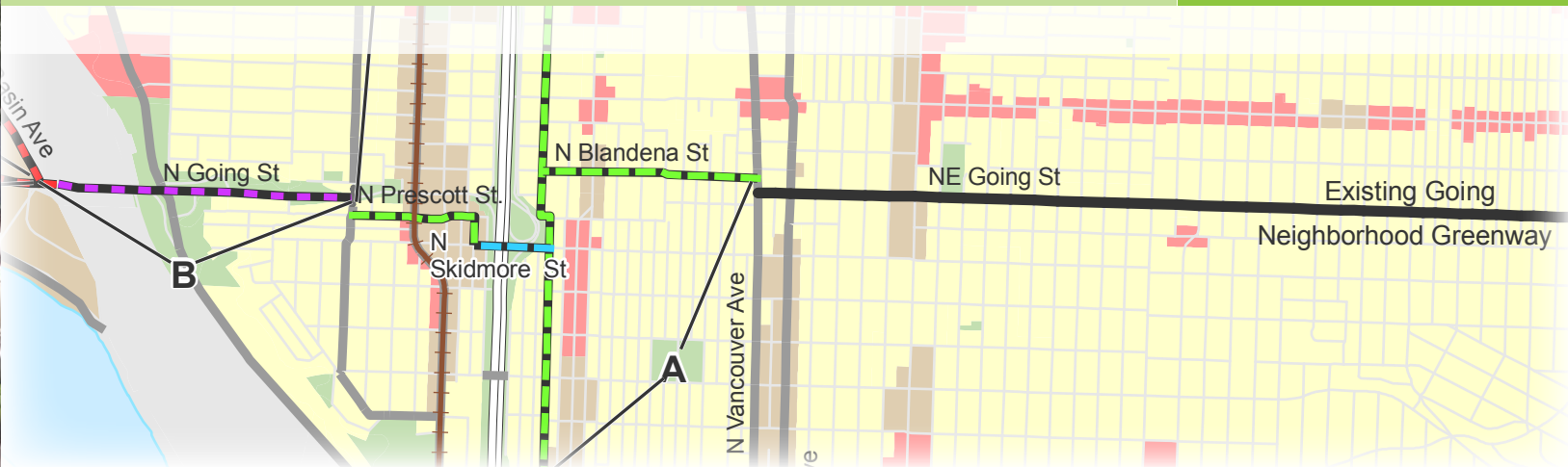
- Speed bumps slow auto traffic and traffic diverters minimize cut-through car traffic.
- Pavement markings alert people driving to expect people bicycling; improved crossings and curb ramps make pedestrian mobility easier and safer.
- Markings on the pavement and signage let you know where the Greenway goes and what's nearby, like parks and business districts.
- Portland does not seem to have a specific guiding plan for Neighborhood Greenways; rather, they are considered part of the overall transportation network, and, a sign that they continue to be associated with bike boulevards, are covered in the new Bike Plan 2030.

Portland Neighborhood Greenways

GOING/ALBERTA GREENWAY

<http://vancouver.ca/engsvcs/streets/greenways/city/central.htm>

GREENWAY



KEYS TO ITS SUCCESS

CALM AND SAFE

- Portland's marquee east-west Neighborhood Greenway is a calm and safe bike boulevard on which bikes and pedestrians coexist peacefully with vehicle traffic.



TARGETED DIVERSIONS

- Carefully-placed and gracefully designed vehicle traffic diversions route cars off the greenway at key intersections with a minimum of infrastructure and cost.
- Bikes are welcomed to continue on the route with clear signage.
- Access for emergency vehicles is maintained.



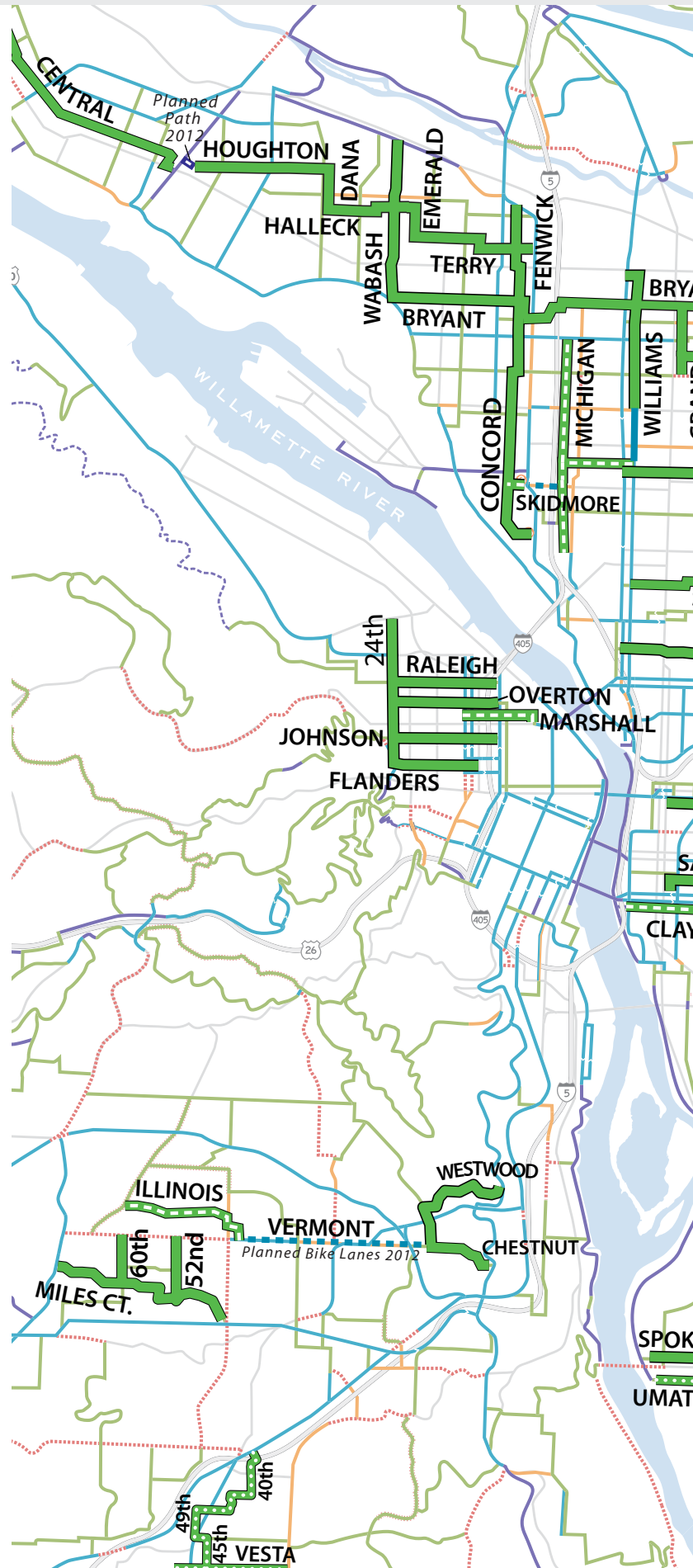
EXTRA-SAFE CYCLE TRACK

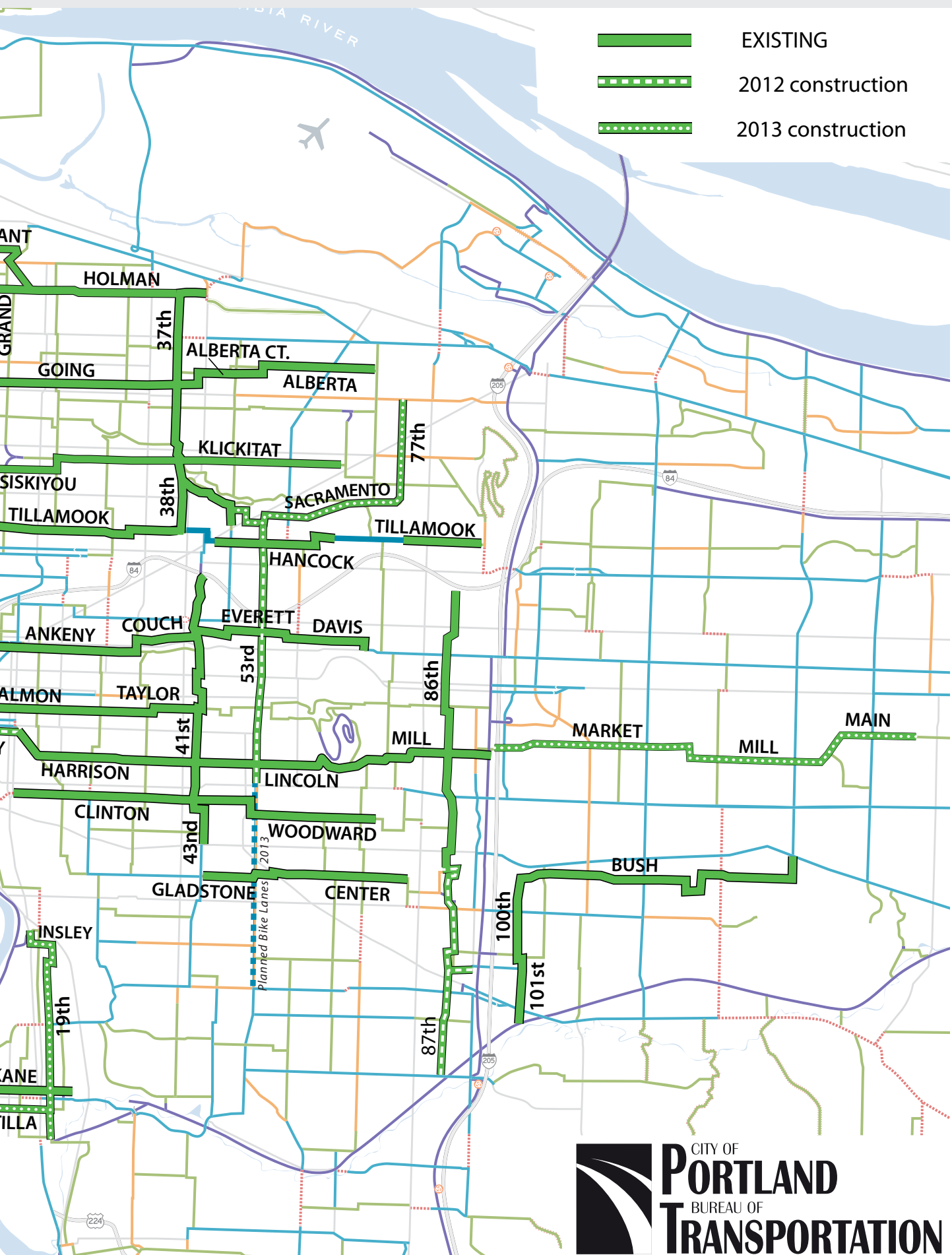
- On a short section of Going St. with particularly high traffic, a two-way cycle-track along the street was installed to ensure safety for bikes.
- Portland uses these short sections of two-way cycle-track on other Neighborhood Greenways where the route must jog on a street with heavy traffic before resuming on a quiet neighborhood street.



GC Best Practices: Portland's Neighborhood Greenways Map

This map of Portland's Neighborhood Greenways, from the Portland Bureau of Transportation (PBOT), won't win any design awards for beauty or presentation, and, on its own, presents a somewhat disjointed view of the city's neighborhood greenway network. But when considered as part of Portland's long-term vision for bikeways throughout the city, part of its Bike 2030 Master Plan (map on next page), it becomes more clear that Portland will be devoting considerable time and resources building out its neighborhood greenway network across town.

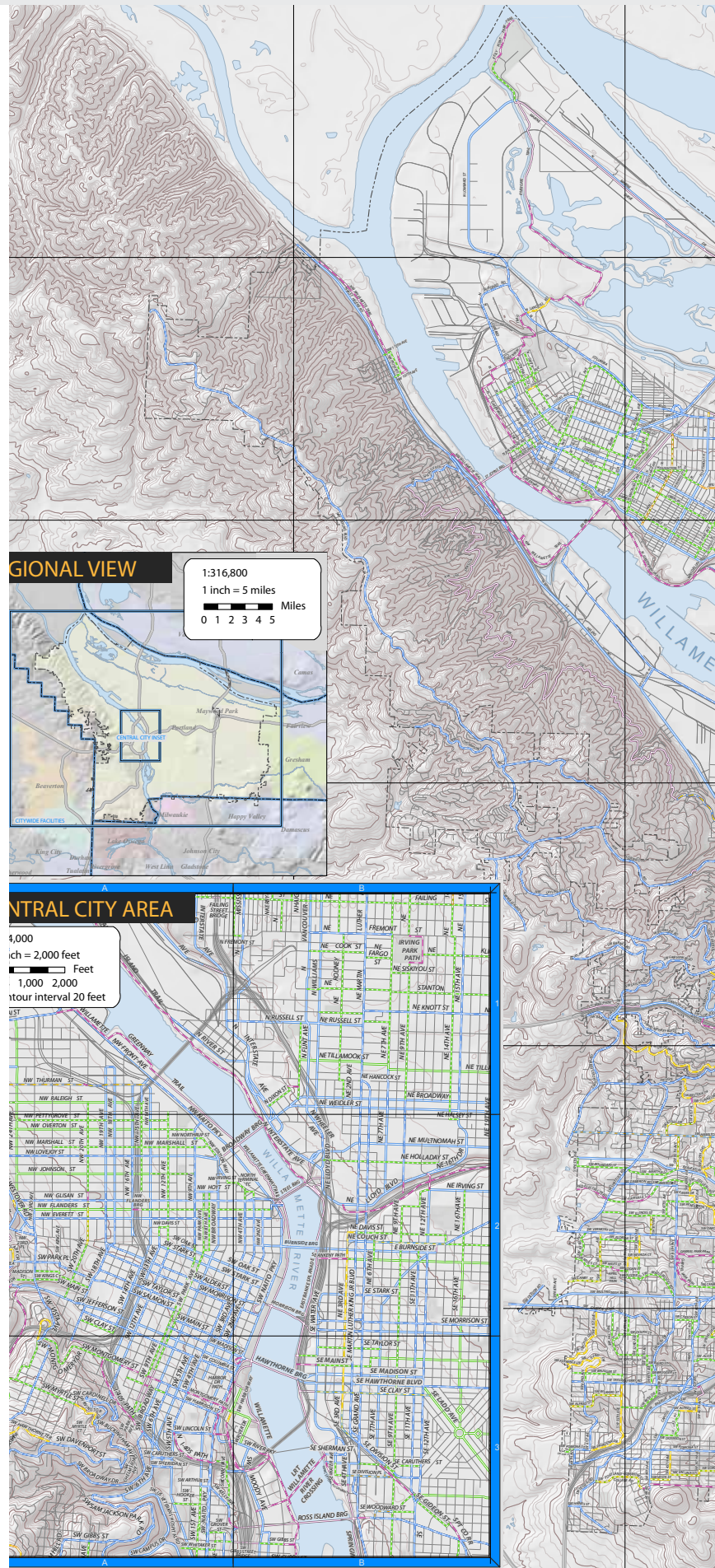




GC Best Practices:

City of Portland Recommended Bikeway Network Map (from Portland's Bike Plan 2030)

This vision map of Portland's recommended bikeway network for 2030, the visual representation of the policies and goals set forth in Portland's Bicycle Plan for 2030, presents a clear and compelling vision for a world-class bike future. To the 309 miles of existing bike facilities this plan would add 681 miles, for nearly 1,000 miles of bike facilities. In its hierarchical ranking of facilities, it puts priority on trails and bikeways that are separated from car traffic, but neighborhood greenways (still called bike boulevards here) are also emphasized, and would make up 30% of the network, with 256 miles planned to be added to the 30 miles existing today.



City of Portland Recommended Bikeway Network

AS ADOPTED
FEBRUARY 11, 2010

EXISTING, FUNDED, OR SUGGESTED BICYCLE FACILITIES

Trails

- Existing or funded trail
- Future trail

Separated in-roadway bikeways (bike lanes, buffered bike lanes, cycle tracks)

- Existing or funded bike lane or separated in-roadway
- Future separated in-roadway
- Future separated in-roadway or enhanced shared roadway
- Future separated in-roadway or advisory bike lane
- Future separated in-roadway, advisory bike lane, or enhanced shared roadway

Bicycle boulevards / advisory bike lanes

- Existing or funded bicycle boulevard
- Future bicycle boulevard
- Future advisory bike lane (suggested)
- Future enhanced shared roadway or advisory bike lane
- Future bicycle boulevard or advisory bike lane

Enhanced shared roadways

- Funded enhanced shared roadway
- Future enhanced shared roadway
- Future bicycle boulevard or enhanced shared roadway

For facility descriptions, please see Appendix G, Glossary, of the Portland Bicycle Plan for 2030.

1:43,200
1 inch = 3,600 feet
0 0.5 1 Miles
Contour interval 20 feet

Portland Bicycle Plan for 2030

Potential alignments for proposed projects are conceptual until detailed project development work is conducted. Any suggested bicycle facilities recommended for roadways over which the Portland Bureau of Transportation is not the Road Authority, or on lands not directly controlled by the Portland Bureau of Transportation, must first meet approval of the appropriate Road Authority or managing authority before the proposed facilities can be developed. Suggested facility types that are innovative treatments must be demonstrated prior to implementation.



Basemap data layers, including the hillshade, USGS contours, detailed waterbodies, city and county boundaries, parks, and freeways are from the Metro RLIS data layers, www.oregonmetro.gov

Portland Green Streets

<http://www.portlandonline.com/bes/index.cfm?c=44407>

PROGRAM



GREEN STREETS EXAMPLES

Westmoreland



Ankeny



SE Clay (Proposed)



New Columbia



THE PROGRAM

Portland's Green Streets program is complementary to its Neighborhood Greenways, but with a focus on stormwater management. A "green connector" role is acknowledged, but Green Streets are primarily designed to help manage stormwater and capture pollutant runoff. Portland's Green Streets "transform impervious street surfaces into landscaped green spaces that capture stormwater runoff and let water soak into the ground as plants and soil filter pollutants. Green Streets convert stormwater from a waste directed into a pipe, to a resource that replenishes groundwater supplies. They also create attractive streetscapes and urban green spaces, provide natural habitat, and help connect neighborhoods, schools, parks, and business districts." They are often, but not always, community-initiated. A 2007 Green Streets policy guides development.

Source: Portland Bureau of Environmental Services website

PROGRAM GOALS:

- Reduce polluted stormwater entering Portland's rivers and streams
- Improve pedestrian and bicycle safety
- Divert stormwater from the sewer system and reduce basement flooding, sewer backups and combined sewer overflows (CSOs) to the Willamette River;
- Reduce impervious surface so stormwater can infiltrate to re-charge groundwater and surface water;
- Increase urban green space;
- Improve air quality and reduce air temperatures;
- Reduce demand on the city's sewer collection system and the cost of constructing expensive pipe systems;
- Address requirements of federal and state regulations to protect public health and restore and protect watershed health; and
- Increase opportunities for industry professionals.

Source: Portland Bureau of Environmental Services website

KEY ELEMENTS

- Green Streets have a primary stormwater management function, using plants and soil to slow, filter, and cleanse stormwater from streets.
- Green Streets are prioritized for improvements where there is a need to reduce or remove stormwater runoff flowing to the sewer system, protect water quality in nearby streams and rivers, improve pedestrian and bicycle safety and protect properties from sewer backup.
- Stormwater curb extensions are the most common tool used, but raingardens and stormwater street planters are also used.
- Several of Portland's Green Streets are considered models, including SW 12th St. and SE Siskiyou.

Portland Green Streets

SW 12th St &

NE Siskiyou St

<http://www.portlandonline.com/bes/index.cfm?c=44407>

GREEN STREETS



KEYS TO THEIR SUCCESS

GRACEFUL DESIGN

- SW 12th St. and NE Siskiyou St. have both been carefully, gracefully designed to fit their context - a more urban context in the case of SW 12th, and a more neighborhood context for NE Siskiyou St.



SERIOUS ABOUT STORMWATER

- Like all of Portland Green Streets, SW 12th and NE Siskiyou are not just pretty and green, they're careful managers of stormwater, helping absorb pollutant runoff and minimize impacts to the neighborhood stormwater system.
- Curb notches are key, and sometime require treatments such as metal plates over drains for pedestrian access.



EDUCATIONAL

- Both SW 12th St. and NE Siskiyou St. are used to help educate the public about the stormwater benefits of Green Streets.
- Clear signage is critical for this educational role.
- Both have served as model Green Streets for other Portland streets and other cities.



Seattle Neighborhood Greenways

<http://www.seattle.gov/transportation/greenways.htm>

PROGRAM



EXAMPLE: WALLINGFORD PILOT

Signage



Green Lanes



Safer Crossings



Traffic Circles



SEATTLE NEIGHBORHOOD GREENWAYS TOOLKIT 2012

Connector Concept



Safer Crossings Concept



Street Concept



Park Connections Concept



THE PROGRAM

Seattle's Neighborhood Greenways program is brand new - in both concept and in planning. Just one Greenway has been implemented as of June, 2012, with a handful more planned. Seattle Greenways, a non-profit (<http://seattlegreenways.org/>), recently formed to encourage more Neighborhood Greenways throughout Seattle. The recently released Seattle Neighborhood Greenways Toolkit 2012 (**below left**) provides a visionary guiding foundation on which to build their new program.

Neighborhood greenways in Seattle are defined as "routes on non-arterial streets that are optimized for safe, family-friendly bicycle and pedestrian travel, and are usually designed for reduced vehicle speeds and volumes." Greenways are intended to provide access to schools, parks, businesses and low-stress, family-friendly streets. "Greenways provide easy access to open space and have many park-like functions that can be very climate-friendly. Planting trees, public art, rain gardens, planting gardens of all kinds along... Greenways are an integral part of evolving our streets to be pleasant places to bike and walk along."

Source: Seattle Neighborhood Greenways website

KEY ELEMENTS

- Signs and pavement legends
- Spot pavement repairs
- Crossing improvements
- Improved landscaping at some traffic circles
- Limited parking restrictions at traffic circles
- Median island with access changes

Seattle Green Streets

http://www.seattle.gov/transportation/rowmanual/manual/6_1.asp

GUIDELINES



GREEN STREETS EXAMPLES

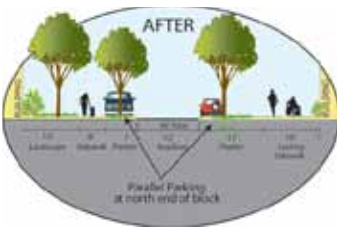
Cedar



Maynard



Terry (Proposed)



Vine St. Steps



THE GUIDELINES

As in Vancouver and Portland, Seattle's Green Streets are focused on stormwater management. Their Green Streets streetscape guidelines are technically composed of two distinct types of green streets, Neighborhood Green Streets and (downtown) Green Streets, but they amount to the same thing, just with different applications for their different places. A Seattle Green Street is defined as a "street right-of-way that, through a variety of design and operational treatments, gives priority to pedestrian circulation and open space over other transportation uses...[through] sidewalk widening, landscaping, traffic calming, and other pedestrian-oriented features." Green Streets "enhance and expand public open space, and reinforce desired land use and transportation patterns on appropriate City street rights-of-way."

Source: Seattle Right-of-way Improvements Manual, Section 6.21

KEY ELEMENTS

- Green Streets are "designated on a number of non-arterial streets within Downtown Seattle."
- "Landscaping, historic character elements, traffic calming, and other unique features distinguish Green Streets from other Street Types. Each Green Street has its own unique character and design."
- Green Streets are "designed to emphasize pedestrian amenities and landscaping in areas that have dense, residential land uses."
- "The street right-of-way dimensions can vary significantly from street to street and from segment to segment."

Source: Seattle Right-of-way Improvements Manual, Section 4.21g

GOALS

- Enhance pedestrian circulation and create open space opportunities in medium to high density residential areas lacking adequate public open space.
- Create a vibrant pedestrian environment in the street right-of-way that attracts pedestrians.
- Strengthen connections between residential enclaves and other Downtown amenities by improving the streetscape for pedestrians, bicycles and transit patrons.
- Support economic activity in Downtown neighborhoods by creating an attractive and welcoming "front door" for pedestrians.
- Maximize opportunities for trees and other landscaping to create a high quality open space.

Source: Seattle Right-of-way Improvements Manual, Section 6.21

Seattle Street Edge Alternatives (SEA) Streets

http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/GreenStormwaterInfrastructure/NaturalDrainageProjects/StreetEdgeAlternatives/index.htm

PROGRAM



SEA STREETS EXAMPLES

Broadview Green Grid



Ballard Rain Garden

Pinehurst Green Grid



110th & Cascade



KEY ELEMENTS Source: Seattle Public Utilities website

Drainage

Reduce impervious surfaces by narrowing the road; create more space for plants and soil to absorb rain water; control flooding and move stormwater away from the roadway.

Water Quality

Utilize a combination of soils and plants to filter rain water and allow it to seep into the ground as it washes off the roadway and parking spaces.

Landscaping

Use natural materials—plants and soils—to slow, filter, and infiltrate stormwater runoff... all within the space of the public right-of-way.

THE PROGRAM

Seattle's Street Edge Alternatives (SEA) are among the more significant stormwater management interventions and street redesign projects to be found in North America. The initial pilot street showcased a range of unique drainage and street design innovations. A completely new project for all involved, it tested the city's ability to implement creative projects of this nature and size. The street was "designed to provide drainage that more closely mimics the natural landscape prior to development than traditional piped systems." Significantly reducing impervious runoff was a major goal, and indeed the new street "reduced impervious surfaces to 11 percent less than a traditional street." The project was closely monitored and followed and after years, showed that "SEA Street has reduced the total volume of stormwater leaving the street by 99 percent.

Source: Seattle Public Utilities website

Mobility

Calm traffic by narrowing and curving the roadway; provide adequate parking for residents and guests; ensure safe access for emergency vehicles, bicycles, and pedestrians.

Community

Bring life to the street by constructing sidewalks, gardening with neighbors, and promoting watershed stewardship.

Education

Set an example for future alternative streets projects; monitor changes in water quality and drainage; share ideas with watershed neighbors and other cities.

Seattle SEA Streets

SEA Street Pilot

& High Point

http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/GreenStormwaterInfrastructure/NaturalDrainageProjects/StreetEdgeAlternatives/index.htm

"SEA" STREETS



KEYS TO THEIR SUCCESS

BOLD & VISIONARY

- Seattle's SEA Street pilot is similar to Vancouver's Crown Street, most evidently its curving, narrow, green look. Seattle has also ventured into new territory with an entirely green mixed-use (half affordable) housing project at High Point, a model sustainable development that has won Seattle Housing Authority numerous awards.



CALM AND SAFE FOR ALL

- Again like Vancouver's Crown Street, Seattle's SEA pilot (and other subsequent SEA streets) are narrow, curving streets that are designed to calm traffic and keep the street safe.
- Designed to encourage "social interaction and physical activity. High Point's narrow streets, short blocks and wide planting strips promote walking, decreasing reliance on cars."

Source: Seattle Housing Authority website



SERIOUS GREEN FEATURES

- The entire High Point development uses the ground to filter stormwater.
- Both the SEA Street pilot and High Point were intended to serve as models for future development, and to educate the public about the stormwater benefits of Green Streets.



New York City Greenways

<http://www.nycgovparks.org/facilities/bikeways>

PLAN



GREENWAY EXAMPLES

Pelham Bay Parkway Greenway Shore Greenway



East River Greenway



Kent Ave Bikeway



THE PLAN

New York City's 1993 Greenways Master Plan envisioned the "nation's most ambitious urban greenway system -- 350 miles of landscaped bicycle and pedestrian paths crisscrossing New York City." It called for an intensive "multi-year effort to create new public recreational opportunities, increase the mobility of cyclists, walkers, and joggers, and enrich the lives of all New Yorkers. The plan builds on New York's substantial legacy of greenways, which were part of every era of open space development in the city." NYC defines a greenway as a "linear open space, such as a path or trail, which links parks and communities around the City, providing public access to green spaces and the waterfront. Greenways expand recreational opportunities for walking, jogging, biking, and in-line skating."

Source: New York City Department of City Planning website

PRIORITY ROUTES KEY ELEMENTS

- Potential for completing a system now substantially in place, or part of a long-distance trail.
- Corridors with roadway congestion or air quality problems where moving people from cars and taxis to bicycles or walking could make a significant difference.
- Potential for a high volume of use because of proximity to major employment, cultural or educational centers, or to regional parks.
- Geographic balance throughout the city.
- Relatively low cost to establish (e.g., acquisition not required), or the cost-to-use ratio is relatively low.

Source: New York City Department of City Planning website

PLAN DETAILS:

Official Plan Name:	Greenway Plan for NYC (part of NYC Bike Plan 1996)
First Approved:	1993
Most Recent Update:	None to date
Planned # of Routes:	49
Total Planned Miles:	350
Total Built Miles (2012):	91
Total Expected Cost:	\$61.2 million (1993 dollars)

NYC GREENWAYS SINCE 1993:

There has not been an update of the Greenways Plan; rather, much of what was proposed has been folded into the Bicycle Plan, or into individual plans such as those for the Prospect Park-Ocean Parkway, Queens East River and North Shore, and Hudson River Greenways.

New York City Greenways

Hudson River Greenway

<http://www.nyc.gov/html/dcp/html/mwg/mwghome.shtml>

GREENWAY



KEY TO ITS SUCCESS

CONTINUOUS & WELL-USED

- Also called the Manhattan Waterfront Greenway, the Hudson River Greenway is the most heavily-used bikeway in America. It is also the longest continuous greenway on Manhattan, some 32 miles long, and it is now continuous and largely complete.



CAREFUL SEPARATION

- Located beside a busy and wide city highways, the Greenway, crucially, is almost entirely separated from car traffic. Whenever possible, faster bicycles are separated from pedestrians.
- Green medians and planters are used for separation, adding to the park-like feel.
- Where separation is not possible, there is clear signage.



SAFE CROSSINGS

- The Greenway has to deal with numerous crossings, including of some arterials, but all crossings have been carefully designed to maximize user safety.
- Paint, bollards, signage, cobblestones, lights, textured concrete, greening, speed tables... - every possible traffic calming device is used to help keep crossings safe for everyone.



Minneapolis National Scenic Byways

<http://www.minneapolis-parks.org/grandrounds/home.htm>

P L A N



BYWAY EXAMPLES

Minnehaha Parkway



Midtown Greenway



Cedar Lake Trail



West River Parkway



THE PLAN

Minnesota's remarkable network of urban trails, paths, and byways is perhaps the best urban trail network in the US. From trails along both sides of the Mississippi River to the Minnehaha Parkway to the trails around the Lakes to the new Midtown Greenway, Minneapolis points the way to a future where a real network of active transportation and recreation paths is possible. If Minneapolis lacks a lead role in pushing sustainable green streets, it may be because in many senses the city has already done this; its trails already link together its parks, and its trails are already lined with trees and open spaces. Minneapolis is new to bike boulevards and neighborhood greenways, defining the former as "local streets adjacent to minor arterials that are traffic calmed to give preference to bicycles," and the latter as streets that "have been closed to cars and are for bicycles and pedestrians only."

Source: Minneapolis Bike Plan 2011, p. 81

PLAN DETAILS:

Official Plan Name:	Bicycle Master Plan
First Approved:	1993
Most Recent Update:	2011
Planned # of Routes:	??
Total Planned Miles:	227
Total Built Miles (2012):	44 (+ 84 miles of trails)
Total Remaining Projects:	136
Total Expected Cost:	\$294 million

KEY RELATED PLAN:

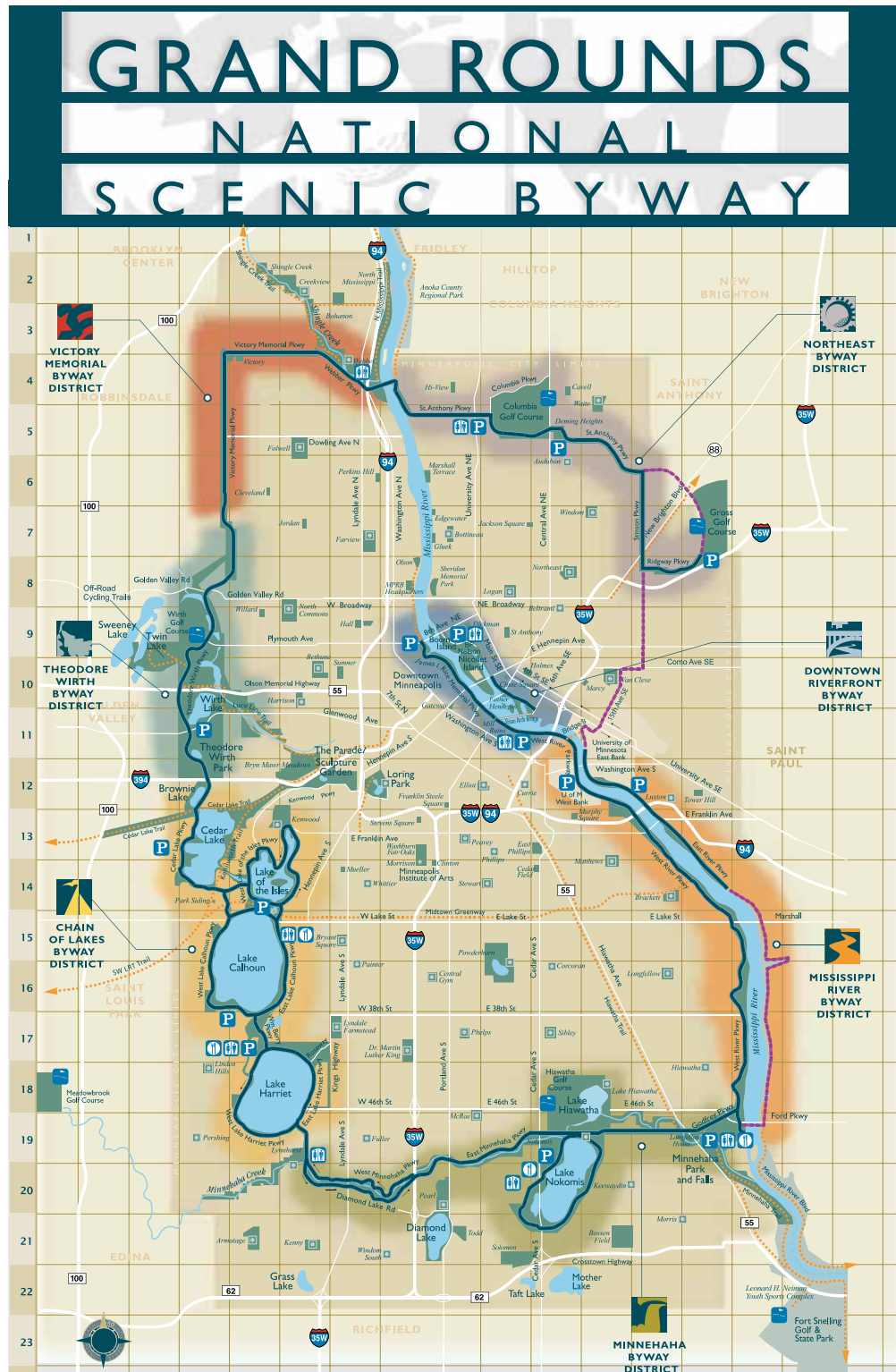
Minneapolis Parks & Rec's **Comprehensive Plan for 2007-2020** complements the Bicycle Master Plan with a vision and strategies for maintaining and improving the city's parks and trails.

KEY ELEMENTS

- Scandinavian-style separation between cars, bikes, and pedestrians wherever possible.
- Since 1883, when the Parks & Recreation Board was created to preserve and maintain parks, the city has a long legacy of parks acquisition and improvement.
- Primary control of the path network remains under the control of the Minneapolis Parks & Recreation Board.
- The network links together the city's key parks
- All-season, all-purpose use: trails are plowed throughout the snowy winter, or used for cross-country skiing.

GC Best Practices: Minneapolis's Ground Rounds Map

This map of Minneapolis's Ground Rounds National Scenic Byway shows the jewel of the city's extensive path, trail, and bikeway network, showcasing its lakes and its prime position along the upper Mississippi River.

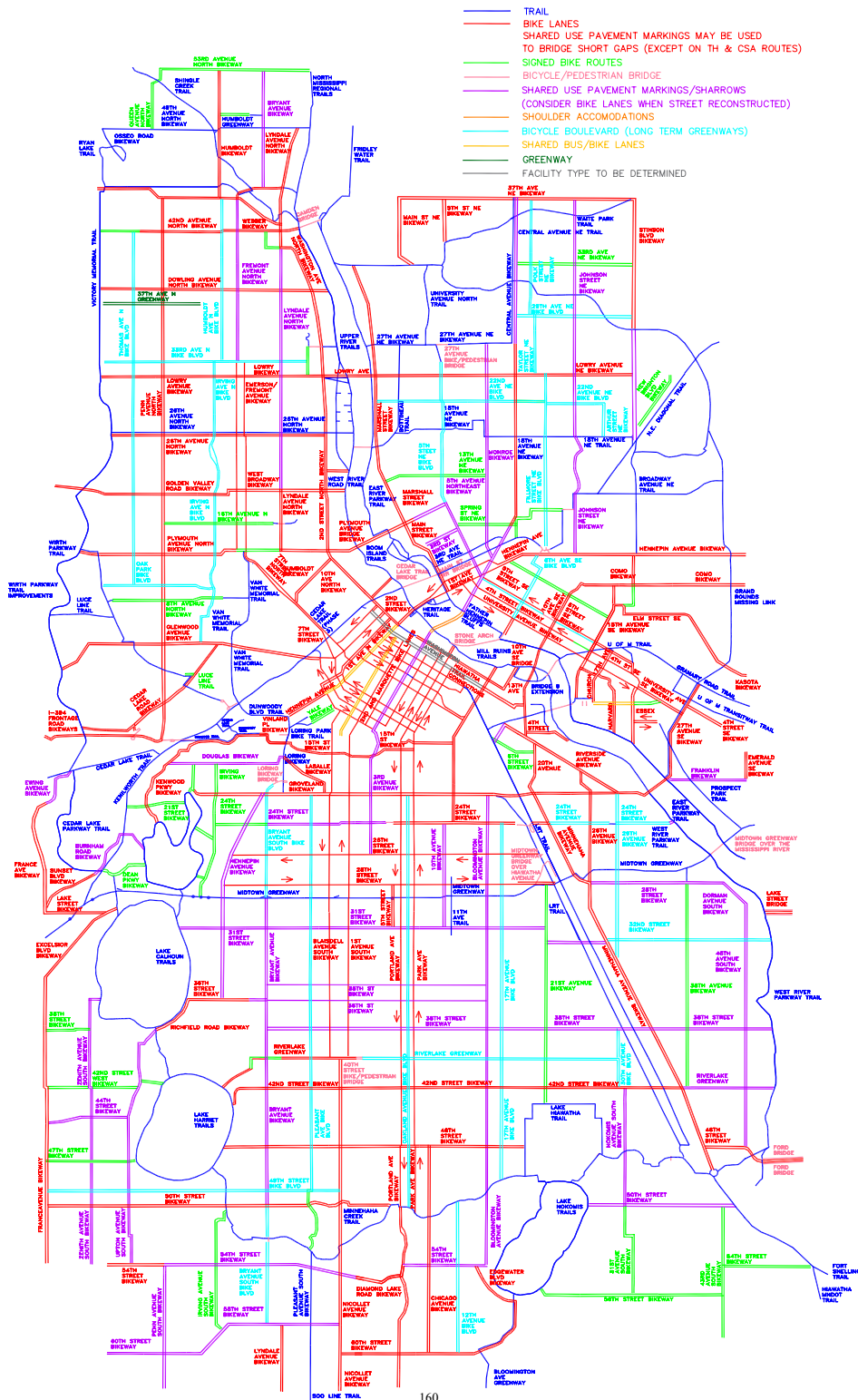


GC Best Practices:

Minneapolis's Bikeways (Master Plan) Map

This map of Minneapolis's existing and planned bikeways aims for an extensive and linked network of bikeways throughout the city. It does not emphasize separated trails and bikeways, and refers to its new bike boulevards as "Long Term Greenways."

Figure 7.7 - Bikeways Master Plan



Denver

Denver Moves Plan

<http://www.denvergov.org/bikeprogram/BicyclinginDenver/StreetsandTrails/Planning/tab-id/438250/Default.aspx>

PLAN



FACILITY EXAMPLES

Cherry Creek Trail



S. Platte River Trail



Bannock St. CycleTrack



Champa St. Protected Lane



THE PLAN

Denver's new active transportation plan, *Denver Moves*, is a forward-thinking effort to envision and plan for a completely integrated active transportation and recreation network. "Denver Moves expands the vision for the non-motorized transportation and recreation system in Denver, identifying the next phase of priorities for making bicycle and multi-use connections in the Mile High City. Denver Moves focuses on integrating the existing off-street and on-street networks to create safe, comfortable corridors that link neighborhoods, parks, employment centers, business districts, transit hubs, and other destinations in all parts of Denver." Few other US cities have gone as far as Denver in this kind of integrated effort, where there is no longer a single plan for bicycles, another for pedestrians, and yet another for trails.

Source: *Denver Moves* final plan, p. 4

PLAN DETAILS:

Official Plan Name:	Denver Moves
Released:	May, 2011
Total Planned Miles:	442
Total Built Miles (2011):	172
Portion on street ROWs:	70%
Portion of Bike Boulevards:	14% (currently 0%)
Total Expected Cost:	\$119,000,000

GOALS

- A biking and walking network where every household is within a quarter mile (5-minute walk or 2-minute bicycle ride) of a high ease of use facility.
- "Achieve a 15% bicycling and walking commute mode share by 2020."

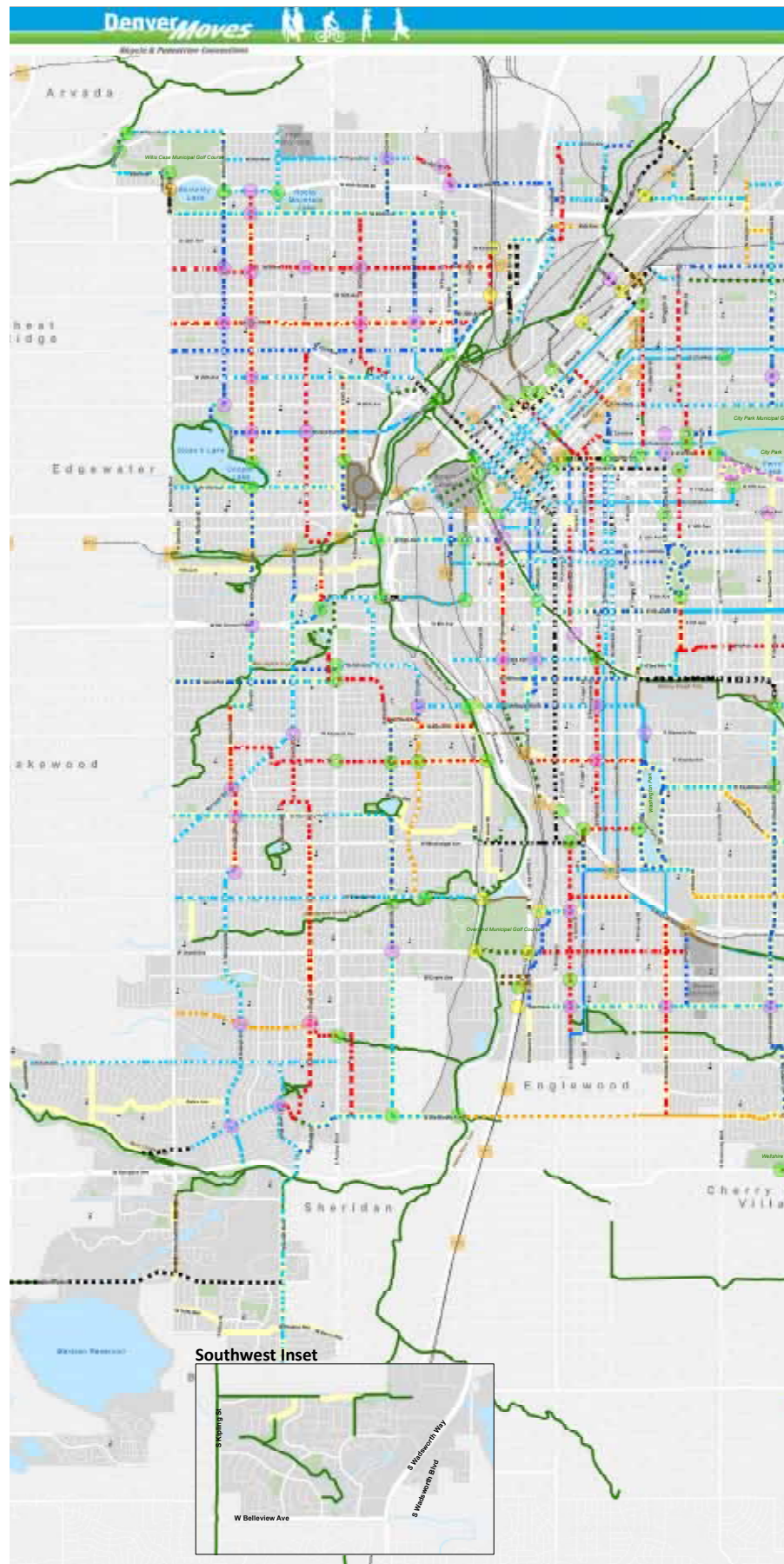
Source: *Denver Moves* final plan.

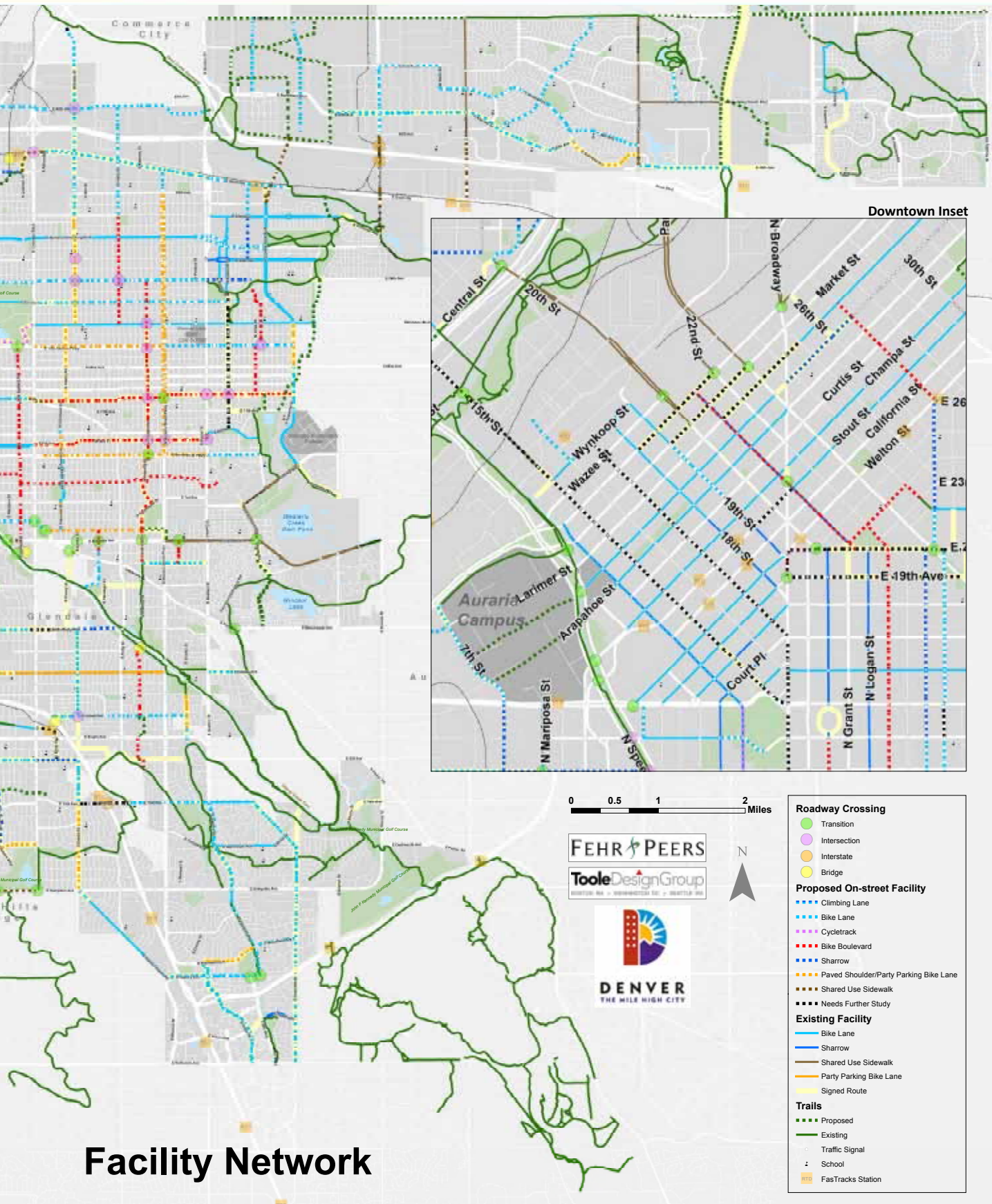
KEY ELEMENTS

- A complete integration of trails, bikeways, and paths. Key objectives were to:
 1. Create a new identity
 2. Build a simpler system
 3. Embrace innovative, practical ideas
 4. Include all users
- Denver's objectives necessitated some new or unusual kinds of facility typologies, such as "Heels and Wheels" trails and "Shared Use Sidewalks."
- Facilities are classified into 3 categories according to "Ease of Use" - Low, Moderate, and High - much like Colorado's ski resorts classify their slopes.

GC Best Practices: Denver Moves Network Map

This vision map of Denver's extensive planned active transportation network is complex, with some 14 different active transportation facilities represented. Denver already has and is planning for an even more extensive off-street trail network (visible as green lines), but these do not get highlighted or branded in any special way, and can escape notice. If one simply imagines all the different colors as being the same, however, it's not difficult to see that Denver's eventual built-out network will be a comprehensive and well-connected active transportation network to rival any other in the US - with a special focus on multi-use front-country trails.





Bike Boulevard

The diagram illustrates the design of a bicycle boulevard. It shows a street layout with a raised median that allows bicyclists to cross the arterial but prevents motorists from cutting through. The median is marked with green paint and white bollards. A green bicycle sign is placed at the intersection. A red octagonal stop sign is located at the end of the street. The photograph shows a real-world example of a bicycle boulevard in Portland, OR, with a cyclist riding on the street. The street is lined with trees and buildings, and a green bicycle sign is visible on the right side of the road.

GC Best Practices: Denver's Heels & Wheels Trails

This typology for what Denver calls its Heels & Wheels Trails, from *Denver Moves*, is a creative attempt to bring clarity to the design and use of multi-use trails.

Heels & Wheels Trail

Definition

Heel & Wheel trails are designed to minimize conflicts between different speed users to reduce conflicts in highly used segments of trail corridors. There are several construction, signage, and striping techniques available to reduce conflicts between different users.

Ease of Use

High. The comfort level for Heels & Wheels users will generally be high as the different users will be traveling within a shared lane with users of the same speed. The relative comfort will also vary substantially according to the width of the facility, signed regulations, and volumes.

Use

Heel & Wheels trails should provide additional capacity to trail segments that have poor Levels of Service (LOS) based on the Federal Highway Administration LOS calculations. Heels & Wheels trails are typically best accomplished by adding a parallel trail, adding to the current trail, or reconstructing the trail. Parallel trails can be constructed in hard or soft surfaces depending on the user types and demands.

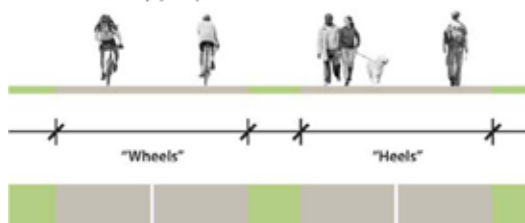
Design Considerations

Heels & Wheels should be designed to provide increased convenience for all trail users by minimizing conflicts between users with a speed differential of more than 10 MPH. Signage and ground markings should clearly identify where users should travel. Maximum and minimum speed limits should be posted, and where safety issues are identified, speed enforcement should be conducted.

The dimensions and posted speed limits of the Heels & Wheels sections will vary greatly based on user levels and physical constraints. A single-direction wheeled travel path should have a minimum width of 5 feet. A single direction heeled section should have a minimum width of 5 feet. A two-way wheeled path should have a minimum width of 12 feet. A two-way heeled section should have a minimum width of 8 feet.

Heel & Wheels trails are necessary where documented safety issues and user levels warrant such treatments. The design of the Heel & Wheel should be carefully considered to maximize the safety and user adherence to the intended trail user separation. A key design and construction consideration should be the speed of users.

A common Heels & Wheels section provides separation for bicycles and walkers/runners. In some instances, families riding bicycles at slower speeds, inline skaters, long boarders, parents pushing strollers, or mobility impaired persons using a mobility device are uncertain where to travel. It will be critical to understand the unique travel requirements of each user of the corridor (vehicle width, clearance, top speed, braking, etc.) and apply the most appropriate designations between users. To minimize conflicts and provide an uninterrupted experience for users, it will be critical to designate speeds that are appropriate for the trail users in the corridors under consideration for Heels & Wheels treatment.



Denver Examples

- Cherry Creek Trail (Downtown)



Cherry Creek Trail - Downtown



FACILITY EXAMPLES

Lakefront Trail



Berteau (future bike boulevard)



Burnham Greenway



Kinzie St. Separated Bikeway



THE PLAN

Chicago's Bike 2015 Plan was adopted in 2006, and is in the process of being updated to the Bike 2020 Plan. 500 miles of bikeways, including 10 miles of Bike Boulevards, were proposed in the 2015 Plan. As in Portland, Bike Boulevards have recently been re-branded as neighborhood greenways. The draft network map for the Bike 2020 Plan marks a major shift in focus, with plans for 60 miles of "bike superhighways," 320 miles of "crosstown bike routes," and 240 miles of "neighborhood bike routes," which they define as "shorter routes that connect to Crosstown Bikeways and provide access to local destinations such as parks, schools, transit, and neighborhood retail, as well as residential areas." Chicago's first Neighborhood Greenway, on Berteau Avenue, is scheduled for completion in summer 2012.

Source: Chicago Streets for Cycling 2020 website

PLAN DETAILS:

Official Plan Name:	Bike 2015 Plan
First Approved:	1992
Most Recent Update:	2006 (2020 update in process)
Total Planned Miles:	500 (incl. 240 mi. of signed routes)
Total Built Miles (2012):	170 (+155 mi. of signed routes)
Portion on street ROWs:	33% now, 13% in 2015

GOALS

Increase bicycle use, so that 5% of all trips less than 5 miles are by bike.
Reduce the number of injuries by 50% from current levels.

KEY RELATED PLANS:

Chicago Trails Plan (2005) identifies 200 existing and proposed trails
NE Illinois Regional Trails & Greenways Plan (2009) proposed a system of 794 miles for Cook County, of which 294 were existing as of 2009.

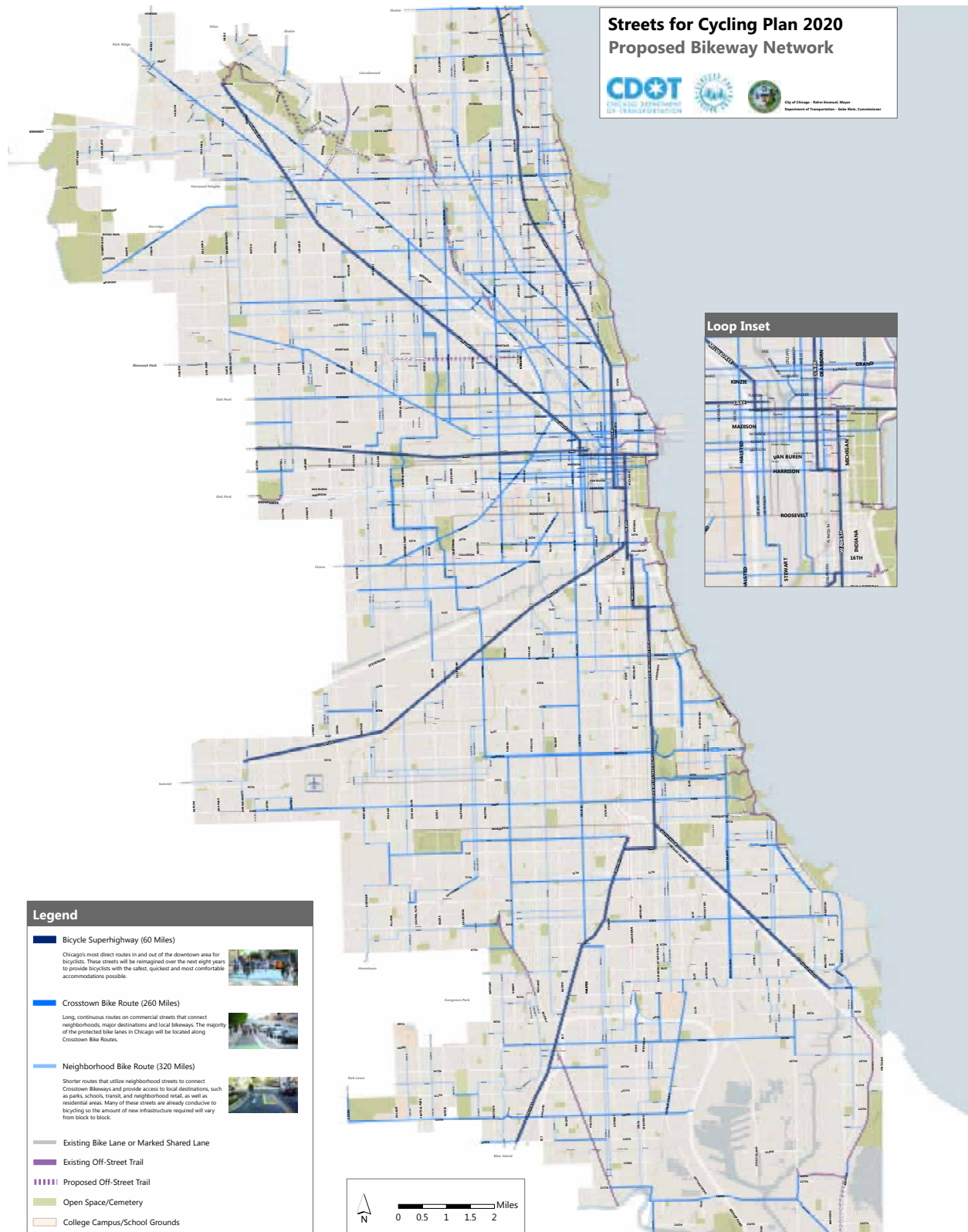
KEY ELEMENTS

- A radical re-envisioning of Chicago's Bike Plan is proposed for the 2020 version, with a whole new classification system of routes under consideration.
- Planning for Chicago's Bike Plan, along with planning for city or metropolitan trails planning (specific plans listed below left), all seem to be on parallel but separate tracks. Chicago's Trails & Greenways Plan does not consider on-street routes as greenways.
- There is not a green stormwater focus in the plans.
- Chicago is also planning for a "High-Line" type greenway on the Bloomingdale Rail Line.

GC Best Practices:

Chicago's Streets for Cycling Plan 2020

This Proposed Bikeway Network map, from *Chicago's Streets for Cycling Plan 2020*, sets out a bold new vision for a layered network of major bike routes (called Bicycle Superhighways) linked together with Crosstown and Neighborhood Bikeways.



Worldwide Best Practices

WORLDWIDE EXAMPLES

Amsterdam

This pathway runs alongside greened light rail tracks



Amsterdam

This separated brick pathway is a lovely route for all



Rotterdam

Lush greenery separates cars from bikes and pedestrians



Rotterdam

Clear signage and markings make clear who goes where



Utrecht

Bikeways are calm and safe for all even in the central city



Vienna

A center median multi-use pathway is green all around



Austria

This green street is pleasant, permeable, and safe



Holland

A classic neighborhood woonerf welcomes everyone



Global Best Practices

These pictures begin to show the range of designs being used today around the world to create safe, inviting, and green paths, greenways, shared streets, and green streets out of the public right-of-way. Western European countries with strong histories and traditions of bicycling like Holland and Denmark lead the way, but many other countries are trying out innovative designs of their own.

Paris

Many Paris boulevards are thick with green trees



Munich

This bikeway is separated from cars and pedestrians



Berlin

This route allows cars but prioritizes bikes and pedestrians



Berlin

This design separates bikes and pedestrians from cars



Florence

This design squeezes in bikes and peds in a narrow ROW



Florence

This design uses parked cars as intersection diverters

